An Analysis of the South African Tyre Manufacturing Industry's Skills Demand Profile: 2009 - 2020

Final Report

Compiled by
Justin Barnes (BA Hons, MSocSci, PhD [Natal]),
Jeanne Terreblanche (BCom Hons, MCom [Natal]), and
Sean Kirby (BSocSci, MDev [UKZN])

Benchmarking and Manufacturing Analysts SA (Pty) Ltd
For the New Tyre Chamber

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Unit 3 St Helier Office Park, Valdean Rd, Gillitts, 3610
PostNet Suite 10139, Private Bag X7005, Hillcrest, 3650
T: +27 (0) 31 764 6100, F: +27 (0) 86 607 4510,
www.bmanalysts.com

Foreword

This research report has been compiled for the New Tyre Chamber of the MerSETA, in response to its request for the completion of a sector report focusing on future employment and associated skills demands within the South African tyre manufacturing industry. Benchmarking and Manufacturing Analysts SA (Pty) Ltd (BMA), as the contracted research company, was responsible for the completion of the project and hence the content and production of this report.

In addition to the authors, BMA would like to acknowledge the contribution made by Ms Elaine Reddy to this research.

Whilst every care has been taken to ensure the accuracy and integrity of the data and analysis presented in this report, BMA and its staff members take no responsibility whatsoever for decisions derived from its content.

Contents

Acronyms

BMA	Benchmarking and Manufacturing Analysts
BA	Bachelor of Arts
BCom	Bachelor of Commerce
BSc	Bachelor of Science
BSocSci	Bachelor of Social Science
BTech	Bachelor of Technology
EU	European Union
GDP	Gross Domestic Product
HR	Human Resource
IR	Industrial Relations
MERCOSUR	Mercado Comun Del Sur – Common Market of South America
MVA	Manufacturing Value Add
NAFTA	North American Free Trade Area
NMMU	Nelson Mandela Metropolitan University
NTC	National Technical Certificate
SADC	Southern African Development Community

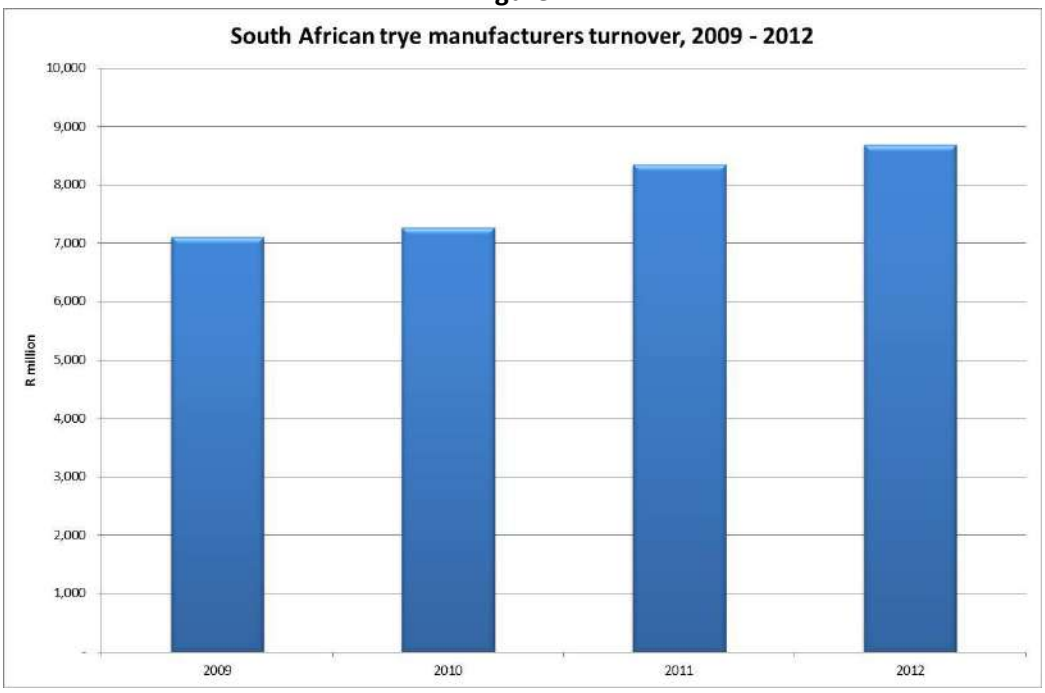
1. Introduction

1.1. The tyre manufacturing industry in South Africa

The tyre manufacturing industry forms part of the automotive assembly and component manufacturing industry in South Africa, a significant industry to the national economy, accounting for 6.8% of the country's 2011 GDP of R2,964.3 billion[1]. In the same year, South African tyre manufacturers contributed 4% of the automotive assembly and component industry's output with a total turnover of approximately R8.3 billion.

The tyre industry employs around 6,000 people between four multinational-owned corporations that operate six factories within South Africa: Apollo (formally Dunlop), Bridgestone, Continental and Goodyear. The six manufacturing facilities are concentrated in the Eastern Cape (Bridgestone, Continental and Goodyear have facilities in Port Elizabeth and Uitenhage), with Apollo operating facilities out of Kwazulu-Natal (Durban and Ladysmith), and Bridgestone also operating a plant in Brits in the Northwest Province.

Figure 1



The total turnover of the tyre manufacturing industry has grown consistently year-on-year from around R7.1 billion in 2009 to just below R8.7 billion in 2012 (Figure 1). This year-on-year growth has been maintained despite the industry being subjected to increasing competitiveness pressure from an influx of imported tyre brands, as well as allegations of dumping in the South African tyre market from China. The industry manufactures tyres for passenger, commercial,

[1] South African Automotive Week Visitors' Guide, 10 – 13 October 2012

agricultural, mining, construction and industrial vehicles and implements. Growth opportunities in the local market are reported to be limited as an outcome of modern tyre technologies that have resulted in extended lifespans for many modern tyres. Growth opportunities for the local tyre manufacturers are therefore heavily dependent on the growth in the vehicle market. This in turn leaves the local tyre industry heavily dependent on export market opportunities: either as a consignment of tyres, or fitted to vehicles, which are being assembled and exported from South Africa[2]. Table 1 shows the breakdown of tyre exports by destination between 2006 and 2011.

Table 1: Tyre exports by region, 2006 - 2011 (R million)

	2006	2007	2008	2009	2010	2011
Africa	367.40	593.10	596.80	615.40	583.40	685.60
EU	544.90	529.20	741.20	496.80	381.30	624.30
Mercosur	2.20	2.70	15.00	39.60	90.50	221.70
NAFTA	130.00	73.10	143.30	54.90	27.00	106.70
Total Exports	**1,044.50**	**1,198.10**	**1,496.30**	**1,206.70**	**1,082.20**	**1,638.30**

Source: SA Automotive Week Visitors' Guide, 2012

About 80 – 85% of the tyre manufacturing industry's turnover by value is consumed by the local market; whilst the balance of 15 – 20% is exported. The largest export destination is Africa accounting for more than 40% of exports with two-thirds of these exports going into the SADC market (R450 million in 2011). The second largest export destination is the EU accounting for 38% of exports in 2011, followed by Mercosur with 14%, and NAFTA with 7%. On the back of positive export growth and considering the current frailty of European vehicle markets, the strategic importance of the African continent as an export market is likely to increase. A key question, of course, is whether South Africa's tyre manufacturers benefit from this opportunity, or whether the opportunity is exploited by tyre manufacturers located either in other parts of Africa, or internationally (most likely in Asia).

1.2. The importance of the New Tyre Chamber skills demand survey

Given the above context, this report examines the results from a detailed firm-level research study that objectively identified the skills profile of the four tyre manufacturers within the New Tyre Chamber, as well as its associated present and future skills supply requirements. Firm-level data for the period 2009 to 2012 was used to compile a detailed review of the current employment position at the New Tyre Chamber firms. In addition, based on the evolutionary path followed over the period 2009 to 2012, three skills demand (and supply) scenarios for the New Tyre Chamber firms were extrapolated for the next three (2015), five (2017) and eight years (2020) respectively. These three scenarios were then modeled over three different possible growth trends: maintenance of present trends (i.e. keeping the trend from 2009 to 2012 constant), an associated low growth projection, and an associated high growth projection.

[2] South African Tyre Recycling Process (SATRP) Company, www.rubbersa.com

Provided the New Tyre Chamber of the MerSETA is satisfied with the quality of the analysis completed in this part of the research, BMA will proceed to the second phase of the project. The second phase will focus on the conversion of the model presented in this document into a simple to use software program that the New Tyre Chamber can use on an on-going basis to accurately monitor the skills demand profile of the tyre manufacturing industry, and to model evolving employment and associated skills demand scenarios on a real-time basis.

1.3. Report Structure

This report comprises two main sections. Following this introduction, Section 2 unpacks in detail the findings from the primary research undertaken. It provides a detailed overview of the industry and its high-level performance from 2009 to present. The section then provides a breakdown (based on 2011 data) of the industry's employment profile, highlighting where skills gaps are emerging. The qualifications required in each employment category and the ability to meet recruitment requirements and associated recruitment lead times is examined in this section.

Section 3 shifts the focus from past and present requirements to future requirements. Building on the employment profile developed in Section 2, this section extrapolates employment and skills demand forward using an excel model that estimates the employment demand profile of the South African tyre manufacturing industry for the next three (2015), five (2017) and eight (2020) years. This model is applied to three different growth scenarios: maintenance of current growth trends, a low growth scenario and a high growth scenario. The projected employment demand and skills required for each of these scenarios is provided. Sub-section 3.3 is particularly important insofar as it provides a detailed breakdown of exactly what qualifications will be required for each category of employee under the three different growth scenarios and ends with a recommendation of what qualifications the industry should be supporting at present in order to meet future requirements.

A short conclusion that focuses on the analytical implications of the findings generated completes the report. Before considering the various research findings, it is necessary to reflect on the research methodology employed for the study, as outlined below.

1.4. Research Methodology

The research methodology encompassed an interrogation of firm-level data as supplied by the four South African tyre manufacturers, as well as structured quantitatively based interviews completed over the period October to November 2012. A firm-level questionnaire and engagement methodology proposed by BMA was scrutinized at a New Tyre Chamber workshop in September 2012 before being finalized and administered at the four participating firms. The primary purpose of the questionnaire was to capture employment information by employee category, turnover rates, recruitment information and Manufacturing Value Added (MVA) over the last few years (2009 – present). All data received was reviewed and any queries were relayed back to firms to ensure that the data used for the study was as precise as possible. Any gaps in the data were reviewed and dealt with using statistical methods to predict the data as

accurately as possible. Wherever this was necessary, the predicted information is highlighted in the relevant section of the report. This part of the process provided BMA with a five plant dataset on which to build the excel model. It is important to note that on the recommendation from industry all expatriates and AATP learners were excluded from the final dataset as the inclusion of this information was unrealistically skewing the data.

The primary data collected was further substantiated through the completion of structured qualitative interviews that were conducted with human resource (HR) representatives from each of the four participating firms. The firm-level engagement methodology was used to unpack each company's HR strategy, address and understand any anomalies in the data provided, and discuss skills demand and supply issues, including recruitment and associated recruitment lead time challenges within priority employment categories.

Based on the information secured from the firm-level questionnaire and firm-level engagement process, BMA developed an excel-based estimation model that unpacks the evolution of the firms' skills demand over the 2009 to 2012 period. This model was then used to predict future employment demand requirements to 2020. The findings from this process were then included in a draft report and examined with firm-level representatives of the New Tyre Chamber at a half-day workshop held in Port Elizabeth on the 22nd of November 2012. Based on inputs received from industry representatives some fine tuning of the methodology was undertaken and the draft report amended. The findings presented in this final report represent the outcome of applying this methodology.

2. Overview of South African tyre manufacturers' present employee and associated skills profile

Using primary data collected from the firms that are part of the New Tyre Chamber, this section provides an aggregated overview of the firms' 2009-2012 trends, as well as a detailed breakdown of the industry's current employment breakdown.

In order to undertake this task, the following methodology was undertaken:

1. A firm-level questionnaire was crafted by BMA and workshopped with industry before being finalized including the inputs received from Chamber representatives. The final questionnaire administered can be found in **Appendix A**.

2. All data collected was reviewed and queries were relayed back to firm representatives to ensure that data was captured as accurately as possible. Where there were gaps in the data, the research team applied statistical methods to estimate the data as accurately as possible. Any estimated data used is highlighted and explained in the report. The total dataset is five plants (n=5 with), with one firm providing multiple datasets for multiple production facilities.

3. In addition to the primary data collected, firm-level interviews were conducted with representatives from each company. The engagement methodology used for these interviews can be found in **Appendix B**. The information obtained in these interviews was used to augment the data secured from the questionnaire.

4. The data presented in this section is thus the aggregate data secured from the primary research phase of the project, comprising the questionnaire, and information obtained during the firm-level interviews that were conducted.

2.1. Growth trends: 2009 – 2012

An index of turnover and Manufacturing Value Added (MVA) from 2009 to 2012[3] is provided in Figure 2 with 2009 representing the base year. Both turnover and MVA have shown overall positive growth for the period, although turnover growth exceeded that of MVA. Moreover, whilst there has consistently been positive turnover growth each year, there is a projected 2.7% decline in MVA between 2011 and 2012. On average for the period turnover has grown at a rate of 7.37% per annum, whilst MVA has grown at 5.14% per annum. MVA per person (Figure 3) is fairly consistent at around R465,000. The decline in 2010 is due to a large increase in employment (9%), accompanied by a comparatively small increase in MVA (2%). In 2012,

[3] The data for 2009 to 2011 is real, whilst the data for 2012 is the projected turnover and/or MVA for the year, as indicated by each of the surveyed firms.

employment remained almost constant whilst MVA growth was negative resulting in a decrease in MVA per person.

Figure 2

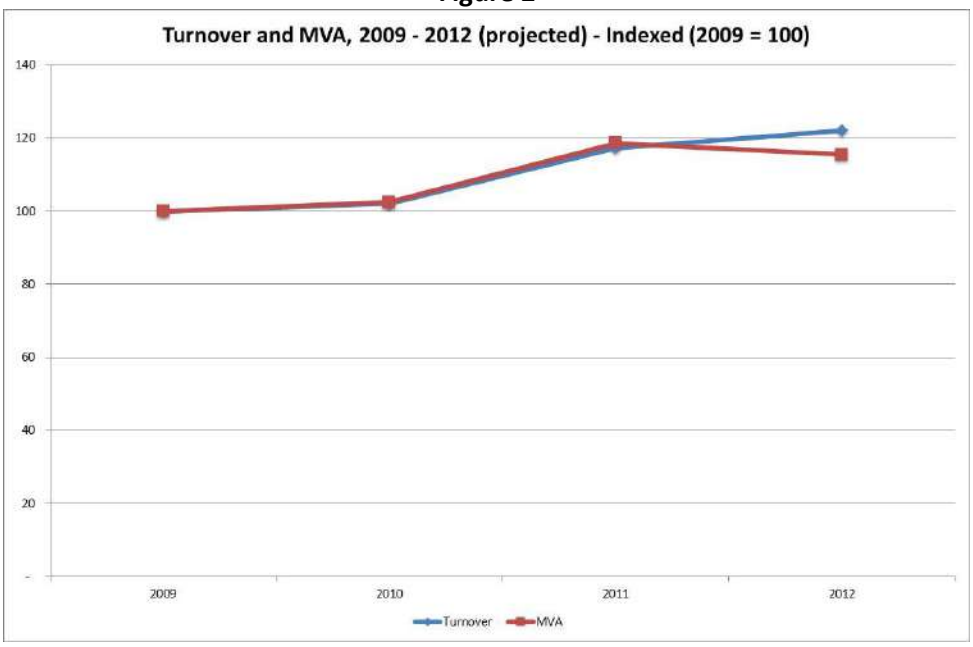
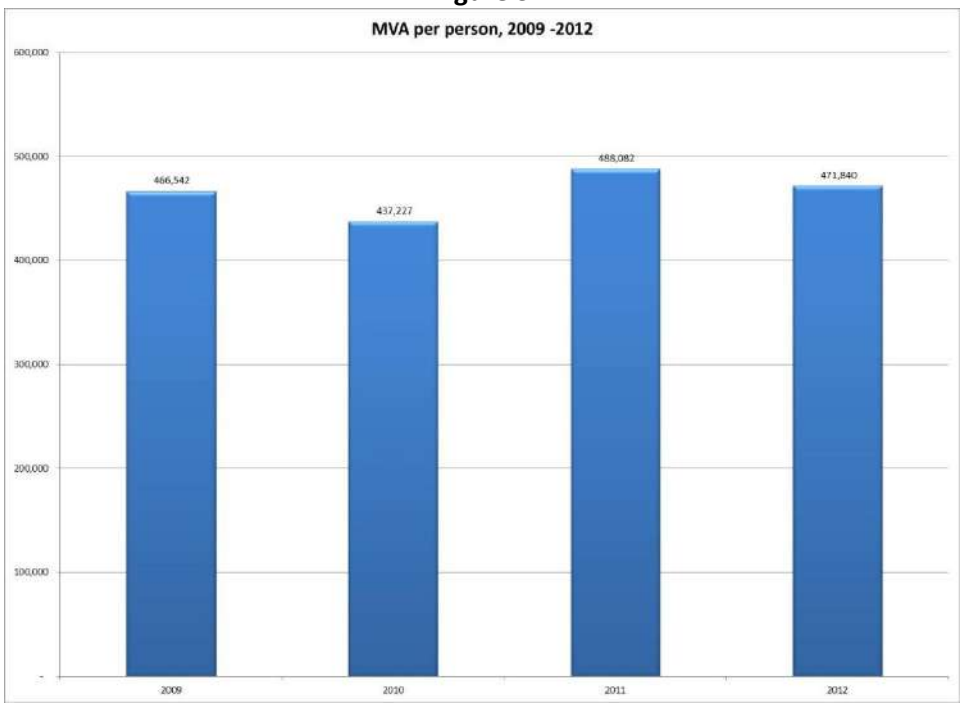


Figure 3



Growth in employment (Figure 4) has similarly been positive for the period under review with total employment increasing from 5,418 people employed by the firms surveyed in 2009 to 6,184 in 2012. This is an overall growth of 14.14% and an average of 4.71% per annum. It is

interesting to note that the rate of growth per annum has declined significantly over the studied period – 9.32% in 2010; 3.73% in 2011; and only 0.65% projected for 2012.

