



Understanding Interactive Capabilities for Skills Development in Sectoral Systems of Innovation

A case study of the Tier 1 automotive component sector in the Eastern Cape

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component sector in the Eastern Cape

Simon McGrath



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LIST OF ACRONYMS AND ABBREVIATIONS

AATP	Accelerated Artisan Training Programme
AECDP	Automotive Experiential Career Development Programme
AIDC	Automotive Industry Development Centre
AIEC	Automotive Industry Export Council
APDP	Automotive Production Development Programme
ASCII	Auto Supply Chain Competitiveness Initiative
CDC	Coega Development Corporation
CKD	completely knocked-down kit
ECPSDF	The Eastern Cape Provincial Skills Development Forum
ECSECC	Eastern Cape Socio-Economic Consultative Council
ELIDZ	East London Industrial Development Zone
IAB	Industry Advisory Board
IPAP	Industrial Policy Action Plan
merSETA	Manufacturing, Engineering and Related Services Sector Education and Training Authority
MIDP	Motor Industry Development Programme
NAACAM	National Association of Automotive Component and Allied Manufacturers
NAAMSA	National Association of Automobile Manufacturers of South Africa
NUMSA	National Union of Metalworkers of South Africa
OEM	original equipment manufacturer
PAB	Programme Advisory Board
PDI	previously disadvantaged individual
SSI	sectoral system of innovation
SSP	Sector Skills Plan
TIA	Technology Innovation Agency
WIL	work-integrated learning

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Simon McGrath of the University of Nottingham synthesised the component parts and developed the overall analytical thread in this report.

Glenda Kruss of the HSRC conceived of and designed the project to investigate the ways in which alignment between post-school education and training organisations and labour markets can be improved, and was responsible for overall project management.

Glenda Kruss and Il-haam Petersen of HSRC developed the conceptual framework and methodology as well as the interview schedules and analytical templates that guided the research.

Il-haam Petersen developed the databases for the network analysis and the analysis of interactive capabilities, while Bongani Nyoka captured the data.

B&M Analysts prepared a background paper on the automotive sector that shaped the empirical focus on Tier 1 firms and the Eastern Cape region.

Salim Akoojee (consultant and adjunct professor at the University of the Witwatersrand) conducted the research and drafted the initial analysis of the Tier 1

firms. Luke Muller (consultant), Michael Gastrow (HSRC), Bongiwe Mncwango (HSRC), Vanessa Taylor (consultant) and Chris Diwu (HSRC) also conducted interviews with firms.

Bongiwe Mncwango conducted the research and drafted the initial analysis of the sectoral intermediaries. Simon McGrath and Glenda Kruss also conducted interviews with intermediaries.

Tim McBride and Joy Papier of the FET Institute at the University of the Western Cape conducted the research and drafted the initial analysis of the three focus FET colleges. Chris Diwu and Il-haam Petersen conducted interviews with the other colleges in the province.

Fiona Lewis (consultant) conducted the research and drafted the initial analysis of the universities.

Vanessa Taylor conducted research on private training providers.

Jessica Paulse (HSRC) tirelessly negotiated access and scheduled interviews with firms, universities, and FET and private colleges.

Tania Fraser (HSRC) was responsible for all logistics and travel arrangements to support fieldwork.

PREFACE

This case study report is a product of the Labour Market Intelligence Partnership (LMIP), a large-scale, long-term research and development project that aims to support the Department of Higher Education and Training's mandate to establish a credible institutional mechanism for skills planning.

Specifically, it reflects research conducted to address the theme of 'Reconfiguring the post-schooling sector'. The aim is to investigate the ways in which alignment between different types of public and private education and training systems and labour markets can be improved. It investigates how organisational capabilities, structures and curriculum mechanisms facilitate or constrain interaction with labour market organisations, in a differentiated post-school sector.

There are two sub-projects in this theme of work. Project 1 is designed to focus on the capabilities of education and training organisations to interact with labour market stakeholders, and is led by Glenda Kruss of the HSRC. Project 2 focuses on curriculum responsiveness and is led by Volker Wedekind of the University of KwaZulu-Natal. The boundaries for the empirical investigation are drawn by four sectoral systems of innovation (SSI):

- Forestry growers (focused in KwaZulu-Natal)
- Sugarcane growers and millers (focused in KwaZulu-Natal)
- Automotive components manufacturers (focused in Port Elizabeth)
- Square Kilometre Array (SKA) (national)

The research attempts to identify appropriate change mechanisms, and hence, provide systemic knowledge to direct funding and interventions where DHET can have leverage in future, and education and training organisations can maintain their core roles in new ways.

This case study analysis forms part of Project 1, which investigates the distinct knowledge and technology base, the main actors, institutions and networks of each SSI, and the ways in which education and training organisations display dynamic interactive capabilities. It should be read in conjunction with a set of inter-related LMIP reports:

- *Report 4: Responding to Shifting Demand for Skills: How do we get firms and post-school education and training organisations to work together?* By Glenda Kruss, Il-haam Petersen, Simon McGrath and Michael Gastrow (2014)
- *Report 6: Understanding Interactive Capabilities for Skills Development in Sectoral Systems of Innovation: A case study of astronomy and the Square Kilometre Array telescope.* By Michael Gastrow (2015)
- *Report 8: Understanding Interactive Capabilities for Skills Development in Sectoral Systems of Innovation: A case study of the sugarcane growing and milling sector in KwaZulu-Natal.* By Il-haam Petersen (2015)

1. UNDERSTANDING INTERACTIVE CAPABILITIES FOR SKILLS DEVELOPMENT IN SECTORAL SYSTEMS OF INNOVATION: AN OVERVIEW OF THE CONCEPTUAL APPROACH, DESIGN AND METHODOLOGY OF THE RESEARCH PROJECT¹

Problem statement: The need to build interactive capabilities¹

This project ultimately focuses on ways to encourage and facilitate more effective interaction between post-school education and training organisations and the labour market.

A central concern of the DHET is to build a credible institutional mechanism for skills planning, with the assumption that it will equip government to encourage education and training organisations and industry to work together more effectively to mutual benefit and to address national skills priorities towards economic development.

We can identify strategies and mechanisms that have been used in other countries, particularly in advanced developed economies. However, if we identify and adopt such strategies, a problem remains:

How do we ensure that in the South African context, post-school education and training institutions have the will, matching expertise and capabilities to meet industry demand?

Post-school education and training organisations with distinct historical trajectories respond in diverse ways to government policy and market imperatives. Similarly, different types of firms – whether multinational corporations, large firms, or SMMEs, and whether in primary, secondary or tertiary

sectors – respond in different ways to global and local shifts, new technologies and new knowledge. In short, firms or universities or colleges will not *automatically* adopt new skills policy interventions and regulations, or respond to attempts at steering.

Hence, we need an understanding of the ways in which post-school education and training organisations interact with firms and labour market organisations to shape their core activities, in order to identify appropriate **change** mechanisms and strategies. There is no simple blueprint or tried-and-tested approach that is guaranteed to yield results in the South African context.

What we propose in this project is to develop a framework to analyse existing interaction and interactive capabilities in key sectoral systems of innovation in South Africa, as a basis on which to proceed. For instance, an FET college may have well-qualified engineering lecturers, but there is no way to communicate with local firms, or no support to change curriculum in response to changing technology in firms in a key sector in its immediate location. The intervention required relates to finding dynamic internal and external interface mechanisms. However, another college may lack qualified lecturers, which means we need different interventions here to improve lecturers' qualifications and pedagogic expertise.

For firms and education and training organisations involved in a sector, such an evidence base can enhance understanding of effective interactions, alignment, organisational strategies, and blockages and gaps, in order to identify specific ways in which to enhance institutional capabilities.

¹ This section was authored by Il-haam Petersen and Glenda Kruss to set the conceptual framework for the project as a whole.

A working framework

The project adopts an innovation systems approach to study skills development in South Africa, an approach that has been used to study university-industry interaction and firm learning in relation to research and innovation, to determine which new insights the approach can provide:

*Basically, the theory underlying innovation system analysis is about learning processes involving **skillful but imperfect rational agents and organisations**. It assumes that organisations and agents have a capability to enhance their competence through searching and learning and that they do so in interaction with other agents and that this is reflected in innovation processes and outcomes in the form of innovations and new competences (Lundvall 2010: 331).*

We propose a framework that emphasises dynamic interaction, interactive capabilities and network alignment, drawing on the innovation systems approach – specifically, the work of Malerba (2005) and Von Tunzelmann (2010). The approach is dynamic and evolutionary, emphasising change over time, but also how historical trajectories and institutions shape what is possible. **‘Interactive capabilities’** are defined as the capacity for learning and accumulation of new knowledge on the part of the organisation, and the integration of behavioural, social and economic factors into a specific set of outcomes (Von Tunzelmann & Wang 2003; 2007 in Iammarino et al. 2009). A good example of interactive capabilities at a university of technology is a work-integrated learning office that has institutional status and sufficient resources to coordinate activities across departments and faculties; build long term partnerships with firms; and mentor and support students, in a way that is functionally integrated into the organisation’s teaching and learning activities and ensures that students are able to receive quality workplace learning to graduate.

Considering that sectors differ significantly in terms of knowledge bases, skills needs and institutional conditions, we focus on analysing specific **sectoral**

systems of innovation (SSIs). Rather than simply emphasising a sector as an industrial concentration, a sector is defined as ‘a set of activities which are unified by some related product groups for a given or emerging demand and which share some basic knowledge’ (Malerba 2005: 65).

Figure 1 provides a **generic** representation of the actors and potential flows and interactive learning in an SSI in the South African context. It illustrates how the system could be mapped, as a basis for studying skills development networks, and the interactive capabilities of the main actors. We integrate Malerba’s (2005) SSI framework and Von Tunzelmann’s (2010) interactive capability and network alignment framework, and identify four main building blocks for analysing the interactive capabilities of education and training organisations and the extent of alignment in skills demand and supply:

- Common knowledge bases and similar technologies;
- Actors and networks;
- Institutions; and
- Interactive capabilities.

What is highlighted is the need to map the existing *structure, agents, mechanisms/strategies and dynamics of skills development* in specific sectors.

On the left-hand side of Figure 1, we describe the diverse groups of firms operating in the sector – whether multinational corporations, large firms or SMMEs – to identify their distinctive skills needs. The framework highlights the need to investigate the strategies and mechanisms that firms use for meeting their routine and changing skills demands, which may provide pointers as to how education and training organisations can, and do, play a role in addressing skills needs in specific SSIs.

On the right hand side, we analyse the different types of post-school organisations that could be addressing multiple skills demand in the sector – whether public FET colleges, universities or universities of technology, private FET or HET colleges, or other skills development programmes such as apprenticeships.

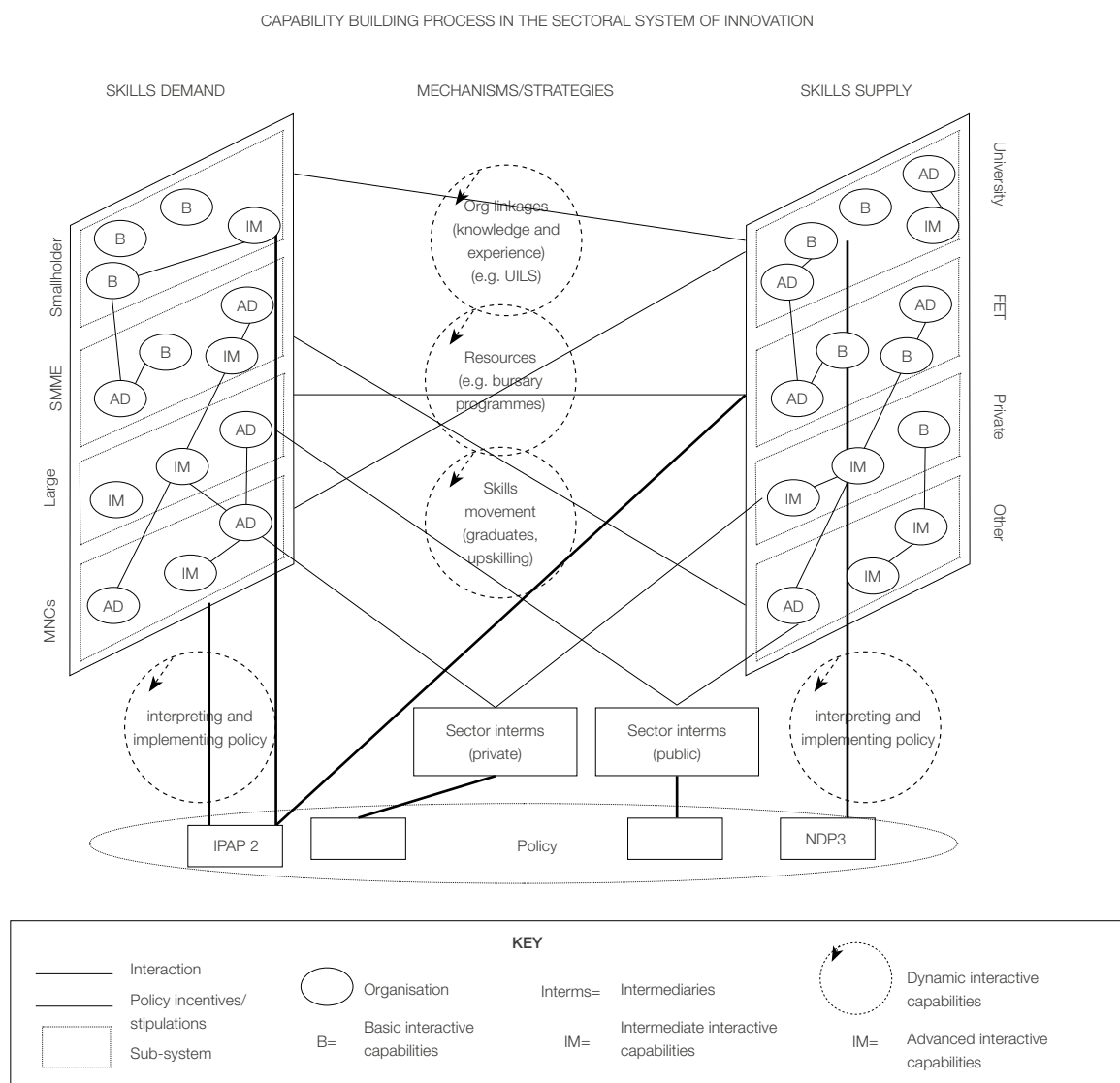
Each of the actors – firms and education and training organisations – is embedded in wider institutional environments, which shape and are shaped by actors' activities. Hence, at the very bottom of the diagram, we map out the key global, national or regional policy mechanisms that could be shaping demand in the sector, or influencing education and training supply. Firms and education and training actors interpret policy and, depending on their interactive capabilities and strategic goals, respond in different ways and to varying degrees.