Figure 4

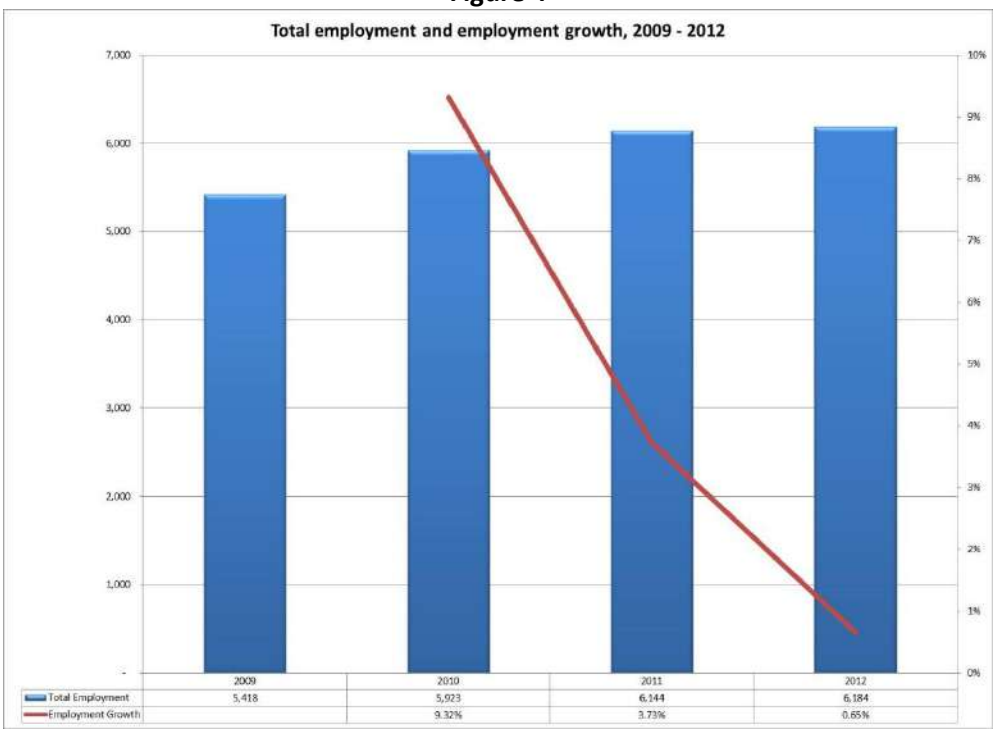
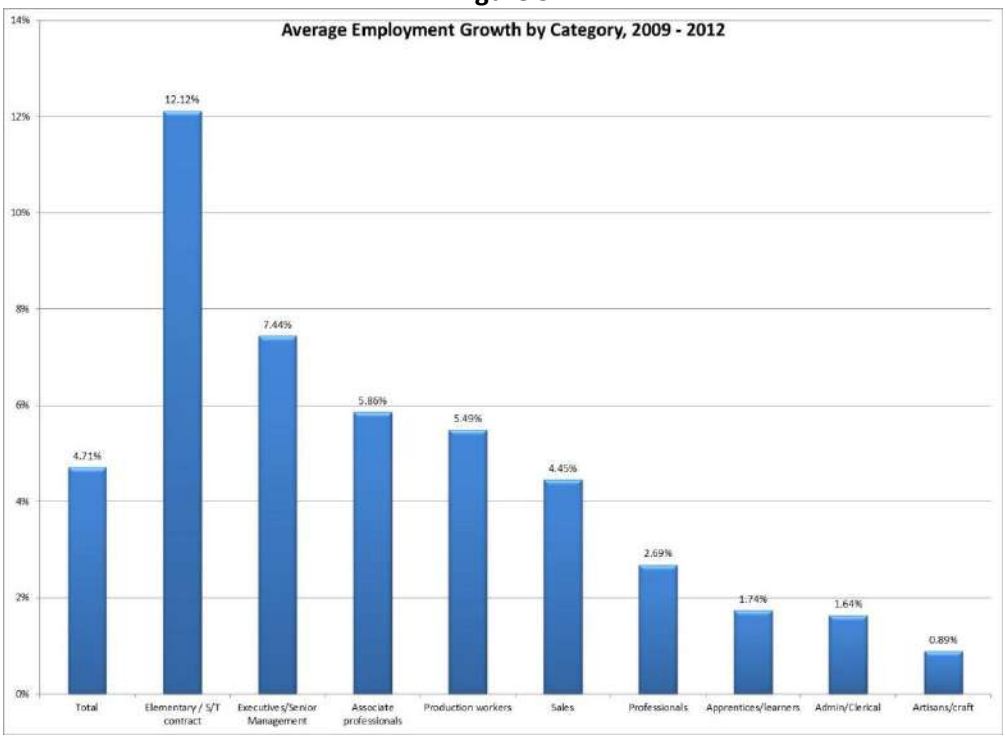


Figure 5



The average employment growth rate per annum by employment category shown in Figure 5 reveals that the highest average growth rate between 2009 and 2012 has been in the elementary/short-term contract category with a 12.12% growth per annum on average. This category is, however, significantly skewed by the number of employees (only 60 in 2012). The elementary/short-term contract category is followed by:

- Executives/senior management: 7.44%
- Associate professionals: 5.86%
- Production workers: 5.49%
- Sales: 4.45%
- Professionals: 2.69%
- Apprentices/learners: 1.74%
- Admin/clerical: 1.64%
- Artisans/craft: 0.89%

Table 2: Breakdown of employment by category, 2009 - 2012[4]

Category	2009	2010	2011	2012	2012 % of Total
Executives/Senior Management[5]	103	103	104	126	2.04%
Professionals[6]	273	268	289	295	4.77%
Associate professionals	489	580	559	575	9.30%
Sales	217	237	241	246	3.98%
Admin/Clerical	428	409	438	449	7.26%
Artisans/craft	411	387	435	422	6.82%
Apprentices/learners[7]	96	163	106	101	1.63%
Production workers	3,357	3,727	3,882	3,910	63.23%
Elementary / Short-term contract	44	49	90	60	0.97%
Total Employment	**5,418**	**5,923**	**6,144**	**6,184**	**100%**

Table 2 illustrates that production workers are by far the largest employment category accounting for more than 60% of total employment. The second largest employment category is associate professionals with 9% of the total, followed by administration/clerical staff with 7%. Executives/senior managers make up just over 2% of total employment, whilst professionals account for nearly 5%.

[4] Employment by category: One firm was not able to separate sales and administration staff figures from the other categories. The separate sales figures provided were therefore proportionately removed from professional and associate professional categories; and the separate administration figures provided were proportionately removed from associate professional and production workers, allowing sales and administration staff to be categorized separately. The turnover percent provided by the firm was then applied to the new breakdown of employment figures.

[5] All expatriates have been excluded from the executive/senior management employment figures.

[6] All expatriates have been excluded from the professionals employment figures.

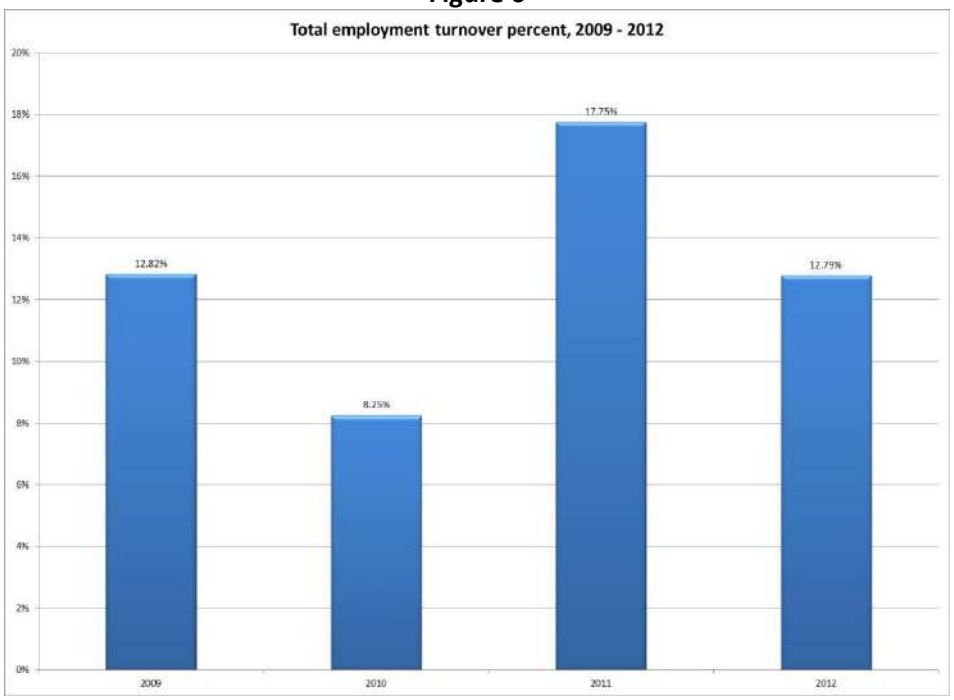
[7] All AATP learners have been excluded from the Apprentices/learners employment figures.

The employment turnover percentage for 2009 to 2012 is depicted in Figure 6, and as is evident it is erratic with a turnover rate of 12.82% in 2009, falling to 8.25% in 2010 before spiking at 17.75% in 2011. The spike in 2011 is, however, largely attributable to retrenchments which were undertaken at multiple firms in this particular year. Total employment turnover for 2012 is projected to be 12.79%.

The employment turnover rate by category averaged over the 2009 to 2012 period shows that the highest turnover rate is in the sales category (15.62%), followed closely by apprentices/learners (15.21%) and then:

- Associate professionals: 13.25%
- Production workers: 13.14%
- Elementary/short-term contract: 13.04%
- Admin/clerical: 12.41%
- Professionals: 11.78%
- Artisans/craft: 10.28%
- Executives/senior management: 8.66%

Figure 6



The largest growth in employment turnover from 2009 to 2012 (Table 3) is evident in the elementary/short-term employment category (nearly 600% growth). There was also an increase in employment turnover amongst executives/senior management (95%); apprentices/learners (92%), associate professionals (76%) and sales (23%). All other employment categories showed a decline in turnover, resulting in a 9% decline for all categories over the period. It is, however, important to note that this trend can be misleading. As Table 3 clearly shows, employment

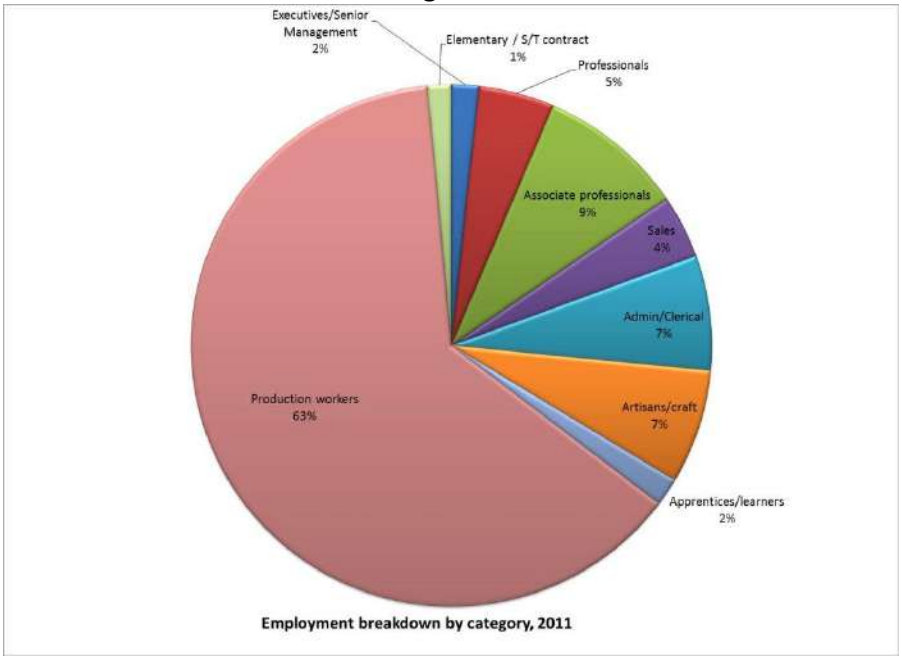
turnover has been erratic over the four year period analysed with the majority of the categories spiking in 2011 due to retrenchments which took place in that year.

Table 3: Employment turnover percentage by category, 2009 - 2012[8]

Category	2009	2010	2011	2012	2009-2012 Growth
Executives/Senior Management	1.86%	10.91%	18.23%	3.64%	95.38%
Professionals	10.69%	10.58%	15.24%	10.61%	-0.75%
Associate professionals	9.87%	8.93%	16.86%	17.33%	75.71%
Sales	15.12%	12.35%	16.42%	18.60%	23.02%
Admin/Clerical	13.36%	12.09%	14.09%	10.09%	-24.53%
Artisans/craft	12.05%	7.01%	13.64%	8.44%	-29.96%
Apprentices/learners	11.12%	8.98%	19.40%	21.35%	92.01%
Production workers	13.83%	7.33%	18.60%	12.81%	-7.32%
Elementary / S/T contract	1.50%	7.53%	32.94%	10.19%	579.07%
Total	**12.82%**	**8.25%**	**17.75%**	**12.79%**	**-0.23%**

2.2. Employment composition: Status quo

Figure 7



A breakdown of employment by category for 2011, as shown in Figure 7, illustrates the expected result that production workers make up the largest employment category with 3,882 production workers (equal to 63% of total employees). Production workers also have the fourth

[8] Note: One of the firms surveyed was unable to provide employment turnover for artisans/craft. Therefore the average of the other firms was used as an estimate for the artisan/craft turnover rate for this firm.

highest average growth rate (5.49%) and the fourth highest average turnover rate (13.14%), indicating that this is an area where a substantial demand for new skills will continue into the future. Associate professionals, defined as skilled technicians who are academically qualified (junior management) make up the second largest employment category with 559 employees (equal to 9% of the 2011 total). This category has the third highest average growth rate (5.86%), as well as the third highest average turnover rate (13.25%). As these are academically qualified employees who are required on the basis of growing demand and a high turnover rate, this category requires special attention and will be discussed in more detail in Section 3.

Admin/clerical staff and artisans/craft staff each represent 7% of total employment followed by professionals at 5%. Comparatively, the professional staff category has low average growth and turnover rates (2.69% and 11.78% respectively). Nevertheless, these are typically highly technically qualified (and experienced) professionals. Having robust succession plans for this category of employee will be critical for the future growth and development of the industry. The sales staff category represents 4% of total employees, and has a relatively low growth rate (4.45%), although this category has the highest average employee turnover rate of 15.62%. The executives/senior management category only contributed 2% of total employment in the industry. This category has the second highest growth rate for the period of 7.44%, but a comparatively low turnover rate of 8.66%. Moreover, executives/senior management have the highest average age of 54 years (Table 6) suggesting that within the next ten years the employee turnover rate is likely to increase significantly as these, the most highly skilled employees in the tyre manufacturing industry, exit the market due to retirement. However, we would expect the high level of growth evident in this category to level off moving forward as:

a) This growth rate is being skewed by a spike in 2012 employment resulting in an 21.15% growth rate, compared to 0% and 0.97% in 2010 and 2011 respectively;

b) Logically, aggregate growth in the high-level management category tends to be smaller than other employment categories because of the proportionately smaller number of employees required in this category.