Sectoral intermediaries, especially public sectoral intermediaries, play an important role in supporting firms and education and training organisations to be

responsive. Between the left- and the right-hand sides, we identify the sectoral intermediaries that serve to connect firms and education and training organisations and align their goals. In the public sector, this includes government departments, agencies like SAQA or QCTO and, critically, the role played by SETAs. In the private sector, intermediaries include industry associations, professional bodies, education and training associations, and so on.

The circular arrows in the middle of the diagram represent some of the typical mechanisms and strategies used to link supply and demand. For example, there may be flows of resources whereby

Figure 1: Capability-building processes at the sectoral level



firms provide scholarships and bursary programmes to meet their future skills requirements. Varying degrees of direct involvement are possible, which could include knowledge flows. For instance, the firm provides a list of topics for thesis research, or the firm hosts artisans for workplace training.

Working definitions of key concepts

In reading the empirical case study reports, it will be useful to consider the working definitions of key concepts from the innovation systems approach used to design data-gathering and analysis.

Sectoral system of innovation

A sectoral system of innovation refers to ‘sets of actors organised around specific types of productive activities and technologies, within distinct geographical and institutional settings’ (see Malerba 2005).

Competencies

Competencies stem from inputs to produce goods and services – that is, the preset attributes of individuals and firms, typically produced by organisations such as education and training organisations (Von Tunzelmann & Wang 2003).

In our framework, competencies take two forms:

- Tacit knowledge embodied in the human resources of the organisation and organisational routines; and
- Codified knowledge present in organisational structures, technologies, formal policies or other physical resources

Interactive capabilities

The capacity for learning and accumulation of new knowledge on the part of the organisation, and the integration of behavioural, social and economic factors into a specific set of outcomes (Von Tunzelmann & Wang 2003; 2007 in Iammarino et al. 2009). It refers to the capacity to form effective linkages with other organisations (e.g. firms, universities). It involves the learning and exploitation of an organisation’s competences, and the

development of organisational routines for producing desired outcomes.

Dynamic interactive capabilities

This is the capacity to sense changes in the business and education environment relevant to the organisation, and to respond effectively and timeously through strategic management. This requires familiarity with the organisation’s competencies and interactive capabilities for appropriately adapting, coordinating, integrating and reconfiguring the organisation’s competencies and internal and external interface mechanisms/strategies to match requirements of the changing environment. Here, leadership skills for strategic management are crucial.

Institutions

Institutions broadly refer to rules or guides for behaviour. Different types and levels of ‘guides for behaviour’ are recognised in the sectoral system of innovation (SSI) approach: formal (e.g. institutional policy, national policy) and informal (e.g. organisational culture), binding (specific regulations) and created by interaction (e.g. contracts), national (e.g. patent system) and sectoral (e.g. sectoral labour markets).

Education and training organisations

These include a diverse set of private and public education and training organisations – that is, universities, universities of technology, vocational education and training organisations (VET or FET), private colleges, private higher education institutions, and other training providers (e.g. SETAS, training centres operated by industry associations, etc.).

Sectoral intermediaries

These are ‘organisations or groups within organisations that work to enable innovation, either directly by enabling the innovativeness of one or more firms, or indirectly by enhancing the innovative capacity of regions, nations or sectors’ (Dalziel 2010: 3–4). Intermediaries may play a role as brokers, supporting and initiating inter-organisational networks, and may engage in other activities enabling the innovativeness of firms (e.g. providing

training and technology development and related activities such as the provision of access to expertise and equipment).

We distinguish between public and private sectoral intermediaries (see Interakumnerd & Chaoroenporn 2013). Public and private intermediaries differ in terms of their main functions. Public intermediaries tend to focus on public good objectives, especially those related to policy. Private intermediaries, on the other hand, tend to focus more on industry or firm-specific issues.

Identifying spaces for intervention

Understanding the existing interaction within a specific SSI provides a basis from which misalignment, challenges and bottlenecks can be identified. In turn, this can inform planning and targeted policy interventions to address the specific gaps and bottlenecks, and enhance strengths. The ability of a firm or education and training organisation to respond effectively to changes in the business and institutional environments that impact on skills development depends on their identification of changes that present opportunities, threats or constraints, and their internal capabilities to respond. An appropriate response often involves the acquisition of new knowledge and capabilities that transform, and are transformed by, the firm or education and training organisation through learning.

The framework allows us to identify a number of potential spaces for intervention to promote such learning and change, each of which will require specific mechanisms and strategies. These strategies may include the identification of

appropriate actors with which to collaborate in order to best address changes and improve performance.

Design and methodology: A set of three vertical case studies

The project uses a multilayered vertical case study design, with the empirical boundaries defined by an SSI, using a combination of:

- desktop and data-based research; and
- key informant interviews at different levels within the firm, sectoral intermediary and education and training organisation actors.

Bartlett and Vavrus (2011) suggest that the vertical case study design makes three important contributions. First, it insists on simultaneous attention to the micro-, meso- and macro-levels to enable 'vertical comparison'. Second, it emphasises the importance of historically situating processes under consideration to enable comparing across time, or 'transversal comparison'. Third, it emphasises the importance of comparing how similar processes unfold in distinct locations in space, or 'horizontal comparison'.

Three such empirical cases were selected, based on the criteria summarised in Table 1. The first criterion was to select across the main sectors in the economy. To define a specific-focus SSI within these main sectoral bands, we were informed largely by convenience, in terms of access to an existing or emerging body of research. Using a commissioned background paper, we identified the most significant segment of the value chain, in terms of the proportion of total employment in the sector in a geographical region, to define an SSI for

Table 1: Selection of case studies

Main sector of economy	Specific sectoral system of innovation	Geographical spread	Un/structured approach to skills planning and development
Primary sector	Agro-processing: sugar millers	KZN	Industry-led schemes and ad hoc
Secondary sector	Automotive: tier 1 component manufacturers	Eastern Cape	Government incentivisation and ad hoc
High technology/big science	Astronomy and the SKA	National/Western Cape	Foresight and planned skills development

Table 2: Research design

Desktop research	Fieldwork interviews	Fieldwork reports	Integrated synthesis case study report
Sector level			
Sector background paper	Interviews with policy-makers	Network analysis report	
Firms			
Desktop research and secondary data	Interviews with firms	Narrative report	
Universities			
Desktop research and secondary data	University interviews (core to SSI)	Narrative report	
Desktop research and secondary data	University interviews (not directly active in SSI)		
FET			
Desktop research and secondary data	FET interviews (core to SSI)	Narrative report	
Desktop research and secondary data	FET interviews (not directly active in SSI)		
Desktop research and secondary data	Other college interviews	Narrative report	
Private providers			
Desktop research and secondary data	Interviews with private providers	Narrative report	
Intermediaries			
Desktop research and secondary data	Interviews with private intermediaries	Narrative report	
	Interviews with public intermediaries		

empirical focus. A further criterion was that the final selection of cases represented a mix of un/structured approaches to skills planning and development, in terms of market-led or government steering and incentivisation schemes.

The design of the research is illustrated in Table 2. Each vertical case study was preceded by development of an initial map of the actors in the SSI to identify the structures of their interaction. The map formed part of a sectoral background paper that was commissioned for each of three sectors. The specific education and training organisations, firms and sectoral intermediaries to be included in the interviews were identified from the initial mapping process, which was elaborated and refined in the course of the fieldwork.

Understanding the policy environment pertaining to the role of each type of actor in skills development is crucial. The fieldwork thus began with interviews with DHET branch managers and other cognate government departments, national or provincial.

To study the scale and degree of network interaction, we asked each of the main actors to

identify the other actors with whom they interact in the SSI. This data was analysed using network analysis software, to produce visual maps of the extent and strength of interaction in the SSI.

Interviews with firms complemented by desktop work – using existing databases, internet and secondary sources and the sectoral background paper – centred on the drivers of innovation and technology change in the sector, and the strategies that firms use to meet their skills needs – and skills constraints – across high, intermediate and basic levels of production. We also asked each interviewee to complete a rating scale to assess his or her perceptions of environmental turbulence in their sector and the dynamic interactive capabilities of his or her firm.

These were followed by interviews with SETAs, industry associations and other sectoral intermediaries, such as professional associations and employer associations, to understand their roles in linking demand- and supply-side actors. The purpose of these interviews is to identify present and future skills needs, capacity and constraints in the sector, and the existence and

effectiveness of mechanisms to facilitate interaction around skills development between firms and education and training organisations.

At the heart of the case study is an in-depth analysis of the interactive capabilities of each of the education and training organisations that provide qualifications and skills development for the core occupations in the sector. The education and training organisations that are most directly and actively involved with other actors were studied in depth – specifically, their capability-building processes.

One empirical challenge was to select focus knowledge and technology fields, programmes and qualifications, in order to provide empirical boundaries that limit the investigation within the education and training organisations. We based this selection on the occupational groupings and levels that are distinctive to the knowledge and technology base of the sector. We excluded four ‘Organising Framework for Occupations’ (OFO) major groups: community and personal services workers (4), managers (1), clerical and admin (5) and sales workers (6) are generic occupational groups not directly related to our focus sectors. We included four occupational groups and the qualifications connected to these: professionals (2), technical and trade workers (3), machinery operators and drivers (7), and elementary workers (8). Using the SAQA list of registered qualifications, we identified an initial list of sector-related qualifications for each of these occupational groupings. This allowed us to identify specific programmes or departments within each type of education and training organisation as the empirical focus for the interviews.

We attempted to study the competences, interactive capabilities and dynamic interactive capabilities within education and training

organisations in relation to three dimensions of their activity:

1. What they teach – the approach and mechanisms by means of which programmes are informed by technological drivers and skills needs in the sector (or not, as the case may be);
2. How they teach – the approach and mechanisms that shape work readiness of graduates, such as workplace learning, internships, apprenticeships or learnerships, in interaction with firms in the sector; and
3. How they facilitate labour market access – the approach and mechanisms that support individuals’ labour market transitions, in interaction with firms in the sector.

The analysis relies primarily on in-depth, semi-structured interviews within education and training organisations, with heads of institutional planning, heads of external interface structures and mechanisms such as careers offices or graduate placement units, and lecturers and trainers in the relevant knowledge fields. Interviews were complemented by desktop research, including the consultation of websites, organisational policy documents and overviews of structural arrangements. Each interviewee was asked to complete a rating scale to assess his or her perceptions of environmental turbulence in the education and training sector and the dynamic interactive capabilities of his or her organisation.

The analysis reflected on the interactive capabilities and strategies of each of the different kinds of actors in terms of their roles and interaction within the SSI. Narrative reports on the different types of actors were prepared by a set of researchers. On this basis, this synthesis case study report on the **Tier 1 Automotive Component Sectoral System of Innovation** was prepared.

2. INTRODUCTION

The automotive sector is a significant part of South African industry and of the economy as a whole. In 2012, it contributed 7% of GDP. However, this underplays the true significance of a sector that contributes more broadly to the development and health of a range of related sectors. The sector is a major employer, with over 100 000 directly employed in manufacturing and another 200 000 in supporting and related services. Moreover, the sector is a vital part of South Africa's export strategy, with over 50% of its output being exported (B&M Analysts 2013: 8).

The sector is also of huge political significance. The National Union of Metalworkers of South Africa (NUMSA) was a key partner in the ANC-COSATU-SACP alliance that came to power in 1994 and senior trade union officials moved on to key roles as ministers and senior government officials. The importance of the car as a symbol of modernity and the national pride linked to having a vibrant automotive industry also should not be discounted, particularly as South Africa is home to two of the most powerful brands in the sector: BMW and Mercedes-Benz.

As part of a larger study of sectors of the South African economy and their interactions with the post-school education and training system, this report focuses on the Eastern Cape and on the Tier 1 firms: the main component suppliers to the automotive manufacturers. In keeping with its sister reports, it will address the following questions:

1. What is the nature and strength of interaction and network alignment in the automotive sectoral system of innovation (SSI)?
2. What are the main components in the automotive SSI addressing skills needs?
3. What are the routine skills needs and non-routine changes in the business environment related to skills development of firms in the sector? What are the strategies they use to address these needs?
4. What are the roles of public and private sector intermediary organisations in building network alignment and addressing misalignment in relation to skills development in the automotive SSI?
5. What are the interactive capabilities of public and private post-school institutions to address the routine, and changes in, skills needs of firms in the SSI?
6. What is the nature of mis/alignment between dynamic skills supply and demand in the SSI to address skills needs and promote economic development? What are the challenges/constraints/threats to growth and skills development in the SSI?

Theoretical framework

The overall project is primarily informed by an innovation studies perspective. However, there is a rich sector-specific literature on automotives, both in South Africa and internationally, that goes beyond this into a wider range of development studies, economics, business and geography literatures, and this set of perspectives also influences this case study. Moreover, the centrality of a focus on education and training providers and their roles in skills formation necessitates an engagement with key skills literatures, as well as existing work on education, training and innovation. This section will outline how

the study understands key concepts from these various traditions and how it draws upon these accounts in the subsequent analysis of the data.