Looking at the breakdown of employment turnover for 2011 shown in Figure 8, the highest turnover rate is in the elementary/short-term category. This is not surprising as one would expect that any uncertainty would result in shrinkage in this type of employment. The high turnover rate in apprentices/learners (second highest category) is also not surprising as young people at the beginning of their careers often change companies and the direction of their career early on. High turnover rates among graduates, both during graduate development programmes, but more alarmingly shortly after the completion of graduate development programmes, was stated as an area of serious concern for more than one of the tyre manufacturers. This is a distressing trend when considering that many of these individuals may leave the tyre industry, which is in critical need of attracting qualified and skilled young technicians and professionals. What is surprising is that the executive/senior management employee category had the fourth highest employment turnover rate of 18.23% in 2011. This is extremely concerning as this category of employee is highly skilled and valuable to the industry. Moreover, it is difficult to find and replace senior management, many of whom leave with years

of experience and tacit knowledge crucial to the future survival of the industry. On a more positive note, there is a marked decline in the expected turnover rate of the executive/senior management category in 2012, with the turnover rate projected at only 3.64%. Across all categories the turnover rate for 2011 was above 10%, which must be considered high and of concern, given the associated loss of skills at individual companies.

Figure 8

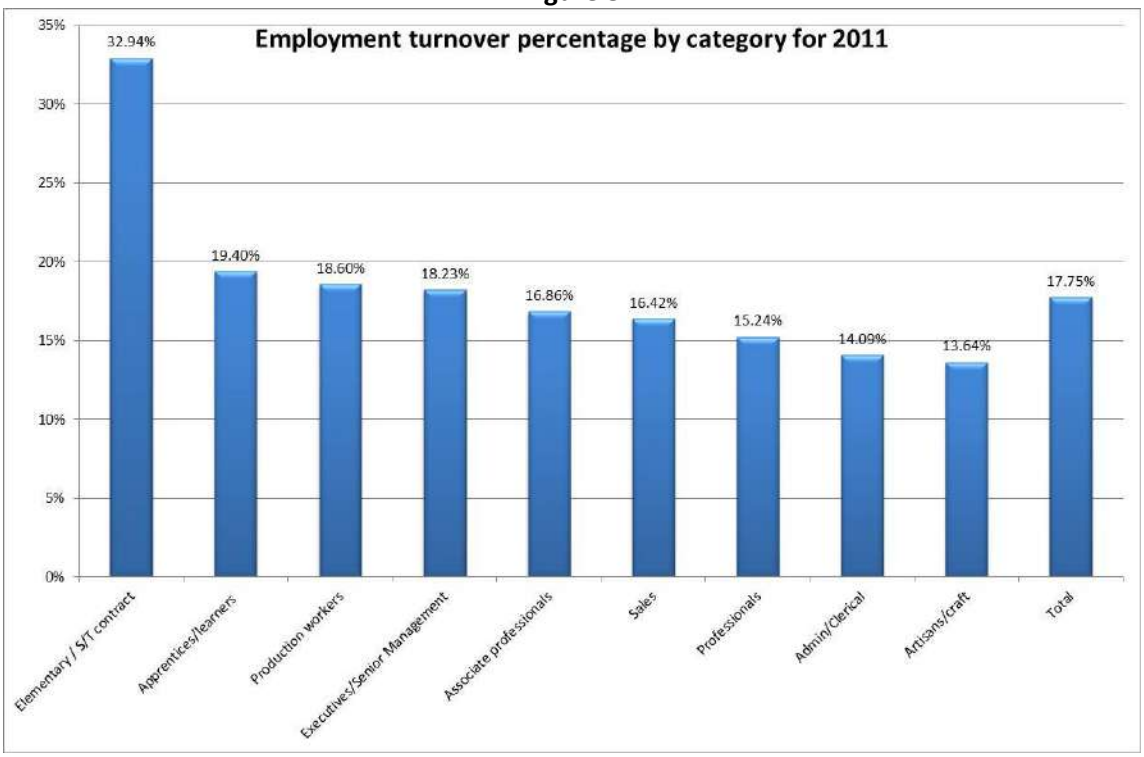


Table 4 disaggregates employment turnover for 2011 into categories for dismissed, resigned, retired and retrenched. By far the greatest reason for employment turnover is resignations, which accounted for more than half of all employee turnover losses. This is despite retrenchments having taken place during 2011. Retrenchments accounted for less than 20% of employment turnover, followed by dismissals (14.60%) and lastly retirement (14.27%).

Of the top three skilled categories – executives/senior management, professionals, and associate professionals, the trend is similar. Slightly below half of the executive/senior management turnover in 2011 was due to resignations (47.53%). With reference to Table 5, none of these resigned employees remained within the tyre industry – more than 60% went to other South African firms, whilst approximately 20% emigrated and 17% became self-employed. Returning to the breakdown of turnover for executives/senior management, a further 28.87% of these employees retired (again representing a major loss of skill to the industry), while 21.20% were retrenched and only 2.40% were dismissed.

Table 4: Proportion of 2011 turnover due to Dismissal, Resignation, Retirement and Retrenchment[9]

Category	Dismissed	Resigned	Retired	Retrenched
Executives/Senior Management	2.40%	47.53%	28.87%	21.20%
Professionals	4.51%	66.14%	18.15%	11.20%
Associate professionals	12.47%	68.05%	6.65%	12.83%
Sales	14.67%	49.35%	16.14%	19.84%
Admin/Clerical	7.42%	55.71%	10.67%	26.20%
Artisans/craft	19.35%	50.76%	18.68%	11.20%
Apprentices/learners	3.00%	80.25%	2.75%	14.00%
Production workers	34.86%	24.30%	22.81%	18.02%
Elementary / Short-term contract	32.70%	22.74%	3.67%	40.89%
Total Employment	**14.60%**	**51.65%**	**14.27%**	**19.49%**

Table 5: Destination of resigned employees, 2011[10]

Category	Other tyre manufacturer	Tyre distributor	Other SA firm	Emigrated	Not working	Self employed
Exec/senior Management	0.00%	0.00%	61.11%	22.22%	0.00%	16.67%
Professionals	0.00%	0.00%	76.98%	5.57%	12.92%	4.53%
Associate professionals	22.26%	0.00%	62.66%	4.17%	6.46%	4.45%
Sales	0.00%	7.59%	87.70%	0.00%	0.00%	4.71%
Admin/clerical	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
Artisans/craft	3.15%	0.00%	96.85%	0.00%	0.00%	0.00%
Apprentices/learners	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%
Production workers	0.00%	0.00%	76.22%	0.00%	20.84%	2.95%
Short-term contract	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%

Within the professionals' category, 66.14% of employment turnover was attributable to resignations. Again, none of these skills were retained within the tyre industry – 76.98% of employees left to go to other SA firms, 12.92% left the labour market entirely, 5.57% emigrated and 4.53% moved to self-employed positions. A full 18.15% of turnover in the professional employee category in 2011 was due to retirement – again suggesting a major loss of skill to the industry, with a further 11.20% due to retrenchment and 4.51% due to dismissal.

The majority of associate professionals' turnover (68.05%) in 2011 was due to resignations. A small proportion of these skills were retained within the tyre manufacturing industry as 22.26% of these resignations went to other tyre manufacturing firms. The majority, however, exited the industry, moving to other South African firms (62.66%); whilst 6.46% stopped working, 4.45% became self-employed and 4.17% emigrated.

[9] One firm surveyed was only able to provide an aggregated percentage for the dismissed, resigned, retired and retrenched employment categories. This total percentage was therefore applied to each employment category on the basis of the breakdown evident for the other tyre manufacturers as it was not possible to proportionately allocate this percentage between the categories.

[10] Employees categorized as "not known" in question 5 of the firm-level survey were proportionately distributed between the other categories, thus removing the "not known" category from the dataset.

Table 6 provides a breakdown of the average age of employees per employment category. The data represented in this table raises another alarm revealing the high average age of employees in the skilled employment categories. For example, executives/senior managers, professionals, artisans/craft all have an average age of more than 50. The reason that this trend is so concerning relates to these skilled employees reaching retirement age within the next 10 to 15 years, suggesting that the rate of turnover in these categories will remain high, and that the need to develop succession plans is of paramount importance.

Table 6: Average age and years of experience of employees, 2012

Category	Average Age	Average years' service
Executives/Senior Management	54	17
Artisans/craft	54	17
Professionals	52	16
Sales	51	15
Production workers	51	20
Admin/Clerical	49	15
Associate professionals	47	15
Apprentices/learners	26	1
Elementary / Short-term contract	22	1
Total all categories	**49**	**18**

2.3. Qualifications

The following section examines the local tyre industry's skills profile by unpacking a set of demand and supply considerations. Firstly, from a demand perspective, the qualifications of employees in four of the critical employment categories: artisans/craft, associate professionals, professionals and executive/senior management are described. Supply-side considerations are then explored by unpacking the recruitment experiences of the four South African based tyre manufacturers.

2.3.1. Demand-side considerations: Employee qualifications

Incorporated in the methodology of the study, firms were requested to provide the highest level of qualification for each employee in the artisan/craft, associate professional, professional and executive/senior management employment categories. Three of the four tyre manufacturers were able to provide us with this information. Based on the information supplied by these three manufacturers we were able to adjust the findings to ensure coverage measured against the total employment levels in 2012 for each category, as depicted in Table 7 below.

Overall, the coverage of employee qualification information provided to BMA was 55.06% of the total sample for the four employment categories, with notably high coverage in the associate-professionals employment category (78.26%)[11].

Table 7: Study coverage of employee qualifications

	Artisans/ craft	Associate Professionals	Professionals	Executives/ senior management	Total
Total sample (2012)	422	575	295	126	1'444
Qualifications provided	154	450	141	50	795
% of 2012 total	36.49%	78.26%	47.80%	33.68%	55.06%

The information provided by the three firms was analysed and the employee qualifications provided were then coded based on the use of the highest level qualification provided for each employee. Table 8 below provides an extensive list of 40 qualification categories along with their respective codes. These codes were deduced from a coding exercise, which attempted to band the various qualifications identified into a narrower set of aligned qualification categories:

- Below Grade 12,
- Grade 12 (Matric or Senior Certificate),
- N-level certificates and courses,
- National Diplomas,
- Bachelors of Technology
- Bachelor Degrees (Bachelor of Arts, Bachelor of Social Science, Bachelor of Science) and
- Other qualifications.

Please note, the research team at BMA apportioned all 'unspecified' responses into subcategories, with the apportioning based on those employee qualifications that were identified. The portion each code received from the "unspecified" category was therefore determined by the percentage each code contributed to the total subcategory (after omitting those classified in the 'unspecified' subcategory)[12]. Please refer to Annexure for a copy of the original master table.

[11] It is important to note that reference to 'the sample' in this section refers to the sample for which qualifications data was provided and not for the total sample captured in the employment data.

[12] For example, the N1-3 category contributed 32% of all N1-3 sub-category responses and was therefore apportioned 32% of the N1-3 (unspecified) responses.

Table 8: Qualification codes

Qualification	Code	Qualification	Code
< Grade 12	1	National Diploma (Other)[4]	21
Grade 12	2	National Diploma (Unspecified)	22
NTC 1-3	3	BTech (Electrical Engineering)	23
NTC 4-6	4	BTech (Mechanical Engineering)	24
N 1-3 Mechanical	5	BTech (Chemical Engineering)	25
N 1-3 Electrical & electronic	6	BTech (Polymer Technology)	26
N 1-3 Fitter/ Turner	7	BTech (HR & LR)	27
N 1-3 Other[1]	8	BTech (Other)[5]	28
N 1-3 Unspecified	9	BTech (Unspecified)	29
N 4-6 Mechanical	10	BA/ BsocSci (to Honours level)	30
N 4-6 Electrical & electronic	11	BCom (to honours level)	31
N 4-6 Other[2]	12	BSc (to honours level)	32
N 4-6 Unspecified	13	BSc Engineering (Chemical)	33
National Diploma (Mechanical Engineering)	14	BSc Engineering (Mechanical)	34
National Diploma (Electrical Engineering)	15	BSc Engineering (Electrical)	35
National Diploma (Industrial Engineering)	16	BSc Engineering (other)[6]	36
National Diploma (Chemical Engineering)	17	Bachelor Degree (other)[7]	37
National Diploma (Polymer/ Rubber technology)	18	Bachelor Degree (unspecified)	38
National Diploma (Education & Training/ HR/ IR/ PR)	19	Other[8]	39
National Diploma (Operations Management) [3]	20	Other (Certificates & Programmes)[9]	40

Notes:

1. This category includes N1-3 Boilermaker (2) Trade (2) and Trade Instrumentation (1).
2. This category includes N4-6 Millwright (1) and Instrument Mechanics (1).
3. This category includes National Diplomas in Business Management (2), Logistics (2), Purchasing Management (3), Production Management (9), Sales Management (2) freight management (1) and Automotive Supply Chain Management (1).
4. This category includes National Diplomas in Administration (2), Analytical Chemistry (4), Book-Keeping (3), Information Technology (6), Marketing Management (9), Quality Management (2) and Work-study (1).
5. This category includes a Bachelor of Technology degree in Cost& Management Accounting (2), Logistics (1), Management (2), Marketing (1) and Quality Management (1).
6. This category includes a Bachelor of Science Degree in Civil Engineering (1).
7. This category includes Bachelor Jurisprudence and Law (1), Bachelor of Education (Honours) (1), Bachelor of Accounting (Honours) (1), International Business Administration (1) and Bachelor of Town & Regional Planning (1)
8. This category includes a Masters of Business Administration (1), Government Certificate of Competency (1), Nursing (2) and Doctorate (PhD) (2).
9. This category includes Certificates in Marketing Management (3), Quality (2), Computers (6), Office Administration (2), Practical Rubber Technology (3) and Operations Management (2)

Figure 9 below provides an aggregated headcount by qualification code. Whilst analysis at this level of aggregation is not very useful given the varying qualification demands among the four employment categories there are some striking figures, even at this level of aggregation. Firstly, there are a very large number of employees (395) with a highest level of qualification of Grade 12 or below. Secondly it is concerning to note the low number of employees with BSc Engineering degrees (8), BTech Engineering (10) degrees, as well as polymer/rubber technology related (8) qualifications within the survey population.

Figure 9

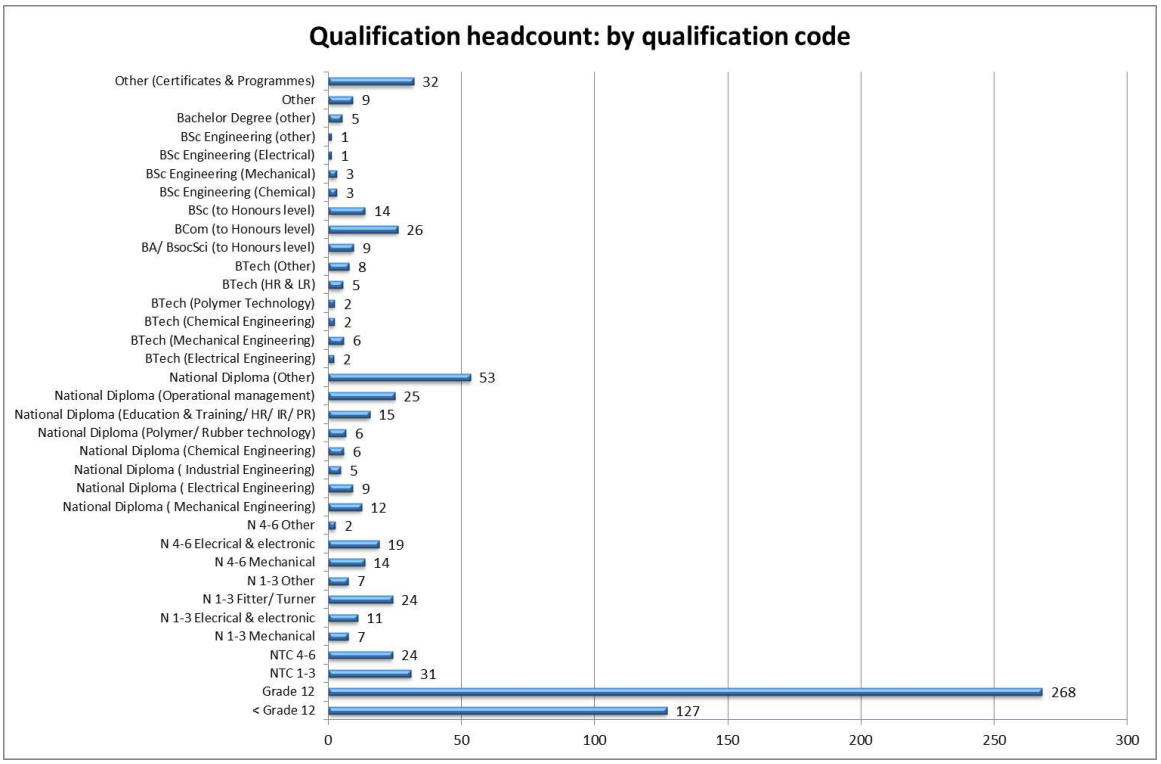


Table 9 below provides a breakdown of the qualification codes by employment category. The data presented is critical, as the next level of employment category analysis is conducted on the basis of the breakdown presented.

Artisans/craft

An overwhelming majority (42%) of the employees in this category have either a Grade 12 (21%) or equal to a Grade 12 (21%) as their highest level qualification. A further 14% of the surveyed artisan/craft population have their highest qualification at the NTC1-3 level, whilst another 20% have N1-3 qualification levels. There were very few artisan/craft employees with N4-6 (8%), or National Diplomas (7%) as their highest level of qualification.