Innovation studies

The larger project draws upon an extensive literature on innovation studies. The project design draws, in particular, on two sets of concepts from this literature: sectoral systems of innovation and technological capabilities.

The notion of a sectoral system of innovation (SSI) draws on an earlier literature about national systems of innovation (Freeman 1988; Lundvall 1988). In Malerba's (2002: 247) classic definition,

a sectoral system is a set of products and the set of agents carrying out market and non-market interactions for the creation, production and sale of those products. A sectoral system has a specific knowledge base, technologies, inputs and demand. Agents are individuals and organisations at various levels of aggregation. They interact through processes of communication, exchange, cooperation, competition and command, and these interactions are shaped by institutions. A sectoral system undergoes change and transformation through the coevolution of its various elements.

Capability is being used in this study in a way that needs clarification. It does not refer to the human development account of capabilities, as developed by Sen and Nussbaum (Nussbaum 1995; Sen 1999), which has been influential on educationalists, including South African writers (e.g. Walker & Unterhalter 2007). Nor is it being used somewhat analogously to learners' competencies, as has sometimes been the case in literatures about vocational and professional education (e.g. Stephenson & Mantz 1998). Rather, the innovation literature draws upon the older notion of technological capabilities (Fransman & King 1984; Westphal et al. 1984). Lall (1992) developed this account and showed how neoclassical theory was insufficient with regards to technological capability and the importance of learning in firms and economies.

Von Tunzelmann and Wang (2003 and 2007) have developed this account by adding the notion of interactive capabilities.² This may be understood as the capacity for learning and accumulation of new knowledge on the part of the organisation, and the integration of behavioural, social and economic factors into a specific set of outcomes. It refers to the capacity to form effective linkages with other organisations (such as universities). It involves the learning and exploitation of an organisation's competences, and the development of organisational routines for producing desired outcomes.

Von Tunzelmann and Wang also stress the dynamic nature of some of these capabilities. A dynamic interactive capability may be defined as the capacity to sense changes in the business and education environment relevant to the organisation and take an effective and timely response through strategic management. This requires familiarity with the organisation's competencies and interactive capabilities for appropriately adapting, coordinating, integrating and reconfiguring these competencies and internal and external interface mechanisms/strategies to match the requirements of the changing environment. Here, leadership skills for strategic management are crucial.

The technological capabilities literature also uses the notion of competency as a key concept, but, again, in a way that is rather different from its usage in educational debates (cf. Hager & Gonczi 1996; Hager 2004). For Von Tunzelmann and Wang (2003), competencies stem from inputs to produce goods and services – that is, the preset attributes of individuals and firms, typically produced by organisations such as education and training organisations. In the present study, competencies take two forms:

2 To further exacerbate the confusion in development studies between two accounts of capabilities – the technological and innovative versus the human development version – Von Tunzelmann and colleagues routinely cite Sen (1999) as a foundational paper for their conceptualisation without any acknowledgment that much of Sen's subsequent work, and large numbers of papers from many others, see this as a key starting point for the human development and capabilities approach.

- Tacit knowledge embodied in the human resources of the organisation and organisational routines; and
- Codified knowledge present in organisational structures, technologies, formal policies or other physical resources.

The approach taken in the project conceptualises the automotive sector as an innovation and skills development system comprising a range of firms, education and training providers and sectoral intermediary bodies, operating within a wider policy environment. It sees the sector as a place of continuous interplay of these varying actors, generating a set of interactive capabilities. Such capabilities are enacted through a series of mechanisms and strategies and are varied in their extent and sophistication. The model directs attention to the ways in which there is coevolution so that institutions are delivering the scale and kinds of qualifications and skills required in the sector. It focuses particularly on the possibilities for developing dynamic interactive capabilities. These are characterised as:

- Sensing – the capability to scan the relevant parts of the environment to identify necessary changes and potential opportunities;
- Learning – the capability to respond to scanning lessons;
- Integrating – the capability to know and act as a single organisation; and
- Coordinating – the capability to organise effectively to pull together disparate knowledge and activities.

The automotive literature

Its iconic status in industrialisation has made the automotive sector a major focus of research literature from a wide range of disciplines (e.g. Womack et al. 1990; Kenney & Florida 1993; Volti 2006). The South African literature largely fits within a development studies strand of these wider accounts. Some of this can be seen as sitting with the innovation and industrial learning accounts of the technological capabilities tradition (e.g. Lorentzen & Barnes 2004; Morris et al. 2006), with a focus on both how learning takes place in and between enterprises and on how this can be seen as being

located within a wider system of innovation.

However, much of the literature takes a political economy approach that is concerned with the way in which the South African automotive sector has been shaped historically by national policy processes but far more by the dynamics of a sector that is ever more globalised (Barnes & Kaplinsky 2000; Barnes 2000; Black 2001; Barnes & Morris 2004; Barnes 2013). This is part of an international literature, both on the automotive sector and on industrial development in the South more generally.³

Importantly for this study, the literature gives an account in which the sector is characterised by strongly structured value chains that are dominated by a small group of global manufacturers. These are able to organise their production at a global level and to discipline their suppliers to produce what, where and when they demand. This implies severe constraints on the ability of national policies or innovation systems to influence production decisions (Sturgeon et al. 2008; 2009). However, the literature also provides examples of where certain countries have been able to gain some ability to be part of automotive innovation rather than just engaging in routinised production. Thus, Altenburg et al. (2008) focus on a shift to innovation in India and China, whilst Dias et al. (2012) review the Brazilian case.

For the South African automotive literature, a key debate is the extent to which positioning within a global production chain, itself an element of a wider globalisation dynamic, can be engaged with by the state, firms and education providers in a way that strengthens employment and innovative capabilities within the South African automotive sector. This is a major, recurrent theme throughout this report.

Education literatures

In its work on higher education, the HSRC has developed a tradition of working with the innovation literature as part of a wider concern with improving the effectiveness of higher education–industry interactions. Although there is literature (such as Kruss 2012; Kruss & Gastrow 2012 on the South

³ Some South African authors are significant contributors to these wider literatures (e.g. Kaplinsky & Morris 2008).

African case) that looks at the interface between higher education and innovation, there are few attempts to link the innovation and vocational education and training (VET) literatures. Toner et al.'s (2004) work in the Australian context stands out as the principal exception to this.

Given the importance of VET to the story of automotive skills development, an important task for this study was to bring together the innovation, automotives and higher education partnerships literatures with VET theory. In keeping with much of the HSRC's past work on VET (Kraak 2003, 2004; McGrath et al. 2004), the approach here is located within the political economy of skills tradition (Ashton & Green 1996; Brown et al. 2001). Like much of the automotives and innovation literature cited above, this tradition sees contemporary questions of skills, technology and industrial structure as profoundly shaped by historical processes and by the interplay of national and international dynamics in societies, economies and politics (see Freund 2013; Hart & Padayachee 2013; and Ashman & Fine 2013 for recent attempts to look at the wider issue of South Africa's developmental path). The political economy approach is primarily a critical account of how national skills systems have evolved and the key tensions they embody. However, many of the key authors also engage with issues of reform and transformation. At the national level, this leads to a concern with coherence of policy and practice (e.g. Kraak 2005). This is mirrored at the institutional research level by concerns about institutional responsiveness to various stakeholders and national development imperatives (e.g. Cosser et al. 2003).

An overall theoretical framework

Together, the HE and FET strands of the HSRC's work stress, at the institutional level, the importance of providers' interactions with other actors (firms, communities, state bodies) at the same time as understanding this as taking place within broader systems, whether conceptualised in terms of innovation, knowledge or skills. A focus from these educational literatures on policies, organisation and systems is married in this study with an understanding of the South African automotive sector as being profoundly disciplined by global

production chains and the wider dynamics of global capitalism. The conceptual tools of the technological capabilities literature are deployed to explore the sectoral set of interactions through the lenses of dynamic and interactive capabilities.

Research design

An overall case study design was developed by the core project team. The current case study was the second to be researched and its design was fine-tuned to take account of learning from the fieldwork phase of the first case study.

This research is designed as a multilayered vertical case study, with the empirical boundaries defined by a sectoral system of innovation. Vavrus and Bartlett (2006: 95) argue that the aim of a vertical case is to 'grasp the complexity of the relationships between the knowledge claims among actors with different social locations as an attempt to situate local action and interpretation within a broader cultural, historical, and political investigation'. The vertical case study breaks out of the local situatedness of a traditional case study to 'take account of historical trends, social structures, and national and international forces that shape local processes at this site' (Vavrus & Bartlett 2006: 96).

The study uses a combination of:

- Desktop and data-based research; and
- Key informant interviews at different levels within a series of firms, sectoral intermediaries and education and training organisation actors.

The components of the case study were designed to be conducted in sequential steps, with each step providing the basis for, and informing, the next.

The *first phase* of the case study had three components, two of which were commissioned from experts in research within the automotive sector. The first task was to develop an initial map of the actors in the sectoral system of innovation to identify the structures of their interaction. The second task, of which the map forms part, was the writing of a desktop-based sectoral background paper (B&M Analysts 2013). One focus was to

identify key occupational levels within firms, and the types of education and training organisations that provide qualifications for each of these. The third element of this initial phase was the development of a database of relevant national and international literature.

The *second phase* of the case study was fieldwork. The initial map generated a set of possible interview targets. These were then considered by the team and a set of target organisations agreed. Fieldworkers received training on the instruments developed for the larger project, with modifications as appropriate based on the experiences of the fieldwork in the first parallel case study.

The various sets of organisations are presented in Table 3.

A total of 81 in-depth semi-structured interviews, guided by a common schedule customised for each type of actor, took place with a range of organisations, as listed above. In most organisations, such interviews took place with a single key respondent as negotiated with the organisation, although 10 were group interviews. In the case of a group of core education and training organisations, a more extended fieldwork visit was conducted. This included interviews with heads of institutional planning, and of external interface structures and mechanisms, and lecturers and trainers in relevant fields. Interviews were complemented by desktop research including the consultation of websites, organisational policy documents and an overview of structural arrangements.

Additionally, respondents were asked to identify the other actors with whom they interact in the SSI using a written tool that was then checked by the interviewer in conversation with the respondent. This was subject to network analysis tools to provide a measure of the scale and intensity of interaction in the SSI. The interviewer also administered a questionnaire using a Likert scale to explore issues of technological change, environmental turbulence and dynamic interactive capabilities.

In almost all cases interviews took place face to face, although a small number was conducted telephonically. A number of fieldworkers conducted interviews, which were recorded and transcribed. Section leaders were responsible for each of six fieldwork reports (national policy, sector and provincial intermediaries, universities, public FET colleges, private education and training providers, and firms), which were written up according to set templates. The automotive study team leader participated in a sample of interviews with a range of respondents in order to get a richer feel for the data.

The design envisaged a sequential approach to these components. Understanding the policy environment pertaining to the role of each type of actor was crucial, so the fieldwork began at the national policy level. Work then proceeded to look at the sectoral intermediaries and the education and training institutions. In the initial design, firms would have been targeted earlier in the sequence. However, a long industrial dispute during 2013 meant that it was prudent to move this segment into early 2014 to allow firms some time to return to normal before being put to the inconvenience of fieldwork visits. Negotiating access and scheduling interviews with firms was a time-consuming and costly process. Nevertheless, most of the fieldwork for each segment was collected within the revised segment fieldwork windows. Inevitably, however, there were some occasions where specific institutions or informants were unavailable and had to be visited at a later date.

The *third phase* was data analysis. The first two phases generated raw interview and questionnaire data; a set of key documents; narrative reports; and accompanying tabulations of quantitative data. These materials were then analysed by the case study team leader and inconsistencies and gaps between the various reports identified and addressed to facilitate the triangulation process. The codes generated are presented in narrative form.

4 Education and training institutions in bold are those with particularly strong engineering skills links to the automotive sector and were the focus of intensive fieldwork visits.

Table 3: Organisations in the fieldwork sample

National policy and sectoral organisations	Provincial intermediary organisations	Firms	Education and training providers
- Department of Higher Education and Training - Department of Trade and Industry - Manufacturing, Engineering and Related Services Sector Education and Training Authority - National Union of Metalworkers of South Africa (NUMSA) - National Association of Automobile Manufacturers of South Africa (NAAMSA) - National Association of Automotive Component and Allied Manufacturers (NAACAM) - Automotive Industry Export Council (AIEC)	- Coega Development Corporation - East London Industrial Development Zone - Eastern Cape Office of the Premier - Eastern Cape Socio-Economic Consultative Council - Eastern Cape Skills Development Forum - Automotive Industry Development Centre (AIDC) (EC) - NUMSA (EC) - NAACAM (EC) - NAAMSA (EC) - merSETA (EC)	- Acoustex - Autocast Aluminium - BASF - Behr - Borbet South Africa - Continental Tyres - Faurecia - First National Battery - Formex Industries - Goodyear - Johnson Controls - Lear Sewing - Onvlee Engineering - Perfect Tooling - REHAU Polymers - S&N Rubber - Schaeffler - Shatterprufe - Stateline Pressed Metal - Tenneco - Visteon	Public higher education institutions - Nelson Mandela Metropolitan University³ - Walter Sisulu University - University of Fort Hare - Rhodes University Public further education and training colleges - East Cape Midlands - Port Elizabeth - Buffalo City - Ikhalala - Lovedale - King Sabata Dalindyebo - King Hintsa - Ingwe Private further and higher education and training providers - Eastcape Training Centre - Production Management Institute

A further core analytical focus was on the dynamic interactive capabilities of Tier 1 firms, intermediary organisations and public providers. Relevant descriptive statistics on the four capabilities were produced and triangulated with interview and documentary data. This data is presented in a set of tables and discussions thereof distributed through the report.

The data on the sectoral interconnections was analysed using network analysis software. This generated visual maps of the extent and strength of interaction in the SSI, presented in the next chapter. Alongside those maps, an analysis of the networks was conducted using three key concepts from social network analysis methods: degree centrality, closeness centrality and betweenness centrality (Borgatti et al. 1998; Brass & Burkhardt 1992). Degree and closeness centrality indicate how easily information can reach a network member. Degree centrality refers to the number of ties in which each node (network member) is involved, and average degree indicates the structural cohesion of a network as more ties between network members yield a tighter structure (De Nooy et al. 2011). These measures thus relate to the strength of ties among nodes or bonding social capital. Betweenness centrality identifies nodes acting as intermediaries in

communication networks and thus provides information about how crucial a network member is to the transmission of information through the network (De Nooy et al. 2011). Measures of betweenness centrality are appropriate for investigating bridging and linking social capital (Borgatti et al. 1998; De Nooy et al. 2005). The data presented in the network maps was also analysed to see how individual actors (and actor types) interacted with six sets of actors: Tier 1 firms; OEMS; intermediaries; universities; public FET colleges; and private training providers. This is presented in a set of diagrams.

Structure of the report

The report proceeds by describing the automotive SSI in Chapter 2, through a mixture of consideration of the existing policy and academic literature about the sector (including its national and global contexts) and a variety of mapping approaches, including network analyses, the presentation of an SSI conceptual model and a spatial representation of the sector in the Eastern Cape. Chapter 3 explores the skills needs and strategies of 21 Tier 1 firms. Chapter 4 looks at a set of public and private intermediary organisations working with the sector in the Eastern Cape to gauge their contribution to sectoral alignment. Chapter 5 focuses on post-

school education and training providers, considering, in turn, public higher education; public further education and training; and private provision to

explore their competences and capabilities to support the SSI. Finally, chapter 6 summarises the report and considers its potential policy implications.

3. THE EASTERN CAPE AUTOMOTIVE SECTORAL SYSTEM OF INNOVATION

A brief history of the South African automotive sector

Since the 1920s, when car manufacturers first entered the country, the sector has been an important element of industrial policy. The building of the first factories in the Eastern Cape came in the aftermath of major white labour unrest and the establishment of the National Party–Labour Party coalition, which led, inter alia, to policies designed to protect and grow blue collar employment for white workers. The South African automotive industry thus began as part of a wider approach to industrialisation based on import substitution, heavy industry and the extension of the colour bar (cf. Gelb 1987; Barnes 2013).

A second wave of government intervention from the 1960s saw an attempt to increase the local input into manufacturing, there having remained a strong tendency to import most components from Europe and America. This resulted in six distinct local content programmes being introduced between 1961 and 1995 (Barnes 2000). Thus, as Barnes (2013: 238) notes, '[t]he South African automotive components industry is therefore, in many ways, a construct of national government intervention'.

A global sector

Automotive production is a global sector, organised as a producer-driven value chain (Sturgeon et al. 2008). In the case of South Africa, this is manifested in a small number of global large corporations (seven original equipment manufacturers, or OEMs, for cars) and a multilevel string of upstream component manufacturers. These OEMs come from

the USA, Japan and Europe (Germany), reflecting the three core sites for both production and consumption of cars.

Many of the OEMs also have factories in the other major global production zones; in major middle-income countries (especially Brazil, India, China and Mexico); and in other Southern locations (e.g. South Africa, Thailand and Vietnam) as well as assembly plants for completely knocked-down kits (CKDs) in less developed countries.

Thus, South African automotive and components factories are both part of a global innovation and production network and are subject to a degree of competition for output quotas with other existing and potential sites, based on their own productivity and competitiveness, but also considerations about the size of local and regional markets and proximity to major international markets.

The South African sector has undergone a major shift in ownership since 1995, integrating it more firmly into this global system. Before then, and particularly during the era of sanctions, much of national production took place under licence arrangements, which meant that South African production was somewhat insulated, but also isolated, from global corporate decisions. This was true also for their direct suppliers: the Tier 1 firms. Both OEMs and Tier 1s have come far more under direct ownership of multinational corporations (MNCs) since 1995. This shift in ownership has led to integration into global production and supply, increasing competitiveness pressures and the risks of disinvestment.

The Tier 1s, the particular focus of this study, are roughly equally split into domestic firms and multinationals of varying scale. Some of these are very large multiproduct producers for whom automotive components are a small aspect of their overall activities; others are smaller or are concentrated solely in autos. This variety points to differences in how they are effectively disciplined by the OEMs, but the only power that the more diversified Tier 1s have is their greater ability to choose to leave the sector.

Automotives as a highly organised tripartite sector

The South African automotive sector has been characterised by an unusual level of structural agreements and cooperation/coordination. The National Bargaining Council is particularly strong and has a very detailed set of agreements on skills. The Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA) has been amongst the most effective of SETAs, drawing on the longer history of both NUMSA and the strong employer structures: the National Association of Automobile Manufacturers of South Africa (NAAMSA), the National Association of Automotive Component and Allied Manufacturers (NAACAM) and the Automotive Industry Export Council (AIEC). In addition, there has been considerable focus on the sector from national and provincial governments, as will be explored subsequently.

The automotive sector and industrial policy

As noted above, the automotive sector has a long history of being a major focus of industrial policy. However, policies prior to 1994 had not left the sector in a strong position at the beginning of the democratic era (Barnes 2013). The government had not acted effectively to prevent a proliferation of models for what remained a relatively low-volume local market. As a result, both OEMs and Tier 1s were locked into a cycle of small production runs that did little to generate economies of scale. Nor were there strong incentives to improve quality, reduce cost or innovate. Coupled with isolation from global production chains due to localised ownership and/or restrictive licensing arrangements, there was

little scope to build exports or meet international quality standards.

The new government, therefore, faced the challenge of reintegrating the industry into the larger international producer-dominated chains at the same time as having to build its own state capacity and respond to new dynamics of globalisation and liberalisation (McGrath 2007).

The Department of Trade and Industry responded by developing the Motor Industry Development Programme (MIDP), which ran from 1995 to 2012.

MIDP

The MIDP arose out of lengthy tripartite discussions. It sought to strengthen both the OEMs and component manufacturers as sources of employment and as exporters, as well as improving the local affordability of vehicles (B&M Analysts 2013). This was to be done through five key policy interventions:

1. A phased reduction in tariffs that gradually opened the sector up to international competition (nominal rates of protection for vehicles fell from 40% to 25% by 2012);
2. A duty-free allowance for domestic OEMs (27% of the wholesale value of the vehicles manufactured for local consumption);
3. A subsidy for small vehicle manufacture using a duty drawback mechanism (this was withdrawn in 2000 after evidence showed that it encouraged even more model proliferation);
4. The removal of local content requirements for domestic vehicle assembly; and
5. A scheme for export duty credits that could be used by firms to offset import duties on cars, components or materials, or which could be sold on the open market (B&M Analysts 2013).

The MIDP sat within a larger policy framework that sought to integrate South Africa carefully into the global economy. This policy thrust continues nearly two decades later. Now, the overall policy framework is shaped by the National Development Plan and the National Growth Plan, supported by the Industrial Policy Action Plans (IPAPs). All of

these policies identify manufacturing, and automotives in particular, as key to overall national strategies. Since January 2013, the MIDP has been replaced by the Automotive Production Development Programme (APDP), which is scheduled to continue till 2020.

APDP

The APDP seeks to 'shift the industry's emphasis away from a primarily export focus, to one that addresses issues of scale in the production of vehicles' (B&M Analysts 2013: 20). It comprises four instruments:

1. A tariff of 25% on imported vehicles and 20% on imported automotive components;
2. A volume assembly allowance that gives a 4% duty credit to OEMs manufacturing more than 50 000 vehicles annually (3.6% from 2015);
3. A further duty credit based on the proportion of local sourcing of materials; and
4. Grant funding of 20–30% of the value of new investments meeting technology and employment criteria. (B&M Analysts 2013: 20–211)

The automotive sector and skills policy

The history of skills policy in South Africa since 1990 cannot be understood without close reference to the automotive, and wider engineering, sector (McGrath & Badroodien 2006; McGrath 2007). As noted above, the two most senior officials responsible for skills development in the Department of Labour in the first democratic decade had previously been NUMSA officials and one of them had formerly been employed by one of the automotive manufacturers. Moreover, NUMSA's report on its Vocational Training Project (NUMSA 1991), an exploration of international and national skills trends, was the very first and key document in the evolution of the new strategy (McGrath 1996). Thus, the struggle for upskilling amongst black workers in the automotive sector played a crucial role in the evolution of skills development nationally, including the establishment of the National Qualifications Framework and a National Skills Development Strategy (McGrath & Badroodien 2006). The German OEMs in particular were major corporate supporters of the new policy regime,

being early and high-profile adopters of new initiatives such as learnerships and Investors in People. McGrath (2007) argues that the early adoption of the new programmes by such large and high-status companies did much to promote the new national skills policies. Moreover, employers also worked closely with provincial governments in Gauteng and the Eastern Cape around the AIDC, which has attempted to build stronger relationships between the industry and public education and training providers (see McGrath [2007] for an account of the early phase of the AIDC in Gauteng).

However, the performance of the sector with regard to skills development is uneven. Technological developments and competitiveness imperatives are pushing up the skills levels needed in the sector but the bulk of workers remain at the semi-skilled level, as Table 4 shows.

Table 4: Breakdown of employment by category for South Africa and the Eastern Cape, 2012

Employment	South Africa		Eastern Cape	
	No.	%	No.	%
Management	4 099	4.1	1 570	5.0
Professionals	5 578	5.5	2 251	7.2
Artisans	4 948	4.9	2 216	7.1
Supervisors	4 992	4.9	1 604	5.1
Production workers	78 383	77.7	22 345	71.5
Other	2 899	2.9	1 294	4.1
Total	100 900	100	31 279	100

Source: B&M Analysts (2013: 33) from original data from the South African Automotive Benchmarking Club and the Automotive Industry Export Council

On some measures there has been considerable sectoral investment in skills. For example, merSETA has provided more than 2 500 bursaries to direct higher education engineering students towards scarce skills in the larger manufacturing sector, whilst there have been 67 000 apprenticeship or learnership completers over the period 2001–11 (merSETA 2012). However, in 2011 the number of training days in components firms was only 1.4 per worker as opposed to an international norm of 3.2, whilst mean training spend globally in 2006 was 3.25% but only 1.4% in the Eastern Cape (B&M Analysts 2013: 39). There are limitations, too, in R&D expenditure in the sector. Between 2007 and

2011 this averaged slightly less than 1%. This is poor by international standards, although it does represent an improvement of 50% in that period alone (B&M Analysts 2013: 41).

The automotive industry in the Eastern Cape

The South African automotive industry began in the province (Port Elizabeth) in 1924, attracted by its ports but also encouraged by government concerns about the concentration of poor whites in the region (Barnes 2013). Port Elizabeth remains a major centre of the industry (with its neighbouring towns of Despatch and Uitenhage), with OEM assembly plants for General Motors and Volkswagen and an engine plant for Ford.⁵ The Nelson Mandela Bay area is also home to a large number of Tier 1–3 suppliers. A second, smaller, cluster is located 240 km away in East London, centred on the Mercedes-Benz plant. As well as the OEMs, there are more than 30 Tier 1 firms and more than 100 component firms in total. There is a strong German flavour to the sector given the important position of German

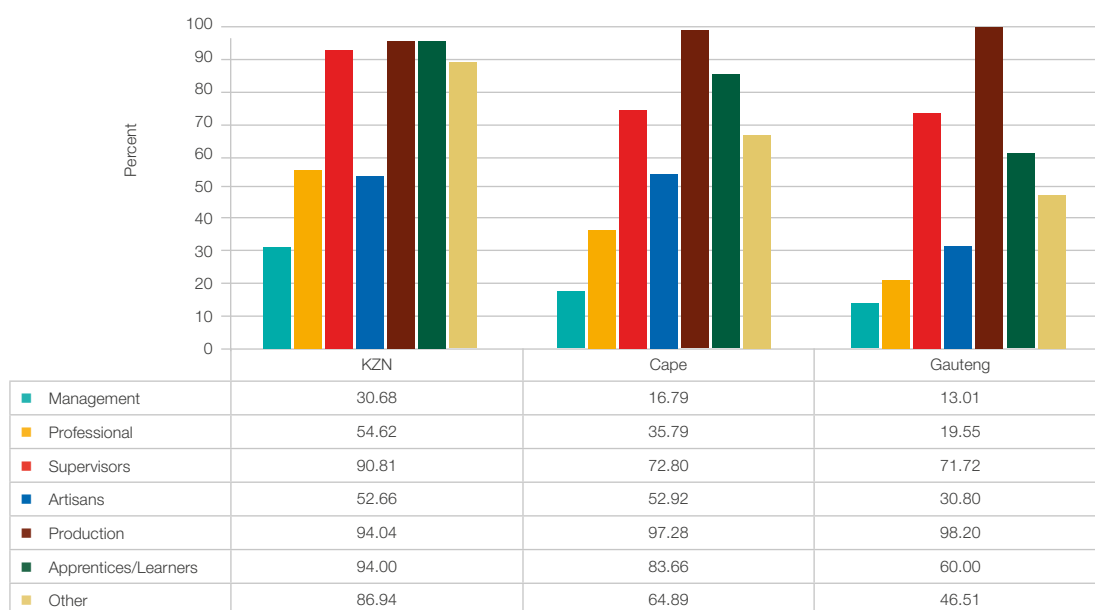
⁵ A plant for the Chinese First Automobile Works is currently under construction. This will start by producing trucks but plans to add cars in its early years of operation.

OEMs and Tier 1s, and this undoubtedly shapes the approach to skilling taken.

The Eastern Cape automotive cluster contributes roughly one-third of total employment in the sector nationally. The sectoral demographics for the province (see Figure 2) show that previously disadvantaged individuals still make up a significantly smaller proportion of professional and managerial staff in the Eastern Cape than in KwaZulu-Natal, although more than in Gauteng.