Associate professionals

Over one-third of associate professionals (37%) have Grade 12 as their highest qualification level, followed by 18% who have a highest qualification below Grade 12. Only 18% have a highest qualification at the National Diploma level, with very few of these (4%) being industry-related engineering or polymer/rubber technology qualifications. Similarly, only 3% of the survey population have BTech qualifications, whilst 7% have Bachelor Degrees (up to the Honours level).

Table 9: Breakdown of qualification and employment category

Qualification	Code	Artisans/ Craft	%	Assoc. Professionals	%	Professionals	%	Exec/ Snr Mgt	%	Total
< Grade 12	1	32	21%	79	18%	15	11%	1	2%	127
Grade 12	2	32	21%	165	37%	54	38%	17	34%	268
NTC 1-3	3	21	14%	7	2%	3	2%	0	0%	31
NTC 4-6	4	13	8%	9	2%	2	1%	0	0%	24
N 1-3 Mechanical	5	4	2%	3	1%	1	1%	0	0%	7
N 1-3 Electrical & electronic	6	6	4%	5	1%	0	0%	0	0%	11
N 1-3 Fitter/ Turner	7	19	12%	5	1%	0	0%	0	0%	24
N 1-3 Other	8	4	2%	3	1%	1	1%	0	0%	7
N 4-6 Mechanical	10	7	5%	5	1%	2	1%	0	0%	14
N 4-6 Electrical & electronic	11	5	3%	9	2%	5	3%	1	2%	19
N 4-6 Other	12	0	0%	2	1%	0	0%	0	0%	2
National Diploma (Mechanical Engineering)	14	5	3%	2	0%	5	4%	0	0%	12
National Diploma (Electrical Engineering)	15	3	2%	4	1%	2	1%	0	0%	9
National Diploma (Industrial Engineering)	16	1	1%	3	1%	0	0%	0	0%	5
National Diploma (Chemical Engineering)	17	0	0%	4	1%	0	0%	1	3%	6
National Diploma (Polymer/ Rubber technology)	18	0	0%	4	1%	2	1%	0	0%	6
National Diploma (Education & Training/ HR/ IR/ PR)	19	0	0%	11	2%	3	2%	1	3%	15
National Diploma (Operational management)	20	1	1%	18	4%	2	1%	4	8%	25
National Diploma (Other)	21	0	0%	38	8%	15	10%	1	3%	53
BTech (Electrical Engineering)	23	0	0%	1	0%	0	0%	1	2%	2
BTech (Mechanical Engineering)	24	0	0%	3	1%	2	2%	0	0%	6
BTech (Chemical Engineering)	25	0	0%	1	0%	1	1%	0	0%	2
BTech (Polymer Technology)	26	0	0%	2	0%	0	0%	0	0%	2
BTech (HR & LR)	27	0	0%	4	1%	0	0%	1	2%	5
BTech (Other)	28	0	0%	3	1%	4	2%	1	2%	8
BA/ BsocSci (to Honours level)	30	0	0%	7	2%	1	1%	1	3%	9
BCom (to Honours level)	31	0	0%	12	3%	6	4%	8	16%	26
BSc (to Honours level)	32	0	0%	7	2%	4	3%	3	5%	14
BSc Engineering (Chemical)	33	0	0%	1	0%	2	1%	0	0%	3
BSc Engineering (Mechanical)	34	0	0%	1	0%	2	1%	0	0%	3
BSc Engineering (Electrical)	35	0	0%	1	0%	0	0%	0	0%	1
BSc Engineering (other)	36	0	0%	0	0%	1	1%	0	0%	1
Bachelor Degree (other)	37	0	0%	2	0%	3	2%	0	0%	5
Other	39	1	1%	3	1%	1	1%	4	8%	9
Other (Certificates & Programmes)	40	1	1%	24	5%	3	2%	4	8%	32
Total		154	100%	450	100%	141	100%	50	100%	795

Professionals
Despite being the second most "senior" employment category, 49% of employees in this category have a highest qualification level below (11%) or equal to (38%) a Grade 12. Less than one-fifth (19%) of professionals have a National Diploma as their highest level qualification, of which only 6% are engineering or polymer/rubber technology related. In total, 13% have a Bachelor Degree as their highest level qualification, although only 3% have BSc. Engineering degrees.

Executive/senior management
Slightly over one-third of executives/senior management (34%) have a Grade 12 as their highest level of qualification, followed by 24% that have a Bachelor Degree, the majority of which are BCom (up to Honours level). Another 17% of executive/senior management employees in the sample have a National Diploma (with 3% of National Diplomas having an engineering or polymer/rubber technology specialisation).

The qualification data discussed above suggests that a large majority of employees in the South African tyre industry have relatively low-level qualifications relative to the positions they hold. Given the age profile of employees within these employment categories, it would appear as if experience and tacit knowledge have driven promotions and/or appointments to senior positions, as opposed high-level academic or professional qualifications. Even though the qualifications data does not provide 100% coverage of the entire industry, the research team is confident that the 55% sample population received is more than sufficient to provide a reasonably accurate reflection of the industry's qualifications status quo for each of the four most skills intensive employment categories analysed.

2.3.2. Supply-side considerations: Recruitment challenges and appointment lead times

To understand the supply side factors driving appointments within the industry, the surveyed firms were requested to select five recruited staff for 2011 to discuss their qualification and experience profiles relative to the advertised positions. In addition to this, in-depth qualitative information was solicited during the course of fieldwork interviews, with the objective of unpacking general recruitment successes and failures at each of the surveyed firms.

In respect of the profiles of the selected recruited persons in 2011, overall, the majority of the selected recruitments met the advertised criteria for both educational and relevant experience requirements. The only exception to this, related to a candidate who did not meet the qualifications requirements set, but had years of experience that far exceeded the minimum requirement set.

In addition to these selected recruitment examples, qualitative data unpacking general recruitment success and failures were discussed to better understand the skills supply-side dynamics in the local tyre industry. A salient issue to emerge from these discussions was the challenges associated with filling vacancies in technical positions, particularly in the artisan category. Firstly, tyre manufacturing entails a unique set of technical skills that make filling key technical vacancies with labourers from other industries (including other automotive sub-

sectors) very challenging. For example, there was consensus that there is a sufficient pool of artisans to employ from, but that the base skills set of the pool was misaligned with the requirements of the tyre industry. This puts pressure on the firms to 'fill the gaps' through extensive in-house training or "finishing schools". It was noted that this is less of an issue in the professional and managerial employee categories, as the skill sets required are typically more generic.

It was emphasised that there is a very limited supply of appropriate, technically skilled graduates from South Africa's tertiary institutions, with interviews suggesting that the Nelson Mandela Metropolitan University (NMMU) in Port Elizabeth is one of the only (reputable) tertiary institutions providing polymer/rubber specific diplomas. All tyre manufacturers consequently have active graduate recruitment programmes aimed at attracting young individuals with engineering qualifications to their respective firms. The success of these initiatives is critical given both the alarmingly high average age of employees (across all employment categories)[13] as well as the shortage of engineering qualifications (at BSc, BTech and National Diploma levels) currently in the industry. It is therefore concerning to note the challenges firms face in respect of retaining graduates from their programmes, both during, as well as shortly after, the completion of the graduate programmes. The most common explanations around this trend were: a) the unfavourable working conditions confronting students on the graduate programmes, with this being synonymous with conditions in tyre factories; b) the undesirable location of the tyre manufacturers' production facilities; and c) opportunities to earn higher salaries elsewhere once graduates have completed their formal education and training.

Figure 10: Number recruited and average leadtime to recruit

Category	Total Internal	Total External	Internal LT average	External LT average
Executives/senior management	3	7	2	8
Professionals	28	26	1	6
Associate professionals	35	37	3	6
Sales	2	13	1	3
Admin/clerical	7	21	0	3
Artisans/craft	0	65	1	9
Apprentices/learners	198	52	0	5
Production workers	0	401	1	3
Elementary/short-term contract	0	42	0	3
Total Average	**275**	**664**	**2**	**5**

Given the difficulties in recruiting artisans as discussed above, it is unsurprising to note that the recruitment lead times for artisans are longer than any other employee category. As revealed in Figure 10 below, the average lead time to recruit artisans is 9 weeks. This is on average one

[13] See Table 6

week longer than that of an executive/senior manager (8 weeks) and three weeks longer than that required to successfully recruit individuals in the professional category (6 weeks). Similarly, the average lead time for successfully recruiting associate professional staff was also 6 weeks[14].

In summary, there are critical supply-side challenges facing South African tyre manufacturers with regard to a shortage of adequately qualified and skilled individuals with technical tyre-specific knowledge in the artisan and associate professional employment categories. In addition to emerging in discussions with HR and training representatives from all tyre manufacturers as a key concern, this issue is similarly reflected in the firms' average employee lead times where external lead times for artisans and associated professionals are longer than evident for other employee categories.

[14] Firm-level interviews suggested significantly longer recruitment lead times for particular appointments, but this was not substantiated by the average recruitment lead time data supplied by the surveyed firms.

3. Extrapolated skills demand in the South African tyre manufacturing industry: 2015, 2017, 2020

Mapping the recent employment growth rate and breakdown of employment within the South African tyre manufacturing industry is obviously important, revealing the industry's skills status quo. More importantly, what does recent performance tell us about the industry's skills demands into the future? What is the industry's employment profile likely to be in the future? How many employees, in what employment categories, and with what skills? It is these questions that inform the content in this section of the report. Building on the profile information presented in the previous section, we endeavor to project employment growth and the likely skills demands of the South African tyre manufacturing industry over the next few years.

Using the primary data collected and the evolutionary path followed over the period 2009 to present, this section presents three skills demand (and supply) scenarios for the New Tyre Chamber firms over the next three (2015), five (2017) and eight years (2020) respectively. The three scenarios follow:

1. A projection based on the maintenance of present growth trends (i.e. from 2009 to 2012);
2. A low growth projection, assuming a 50% downward performance trend relative to the base projection outlined above; and
3. A high growth projection, assuming a 50% upward performance trend relative to the base projection outlined above.

3.1. Methodology used

To calculate the employment growth rate of the South African tyre manufacturers to 2015, 2017 and 2020; the likely composition of the employment aggregates for each of the years; and finally the skills profile and ***associated skills demands*** within each critical employment category (i.e. executives/senior management, professionals, associate professionals, and artisans/craft), the following methodological steps were completed:

1. **Employment Elasticity:** To calculate employment growth in relation to output growth, it was necessary to calculate the elasticity of employment for the tyre manufacturers over the 2009 to 2012 period. Given materials price distortions in company sales figures[15], it was decided that employment elasticity would best be calculated against MVA. The employment elasticity of MVA can be defined as the percentage change in employment for every 1% change in MVA. An elasticity of 1 implies that for every 1% increase in MVA there will be a 1% increase in employment. An elasticity of 0.4 implies that for every 1% increase in MVA there will be a 0.4% increase in employment. To calculate the employment elasticity of

[15] Sales per employee figures can be distorted by materials price movements that are then accommodated in the selling price of a manufacturer's products.

MVA, average employment growth for the period 2009 – 2012 was calculated and divided by the average MVA growth for the same period. The employment elasticity per category is presented in Table 10.

Having calculated employment elasticity per category it became evident that it would not be possible to build a model at this disaggregated level because the elasticity per category does not always make sense. For example, an elasticity of 1.45 for executives/senior management means that for every 1% increase in MVA there is a 1.45% increase in executive/senior management employment. An elasticity of greater than 1 is clearly inaccurate for this category, with the 2009 to 2012 figure likely compromised by the Global Credit Crisis of 2008 and the subsequent termination of senior employment positions at manufacturing firms. This appears to have created an artificially low employment base for 2009, which was then corrected as the tyre market recovered through 2010 and 2011, resulting in the highly skewed employment growth evident for this category, and a contamination of the employment elasticity figure. It was therefore necessary to apply the total elasticity for all categories (0.92) to each of the employment categories analysed. We believe this is necessary until a more accurate and robust longitudinal dataset is generated (probably of at least five years)[16]. Moreover, whilst using aggregate employment elasticity is not ideal, this method of calculating employment growth is still more accurate than simply extrapolating previous trends in employment numbers.

Table 10: Employment elasticity of MVA

Employment category	Elasticity
Executives/Senior Management	1.45
Professionals	0.52
Associate professionals	1.14
Sales	0.87
Admin/Clerical	0.32
Artisans/craft	0.17
Apprentices/learners	0.34
Production workers	1.07
Elementary /short-term contract	2.36
Total	**0.92**

2. **Employment breakdown per category:** The 2012 employment breakdown per category was held constant in all the models.

3. **Employment turnover and loss to the industry:** The average employment turnover per category for 2009 to 2012 was used to calculate the number of employees that would be lost to the tyre manufacturers (Table 11). However, not all employment turnover lost at an individual firm level is actually lost to the industry. If an employee leaves one tyre

[16] To compensate for this deficiency, the refinement of the employment elasticity figure will be built into the software architecture built into Phase 2 of the project. This will ensure the accuracy of outputs as additional years of data are inputted into the software model.

manufacturer to work at another, then his/her skills are retained within the industry. Retrenched employees could also arguably be available for employment in the future. Therefore, a measure of how much individual firm employment turnover is lost to the industry as a whole is required.

Table 11: Average employment turnover, 2009 -2012

Employment category	Turnover %
Executives/Senior Management	8.66%
Professionals	11.78%
Associate professionals	13.25%
Sales	15.62%
Admin/Clerical	12.41%
Artisans/craft	10.28%
Apprentices/learners	15.21%
Production workers	13.14%
Elementary /short-term contract	13.04%
Total	**12.90%**

Questions 4 and 5 of the Questionnaire that was administered at the surveyed firms was used for this purpose (see Appendix A). Question 4 asked for the proportion of employee turnover due to dismissals, resignations, retirement and retrenchments, with the following assumptions[17] then made for the purpose of modeling future skills demands:

a) 90% of dismissed employees at individual firms are lost to the industry, 10% are re-employed within the industry

b) 95% of retired employees at individual firms are lost to the industry, 5% return

c) Four out of five (80%) retrenched employees at individual firms are available for future employment. We built in a 20% loss factor, based on the view that some of the retrenched employees (20%) may have found alternative employment that would preclude them from returning to the tyre manufacturing industry.

d) Employees that resigned were broken down further, based on the profile breakdown within Question 5. Here we made the following assumptions:

   i. All employees that joined other tyre manufacturers are still available to the industry i.e. 0% are lost to the industry

   ii. 20% of employees that joined tyre distributors are still available to the tyre manufacturers, 80% are lost to the industry

   iii. 20% of employees that joined other SA firms are still available to the tyre manufacturers, 80% are lost to the industry

   iv. 100% of employees that emigrated are lost to the industry

[17] These assumptions were derived from industry representative inputs secured at a draft report review workshop held on the 22nd of November in Port Elizabeth.

v. 20% of employees that are not working may return to the industry, 80% are lost

vi. 20% of employees that went into self-employment may return, 80% are lost to the industry

vii. The "% not known" category was proportionately distributed amongst the other categories in the question and excluded from the final calculation.

Based on the deductive reasoning described above we were able to estimate the percentage of employment turnover per category that is actually lost to the South African tyre manufacturing industry in aggregate and would thus need to be replenished. The outcome is depicted in Table 12, and shows that an estimated 73.8% of the 12.90% of employees that leave the tyre manufacturers annually are permanently lost to the industry.

Table 12: Proportion of employment turnover that is permanently lost

Employment category	Turnover %
Executives/Senior Management	73.80%
Professionals	77.19%
Associate professionals	63.00%
Sales	72.13%
Admin/Clerical	66.62%
Artisans/craft	76.74%
Apprentices/learners	72.31%
Production workers	76.09%
Elementary /short-term contract	59.29%
Total	**73.80%**

4. **Growth trends:** For the first scenario used to project employment demand to 2015, 2017 and 2020 respectively, the maintenance of the current growth rate was used. This is the average MVA growth for the period 2009 to 2012 of 5.14% per annum. For the low-growth scenario half this average (2.57% per annum) was used, and for the high growth scenario one-and-a-half times this average (7.72% per annum) was used.

Applying this methodology, aggregated and category-specific skills demands under the three different growth scenarios were extrapolated to 2015, 2017 and 2020 respectively, the results of which are presented below.

3.2. Skills demands to 2015, 2017 and 2020

3.2.1. Maintenance of current growth trend

Maintaining the current trend in MVA growth of 5.14% per annum, using an employment elasticity of 0.92, and holding constant the breakdown in employment categories, the estimated increase in employment per category is provided in Table 13. By 2015 total employment will grow by 15%, requiring an additional 881 employees. Of these 916 employees,

19 new executives/senior management will be required; 44 professionals; 85 associate professionals; and 63 artisan/craft workers. By 2017 there will be a 26% increase in employment and by 2020 employment will increase by 45% on 2012 base levels. In total, by 2020 the South African tyre manufacturing industry will require an additional 56 executives/senior management; 131 professionals; 2,456 associate professionals and 188 artisans/craft workers.

Table 13: Growth in employment due to MVA growth (base scenario using 2009-2012 trends)

Employmment	2012	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	126	132	138	145	151	159	166	174	182
Professionals	295	309	323	339	355	371	389	407	426
Associate professionals	575	602	630	660	691	724	758	794	831
Sales	246	258	270	282	296	310	324	340	356
Admin/Clerical	449	470	492	516	540	565	592	620	649
Artisans/craft	422	442	463	485	507	531	556	583	610
Apprentices/learners	101	106	111	116	121	127	133	139	146
Production workers	3,910	4,094	4,287	4,489	4,701	4,922	5,154	5,397	5,652
Elementary / S/T contract	60	63	66	69	72	76	79	83	87
Total	**6,184**	**6,475**	**6,781**	**7,100**	**7,435**	**7,785**	**8,152**	**8,536**	**8,938**

In addition to new employees being required as a result of employment growth, employees who exit the tyre manufacturing industry also need to be replaced. Table 14 consequently provides, by employment category, the number of employees that are projected to be lost to the industry as a result of employee turnover, multiplied by the proportion of those employees that are likely to be permanently lost to the industry per category, as calculated in Table 12. On this basis of calculation an additional 1,304, 2,278 and 3,920 employees will be required by 2015, 2017 and 2020 respectively.

Table 14: Employment loss due to labour turnover

Employmment	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	8	9	9	10	10	11	11	12
Professionals	20	21	22	23	24	25	26	27
Associate professionals	39	40	42	44	46	49	51	53
Sales	16	17	18	19	20	21	22	23
Admin/Clerical	30	32	33	35	36	38	40	42
Artisans/craft	28	30	31	32	34	36	37	39
Apprentices/learners	7	7	7	8	8	9	9	9
Production workers	262	275	288	301	315	330	346	362
Elementary / S/T contract	4	4	4	5	5	5	5	6
Total	**415**	**434**	**455**	**476**	**499**	**522**	**547**	**572**

Adding the number of new employees required due to MVA growth (Table 13) and the number of employees lost to the industry due to employment turnover (Table 14) we are able to provide an estimate of the total number of employees required should the current average MVA

growth path of the tyre manufacturing industry be maintained. This total employment demand per category to 2020 is illustrated in Table 15. By 2015, only three years from now, the tyre manufacturing industry will need to recruit 2,220 new employees – of which 45 will be executives/senior managers, 106 professionals, and 206 associate professionals. This figure will have increased to 3,880 by 2017, and to nearly 6,700 by 2020, comprising an additional 136 executives/senior managers, 318 professionals and 621 associate professionals.

Table 15: Total employment demand

Employmment	2013	2014	2015	2016	2017	2018	2019	2020	Total 2015	Total 2017	Total 2020
Executives/Senior Management	14	15	16	17	17	18	19	20	45	79	136
Professionals	34	35	37	39	40	42	44	46	106	185	318
Associate professionals	66	69	72	75	79	83	87	91	206	361	621
Sales	28	29	31	32	34	35	37	39	88	154	265
Admin/Clerical	51	54	56	59	62	65	68	71	161	282	485
Artisans/craft	48	50	53	55	58	61	64	67	151	265	455
Apprentices/learners	12	12	13	13	14	15	15	16	36	63	109
Production workers	446	468	490	513	537	562	589	616	1,404	2,453	4,220
Elementary / S/T contract	7	7	8	8	8	9	9	9	22	38	65
Total	**706**	**739**	**774**	**811**	**849**	**889**	**931**	**975**	**2,220**	**3,880**	**6,674**

3.2.2. Low growth scenario

The low growth projections to 2015, 2017 and 2020 are based on an MVA growth rate of half the current average, or 2.57% per annum. The employment elasticity of MVA growth remains at 0.92 for all categories, and the employment breakdown per category is kept constant. Using these variables, the growth in employment to 2015, 2017 and 2020 is presented in Table 16.

Table 16: Growth in employment due to low MVA growth

Employmment	2012	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	126	129	132	135	138	142	145	148	152
Professionals	295	302	309	316	324	331	339	347	355
Associate professionals	575	589	602	617	631	646	661	677	693
Sales	246	252	258	264	270	276	283	290	296
Admin/Clerical	449	460	470	481	493	504	516	529	541
Artisans/craft	422	432	442	453	463	474	485	497	508
Apprentices/learners	101	103	106	108	111	113	116	119	122
Production workers	3,910	4,002	4,096	4,193	4,292	4,393	4,496	4,602	4,711
Elementary / S/T contract	60	61	63	64	66	67	69	71	72
Total	**6,184**	**6,330**	**6,479**	**6,632**	**6,788**	**6,948**	**7,111**	**7,279**	**7,451**

Table 17: Employment loss due to labour turnover

Employmment	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	8	8	9	9	9	9	9	10
Professionals	19	20	20	21	21	22	22	23
Associate professionals	38	39	39	40	41	42	43	44
Sales	16	17	17	17	18	18	19	19
Admin/Clerical	29	30	31	32	32	33	34	35
Artisans/craft	28	28	29	30	30	31	32	33
Apprentices/learners	7	7	7	7	7	7	8	8
Production workers	256	262	269	275	281	288	295	302
Elementary / S/T contract	4	4	4	4	4	4	5	5
Total	**405**	**415**	**425**	**435**	**445**	**455**	**466**	**477**

An MVA growth rate of 2.5% coupled with an employment elasticity of 0.92 results in a 7% increase in employment to 6,636 in 2015. Employment to 2017 increases by 12% to 6,948, and by 2020 employment will have increased by a total of 20% to 7,451. Even considering a low growth scenario the increase in the number of skilled workers required is significant. By 2020 an additional 26 executives/senior management will be required, along with 60 professionals and 118 associate professionals.

In addition to employment growth, skills will once again need to be replaced due to employment turnover. Using the same proportion of employment turnover estimates as before, the total number of employees that will need to be replaced due to turnover losses is 1,245, 2,125 and 3,524 for 2015, 2017 and 2020 respectively.

As a result of employment growth, coupled with employment turnover under a low growth scenario, the tyre manufacturing industry in South Africa is projected to require the following additional employees for each of the three assessed years (Table 18):

- 2015: A total of 1,693 employees, including 34 executives/senior managers, 81 professionals and 157 associate professionals. This is equivalent to 27% of the 2012 number of employees.
- 2017: A total of 2,888 employees, including 59 executives/senior managers, 138 professionals and 269 associate professions. This is equivalent to 47% of the number of people employed in 2012.
- 2020: A total of 4,790 employees, including 98 executives/senior managers, 229 professionals and 445 associate professionals. This is equivalent to nearly 80% of the number of people employed in 2012.

Table 18: Total employment demand (low growth scenario)

Employmment	2013	2014	2015	2016	2017	2018	2019	2020	Total 2015	Total 2017	Total 2020
Executives/Senior Management	11	11	12	12	12	13	13	13	34	59	98
Professionals	26	27	28	28	29	30	30	31	81	138	229
Associate professionals	51	52	54	55	56	58	59	60	157	269	445
Sales	22	22	23	24	24	25	25	26	67	115	191
Admin/Clerical	40	41	42	43	44	45	46	47	123	210	348
Artisans/craft	38	38	39	40	41	42	43	44	116	197	327
Apprentices/learners	9	9	9	10	10	10	10	11	28	47	78
Production workers	348	357	365	374	382	391	401	410	1,070	1,826	3,029
Elementary / S/T contract	5	5	6	6	6	6	6	6	16	28	46
Total	**551**	**564**	**577**	**591**	**605**	**619**	**634**	**649**	**1,693**	**2,888**	**4,790**

3.2.3. High growth scenario

To extrapolate the employee demand under a high growth scenario an MVA growth rate of 1.5 times the current average was used. This provides for a growth rate of 7.72% per annum. Once again, an employment elasticity of 0.92 for each category was used, and the 2012 breakdown of employment per category was held constant. As revealed in Table 19, this high growth scenario predicts significant increases in employment demand to 2015, 2017 and 2020, which in turn creates a tremendous amount of pressure on skills development.

Table 19: Growth in employment due to high MVA growth

Employmment	2012	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	126	135	144	155	166	177	190	203	218
Professionals	295	316	338	362	388	415	444	476	509
Associate professionals	575	616	659	706	756	809	866	928	993
Sales	246	263	282	302	323	346	371	397	425
Admin/Clerical	449	481	515	551	590	632	676	724	775
Artisans/craft	422	452	484	518	555	594	636	681	729
Apprentices/learners	101	108	116	124	133	142	152	163	174
Production workers	3,910	4,186	4,482	4,799	5,138	5,502	5,891	6,307	6,753
Elementary / S/T contract	60	64	69	74	79	84	90	97	104
Total	**6,184**	**6,621**	**7,089**	**7,590**	**8,127**	**8,701**	**9,316**	**9,975**	**10,680**

By 2015, employment is projected to grow by 23% due to MVA growth alone (1,406 employees). A further 1,364 employees will be lost to the industry due to employment turnover resulting in a total demand for new employees of 2,771 new employees – the equivalent of 45% of the 2012 level of employment.

Table 20: Employment loss due to employee turnover

Employmment	2013	2014	2015	2016	2017	2018	2019	2020
Executives/Senior Management	9	9	10	11	11	12	13	14
Professionals	20	22	23	25	27	28	30	33
Associate professionals	39	42	45	48	52	55	59	64
Sales	17	18	19	21	22	24	25	27
Admin/Clerical	31	33	35	38	40	43	46	50
Artisans/craft	29	31	33	36	38	41	44	47
Apprentices/learners	7	7	8	9	9	10	10	11
Production workers	268	287	307	329	352	377	404	432
Elementary / S/T contract	4	4	5	5	5	6	6	7
Total	**424**	**454**	**486**	**520**	**557**	**597**	**639**	**684**

By 2017, employment will have grown by more than 40% to 8,701 people due to MVA growth. An additional 2,442 employees will be required due to employment turnover resulting in a total demand of 4,959 new employees (80% of the number of employees in 2012). By 2020, employment will have grown 73% due to MVA growth and a further 4,361 employees will be required due to turnover. Total recruitment through to 2020 is projected at 8,858 people under the high growth scenario. There will be a demand for 180 new executives/senior managers, 423 professionals and 824 associate professionals. By 2020 nearly 1.5 times the 2012 number of employees will be required just to meet the demand for new jobs.

Table 21: Total employment demand (high growth scenario)

Employmment	2013	2014	2015	2016	2017	2018	2019	2020	Total 2015	Total 2017	Total 2020
Executives/Senior Management	18	19	20	22	23	25	26	28	56	101	180
Professionals	41	44	47	50	54	58	62	66	132	237	423
Associate professionals	80	86	92	98	105	113	121	129	258	461	824
Sales	34	37	39	42	45	48	52	55	110	197	352
Admin/Clerical	63	67	72	77	82	88	94	101	201	360	643
Artisans/craft	59	63	67	72	77	83	89	95	189	338	604
Apprentices/learners	14	15	16	17	18	20	21	23	45	81	145
Production workers	545	583	624	668	716	766	820	878	1,752	3,136	5,601
Elementary / S/T contract	8	9	10	10	11	12	13	13	27	48	86
Total	**861**	**922**	**987**	**1,057**	**1,132**	**1,212**	**1,297**	**1,389**	**2,771**	**4,959**	**8,858**

3.3. Skills demand profile

Table 22 provides a summary of extrapolated employment demand to 2015, 2017 and 2020 for each of the scenarios that have been modeled in the section above i.e. maintenance of current trend (average MVA growth of 5.14%); low growth scenario (MVA growth of 2.57%); and high growth scenario (MVA growth of 7.72%). In each scenario the number of new employees, and therefore new skills required is significant, revealing the importance of understanding the skills demand profile of these new jobs.

Table 22: Projected employment demand summary: 2015, 2017, 2020

	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
	Current	Low	High	Current	Low	High	Current	Low	High
Executives/Senior Management	45	34	56	79	59	101	136	98	180
Professionals	106	81	132	185	138	237	318	229	423
Associate professionals	206	157	258	361	269	461	621	445	824
Sales	88	67	110	154	115	197	265	191	352
Admin/Clerical	161	123	201	282	210	360	485	348	643
Artisans/craft	151	116	189	265	197	338	455	327	604
Apprentices/learners	36	28	45	63	47	81	109	78	145
Production workers	1,404	1,070	1,752	2,453	1,826	3,136	4,220	3,029	5,601
Elementary / S/T contract	22	16	27	38	28	48	65	46	86
TOTAL	**2,220**	**1,693**	**2,771**	3,880	2,888	4,959	6,674	4,790	8,858

Looking ahead to the projected skills demand profile for 2020, there are a number of key supply side issues to consider. Most notably is the demand for associate professionals (skilled technicians who are academically qualified – junior management) and artisans/craft employees. These two categories are the second and fourth largest employment categories respectively with projected employment figures revealing that employment demand in these categories

almost double from 2015 to 2017, and again to 2020 in all three growth scenarios. If the industry remains on its current MVA growth path, the employment of 445 associate professionals and 327 artisans will be required by 2020; and if the industry achieves the higher growth path then these figures jump to 824 and 604 respectively. Such significant increases in demand for critical skills sets associated with these employment categories have substantial supply-side implications. Although 55% of associate professionals have a highest qualification level of Grade 12 or lower, with a further 18% having a National Diploma, and only 4% have engineering or rubber/polymer technology focused National Diplomas, it is clear from the firm-level interviews completed as part of the research project that formal higher level qualifications will become more important for the industry. It is therefore projected that the qualification demands associated with the growth in demand for associate professional over the next decade will see a shift in demand away from grade 12 qualifications towards more specialized qualifications for employees in this category.

Focusing on the qualifications of artisans/craftsmen, 42% have Grade 12 or lower as their highest level of education with 28% having an N1-6 and 7% National Diplomas. A salient finding in the study has been the lack of artisans with adequate skill sets to operate efficiently in the tyre industry. The average recruitment lead time of nine weeks for this category of employment reflects the challenges of recruiting these critical skills from the labour pool. There is thus an urgent need to grow those qualification channels that supply polymer/rubber technology focused qualifications in order to adequately meet the projected growth in demand for this employment category. Given the current supply-side constraints in this regard, even if the industry were to follow a low growth trajectory, there would be a grossly inadequate supply of these skilled artisans in 2020 (327). Currently, the Nelson Mandela Metropolitan University is the only tertiary institution providing reputable qualifications that cater specifically to the tyre industry's needs. This highlights the strategic need to strengthen the relationships between tyre manufacturers and tertiary institutions as a means to ensuring there is better congruence between skills demands and associated supply. A suggestion is for the industry to work collectively with strategic tertiary institutions to ensure critical technical skills (such as polymer/rubber technologies) are developed among young school leavers. Given the current age profile of employees in the industry, this last point is particularly important in ensuring the long-term viability of the industry.

Although comparatively smaller than the associated professionals and artisan categories by headcount, the professional and executive management employment categories are expected to face similarly demanding supply side challenges based on their projected growth in demand. Given a growth trajectory based on the current status quo, demand for professionals almost triples for both categories from 2015 to 2020. It is concerning that the majority of the employees in both the professional (49%) and the executive/senior management level (36%) have a highest level qualification equal to a Grade 12 or lower. A significant portion of professionals (21%) and executives (16%) have qualifications equal to a National Diploma level. Interviews at the tyre manufacturers suggest future demand will set this as a base level or even higher (BTech – Bachelor degrees) in order to meet industry requirements for these categories. External recruitment lead times for these categories were six weeks for professionals and eight

weeks for executives. Interviews indicated that the supply-side constraints for these employment categories were not severe, especially as more generic educational requirements were sufficient at this senior management level. For example, 8% of professionals and 16% of executives/senior management have Bachelor of Commerce and BSc Engineering degrees. Firms are able to recruit employees with these qualifications from a much larger pool of tertiary institutions nationally.

Further to this overview of skills demands, Sections 3.3.1 to 3.3.4 below unpack the associated qualification demands based on the projected headcount for the artisan/craft, associate professional, professional and executive/senior management employment categories. However, in order to provide more meaningful insight into the future skills demand requirements of the SA tyre manufacturing industry some amendments were made to the initial coding of the qualifications data. These include:

1. Given that a Grade 12 or lower qualification is no longer no longer sufficient for these categories of employees, the Grade 12 and lower qualification headcount was re-apportioned into the other qualification categories based on the proportionate breakdown of more advanced qualifications between the categories.
2. A technical Grade 12 equivalent grouping was created consisting of:
    - N1-3 Mechanical
    - N1-3 Electrical and Electronic
    - N1-3 Fitter/turner
    - N1-3 Other (e.g. boiler maker)
3. A technical post matric grouping was created consisting of:
    - N4-6 Mechanical
    - N4-6 Electrical and Electronic
    - N4-6 Other (e.g. millwright)
4. A University of Technology grouping was created consisting of all National Diplomas and BTech Degrees categorized as:
    - Mechanical engineering
    - Electrical engineering
    - Industrial engineering
    - Chemical engineering
    - Polymer/rubber technology
    - Education/training/HR/IR/PR
    - Operations Management (e.g. business management, purchasing and logistics)
5. A University Degree grouping was created consisting of:
    - Bachelor Degree Other (to honours) e.g. BCom, BA/BsocSci
    - BSc Chemical Engineering
    - BSc Mechanical Engineering
    - BSc Electrical Engineering
    - BSc Other (e.g. Civil Engineering)

6. The "Other" and "Other (certificates and programmes)" qualification categories were proportionately re-allocated to all the categories.