The province has identified the automotive sector as a crucial component of its economic and social development strategies (Province of the Eastern Cape 2004; Department of Economic Development, Environmental Affairs and Tourism 2010). The core of current policy is the Eastern Cape Provincial Industrial Development Strategy (Department of Economic Development, Environmental Affairs and Tourism 2010). This includes an Auto Cluster Initiative, including continued support to the provincial component of the AIDC. The cluster initiative focuses on logistical infrastructure, skills and supplier development. The province is also home to two industrial development zones, Coega

Figure 2: Percentage of previously disadvantaged individuals (PDIs) employed in each employment category (2006)



Source: Barnes & Hartogh (2009)

and the East London Industrial Development Zone (ELIDZ), discussed in more detail in Chapter 4. Both sites have strong automotive elements, including the new FAW plant and a range of Tier 1 firms.

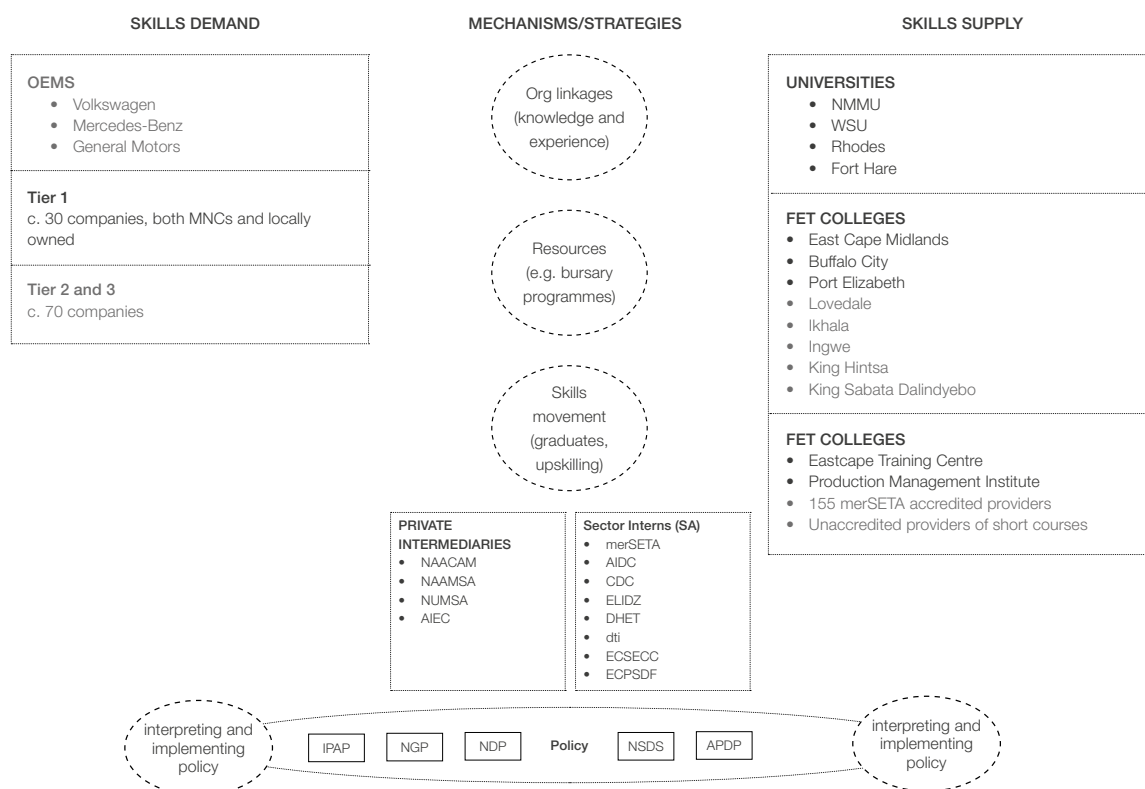
Although the Eastern Cape is one of the poorest South African provinces, with 50% of its population considered to be living in poverty in 2010 (www.ecsecc.org/files/library/documents/Poverty_social_statistics_2012.xlsx), the Nelson Mandela Bay and Buffalo City metropolitan areas contain considerable educational infrastructure alongside major industrial-port complexes as well as a set of both public and private intermediary organisations. Thus the provincial automotive SSI is a mixture of OEMs, Tier 1–3 firms, intermediary organisations and public and private education providers, as shown in Figure 3.

Figures 4 and 5 graphically present the network analysis of the SSI, carried out as part of this study.

They will be discussed in further detail in subsequent chapters but headlines include the important finding that education and training providers do form much of the core of the two network maps. In Figure 6, NMMU is the most connected organisation, closely followed by WSU. Both the Eastcape Training Centre and PMI are also in the top 10 network actors by number of connections, as are East Cape Midlands and Port Elizabeth FET colleges. Buffalo City college has a third fewer connections than either of these, reflecting its location in the less densely networked East London area. On this measure, too, NMMU and WSU are the key players in the network.

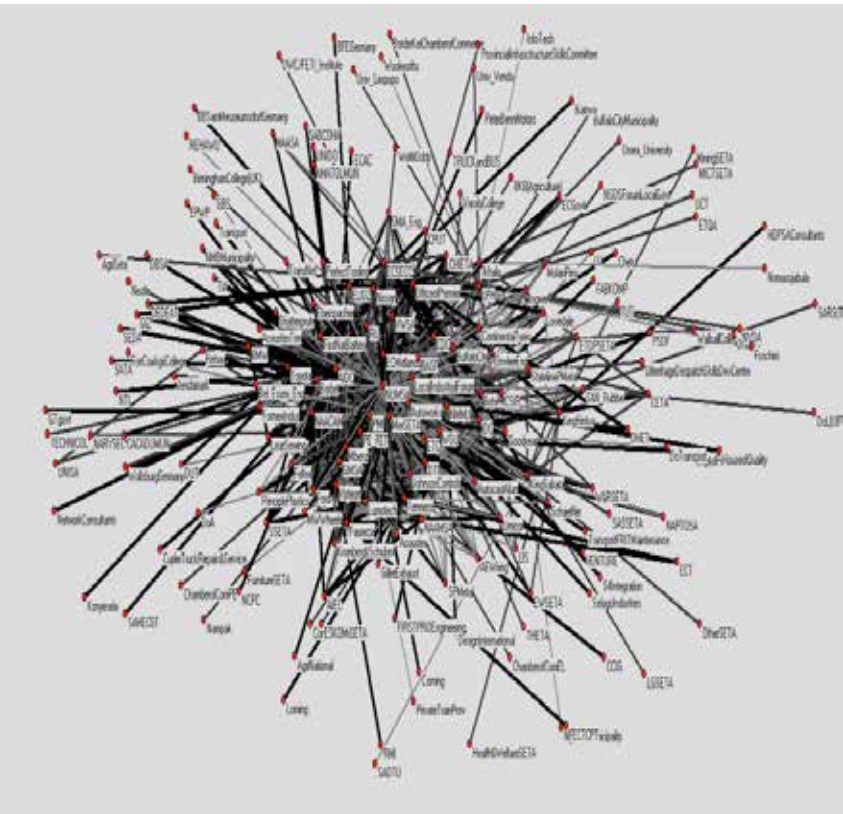
When we look at a third element of the network analysis – how far organisations work as ‘bridging actors’, linking different groups of actors not otherwise connected – NMMU and WSU slip to second and third, but are joined in the top 10 by PMI, East Cape Midlands College and Port

Figure 3: Capability-building processes in the Automotive SSI, Eastern Cape



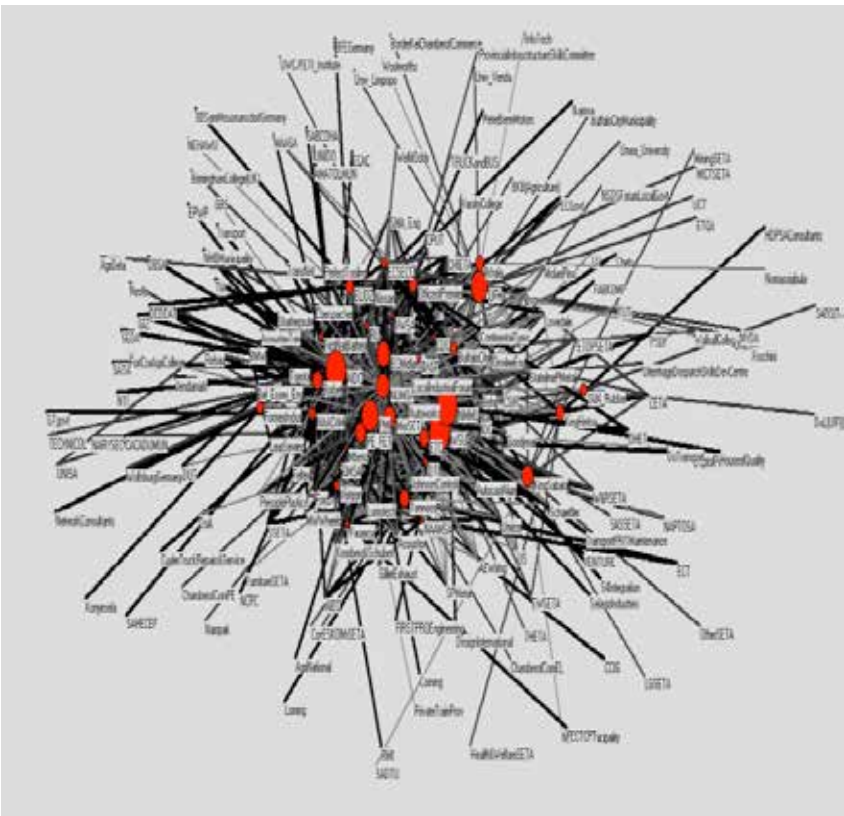
Note: the organisations in grey are not a core part of this study but are actors in the SSI.

Figure 4: Network analysis of Eastern Cape Automotive SSI – number and strength of connections



Source: Project survey data

Figure 5: Network analysis of Eastern Cape Automotive SSI – bridging actors



Source: project survey data

Elizabeth College. Strikingly, Fort Hare and King Sabata also feature highly, although neither reported links to any of the Tier 1 firms. The size of the circles in Figure 7 reflects the importance of the network actor as a bridging agent.

Conclusion

The Eastern Cape is a province of extremes, even by South African standards. The SSI exists in a province characterised on the one hand by large rural areas that once comprised two of the oldest and largest of the apartheid homelands and, on the other, by two industrial centres located around major ports. It is home to three OEMs (plus the Ford engine plant and the CFAW plant under construction); more than 30 Tier 1s, many of which are also major MNCs; and many other firms in Tiers 2 and 3. It also possesses a strong infrastructure of

intermediary organisations, as well as four public universities; eight public further education and training colleges; and more than 150 accredited private training providers.

This makes for a complex network of interactions, as is shown in the network maps above. A large number of partnerships is in evidence. However, the brief reading of the international and national automotive literature in this chapter points to the need for caution in interpreting this as a vibrant SSI with a supportive skills development architecture. The literature suggests that the automotive component sector in the Eastern Cape is powerfully disciplined by a global production network and that the scope for innovation at the plant level needs to be questioned, as does the level of skills needed by the sector. These issues will be explored through an analysis of firm-level data in Chapter 3.

4. SKILLS AND THE EASTERN CAPE AUTOMOTIVE SECTOR: TIER 1 FIRMS' PERSPECTIVES

The Tier 1 firms in the Eastern Cape automotive sector exist within a complex network. Some are relatively small local firms, whilst other locally owned firms are themselves part of larger national industrial conglomerates. Others are MNCs, again with a mixture of automotive-specific and more general industrial interests. Moreover, the Tier 1s cover a range of components sub-sectors. This leads to a very variegated situation, as Table 5 shows.

Whatever their characteristics, all of the Tier 1s operate in a highly turbulent and challenging business environment. As was explored in Chapter 2, the sector is characterised by global production chains, and production in one country is heavily dependent on comparative national policy regimes, economic performance and exchange rates as well as technological and marketing decisions and external shocks. In South Africa, furthermore,

Table 5: The Tier 1 sample – sub-sector and ownership

Firm	Ownership		Primary product
	MNC	RSA	
Acoustex		x	Sound deadeners, moulded insulation parts, carpets, parcel trays, tailgate covers, back panel components and extruded products
Autocast Aluminium		x	Cylinder heads
BASF	x (Ger)		Catalytic converters
Behr (Mahle Behr)	x (Ger)		Air-conditioning units and air-cooling systems
Borbet South Africa	x (Ger)		Alloy wheels
Continental Tyres	x (Ger)		Tyres
Faurecia	x (Fra)		Seats, cockpits, door panels, acoustics and soft trim
First National Battery		x	Battery
Formex		x	Pressed components for the automotive markets Tubular and exhaust-related components for exhaust systems and catalytic converters Catalytic converters
Goodyear	x (USA)		Tyres
Johnson Controls	x (USA)		Seats
Lear Sewing	x (USA)		Automotive seating and electrical components and parts
Onvlee Engineering		x	Automotive metal stampings
Perfect Tooling		x	Automotive metal components
REHAU Polymers	x (Ger)		Bumpers
S&N Rubber		x	Custom rubber components
Schaeffler	x (Ger)		Clutches and bearings
Shatterprufe		x	Auto glass
Stateline Pressed Metal		x	Body panel metal pressings
Tenneco	x (USA)		Catalytic converters
Visteon	x (USA)		Electronic components
	12	9	

turbulence is increased by the problematic nature of labour relations, with fieldwork taking place shortly after a major strike in the OEMs. Indeed, interviewees note that the current situation of OEM and Tier 1 collective bargaining taking place in alternate years meant that a labour dispute was always a short-term possibility.

The existence of the global automotive productive chain has a central disciplinary effect on the South African Tier 1 sub-sector and its skills needs and strategies. As was noted in Chapter 2, OEMs, increasingly, have concentrated their supply chains and each deals with fewer Tier 1s than a decade ago. Many local Tier 1s have been forced into partnerships or mergers with global Tier 1s, often those from the OEMs' home countries, in order to survive.

This leads in turn to a further series of challenges. Most research and development takes place at the headquarters level of the MNC Tier 1s. Borbet, for instance, is dependent on 'master' castings of its alloy wheels being shipped from Germany, from which it must do its own manufacturing.

For local Tier 1s, the real threat is being cut out of the chain. Even when they are included, it is clear where they stand with regards to technological development:

BMW will tell us who we need to make an agreement with in Germany so we can acquire the technology. ... Five or six years before the new model that is going to come out ... we have to make a licensing agreement with that company ... what we do is how we localise that ... [the] German licensor will give us that info. We modify our processes ... We can't tell BMW in Germany what we want; they won't even listen to us. (Acoustex).

This difference between MNC and local Tier 1s is reflected in their ratings of the level of environmental turbulence experienced by the sector, as shown in Table 6.

Table 6: Firm-level perceptions of environmental turbulence

Firm	Respondents	Average score
Autocast Aluminium	1	1.38
Acoustex	1	1.63
Onvlee Engineering	1	1.88
S&N Rubber	1	1.88
Stateline Pressed Metal	1	1.88
Visteon	1	2.00
Shatterprufe	1	2.13
Perfect Tooling	1	2.25
Formex Industries	1	2.38
REHAU	1	2.63
Behr	1	2.75
Faurecia	1	2.75
Tenneco	2	2.75
Continental Tyres	1	3.00
First National Battery	1	3.00
BASF	1	3.13
Borbet SA	1	3.38
Lear Sewing	1	3.88
Johnson Control	1	4.00

Scale: 1 = Disagree; 2 = Agree somewhat; 3 = Agree; 4 = Strongly agree

Source: Project survey data

With a few exceptions, this table divides neatly along ownership lines, with MNCs perceiving far greater turbulence on average, which may be indicative of their strong sensing capabilities as will be explored later. Table 7 provides a more detailed sense of firms' perceptions of the nature of this turbulence across eight sub-elements.

Table 7: Firm-level perceptions of environmental turbulence by theme

Theme	Mean	SD
The technology in this product area is changing rapidly	2.75	0.967
Technological breakthroughs provide big opportunities in this product area	2.95	0.887
In our kind of business, customers' product preferences change a lot over time	2.60	1.046
Marketing practices in our product area are constantly changing	2.53	0.905
New product introductions are very frequent in this market	2.30	1.261
The environment in our product area is continuously changing	2.58	0.902
Environmental changes in our industry are very difficult to forecast	2.79	1.084
Skills needs change frequently in our sector and so are difficult to forecast	2.10	0.968
Environmental turbulence scale overall	2.55	0.726

Source: Project survey data

The importance of technology is particularly significant for all respondents (mean 2.95; standard deviation 0.887). Conversely, the lack of agreement regarding the extent of new product introductions is suggestive of the differences between local and MNC Tier 1s regarding how information trickles down the global production chain. When triangulated with the interview data, the issue of skills needs (ranked fifth overall in the table) suggests the difficulty of companies in forecasting skills needs, rather than skills needs changing frequently.

Skills needs are considered difficult to forecast as they are dependent on the extent of change in product introductions made at OEM head office, which owns the R&D capability. In spite of the reduction in the number of Tier 1s with which each OEM typically engages, most of the firms in the sample have relationships with at least two OEMs and some, like Goodyear, are suppliers to all of them. Some speak in the interviews about the need to reduce their dependence on a single primary OEM partner. Table 8 presents data on Tier 1–OEM interactions.

Nonetheless, there is a strong sense from the Tier 1s that the global recession has led to them being squeezed further by the OEMs, at a point where they have little capacity to absorb further challenges. They

are being required to move further towards product rationalisation, quality improvements and new requirements for sequenced in-line supply, meaning that components must not only be delivered just in time but in the exact sequence in which they will be required on the assembly line (e.g. bumpers are delivered to match the planned pattern of model and colour in the OEM's production schedule). Though cutting-edge research and development is heavily concentrated in and around the OEM's headquarters, it is clear that more process-focused innovation is required at the factory level amongst Tier 1s as a result of these pressures.

Both local and MNC Tier 1s are facing significant challenges. The future looks particularly bleak for some local Tier 1s. Autocast is in curatorship whilst Stateline has retrenched many workers and put the rest on short time, working one week in two. Other firms speak of the challenges that come with being part of a global company. BASF has the only plant in South Africa that supplies catalytic converters (after its sister plant in Gauteng closed down). However, the respondent argues that this does not mean that the firm can relax. Rather, it needs to bid for work internally as it would be perfectly possible for BASF in Germany to give its work to another plant within its international network.

Table 8: Tier 1–OEM interactions

Firm	Volkswagen	Toyota	Nissan	Mercedes-Benz	General Motors	BMW	Ford
Acoustex	X	X	X	X	X	X	
Autocast	X			X			
BASF	X	X	X	X	X		
Behr	X				X		
Bobert	X		X	X	X	X	X
Continental	X						
Faurecia	X				X		
Formex	X						
First National	X	X	X	X	X	X	X
Johnson	X		X	X	X	X	X
Lear	X				X	X	
Onvlee	X						
REHAU	X			X			
S&N	X						
Stateline	X		X		X		
Tenneco	X			X	X		X

Source: Project survey data

The restructuring of parent companies could bring potential benefits or serious challenges. Behr's parent company has recently been acquired by Mahle, another major Tier 1 MNC. This has resulted in the Port Elizabeth Behr factory expanding from aluminium to stainless steel work. However, Visteon's American parent company has announced that it is leaving the sector globally, leading to an attempt to organise a management buy-out.

Sectoral perspectives regarding skills needs

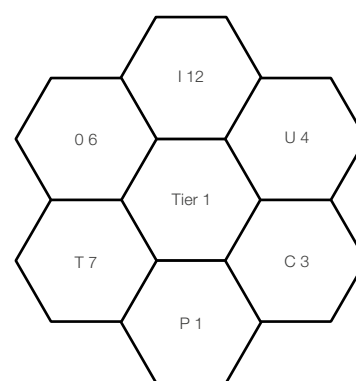
The first important point to make here is that there is little in the way of a sectoral perspective on skills in the sense of their being a coordinated approach to skills development as has been found in some of the literature on industrial districts and sectoral systems of innovation. There is currently a limited sense of horizontal cooperation between Tier 1 firms more generally, and nothing in the skills area. However, a planned national Auto Supply Chain Competitiveness Initiative (ASCCI), a partnership between NAAMSA, NAACAM, the dti, merSETA, NUMSA and firms will have a major focus on skills development to enhance supplier capabilities. It is anticipated that the initiative will include engineer, artisan and operator skills programmes as well as team leader training.

In the network analysis, Tier 1 firms report far fewer average interactions with other actors than other groups do. Their most common interactions are reported as being with sectoral intermediaries, with a greater likelihood of this including private intermediaries (NAACAM, NAMSA and NUMSA) than is the case for other groups of actors. They tend to have concentrated relationships with one or two OEMs. Most do not report interacting with other Tier 1 firms, although five MNCs do record intra-group linkages. These are concentrated in the catalytic converter sub-sector around Tenneco and BASF, with other key MNC partners including Faurecia, Eberspacher and Umicore.⁶ None of the

South African firms mention any links to other Tier 1s, consistent with a sense of strong interactive capabilities amongst MNCs.

On average, each Tier 1 has a single partnership with the public higher and further education and training sectors, with a quarter of these (almost entirely with NMMU and Port Elizabeth College) being rated as wide-ranging. Reported partnerships with private providers are few and weak. This is shown graphically in Figure 6.

Figure 6: Network interactions of Tier 1 firms



Note: I = intermediaries; U = public universities; C = public colleges; P = private providers; T = Tier 1 firms; O = OEMs. The numbers represent the mean weight for that category of network actor of relationships calculated as the product of the number of partnerships and their relative strengths, as reported in the network survey.

Overall, the firms interviewed do not see skills shortages as a major constraint on their operations. It is argued by some, particularly amongst the more routinised metalworking elements of the domestic segment (such as Autocast, Formex, Onvlee and Perfect), that technological change does not result in radical changes in skills requirements. As the Acoustex informant notes:

[M]otor companies will come to us to say we have a new requirement/specifications. We then align with [a] licensor who will give us initial technology ... The licensing agreement will tell you exactly where to get the machines from. ... Once [the] polymer technologist knows theory, when you get a new recipe, he knows what to do ... same old stuff; different colour.

⁶ National Senior Certificate – the old academic school-leaving certificate ('matric'), which is being phased out. Port Elizabeth College was one of only three colleges nationally to offer this award in 2011 (DHET 2013a: 18).

However, it is evident overall that there are strong imperatives to move to higher levels of quality and complexity of production, but with fewer staff. Notions of innovation at plant level are primarily about ‘how best to get the job done most cost effectively’, a concern with process-level efficiency gains. As the informant from Johnson Controls notes, there is a need for continuous improvement: ‘... always looking for improvements either in terms of the product or in terms of saving costs to pass on to our customers’.

Sometimes, this can lead to short-term solutions that work around skills needs rather than addressing them directly. Thus, the challenging commercial environment has seen some firms move towards using temporary workers for times when expanded productivity runs are required. Being able to adjust the workforce easily is important in the face of inconsistent OEM demand. One MNC reports that it routinely uses ‘outsourced and temporary personnel’, whilst another has a ‘large army of skilled workers’ that could be called upon rapidly. In others, the first approach to dealing with larger production runs is to ask existing staff to work double shifts. Many workers in the sector are on one-year, fixed-term contracts.

In some segments, however, technological advances are causing the obsolescence of certain skills. BASF is one of several firms that reports addressing this through staff redeployment. Overall, there is a strong sense of low labour force attrition and a powerful tendency to upskill internally. Behr, for instance, reports that it has a policy to develop the capacity of current staff to move up the ladder to higher-skilled and managerial jobs. Operators are trained to be team leaders and team leaders to be supervisors. After operators complete a structured training programme, they will be promoted into team leader positions. Schaeffler has also identified the skills development needs of team leaders and supervisors as central. As well as introducing new training, it has also reorganised its team structure to take account of limited skills capacity at the supervisory levels.

This has resulted in little recruitment across the Tier 1 firms, with what there is being concentrated in

either limited recruitment at the bottom of the skills chain or, more commonly, the targeting of very specific skills needs. It is noted, with some concern, that the lean business model that permeates the sector does not allow the ‘fat’ for companies to build internal capacity through employing junior engineers and managers to work alongside senior colleagues with a view to becoming future leaders.

It is estimated that as much as 70% of employment is at ‘basic’ operative levels,⁷ levels at which the principal skills needs are typically in life skills, literacy and numeracy. There are seen to be many intermediate-skilled workers available in the broader labour market, with demand for such workers being low in any case due to a preference for internal promotions in many companies. Equally, the challenging market conditions mean that relatively few new engineers are required.

Whilst firms do not see skills needs as being particularly serious, there are nonetheless specific challenges that some firms note. The need to overcome the legacy of white domination of artisan and engineer occupational levels is keenly felt by some employers. As Figure 5 shows, the proportions of black artisans and engineers in the sector is significantly below national demographics. Behr notes that mechanical engineers, for instance, are not in short supply in aggregate terms, but there is a shortage of black mechanical engineers, whilst Lear bemoans the lack of black female engineers. Schaeffler sees the challenge as being more at the supervisor level: ‘It requires you to, to develop people and to, to fast track them and get them ready for, for positions at a higher level but the ability to manage and to lead is hugely lacking and we’re trying now [to address this]’. These issues are not just about engineering-specific skills, as some Tier 1 firms also speak of the particular challenges of getting black finance staff.

Because of the shortages of the right candidates for many posts, firms also report having to pay an ‘equity premium’ to recruit the right staff. Even if they could recruit successfully, they note that high

7 This tallies with the sectoral data presented in Table 1.

demand, particularly in the Western Cape and Gauteng, means that retention is a major problem. As the respondent from Behr notes, it is not uncommon for good appointees to leave within six months to take up a higher-paid job. This also means that succession planning is a major challenge for the sector.

Given that artisans only make up 7% of the work force, it is unsurprising that there is a general sense that there is not an absolute shortage of artisans. Nonetheless, concerns have been raised about specific elements of the artisanal skills set. Diagnostic skills are seen as insufficiently developed. The high pace of production and the increasing requirements not just to supply to the OEMs just in time but also sequenced in-line mean that any production downtime could be very costly. Hence, it is vital to have artisans (and, indeed, operators) who can solve as many problems as possible themselves, without waiting for specialised maintenance staff. Supervisory skills are also seen as needing further augmenting, as are the soft skills of artisans (and operators). Indeed, several firms see a 'correct attitude to work' as being their paramount skills issue. Nonetheless, some firms do note specific shortages of artisans such as fitters and turners, or of skilled workers with experience of certain specialist sub-sectors such as glass and battery.

Skills strategies

Even if there are not acute skills shortages, there are ongoing skills requirements that firms need to address. A number of firms exhibit strong capacities to identify these requirements. Behr, for instance, conducts a process of annual individual training needs analyses to identify the specific skills needs of individual staff, whilst REHAU identifies skills gaps through its performance review system. For many Tier 1 firms, the driver of much of their skills development work is the introduction of new processes and equipment. As the Shatterprufe respondent notes, 'it is kind of a reactive thing, you say okay, our technology has changed, let's train someone'. Often this is a response to changes in the global automotive production chain.

Whilst firms can be seen as having been heavily disciplined by their subordinate place in the global production chain, their integration into this chain does contribute importantly to their capacity to respond to skills needs. Indeed, vertical knowledge transfer and skills development are closely related. Often, when a new product line is introduced in the MNCs, head offices will send engineers out to their branch plants to train the local engineers. Equally, new equipment is often accompanied by a training visit from the manufacturers. In other cases, staff are sent overseas for training. Acoustex reports that this is common when licensing technology: '[W]hen you sign a technical agreement, [it is] always part of the agreement'. However, as an MNC, REHAU also notes sending 'South African based employees to get "know how" from our colleagues in Germany'.