Table 23 below provides an overview of this new breakdown of qualifications consisting of 19 categories (as opposed to the previous 40 categories). Please refer to Annexure D for a breakdown of how the original categories were re-apportioned.

Table 23: Re-categorized qualification codes

Grouping	Qualification	Code
Technical Grade 12 Equivalent[1]	N 1-3 Mechanical	1
	N 1-3 Electrical & electronic	2
	N 1-3 Fitter/ Turner	3
	N 1-3 Other[2]	4
Technical Post Matric Qualifications[3]	N 4-6 Mechanical	5
	N 4-6 Electrical & electronic	6
	N 4-6 Other[4]	7
University of Technology - National Diploma & BTech	Mechanical engineering	8
	Electrical engineering	9
	Industrial engineering	10
	Chemical engineering	11
	Polymer/rubber technology	12
	Education/training/HR/IR/PR	13
	Operations management[5]	14
Degree	Bachelor Degree Other (to honours)[6]	15
	BSc chemical engineering	16
	BSc mechanical engineering	17
	BSc electrical engineering	18
	BSc Other[7]	19

Note:

1. All NTC 1-3 non-specified qualifications were apportioned among codes 1-4.
2. This category includes N1-3 Boilermaker (2) Trade (2) and Trade Instrumentation (1).
3. All NTC 4-6 qualifications were apportioned among codes 5-7.
4. This category includes N4-6 Millwright (1) and Instrument Mechanics (1).
5. This category includes National Diplomas in Business Management (2), Logistics (2), Purchasing Management (3), Production Management (9), Sales Management (2) freight management (1) and Automotive Supply Chain Management (1); National Diplomas in Administration (2), Analytical Chemistry (4), Book-Keeping (3), Information Technology (6), Marketing Management (9), Quality Management (2) and Work-study (1); Bachelor of Technology degree in Cost & Management Accounting (2), Logistics (1), Management (2), Marketing (1) and Quality Management (1).
6. BA/BSocSci (19) and BCom (50), Bachelor Jurisprudence and Law (1), Bachelor of Education (Honours) (1), Bachelor of Accounting (Honours) (1), International Business Administration (1) and Bachelor of Town & Regional Planning (1)
7. Includes BSc Civil Engineering (1).

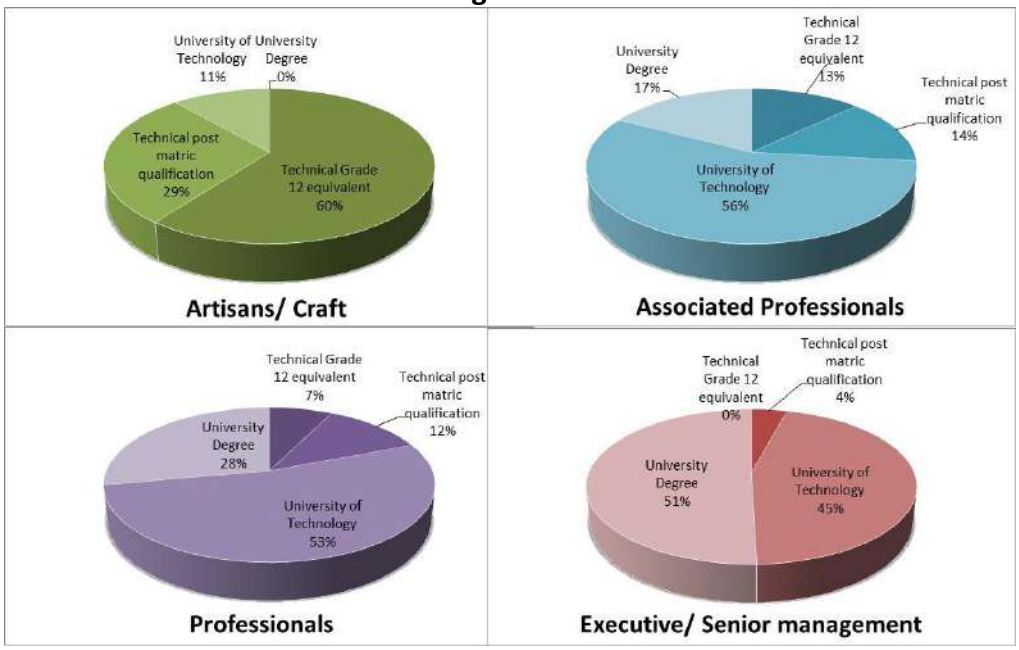
Re-categorizing the qualifications in this manner provides a much more valuable breakdown of qualification levels on which to build projected qualification demands as can be seen in Table 24 and Figure 11. This data illustrates that the majority of artisans/craft have the equivalent of a technical Grade 12 qualification of an N1-3 (60%); 28% have a technical post matric qualification (N4-6); and 11% have a National Diploma or BTech. No artisan/craft employees

had university degrees. The majority of associate professionals on the other hand have a National Diploma or BTech (56%); 17% have a university degree; 14% have a technical post matric qualification (N4-6); and 13% have the equivalent of a technical Grade 12 (N1-3).

Table 24: Breakdown of updated qualifications per employment category

Grouping	Qualification	Code	Artisans/ Craft	%	Associated Professionals	%	Professionals	%	Executive/ Senior management	%	Total
Technical Grade 12 Equivalent	N 1-3 Mechanical	1	11	7%	10	2%	5	4%	-	0%	26
	N 1-3 Electrical & electronic	2	16	11%	19	4%	-	0%	-	0%	36
	N 1-3 Fitter/ Turner	3	55	35%	19	4%	-	0%	-	0%	74
	N 1-3 Other	4	11	7%	10	2%	5	4%	-	0%	26
	TECHNICAL GRADE 12 TOTAL		**93**	**60%**	**58**	**13%**	**10**	**7%**	**-**	**0%**	**161**
Technical Post Matric Qualification	N 4-6 Mechanical	5	26	17%	19	4%	4	3%	-	0%	50
	N 4-6 Electrical & electronic	6	18	11%	34	8%	12	9%	2	4%	66
	N 4-6 Other	7	-	0%	10	2%	-	0%	-	0%	10
	TECHNICAL POST MATRIC TOTAL		**44**	**28%**	**63**	**14%**	**17**	**12%**	**2**	**4%**	**125**
University of Technology - National Diploma & BTech	Diploma/BTech Mechanical engineering	8	9	6%	14	3%	16	11%	-	0%	38
	Diploma/BTech Electrical engineering	9	4	3%	14	3%	4	3%	2	4%	25
	Diploma/BTech Industrial engineering	10	2	1%	8	2%	-	0%	-	0%	11
	Diploma/BTech Chemical engineering	11	-	0%	14	3%	2	2%	3	6%	19
	Diploma/BTech Polymer/rubber technology	12	-	0%	16	4%	4	3%	-	0%	21
	Diploma/BTech Education/training/HR/IR/PR	13	-	0%	39	9%	6	5%	5	10%	50
	Diploma/BTech Operations management	14	2	1%	147	33%	42	29%	13	26%	204
	UNIVERSITY OF TECHNOLOGY TOTAL		**18**	**11%**	**251**	**56%**	**75**	**53%**	**23**	**45%**	**367**
University Degree	Bachelor Degree Other (to honours)	15	-	0%	53	12%	21	15%	19	39%	93
	BSc chemical engineering	16	-	0%	8	2%	7	5%	2	3%	17
	BSc mechanical engineering	17	-	0%	8	2%	7	5%	2	3%	17
	BSc electrical engineering	18	-	0%	8	2%	-	0%	2	3%	10
	BSc Other	19	-	0%	-	0%	4	3%	2	3%	5
	UNIVERSITY DEGREE TOTAL		**-**	**0%**	**78**	**17%**	**39**	**28%**	**25**	**50%**	**143**
Total all groups			**154**	**100%**	**450**	**100%**	**141**	**100%**	**50**	**100%**	**795**

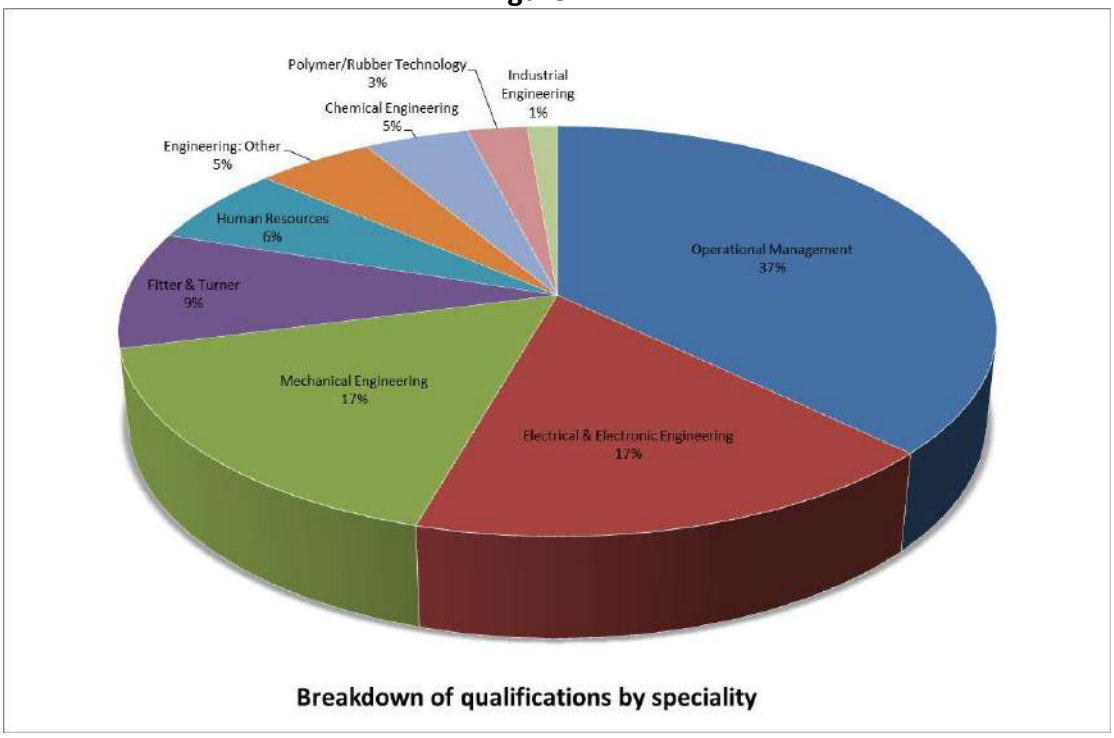
Figure 11



Similar to the associate professionals, 53% of professionals have a University of Technology qualification (National Diploma or BTech); whilst 28% have university degrees; 12% a technical post-matric qualification (N4-6); and 7% have the equivalent of a technical Grade 12 (N1-3). Amongst the executives and senior management none have the equivalent of a technical Grade 12 and only 4% that have technical post-matric qualification. Half of the executives/senior managers have a university degree and 45% have University of Technology qualifications.

If this new coding of qualifications data is analysed by qualification specialty (Figure 12) it is interesting to note that the largest proportion falls under operational management (37%). Operational management consists of a number of general management qualifications ranging from a BCom degree to diplomas in logistics, purchasing management, marketing management, administration and even information technology. HR-related qualifications also form a significant non-engineering requirement with 6% of the total. It is clear that the greatest concentration within the engineering fields lies within mechanical and electrical & electronic engineering, comprising 17% each. Polymer/rubber technology forms only a small proportion with 3% of the total.

Figure 12[18]



Breakdown of qualifications by speciality

[18] A detailed breakdown of qualifications by specialty can be found in Appendix E

3.3.1. Projected qualification demands: Artisan/craft

Table 25 below provides a projected breakdown of the number of qualifications required to meet the projected demand for artisans in all three growth scenarios. The most significant qualification demands in the artisan/craft category are for individuals with N1-3 Fitter/Turner qualification, N4-6 Mechanical, N4-6 Electrical and Electronic, and N1-3 Electrical and Electronic qualifications. Short-term demand based on a continuation of the industry's current MVA growth trend will translate into the industry requiring 53, 26, 17 and 16 new employees with these respective qualifications. By 2020 this requirement will increase to 161, 78, 52 and 48 new employees. Therefore for this category of employee the focus needs to be on electrical, mechanical and fitter/turner qualifications.

Table 25: Projected qualification demands 2015, 2017, 2020: Artisans/craft

	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
Qualification	**Current**	**Low**	**High**	**Current**	**Low**	**High**	**Current**	**Low**	**High**
N 1-3 Mechanical	11	8	13	19	14	24	32	23	43
N 1-3 Electrical & electronic	16	12	20	28	21	36	48	35	64
N 1-3 Fitter/ Turner	53	41	67	94	70	120	161	116	214
N 1-3 Other	11	8	13	19	14	24	32	23	43
N 4-6 Mechanical	26	20	32	45	34	58	78	56	103
N 4-6 Electrical & electronic	17	13	21	30	22	38	52	37	69
BTech/Diploma Mechanical engineering	9	7	11	15	11	19	26	19	34
BTech/Diploma Electrical engineering	4	3	5	8	6	10	13	9	17
BTech/Diploma Industrial engineering	2	2	3	4	3	5	6	5	9
BTech/Diploma Operations management	2	2	3	4	3	5	6	5	9
Total	**151**	**116**	**189**	**265**	**197**	**338**	**455**	**327**	**604**

3.3.2. Projected qualification demands: Associated professionals

Referring to the qualification demands for the associate professional employment category in Table 26, operational management qualifications are by far the largest requirement for associate professionals. If the current growth trend is maintained, 67 new employees with operational management qualifications will be required by 2015 and by 2020 an additional 203 employees will be required. This, combined with non-engineering bachelor degrees (73 by 2020 required under current growth trend) and HR-related qualifications (53 by 2020), makes up 53% of total demand for associate professionals. Within the engineering fields, the greatest requirements are for electrical and electronic qualifications, mechanical engineering and chemical engineering qualifications. If the current growth trend continues a respective 104, 70 and 31 new employees with these qualifications will be required by the industry.

Table 26: Projected qualification demands 2015, 2017, 2020: Associated professionals

Qualification	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
	Current	Low	High	Current	Low	High	Current	Low	High
N 1-3 Mechanical	4	3	6	8	6	10	13	10	18
N 1-3 Elecrical & electronic	9	7	11	15	12	20	27	19	35
N 1-3 Fitter/ Turner	9	7	11	15	12	20	27	19	35
N 1-3 Other	4	3	6	8	6	10	13	10	18
N 4-6 Mechanical	9	7	11	16	12	20	27	19	35
N 4-6 Elecrical & electronic	15	12	19	27	20	35	47	33	62
N 4-6 Other	4	3	6	8	6	10	13	10	18
BTech/Diploma Mechanical engineering	6	5	8	11	8	14	19	13	25
BTech/Diploma Electrical engineering	6	5	8	11	8	14	19	14	25
BTech/Diploma Industrial engineering	4	3	5	7	5	9	11	8	15
BTech/Diploma Chemical engineering	6	5	8	11	8	14	19	14	25
BTech/Diploma Polymer/rubber technology	8	6	9	13	10	17	23	16	30
BTech/Diploma Education/training/HR/IR/PR	18	13	22	31	23	39	53	38	71
BTech/Diploma Operations management	67	51	84	118	88	150	203	145	269
Bachelor Degree Other (to honours)	24	18	30	42	32	54	73	52	97
BSc chemical engineering	4	3	5	7	5	9	12	8	15
BSc mechanical engineering	4	3	5	7	5	9	12	8	15
BSc electrical engineering	4	3	5	7	5	9	12	8	15
Total	**206**	**157**	**258**	**361**	**269**	**461**	**621**	**445**	**824**

3.3.3. Projected qualification demands: Professionals

Table 27: Projected qualification demands 2015, 2017, 2020: Professionals

Qualification	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
	Current	Low	High	Current	Low	High	Current	Low	High
N 1-3 Mechanical	4	3	5	7	5	9	12	8	16
N 1-3 Other	4	3	5	7	5	9	12	8	16
N 4-6 Mechanical	3	2	4	5	4	7	9	7	12
N 4-6 Electrical & electronic	9	7	12	16	12	21	28	20	37
BTech/Diploma Mechanical engineering	12	9	15	21	15	27	36	26	47
BTech/Diploma Electrical engineering	3	2	4	6	4	7	10	7	13
BTech/Diploma Chemical engineering	2	1	2	3	2	4	5	4	7
BTech/Diploma Polymer/rubber technology	3	2	4	6	4	7	10	7	13
BTech/Diploma Education/training/HR/IR/PR	5	4	6	8	6	11	15	10	19
BTech/Diploma Operations management	31	24	39	55	41	70	94	67	125
Bachelor Degree Other (to honours)	16	12	19	27	20	35	47	34	62
BSc chemical engineering	6	4	7	10	7	13	17	12	22
BSc mechanical engineering	6	4	7	10	7	13	17	12	22
BSc Other	3	2	3	5	4	6	8	6	11
Total	**106**	**81**	**132**	**185**	**138**	**237**	**318**	**229**	**423**

Turning our attention to the Professional employment category, the largest requirement for this group of employees is similarly operational management, followed by non-technical Bachelor Degree (to honours level). If the current growth trend is extrapolated to 2020 then an additional 94 employees with operational management qualifications will be required, and there will be a demand for 47 new employees with non-technical degrees. These figures increase to 125 and 62 respectively under the high-growth scenario. National Diploma/BTech in

mechanical engineering and N4-6 in electrical and electronic engineering are also projected to be important qualifications for this category.

3.3.4. Projected qualification demands: Executives/senior management.

The profile of qualifications demand at the executive/senior management level shifts from technical qualifications to more generic business and management related qualifications. These are generally at a higher academic level with Bachelor degrees the most significant qualification category at this employment level. Bachelor degrees are clearly projected to be the largest qualification demand for this category with 52 additional employees with such qualifications required through to 2020, based on a continuation of the current growth trajectory, and 69 based on a high-growth trajectory. This is much greater than the demand for similar qualifications at the National Diploma and BTech level, clearly indicating that the level of qualification becomes noticeably more important in this employment category. As suggested in Section 2.3, it is not foreseen that the industry will experience great difficulty sourcing individuals with such qualifications even though specific industry knowledge will need to be developed. HR-related qualifications also feature at the executive/senior management level with a demand for an additional 9, 13 and 17 employees by 2020 for the low, current and high growth scenarios respectively. None of the technical qualifications feature substantially at this level of employment with a fairly even spread between electrical, chemical and mechanical engineering qualifications.

Table 28: Projected qualification demands 2015, 2017, 2020: Executive/senior managers

Qualification	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
	Current	Low	High	Current	Low	High	Current	Low	High
N 4-6 Electrical & electronic	2	1	2	3	2	4	6	4	7
BTech/Diploma Electrical engineering	2	1	2	3	2	4	6	4	7
BTech/Diploma Chemical engineering	2	2	3	4	3	6	7	5	10
BTech/Diploma Education/training/HR/IR/PR	4	3	5	8	6	10	13	9	17
BTech/Diploma Operations management	12	9	15	21	15	26	36	26	47
Bachelor Degree Other (to honours)	17	13	22	30	23	39	52	38	69
BSc chemical engineering	1	1	2	2	2	3	4	3	5
BSc mechanical engineering	1	1	2	2	2	3	4	3	5
BSc electrical engineering	1	1	2	2	2	3	4	3	5
BSc Other	1	1	2	2	2	3	4	3	5
Total	**45**	**34**	**56**	**79**	**59**	**101**	**136**	**98**	**180**

3.3.5. Summary of projected qualification demands: 2015, 2017, 2020 (All categories)

Table 29: Summary of qualifications required to 2020 (all categories)

Qualification	TOTAL TO 2015			TOTAL TO 2017			TOTAL TO 2020		
	Current	Low	High	Current	Low	High	Current	Low	High
BTech/Diploma Operations management	112	86	140	197	147	251	338	243	449
N 1-3 Fitter/ Turner	62	48	78	109	81	139	188	135	249
Bachelor Degree Other (to honours)	57	43	71	100	75	128	172	124	228
N 4-6 Electrical & electronic	44	34	55	77	57	98	132	95	175
N 4-6 Mechanical	38	29	47	66	49	84	114	82	151
BTech/Diploma Education/training/HR/IR/PR	27	20	34	47	35	60	81	58	107
BTech/Diploma Mechanical engineering	27	20	33	47	35	60	80	58	107
N 1-3 Electrical & electronic	25	19	31	44	32	56	75	54	99
N 1-3 Mechanical	19	15	24	33	25	43	57	41	76
N 1-3 Other	19	15	24	33	25	43	57	41	76
BTech/Diploma Electrical engineering	16	12	20	27	20	35	47	34	63
BTech/Diploma Polymer/rubber technology	11	8	13	19	14	24	32	23	43
BSc chemical engineering	11	8	13	19	14	24	32	23	43
BSc mechanical engineering	11	8	13	19	14	24	32	23	43
BTech/Diploma Chemical engineering	11	8	13	19	14	24	32	23	42
BTech/Diploma Industrial engineering	6	5	7	10	8	13	18	13	24
BSc electrical engineering	5	4	6	9	7	12	16	11	21
N 4-6 Other	4	3	6	8	6	10	13	10	18
BSc Other	4	3	5	7	5	9	12	9	17
Total	**508**	**388**	**635**	**890**	**663**	**1,137**	**1,530**	**1,099**	**2,031**

Sorted by requirements to 2020 based on a continuation of the current growth path,
Table 29 provides a summary of the total number of employees per qualification for all four employment categories under consideration. The highest category (338 people or 22% of total new requirements) relates to Operational Management qualifications, either at a National Diploma or BTech level. Non-technical Bachelor Degrees (up to honours) also feature prominently making up 11% of total demand for 2020 based on the current growth path, and HR-related qualifications 5% of total demand. Using current qualifications as the base, only 2% of skilled employee demand to 2020 under the current growth trajectory will require polymer/rubber technology qualifications. This breakdown of requirements provides firms in the New Tyre Chamber with a clear indication of what technical engineering qualifications should be supported by the industry in order to guarantee that its future skills requirements are met. Based on the research findings, and the modeling of demand to 2015, 2017 and 2020 respectively, it is recommended that the following high demand qualifications receive priority support:

- National Diplomas and BTech Degrees specializing in operational management, HR/IR, electrical engineering, mechanical engineering, HR/IR, chemical engineering and polymer/rubber technology
- N4-6 specializing in electrical and electronic, as well as mechanical fields
- BSc degrees with a focus on chemical, mechanical and electrical engineering
- N1-3 fitter/turner

4. Conclusion

The tyre industry is an important part of the South African manufacturing industry, contributing around 4% of the automotive assembly and component manufacturing sector's output. Since 2009, the industry has exhibited overall positive trends in output, exports and employment. The industry employs more than 6,000 people currently. However, there are a number of significant challenges confronting the industry with regards to employment demand and supply. The research findings presented in Section 2 and 3 of this report are enlightening in this regard. The disaggregation of current employment and qualification levels reveals that next to semi-skilled production workers, associate professionals are the largest employment category. This is a skilled employee category that has exhibited high growth rates since 2009, along with high turnover rates. The average age of employees in this category is also quite high at 47 years. Moreover, nearly 70% of the turnover in this category is attributed to resignations, with only 22% of these resignations remaining within the industry. This indicates that a sustained level of skills supply is required to ensure that the ongoing loss of skills from this category is effectively replaced.

The 2009 to 2012 employment trend reveals that there has also been substantial growth in the employment of executives/senior managers. Although this has occurred in the context of a low employee turnover rate, the average age of these employees is even higher than evident for the associate professional category, at 54 years of age. While the growth rate for this category of employee should decline significantly in future, the rate of turnover should increase over the next ten years as more executives/senior managers reach retirement age. For example, in 2011 nearly 30% of the turnover in this category was due to retirement, whilst 50% of turnover was due to resignations, with all of the resigned employees exiting the tyre manufacturing industry. Succession planning is therefore vital for executive/senior management appointments. Succession planning for professionals is also vital. Although this group of employees exhibited both relatively low growth and low employment turnover, this is a highly skilled category of employee and new staff will be required for growth and replenishment of those who exit the industry over the next few years.

The research on highest qualifications currently present within the industry yielded some alarming results. Of the more skilled employment categories consisting of executives/senior managers, professionals, associate professionals and artisans/craft, half (50%) have either a Grade 12 or lower level of education. Whilst these employees have many years of experience behind them, the high average age of employees within the industry as a whole means that firms will not be able to rely on deep tacit knowledge as a compensatory mechanism to meet skilled employment demands in the future. A far greater focus on formal qualifications is therefore a critical industry requirement.

Based on the 2009 to present trends, as well as a detailed breakdown of 2011 employment within the tyre manufacturing industry in South Africa, Section 2 estimated future employment demand to 2020 under three different growth scenarios: a) maintenance of current growth

trends; b) a low growth scenario; and c) a high growth scenario. This section of the research suggests that there is likely to be very substantial skills demand by the industry to 2015, 2017 and 2020 under each of the growth scenarios presented. Moreover, there are serious concerns about whether the South African institutional environment or the firms themselves are currently positioned to be able to meet these requisite skills needs.

Whilst the industry currently has many employees with non-industry specific qualifications, calculations projecting future qualifications demand highlight the importance of more technical qualifications. Various qualifications such as BSc, BTech, N4-6, and National Diplomas focusing on electrical, chemical, mechanical engineering and polymer/rubber technology appear particularly important. The industry needs to closely monitor the demand profile relating to these qualifications, and ideally should be preemptively reacting to supply constraints in each of these technical qualifications. The need for higher levels of qualifications is growing and any investment in new technology will only strengthen the demand for skilled employees. Whilst, the absence of BSc Engineering degrees at the executive level is surprising, the projected demand for commerce-related qualifications (at the Bachelor level) should not pose too many significant supply-side challenges for the industry because of the more generalist nature of these qualifications.

Of the three growth scenarios presented in Section 3, the maintenance of the current trend in MVA growth, or slightly lower, is probably most likely. This is based on the fact that local market growth is likely to be limited; and that a substantial increase in output will need to be derived from exports, particularly into Southern Africa. Projected employment demand to 2020 is therefore 6,674 people - based on the maintenance of current MVA growth of 5.14% per annum, and an average employment elasticity of 0.92.

Of these new employees, the majority required (63%) will be semi-skilled production workers. Nevertheless, a significant number of skilled executives/senior managers (136), professionals (318), associate professionals (621) and artisans/craft (455) employees will also be required. In the next eight years the industry will be required to recruit and train a total of 1,530 skilled individuals with qualifications ranging from BTech degrees, BSc Engineering degrees, National diplomas and N 4-6 qualifications.

The research shows that there are significant supply-side challenges when recruiting individuals with technical and tyre-specific qualifications, especially in the artisan/craft and associate professional categories. This was substantiated in the completed quantitative research (e.g. long average recruitment lead times), as well as from the qualitatively based firm-level interviews. One way that the industry is trying to overcome this challenge is through its apprenticeship/learnership programs. However, the success of these programs is mitigated by the high turnover of these candidates, especially shortly after they have qualified. Given the need for in-house training due to the lack of tyre manufacturing-specific training provided by tertiary institutions, it is critical for firms to find ways to retain these skills.

Strong demand for skills in the tyre manufacturing industry is healthy for the South African economy, but the ability of firms to find and train employees to meet their skills requirements timeously is of concern. Projected skills demands to 2020 may be completely wrong, precisely because skills supply constraints grow to the point where firms can no longer grow their business, nor effectively compete with international competitors. If this occurs, it is entirely conceivable that demand will drop sharply as firms stabilize (or even contract) their output levels; and supply will no longer be an issue. Urgent attention to emerging skills demand and supply issues is necessary if this situation is to be avoided, hence the central importance of the findings presented in this report – and the associated development of a software tool that accurately identifies skills demands requirements within the industry on an ongoing basis.

Appendix A

South African tyre manufacturers' skills demand and supply questionnaire

Company: _____
Date: _____
Name of Respondent: _____
Position in Company: _____

Please note that this questionnaire comprises ten questions that together provide the basis for an excel-based skills demand-supply model to be developed by B&M Analysts for the New Tyre Chamber of the MerSeta. The accuracy of questionnaire responses provided by the four individual tyre manufacturers is therefore critical to the integrity of the model that is developed. Also, please note that formulae definitions/explanations for the various measures are included as footnotes where appropriate. If you have any queries regarding the content of the questionnaire please contact Mr. Sean Kirby at sean.kirby@bmanalysts.com

With the exception of the final three questions, it is imperative that this questionnaire be completed and returned to B&M Analysts prior to the firm-level visit component of the study (where points of data clarity and qualitative inputs required to support the development of the model are secured).

1. Please indicate your total company sales (from own production), and total company Manufacturing Value Added for each of the calendar years 2009 to 2011, as well as your projection for 2012:

Year	Sales from own production (Rands)	Manufacturing Value Added (Rands)[19]
2012: Projected		
2011		
2010		
2009		

2. Please provide your total employment levels (and a breakdown of your employment complement) on the 31st of December for 2009-2011, as well as presently:

	2012 (present)	**2011**	**2010**	**2009**
Total				
Executives/Senior management[20]				
Professionals[21]				
Associate professionals[22]				
Sales				
Administration/Clerical				
Artisans/Craft				
Apprentices/Learners				
Production Workers				
Elementary/short term contract[23]				

[19] **Manufacturing Value-added** = Sales from manufacturing activities minus all material/component purchases.
[20] Peromnes Grade 1-5.
[21] Professionally qualified and experienced specialists – middle management.
[22] Skilled technicians who are academically qualified – junior management.
[23] **Not** labour brokers.

3. Please provide your total employment turnover rate for each of the years 2009 to 2011, as well as YTD 2012 for each employment category:

	2012: YTD	2011	2010	2009
Total employment turnover rate[24]				
Executives/Senior management				
Professionals				
Associate professionals				
Sales				
Administration/Clerical				
Artisans/Craft				
Apprentices/Learners				
Production Workers				
Elementary/short term contract				

4. For **2011 only**, please indicate the proportion of your employee turnover due to dismissals, resignations, retirement and retrenchments:

	Dismissed	**Resigned**	**Retired**	**Retrenched**	**Total**
Executives/Senior management					100%
Professionals					100%
Associate professionals					100%
Sales					100%
Administration/Clerical					100%
Artisans/Craft					100%
Apprentices/Learners					100%
Production Workers					100%
Elementary/short term contract					100%

5. For **2011 only**, please indicate the destination of employees that resigned:

	% joined other SA tyre manufacturers	% joined SA tyre distributors/ retailers	% joined other SA firms	% emigrated	% not working[25]	% to self-employment	% not known	Total
Executives/Senior management								100%
Professionals								100%
Associate professionals								100%
Sales								100%
Administration/Clerical								100%
Artisans/Craft								100%
Apprentices/ Learners								100%
Production Workers								100%
Elementary/short term contract								100%

6. For yearend **2011**, please indicate the average age of employees in each employment category, as well as their average years of experience in that employment category:

	Average age	**Average years of experience**
Executives/Senior management		
Professionals		
Associate professionals		
Sales		
Administration/Clerical		
Artisans/Craft		

[24] **Employee turnover rate:**

$$\frac{\text{Number of employees dismissed/resigned/retired/retrenched during year}}{\text{Average number of employees during year}} \times 100 = \text{Employee turnover rate (\%)}$$

Employees include medium- and long-term contract workers, as well as casuals, but exclude all labour contracted through labour brokers. For individual employee categories replace "number of employees" with number of [employee category] respectively.

[25] Studying, non-remunerative housework, work sabbatical, etc.

Apprentices/ Learners		
Production Workers		
Elementary/short term contract		
Total		

7. Please indicate the total number of employees recruited by your company in 2011, as well as the average recruitment lead time (from placement of advertisement to actual appointment) to find a suitable candidate to fill the positions. Please separate the total number recruited and the average recruitment lead time in accordance with whether the positions were filled by internal or external candidates.

	Total recruited		**Average recruitment lead time (in weeks)**	
	Internal	**External**	**Internal**	**External**
Executives/Senior management				
Professionals				
Associate professionals				
Sales				
Administration/Clerical				
Artisans/Craft				
Apprentices/ Learners				
Production Workers				
Elementary/short term contract				
Total				

Please note that the following questions only need to be completed when the firm-level visit component of the study takes place. However, it is crucial that each manufacturer prepares for the completion of the questions, particularly if the information is not readily available.

8. For each recruited person in 2011, please indicate their highest level of qualification, age (in years) at time of employment, years of work experience (in the position recruited), and the institution/company they were recruited from, as per the following format:

Employment category	**Employee position**	**Age at recruitment**	**Highest qualification**	**Years of work experience**	**Recruited from**
e.g. Management	*e.g. Production manager*	*e.g. 34*	*e.g. BTech (Production management)*	*e.g. 3.5*	*e.g. another company, FET, University*

* Please note that the names of individuals do not need to be supplied.

9. For each of the recruited persons listed in Question 8, please indicate the qualification level specified for the position they were recruited into, as well as the number of years of experience originally specified, as per the following format:

Employment category	**Employee position**	**Specified qualification level**	**Specified years of work experience**
e.g. Management	*e.g. Production manager*	*e.g. BTech (Production management)*	*e.g. 5.0*

* Please note that the names of individuals do not need to be supplied.

10. Please indicate the highest level of qualification for each employee in the company that falls into your management, professional, associate professional, and artisan categories, as per the following format:

Employment category	**Employee position**	**Highest qualification**	**Year of qualification (if available)**
e.g. Management	*e.g. Production manager*	*e.g. BSc Hons (Polymer Science)*	*e.g.1981*

* Please note that the names of individuals do not need to be supplied.

Thank you for completing – please email to sean.kirby@bmanalysts.com.