In some cases, the process is less about the vertical transfer of skills from headquarters to its local plants, and more about horizontal learning across a global production network. Several MNCs report their capability to learn through their internal company networks. BASF, for instance, 'supports its products with a network of global teams', whilst REHAU speaks of how 'information is shared between manufacturing concerns globally'. In other firms, engineering, and sometimes artisanal, staff might be sent between plants to 'gain knowledge and experience', as at Goodyear. Thus, South African plants also show some capacity to contribute to company-wide learning. At the time of the fieldwork visit, six South Asian staff were present at the Continental plant as part of a regular programme of staff exchange across the global company. BASF staff have previously been sent to Poland to assist in setting up a new plant there.

Learning also takes place within wider international industry networks. Others speak of encouraging engineers to keep up to date with international trade publications or of sending staff to attend international conferences. It must be noted, however, that the majority of the international networking reported to be taking place was concentrated amongst the MNC firms. This is potentially serious as it may suggest that South African firms are not building strong interactive

capabilities (cf. Nübler [2014] on the failures of Mexican industrial policy to support the productive capabilities of domestic automotive component firms and the negative effect this has had on Mexican economic development).

Many firms have significant capacity to deliver their own in-house training. Several companies talk about the centrality of skills upgrading to their human resources strategies. This leads to a strong emphasis on the roles of foremen and supervisors. Onvlee, for instance, conducts internal basic training through such staff, but then employs or contracts specialist trainers for more complex tasks such as training for CNC operatives. At Behr, there is an in-house training centre that focuses on training lower-level staff. This includes programmes on quality and lean production; work habits; health and safety; hand-eye coordination; and use of tools. The centre also delivers ABET classes and testing.

However, such capacity can be rather fragile in its personalised nature. Shatterprufe reports how its internal training relies heavily on a former employee who is the embodiment of much of its tacit technological capabilities:

[W]e have got an old person that comes and does training here. His name is 'Doc Van' ... every time we employ someone they go on 'Doc Van training'. If he drops dead we do not know what will, who will train the people on the glass. He is the only one that knows, apparently he is very old and he worked here many years ago, but we contract him out to train every new employee on glass ... And now he is retired and we pay him an hourly rate to do training ...

Formal training capacity, however, is limited. Although all firms do conduct training to some extent, only five of the sample are accredited training providers (Autocast, BASF, Behr, Goodyear and REHAU), with only the latter two currently active. The Goodyear HR manager says:

[W]e are an accredited training provider through the merSETA ourselves so all our programmes are accredited with the

merSETA, any programmes that are outside of the skills programmes so like in other words like a soft skills training programme customer service selling skills, etc. we have certified and accredited trainers so the programme is sourced from an outside provider. It is an accredited programme but our trainers have been trained in them and therefore they are accredited and certified to present ... training. Obviously we have a very, a very developed apprenticeship programme.

Table 9 shows the nature and scale of accredited training delivered by the REHAU SA Academy in recent years.

Table 9: Accredited training at the REHAU SA Academy

Qualification	Number of learners	Year
NQF 1 Manufacturing and Assembly Operations Skills Programme	10	2011
NQF 2 Plastics Manufacture Learnership	20	2012
NQF 2/4 Plastics Manufacture Learnership	27	2013
NQF 4 Operations Supervision Learnership	3	2014
NQF 4 Generic Management Learnership	27	2014

Source: Project survey data

Although there is capacity in both of these firms to train to NQF standards, this training is internally focused.

The Tier 1 firms are able to source much of their training needs from private training providers. There is a range of statutory training that firms need to ensure takes place. This includes training for forklift driving, firefighting, first aid and safety. Whilst some of this is delivered internally, there is also a number of private providers who specialise in such training. A range of other training is delivered by private providers, both accredited and non-accredited. Onvlee, for instance, reports that foremen and supervisor training is delivered for them by merSETA-accredited providers. Some firms also use the Volkswagen Training Academy, which is merSETA-accredited. For instance, Goodyear reports using the Academy for its apprenticeship programmes, whilst Johnson and Autocast talk about using it for trade tests. The most important private training partners for the Tier 1 firms as a

whole are the Eastcape Training Centre and the Production Management Institute, both of which are discussed in Chapter 5.

Several firms expressed a strong commitment to artisanal skills development, including Lear, which noted that it offered a R1 500 per month stipend for learners on workplace experience with them. There was a number of partnerships with the three urban public FET colleges. From the interviews and survey data it appears that these are rarely long-term and deep relationships. Rather, it seems largely that firms identify specific skills needs and then use their knowledge of providers to identify the best partner for a particular activity. Taking the interviews and the network analysis together, there is evidence of 10 firms having had recent engagements with colleges on learnerships and/or apprenticeships. Examples of strong relationships include the learnership partnership between Continental and both East Cape Midlands and Port Elizabeth in both Rubber Technology and Mechatronics (Port Elizabeth College only). Continental also sources apprenticeship candidates from both, and describes East Cape Midlands as a 'leader in rubber technology'.

However, other firms reported little or no engagement with colleges, or frustrations regarding their experiences. Faurecia says that 'we never needed them', whilst Behr feels that its training needs are too specific to match to the kinds of programmes offered by public colleges. The HR manager from Behr is not averse, in principle, to working with the colleges, arguing that the Eastern Cape's nature as a major employer in the automotive component supplier sub-sector means that public education and training providers in the Eastern Cape should be providing customised programmes for the components firms.

The sourcing and upgrading of professional engineering skills is important for many firms. Indeed, REHAU notes middle management skills as the biggest challenge the company faces. Half of the firms located in the Nelson Mandela Bay metropolitan area report links to NMMU. Their interactions with NMMU include recruitment of graduates; offering placements to students, both as part of formal qualifications and through internships;

engagement with the university on course design; and university provision of leadership training. Continental takes almost all of its new graduates from NMMU. Faurecia reports that BTechs at NMMU are the principal source of its key professional entry-level group: project leaders, whilst Goodyear talks of recruiting its industrial engineers and analytical chemists from the university. The Tenneco HR manager speaks of working closely with the NMMU careers and placement service, which keeps CVs of suitable students and graduates on file for them. Tenneco is one of several firms that also regularly attended graduate fairs. There is some sense from East London firms of the disadvantage of being so far away from NMMU.

Taking NMMU students for placements during their studies is also seen by several firms as a useful source of additional skills capacity. Lear takes NMMU students for their six-month practical placements and pays them R4 500 per month. Behr, First National, Goodyear, Johnson and Shatterprufe also provide such placements and see them as a key means of identifying future employees through the 'long interview' (Gleeson et al. 2005) that the placement provides. S&N Rubber, Continental and Shatterprufe all mention graduate internships.

A few do not simply take students from existing NMMU courses but sought to engage with programme development at the university with a view to enhancing the skills of future automotive engineers. Continental reports having input into rubber technology and polymer technology course design and has had representation in both engineering and business faculty industrial advisory boards at NMMU. BASF also confirms working with NMMU on course design.

A small number of MNC firms (BASF, Schaeffler, Tenneco) also sources leadership training from NMMU. Schaeffler reports on a new development:

[W]e've got a plan in place [for a] leadership training programme that we have in conjunction with the local university, Nelson Mandela University [sic], trying to, to improve that ability within our employees structures

and that's coming right from team leaders up to management ... I had a meeting with the person from the university we discussed their programme we, we compared it to our needs and found that it, it was a possibility we started off with a pilot programme ...

[W]e want the person at the end of this training to receive a qualification that was transferable and that would really put weight to that qualification. If we are going to be spending these huge amounts of money (because at this stage it's about R30 000 a year for one and it's time off and work projects and so forth), if we are going to be investing these large sums of money we want to see a return on that investment and also the individual is putting in so much time and effort that it must be, they must be able to feel that this which I have achieved has given me an opportunity in future.

The interviews were focused on skills development rather than knowledge transfer or research partnerships. However, the NMMU interviews did pick up on some examples here, such as the NMMU partnership with S&N Rubber on innovations in rubber injection processes.

Continental is also a partner in the NMMU Formula Student project, as are Volkswagen and merSETA. The project dates back to 2008 and arose out of an international student exchange with Germany as part of the VWSA-DAAD support to the Automotive Chair (discussed in Chapter 5). NMMU students attended the Formula Student Germany event at which racing cars designed and manufactured by university teams compete around the Formula One circuit at Hockenheim. In 2011, NMMU racing became the first African team to compete, and this was followed in 2013 by an electric car. This is particularly noteworthy as over 100 teams competed for only 40 places.

In spite of this range of partnerships, and much positive comment about the value of the NMMU relationship, there are some concerns about graduate quality. Some speak of falling standards,

with one company reporting that one graduate engineer was unable to read 3D drawings. The respondent from Johnson shows less concern about notions of falling standards but does raise concerns about generic skills:

[M]ore of a generic programme which deals with things like communication, work ethics, presentation skills, how to present yourself in a professional manner that type of thing. There seems to be a lot of that lacking.

NMMU has been requested to develop programmes to address these weaknesses, again illustrating a firm-level capability to intervene in the skills development system.

Staff in several firms have also been supported to upgrade their formal qualifications as part of wider firm upskilling strategies. Tenneco runs an Employee Assistance Programme for staff who would like to further their studies. The company promises to reimburse fees if staff pass their courses. Behr and Formex are amongst those who pay bursaries to staff seeking to gain higher qualifications.

Dynamic interactive capabilities

Firms were asked to self-rate themselves on sub-elements of each of four dynamic interactive capabilities, with the data then aggregated across respondents and sub-elements, as shown in Table 10. Whilst these responses must be read cautiously as self-reporting, they are broadly indicative of much of what has been discussed above. Firms, on average, consider that they are very strong at scanning the environment, with the variance between MNCs and local firms replaying the differences found in terms of their sense of environmental turbulence. Some sense comes through the data above of the gap between knowing what is happening and the ability to respond. Again, this is consistent with the characterisation of a sector heavily disciplined from outside. However, this must be seen as a matter of degree, with relatively few self-ratings falling below 3: 'effective' (11/65). Overall, firms believe that they have good levels of dynamic interactive capabilities.

Table 10: Firms' self-ratings of their dynamic interactive capabilities

Firm	Sensing capability Mean	Learning capability Mean	Integrating capability Mean	Coordinating capability Mean	Dynamic interactive capability Mean
MNC					
Faurecia	4.00	3.80	3.40	4.00	3.80
Borbet SA	4.00	4.00	3.40	3.60	3.75
Behr	4.00	4.00	3.40	3.40	3.70
REHAU	3.75	3.40	3.00	4.00	3.54
Continental Tyres	3.50	3.00	4.00	3.00	3.38
Johnson Control	4.00	3.20	3.00	3.00	3.30
Lear Sewing	4.00	2.60	3.20	3.20	3.25
Visteon	3.00	3.40	3.60	3.00	3.25
BASF	3.75	2.80	3.20	3.00	3.19
Tenneco	3.25	3.00	2.90	2.80	2.99
MNC mean	3.73	3.32	3.31	3.3	3.42
Local					
Formex Industries	4.00	3.80	4.00	4.00	3.95
Autocast Aluminium	4.00	3.80	3.20	4.00	3.75
Perfect Tooling	3.00	3.00	2.80	4.00	3.20
Onvlee Engineering	3.00	3.00	3.20	3.20	3.10
First National Battery	N/A.	3.60	2.60	3.20	3.00
Stateline Pressed Metal	N/A.	N/A.	3.00	3.20	3.00
S&N Rubber	3.00	2.60	3.00	3.00	2.90
Acoustex	2.00	2.20	2.00	2.80	2.25
Local Mean	3.17	3.15	2.98	3.43	3.18
Overall Mean	3.52 (SD 0.44)	3.25 (SD 0.52)	3.22 (SD 0.46)	3.36 (SD 0.44)	3.34 (SD 0.4)

Scale: 1 = not effective; 2 = somewhat effective; 3= effective; 4 = very effective

Source: Project survey data

Conclusion

It is evident that the firms sampled typically take skills development seriously. There is a number of interactions with the key public and private providers that form the focus of Chapter 5. These include significant partnerships, including participation in the innovative Formula Student project at NMMU; collaboration on course design; and the payment of generous stipends to learners. Nonetheless, the overall impression is of a sector in which there are relatively limited needs for skills produced by post-school providers. Nearly three-quarters of employees are classed as lower-skilled, and there is relatively low turnover of artisanal and professional engineers. Much product innovation takes place elsewhere, particularly in Germany. Thus, there is a sense that the public post-school providers are

over-supplying engineering qualifications, at least from the perspective of the Tier 1 automotive component segment. Rather, given their skills profile, much of firms' attention in terms of skills is on staff upgrading. Much of this will be done in-house and what these firms want most from external providers are short courses: something the public providers are generally poorly placed to deliver. Whilst some HR managers are critical of public providers or see them as irrelevant, the majority acknowledge valuable relationships with such providers, particularly NMMU. However, this value does not appear to be of key strategic importance to firms.

What post-school education and training providers are doing to interact with the sector will be explored in Chapter 5. First, the focus shifts to the role of intermediary organisations.

5. BRINGING THE SECTOR TOGETHER: THE ROLES OF PUBLIC AND PRIVATE INTERMEDIARIES

As the sector is seen as of economic, employment and symbolic importance to the country, it has a large range of national intermediary organisations, both private and public. At the same time, the Eastern Cape and national governments have developed a set of local and provincial organisations designed to address the province's developmental challenges and potentialities. Thus, the provincial automotive sector is served by a large and complex set of public and private intermediary organisations.

Before exploring key themes about their work in seeking to align the skills needs of the sector in the province, it is useful to introduce each of the key intermediaries briefly in turn. First, five provincial public intermediaries are introduced, which operate at varying levels of sector specificity.

The **Eastern Cape Socio-Economic Consultative Council (ECSECC)** is the oldest of the provincial intermediary organisations, having been established in 1995. ECSECC is a structure of the Office of the Premier and was constituted as an inclusive council comprising representatives from provincial government, the labour movement, organised business and the NGO sector. Since 2006, the council has additional representation from local government and institutions of higher learning. The main objective of ECSECC is to advise and assist government and other ECSECC stakeholders to achieve an integrated development strategy for the province and its constituent regions in order to address the socio-economic development of the province.