Appendix B

Fieldwork and interview outline

Fieldwork context

An important complement to the firm-level skills demand survey to be administered at each tyre manufacturer is a site visit to each firm. The site visit will focus on clarifying all questionnaire responses, as well as the completion of a set of qualitative-type interviews that unpack important strategic Human Resource related interventions and developments at the firms (and that are of direct relevance to understanding data included in the questionnaire).

Site visit schedule and process

BMA will visit each of the tyre manufacturers in South Africa over the period 1st to 12th of October 2012. Ideally, the first tyre manufacturer visited should be Apollo Tyres in Durban, as the first site visit will involve the lead researcher (Justin Barnes) and BMA's research team (Sean Kirby and Jeanne Terreblanche) – all of whom are Durban based. The balance of site visits (to Bridgestone, Continental and Goodyear), will need to be completed by the close of the 12th of October. Each visit will follow the same basic format:

Time	Agenda item	Purpose
09:00	Arrival and overview/clarification of study to HR team at participating tyre manufacturer	Context and importance of study to be understood
09:15	Review of company HR strategy since 2009	Ensure research at each firm is contextualised in relation to its HR strategy
10:30	Tea	
10:45	Review of skills demand questionnaire responses (questions 1-7): 1. Points of clarity in respect of outliers, data inconsistencies, potential anomalies 2. Qualitative discussion for each question	Ensure clean skills demand questionnaire that accurately reflects the firm's skills issues
12:45	Lunch	
13:30	Secure data for/understanding of final two questions: 1. Points of clarity regarding qualifications 2. Discussion of qualification sources (and associated quality): junior and senior staff recruitment, promotion	Ensure understanding of firm's employee qualification and experience levels, and evolving skills requirements
15:30	Closure meeting covering any outstanding HR issues of importance to the study	Ensure full coverage of all HR issues of relevance to the study
16:00	Closure	

Interview questions

1. **<u>Company HR strategy</u>**

- Please explain the company's HR strategy over the period 2009 to 2012?

- How is the company's 2009 to 2012 HR strategy different from its previous HR strategies?
- How has the company's HR strategy aligned with its manufacturing and product development/improvement strategies?
- How is the company's future HR strategy likely to change over the next five years?
- What are the company's core skills development challenges? How have the company's core skills development requirements changed since 2009? Are they likely to change further in future? If so, please explain.

2. Review of skills demand questionnaire (Questions 1-7)

- What have the implications of the company's MVA growth/decline been for its skills requirements over the period 2009 to 2012?
- Have there been any notable shifts in the composition of the company's employee base since 2009? (e.g. more/less employees in a particular category as a per cent of total employment? Reasons for the shift? Likely trend in the future?)
- What are the major factors driving high/low employee turnover levels? (remuneration, working environment, aging workforce, demographic factors (employ more young women, etc.)
- If any concentrations of dismissals, resignations, retirements, retrenchments, why?
    - Dismissals due to poor performance (e.g. management performance, fraud)
    - Resignations (e.g. new working conditions – shift configurations)
    - Retirements (e.g. package offered for employees to take early retirement)
    - Retrenchments (e.g. department/position made redundant, mass retrenchment tied to particular factor)
- Unpack any major factors driving employees to join other tyre manufacturers, or other South African firms, as well as any specific factors driving emigration, decision not to work, or to seek self-employment
- Any specific reason for the age profile of employees in any particular category? (e.g. new technology, technical skills, maths and science requirements, tacit knowledge requirements, etc.)
- Reasons for specific recruitment profile at company? New technology, new product
- Reasons for short or long lead times for each employment category? (Good university or FET skills available/unavailable, etc.)

3. Recruitment

- Select 5 recruited staff for 2011 and discuss the profile of the recruited person relative to the advertised position (secure advertisement and then assess qualifications and years of experience versus advertised experience and skills requirements)

- Discuss recruitment successes: unpack good sources of employment (tertiary education institutions, companies, sectors) and identify why these sources are viewed positively
- Discuss recruitment failures: unpack poor sources of employment (tertiary education institutions, companies, sectors) and identify why these sources are viewed negatively

4. Qualification levels

- Unpack existing qualification levels at **each** employee category level and discuss gaps between existing qualification and ideal qualification levels
- Discuss how existing qualification levels at the SA tyre manufacturer differs from sister plants around the world (use China/India and Europe/North America as the two reference points)

5. Closure of visit

- Ensure all questions answered
- If any information is outstanding at the end of the day, secure agreement on date of submission of information to BMA
- If any information is unavailable, attempt to secure proxy information and/or estimates.

Annexure C

Qualification	Code	Artisans/ Craft	%	Associated Professionals	%	Professionals	%	Executive/ Senior management	%	Total
< Grade 12	1	32	20.78	79	17.56	15	10.64	1	2	127
Grade 12	2	32	20.78	165	36.67	54	38.30	17	34	268
NTC 1-3	3	21	13.64	7	1.56	3	2.13	0	0	31
NTC 4-6	4	13	8.44	9	2.00	2	1.42	0	0	24
N 1-3 Mechanical	5	2	1.30	2	0.44	1	0.71	0	0	5
N 1-3 Electrical & electronic	6	3	1.95	4	0.89	0	0.00	0	0	7
N 1-3 Fitter/ Turner	7	10	6.49	4	0.89	0	0.00	0	0	14
N 1-3 Other	8	2	1.30	2	0.44	1	0.71	0	0	5
N 1-3 Unspecified	9	15	9.74	4	0.89	0	0.00	0	0	19
N 4-6 Mechanical	10	3	1.95	4	0.89	1	0.71	0	0	8
N 4-6 Electrical & electronic	11	2	1.30	7	1.56	3	2.13	1	2	13
N 4-6 Other	12	0	0.00	2	0.44	0	0.00	0	0	2
N 4-6 Unspecified	13	7	4.55	3	0.67	2	1.42	0	0	12
National Diploma (Mechanical Engineering)	14	4	2.60	2	0.44	5	3.55	0	0	11
National Diploma (Electrical Engineering)	15	2	1.30	4	0.89	2	1.42	0	0	8
National Diploma (Industrial Engineering)	16	1	0.65	3	0.67	0	0.00	0	0	4
National Diploma (Chemical Engineering)	17	0	0.00	4	0.89	0	0.00	1	2	5
National Diploma (Polymer/ Rubber technology)	18	0	0.00	4	0.89	2	1.42	0	0	6
National Diploma (Education & Training/ HR/ IR/ PR)	19	0	0.00	10	2.22	3	2.13	1	2	14
National Diploma (Operational management)	20	1	0.65	16	3.56	2	1.42	3	6	22
National Diploma (Other)	21	0	0.00	34	7.56	14	9.93	1	2	49
National Diploma (Unspecified)	22	2	1.30	8	1.78	1	0.71	2	4	13
BTech (Electrical Engineering)	23	0	0.00	1	0.22	0	0.00	1	2	2
BTech (Mechanical Engineering)	24	0	0.00	3	0.67	2	1.42	0	0	5
BTech (Chemical Engineering)	25	0	0.00	1	0.22	1	0.71	0	0	2
BTech (Polymer Technology)	26	0	0.00	2	0.44	0	0.00	0	0	2
BTech (HR & LR)	27	0	0.00	4	0.89	0	0.00	1	2	5
BTech (Other)	28	0	0.00	3	0.67	3	2.13	1	2	7
BTech (Unspecified)	29	0	0.00	1	0.22	1	0.71	0	0	2
BA/ BsocSci (to Honours level)	30	0	0.00	7	1.56	1	0.71	1	2	9
BCom (to Honours level)	31	0	0.00	12	2.67	6	4.26	6	12	24
BSc (to Honours level)	32	0	0.00	7	1.56	4	2.84	2	4	13
BSc Engineering (Chemical)	33	0	0.00	1	0.22	2	1.42	0	0	3
BSc Engineering (Mechanical)	34	0	0.00	1	0.22	2	1.42	0	0	3
BSc Engineering (Electrical)	35	0	0.00	1	0.22	0	0.00	0	0	1
BSc Engineering (other)	36	0	0.00	0	0.00	1	0.71	0	0	1

Bachelor Degree (other)	**37**	0	0.00	2	0.44	3	2.13	0	0	5
Bachelor Degree (unspecified)	**38**	0	0.00	0	0.00	0	0.00	3	6	3
Other	**39**	1	0.65	3	0.67	1	0.71	4	8	9
Other (Certificates & Programmes)	**40**	1	0.65	24	5.33	3	2.13	4	8	32
Total		154	100.00	450	100.00	141	100	50	100	**795**

Annexure D

Qualification	Code	Artisans/ Craft	%	Associated Professionals	%	Professionals	%	Executive/ Senior management	%	Total
< Grade 12	1-19	32	20.8	79	17.6	15	10.6	1	2	127
Grade 12	1-19	32	20.8	165	36.7	54	38.3	17	34	268
NTC 1-3	1-4	21	13.6	7	1.56	3	2.13	0	0	31
NTC 4-6	5-7	13	8.44	9	2	2	1.42	0	0	24
N 1-3 Mechanical	1	2	1.3	2	0.44	1	0.71	0	0	5
N 1-3 Electrical & electronic	2	3	1.95	4	0.89	0	0	0	0	7
N 1-3 Fitter/ Turner	3	10	6.49	4	0.89	0	0	0	0	14
N 1-3 Other [1]	4	2	1.3	2	0.44	1	0.71	0	0	5
N 1-3 Unspecified	1-4	15	9.74	4	0.89	0	0	0	0	19
N 4-6 Mechanical	5	3	1.95	4	0.89	1	0.71	0	0	8
N 4-6 Electrical & electronic	6	2	1.3	7	1.56	3	2.13	1	2	13
N 4-6 Other [2]	7	0	0	2	0.44	0	0	0	0	2
N 4-6 Unspecified	5-7	7	4.55	3	0.67	2	1.42	0	0	12
National Diploma (Mechanical Engineering)	8	4	2.6	2	0.44	5	3.55	0	0	11
National Diploma (Electrical Engineering)	9	2	1.3	4	0.89	2	1.42	0	0	8
National Diploma (Industrial Engineering)	10	1	0.65	3	0.67	0	0	0	0	4
National Diploma (Chemical Engineering)	11	0	0	4	0.89	0	0	1	2	5
National Diploma (Polymer/ Rubber technology)	12	0	0	4	0.89	2	1.42	0	0	6
National Diploma (Education & Training/ HR/ IR/ PR)	13	0	0	10	2.22	3	2.13	1	2	14
National Diploma (Operational management)[3]	14	1	0.65	16	3.56	2	1.42	3	6	22
National Diploma (Other)[4]	14	0	0	34	7.56	14	9.93	1	2	49
National Diploma (Unspecified)	8-14	2	1.3	8	1.78	1	0.71	2	4	13
BTech (Electrical Engineering)	9	0	0	1	0.22	0	0	1	2	2
BTech (Mechanical Engineering)	8	0	0	3	0.67	2	1.42	0	0	5
BTech (Chemical Engineering)	11	0	0	1	0.22	1	0.71	0	0	2
BTech (Polymer Technology)	12	0	0	2	0.44	0	0	0	0	2
BTech (HR & LR)	13	0	0	4	0.89	0	0	1	2	5
BTech (Other)[5]	14	0	0	3	0.67	3	2.13	1	2	7
BTech (Unspecified)	8-14	0	0	1	0.22	1	0.71	0	0	2
BA/ BsocSci (to Honours level)	15	0	0	7	1.56	1	0.71	1	2	9
BCom (to Honours level)	15	0	0	12	2.67	6	4.26	6	12	24
BSc (to Honours level)	19	0	0	7	1.56	4	2.84	2	4	13
BSc Engineering (Chemical)	16	0	0	1	0.22	2	1.42	0	0	3
BSc Engineering (Mechanical)	17	0	0	1	0.22	2	1.42	0	0	3
BSc Engineering (Electrical)	18	0	0	1	0.22	0	0	0	0	1

BSc Engineering (other)[6]	19	0	0	0	0	1	0.71	0	0	1
Bachelor Degree (other)[7]	15	0	0	2	0.44	3	2.13	0	0	5
Bachelor Degree (unspecified)	15	0	0	0	0	0	0	3	6	3
Other[8]	1-19	1	0.65	3	0.67	1	0.71	4	8	9
Other (Certificates & Programmes)[9]	1-19	1	0.65	24	5.33	3	2.13	4	8	32
Total		**154**	**100**	**450**	**100**	**141**	**100**	**50**	**100**	**795**

Notes:

10. This category includes N1-3 Boilermaker (2) Trade (2) and Trade Instrumentation (1).
11. This category includes N4-6 Millwright (1) and Instrument Mechanics (1).
12. This category includes National Diplomas in Business Management (2), Logistics (2), Purchasing Management (3), Production Management (9), Sales Management (2) freight management (1) and Automotive Supply Chain Management (1).
13. This category includes National Diplomas in Administration (2), Analytical Chemistry (4), Book-Keeping (3), Information Technology (6), Marketing Management (9), Quality Management (2) and Work-study (1).
14. This category includes a Bachelor of Technology degree in Cost& Management Accounting (2), Logistics (1), Management (2), Marketing (1) and Quality Management (1).
15. This category includes a Bachelor of Science Degree in Civil Engineering (1).
16. This category includes Bachelor Jurisprudence and Law (1), Bachelor of Education (Honours) (1), Bachelor of Accounting (Honours) (1), International Business Administration (1) and Bachelor of Town & Regional Planning (1)
17. This category includes a Masters of Business Administration (1), Government Certificate of Competency (1), Nursing (2) and Doctorate (PhD) (2).
18. This category includes Certificates in Marketing Management (3), Quality (2), Computers (6), Office Administration (2), Practical Rubber Technology (3) and Operations Management (2)

Appendix E

Speciality	Education Level	Code	Artisans/ Craft	%	Associated Professionals	%	Professionals	%	Executive/ Senior management	%	Total	%
Operational Management	Degree	15	-	0%	53	12%	21	15%	19	39%	**93**	12%
	Diploma/Btech	14	2	1%	147	33%	42	29%	13	26%	**204**	26%
	OPERATIONAL MANAGEMENT TOTAL		**2**	**1%**	**200**	**44%**	**62**	**44%**	**33**	**65%**	**297**	**37%**
Electrical & Electronic Engineering	N1-3	2	16	11%	19	4%	-	0%	-	0%	**36**	4%
	N4-6	6	18	11%	34	8%	12	9%	2	4%	**66**	8%
	Diploma/Btech	9	4	3%	14	3%	4	3%	2	4%	**25**	3%
	BSc	18	-	0%	8	2%	-	0%	2	3%	**10**	1%
	ELECTRICAL/ELECTRONIC ENGINEERING TOTAL		**38**	**25%**	**75**	**17%**	**17**	**12%**	**6**	**11%**	**136**	**17%**
Mechanical Engineering	N1-3	1	11	7%	10	2%	5	4%	-	0%	**26**	3%
	N4-6	5	26	17%	19	4%	4	3%	-	0%	**50**	6%
	Diploma/Btech	8	9	6%	14	3%	16	11%	-	0%	**38**	5%
	BSc	17	-	0%	8	2%	7	5%	2	3%	**17**	2%
	MECHANICAL ENGINEERING TOTAL		**46**	**30%**	**51**	**11%**	**33**	**23%**	**2**	**3%**	**131**	**16%**
Fitter & turner	N1-3	3	55	35%	19	4%	-	0%	-	0%	**74**	9%
	FITTER & TURNER TOTAL		**55**	**35%**	**19**	**4%**	**-**	**0%**	**-**	**0%**	**74**	**9%**
Human Resources	Diploma/Btech	13	-	0%	39	9%	6	5%	5	10%	**50**	6%
	HR TOTAL		**-**	**0%**	**39**	**9%**	**6**	**5%**	**5**	**10%**	**50**	**6%**
Engineering: Other	N1-3	4	11	7%	10	2%	5	4%	-	0%	**26**	3%
	N4-6	7	-	0%	10	2%	-	0%	-	0%	**10**	1%
	BSc	19	-	0%	-	0%	4	3%	2	3%	**5**	1%
	ENGINEERING: OTHER TOTAL		**11**	**7%**	**19**	**4%**	**9**	**6%**	**2**	**3%**	**41**	**5%**
Chemical Engineering	Diploma/Btech	11	-	0%	14	3%	2	2%	3	6%	**19**	2%
	BSc	16	-	0%	8	2%	7	5%	2	3%	**17**	2%
	CHEMICAL ENGINEERING TOTAL		**-**	**0%**	**22**	**5%**	**10**	**7%**	**4**	**8%**	**36**	**5%**
Polymer/Rubber Technology	Diploma/Btech	12	-	0%	16	4%	4	3%	-	0%	**21**	3%
	POLYMER/RUBBER TECHNOLOGY TOTAL		**-**	**0%**	**16**	**4%**	**4**	**3%**	**-**	**0%**	**21**	**3%**
Industrial Engineering	Diploma/Btech	10	2	1%	8	2%	-	0%	-	0%	**11**	1%
	INDUSTRIAL ENGINEERING TOTAL		**2**	**1%**	**8**	**2%**	**-**	**0%**	**-**	**0%**	**11**	**1%**
Total all groups			**154**	**100%**	**450**	**100%**	**141**	**100%**	**50**	**100%**	**796**	**100%**