The **Eastern Cape Provincial Skills Development Forum (ECPSPDF)**: Provincial Skills Development

Fora were established in 2008, although they were provided for under the 1998 Skills Development Act. PSDFs are responsible for skills development initiatives at the respective provinces. The ECPSPDF brings together municipalities, SETAs, provincial departments, IDZs, further and higher education providers, organised labour and business. Its principal objective is to ensure the provincial delivery of the National Skills Development Strategy III.

The **Coega Development Corporation (CDC)**:

Coega is one of South Africa's industrial development zones (IDZs), which aim to attract inward investment; support exporting; build competitiveness; and support job creation. It is located just outside Port Elizabeth around the deepwater port of Ngqura. It is a general IDZ but its location makes the automotive sector a key element of its strategy and operations. It manages the Nelson Mandela Bay Logistics Park, which includes the factories of six Tier 1 firms and the General Motors Pan African Distribution Centre. The Chinese OEM, First Automobile Works (FAW), is currently building a factory at Coega. This will initially build heavy vehicles but car manufacturing is planned for phase two of operations. Amongst CDC's operations is its Human Capital Solutions unit, offering services to both IDZ tenants and firms across the Eastern Cape in human resources management, training and staff development, recruitment, employee relations and enterprise development. It conducts labour market analysis and has its own training facility.

The **East London Industrial Development Zone (ELIDZ)**: Like Coega, the ELIDZ incorporates an automotive supplier park, which is home to nine Tier

1 firms. Mercedes-Benz has a vehicle storage facility within the IDZ.

The **Automotive Industry Development Centre (AIDC)**: As noted in Chapter 2, the AIDC had its origins in a Gauteng Provincial Government initiative to improve competitiveness in the automotive sector in that province and was then replicated through similar (though smaller) provincial funding in the Eastern Cape. The AIDC is 100% owned by the Eastern Cape Development Corporation and describes itself as ‘an implementing agency of national and provincial government that provides subsidised technical and manufacturing related services and programmes to South African companies’ (www.aidc.co.za), with the following aims:

- To grow the South African automotive industry’s global competitiveness;
- To support the government’s automotive-related objectives; and
- To contribute to the government and industry’s goals of continuous growth and sustainable job creation.

Second, in addition to these provincial public intermediary organisations, the **Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA)** has a strong provincial presence. Like the other original SETAs, merSETA was established under the 1998 Skills Development Act. It has five chambers: metals, plastics, auto (comprising the seven OEMs), motor (including automotive components manufacturers as well as the motor retail and service subsector) and tyre, all of which have connections with the automotive value chain. The merSETA is responsible for:

- Monitoring the skills needs of the sector and developing a Sector Skills Plan within the framework of the National Skills Development Strategy;
- Approving workplace skills plans;
- Allocating grants to employers, education and training providers and workers; and
- Establishing, promoting and quality-assuring new programmes.

The merSETA has a regional office in Port Elizabeth and sub-offices in both Buffalo City and Port Elizabeth public FET colleges, as discussed in Chapter 5.

Third, there is also a number of national private intermediary organisations in the sector, including trade union and employer bodies, some of which have strong provincial structures.

The **Automotive Industry Export Council (AIEC)** was established in 1999 as the official private-sector export-promotion body for the South African automotive industry. It represents the OEMs, commercial vehicle manufacturers and components firms and works in partnership with Trade and Investment South Africa, the export-promotion arm of the dti. It is primarily engaged in promotion work but its concerns include the identification of key automotive industry export capabilities, and key competitive and potentially competitive automotive products. This typically leads to the identification of training needs, particularly among small and medium component manufacturers.

The **National Association of Automobile Manufactures of South Africa (NAAMSA)** was originally the official body of the South African-based OEMs but now also includes importers and distributors of other models. It conducts analysis of sales and other sectoral data and disseminates this to its members. It acts as an industry-lobbying and liaison body with government, including technical work on safety and crime prevention, carried out with the South African Bureau of Standards and the Department of Transport. It has a provincial structure.

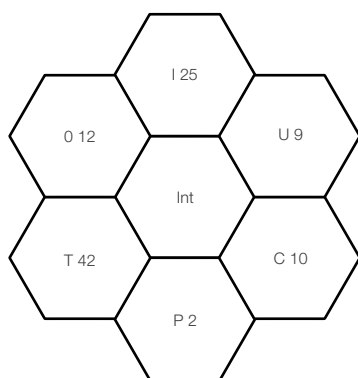
The **National Association of Automotive Component and Allied Manufactures (NAACAM)** is the association representing the interests of South Africa’s automotive components manufacturers. It has regional representatives in both East London and Port Elizabeth. NAACAM liaises with government on policies that affect the industry; distributes information to members on legislation that impacts the sector; participates in overseas trade missions; hosts networking events for the industry; and provides relevant statistical data to its members.

The **National Union of Metalworkers of South Africa (NUMSA)** was formed in 1987 through the merger of several previous unions and is the biggest trade union in South Africa. It is an affiliate of the Congress of South African Trade Unions, although it resolved in late 2013 to cease paying its membership fee and is in political dispute with the Congress over participation in the ANC-COSATU-SACP Triple Alliance. As well as its core focus on defending workers' rights and bargaining on wages and working conditions, NUMSA has had a long tradition of engaging in skills development matters (see Chapter 2) and engages at workplace, provincial and national levels, focusing particularly on the needs of current and retrenched workers but also supporting members' children through bursaries. It has regional offices in Port Elizabeth.

Intermediaries and skills alignment

Figure 7 presents the inter-network relationships of these diverse intermediary organisations.

Figure 7: Network interactions of intermediary organisations



Note: I = intermediaries; U = public universities; C = public colleges; P = private providers; T = Tier 1 firms; O = OEMs.

These intermediaries are engaged in the provincial automotive skills system in a range of ways that contribute to its overall competitiveness, export orientation and job-creation objectives. As might be expected, the network analysis suggests that NAACAM, NUMSA and merSETA have relatively close relationships across the Tier 1 segment, as does AIDC. Relationships with public providers are rare for the private intermediaries (excluding

NUMSA, which has some linkages to both public and private providers). However, they are much stronger for merSETA, AIDC and the various organs of the provincial government. NMMU stands out as the preferred educational partner for most intermediaries. In the overall analyses presented in Figures 4 and 5, AIDC is the top bridging actor and is rated third for both the number and closeness of its relationships, with merSETA featuring strongly in all three categories. Both organisations were repeatedly mentioned in the interviews with firms. Although it was mentioned infrequently in the interviews, NUMSA is also in the top 10 network actors in each category, reflecting its integral role in skills development at the workplace level.

Part of the role of some intermediaries lies in capacitating the overall skills development system of the province or sector. Thus, the ECSECC and ECPSDF are economy-wide structures at the provincial level and AIEC is concerned with the identification of skills needs within the sector nationally as this affects export capabilities. Such structures contribute to the Eastern Cape automotive sector as part of their wider roles. Given the importance of the sector to the provincial economy, all provincial initiatives – such as the ECSECC and ECPSDF, as well as the local IDZs – have a particular interest in the automotive sector, whilst the eAIDC Eastern Cape was established for the sole purpose of supporting the sector. The possibilities for automotive skills articulation in the Eastern Cape are considerably strengthened by the presence of the public intermediary organisations.

Sector-specific partnership building with regards to skills development is a focus of a number of public intermediaries' activities. Some of this relates to building partnerships between education providers and industry and will be examined in more detail in the next chapter. Nonetheless, some highlights of this can be foreshadowed here. For instance, the AIDC has brokered a number of partnerships in the automotive sector, including between Rhodes University and Mercedes-Benz. The merSETA has facilitated FET–HE partnerships and established a welding centre of excellence with the CDC and Eastcape Training Centre. The ECSECC has supported OEM–FET partnerships.

A core element of the intermediaries' role in skills alignment is their contribution to the identification of skills needs for the sector. This is a core function of merSETA, which is responsible for developing the Sector Skills Plan (SSP). This is supported by merSETA's commissioning of research; engagement with other stakeholders; and management of the process of developing workplace skills plans. The SSP is communicated both to employers and to education and training providers. The ECPSDF is responsible for the Provincial Skills Development Strategy, which is heavily influenced by analytical work done by the ECSECC and the AIDC. Coega's Human Capital Solutions unit has developed one of the most sophisticated labour market forecasting models in South Africa, which is also a crucial resource for provincial skills planning. Through their regional structures, the employers' intermediaries also feed skills needs information into the provincial skills planning process, whilst NUMSA is particularly active in the identification of the skills needs of its membership. Together, these intermediaries provide a wealth of information on sectoral skills needs.

Coega has a particular focus on skills retention. This followed a realisation that the Eastern Cape loses large numbers of high-level skills to other provinces. The Human Capital Solutions unit has implemented a Zone Labour Agreement, which has resulted in a staff turnover at the IDZ of less than 0.1%, compared to the international average of 2.4%. This led to an ILO best practice award. Skill retention is also seen as an important factor in promoting the attractiveness of the IDZ to potential inward investors, including Tier 1s and OEMs.

Programme development and quality assurance is also a core merSETA function. It has promoted the development of a series of sector-specific learnerships through identifying the need for such a learnership; partnering with education and training institutions to develop the qualification; registering learnerships; supporting materials development, trainer development and infrastructural investments; marketing learnerships to firms; facilitating learnership agreements; and quality-assuring provision and awards. It has also developed the Accelerated Artisan Training Programme (AATP). This is a project designed to accelerate artisanal

training (Akoojee & Brown 2010). Acknowledging that public FET college graduates struggle to get the work experience and further skills development necessary to achieve artisanal status, the programme offers 26 weeks of structured theoretical and simulated practical learning, followed by 54 weeks of structured workplace learning. The merSETA has been able to get a number of key industry partners to participate in this scheme, including Mercedes-Benz (in partnership with Buffalo City College).

The merSETA has been involved in programme development at WSU and, especially, at NMMU. It has supported the development of programmes at all of the three core public FET colleges and has also supported learnerships at the more rural Ikhala and Lovedale colleges, which are accredited merSETA providers, as is King Hintsa College. These interactions will be explored in greater depth in Chapter 5.

The AIDC has also been involved in programme development at public institutions. For instance, its facilitation of the Rhodes University–Mercedes-Benz partnership resulted in the development of a Level 6 qualification in automotive management, whilst a partnership with Volkswagen, NMMU and East Cape Midlands College has generated a Level 5 mechatronics programme. The AIDC has developed a number of short courses for suppliers in areas such as total quality management and sustainability, and has been a partner in the Siemens–NMMU training collaboration in the Advanced Mechatronics Technology Centre (AMTC), which has resulted in more than 500 technicians receiving industry-approved training. Again, these issues are returned to in more detail when considering higher education provision in the next chapter. The AIDC was mentioned by eight firm respondents as having worked with them to address their skills needs. Formex noted the AIDC's role in the development of the Automotive Wellness Programme; Autocast mentioned training on energy saving; and Behr reported participation in AIDC-supported leadership training.

Allied to programme development is institutional development support, which includes staff

development, funding, infrastructural development and support to work experience. The flagship of intermediaries' partnerships with higher education is the merSETA–NMMU partnership, centred on the merSETA Chair in Engineering Development, which is discussed at greater length in Chapter 5. The merSETA has funded the chair and a range of its activities, including the AMTC and BEng bursaries, with its total investment being several million rands. The merSETA's partnership with Mercedes-Benz and Buffalo City College facilitated the training of lecturers in Germany and the refurbishment of the college's workshops. Both the merSETA and AIDC have been involved in initiatives to support lecturer development for the FET sector, including through supporting NMMU and WSU to partner with colleges. AIDC has been involved in several key initiatives with the public universities that have built university capabilities. Between 2004 and 2011, AIDC provided matched funding worth R7.5 million to NMMU, which was able to leverage total external funding for automotive initiatives of R33 million. AIDC also provided start-up support to the WSU Tooling Design and Development Centre, a project in which the ELIDZ was also involved. The ECPSDF has a partnership with merSETA to fund work-based learning programmes and provides coordination for student funding from the Premier's Bursary Fund. Building work experience for students is also a major challenge for skills providers. A number of intermediaries play a role here, including the merSETA, ECPSDF, AIDC and IDZs.

The provision of skills development is only one aspect of what is required in the poorly functioning South African labour market, and graduate placement has become a growing focus of post-school providers. Intermediary organisations also play a role in this regard. The merSETA's agreement with NMMU includes a focus on graduate placement and a particular emphasis on the promotion of women in engineering. The AIDC, with Development Bank of Southern Africa funding, managed the Jobs Fund Programme, which placed 135 graduates into employment within the sector. The ECSECC has also targeted graduate placement.

Several of the intermediaries are well aware that skills supply issues begin before the post-school

sector and this has led to a number of initiatives focused on schooling. The AIDC developed the Automotive Experiential Career Development Programme (AECDP), an educational and mentoring programme focusing on black Grade 12 learners. It has run winter schools at NMMU since 2004. More than half of its graduates now proceed onto the BEng Mechatronics. Many of the students on the programme are sponsored by OEMs, who have also provided industry site visits. Many students have subsequently been employed in the sector. ECPSDF has focused particularly on supporting technical high schools, as has merSETA, which has supported staff development in the technical subjects.

The capabilities of the intermediaries

The sector has already been described as unusually well organised by South African standards and many of these intermediary organisations are very large and well funded. The CDC has signed agreements worth more than R30 billion and it is capable in the skills area of running an international quality labour market forecasting model. It also has its own training centre and develops and delivers programmes, and partners with key providers such as Eastcape Training Centre, East Cape Midlands College and NMMU.

NAACAM and NAAMSA have small secretariats but have the support of large corporations behind them and both have a reputation for technical excellence. NUMSA has a very strong tradition of working in the skills sector over the past 25 years and has a membership of nearly 400 000. The merSETA is the largest of the SETAs, with strong employer and union representation and considerable internal capacity. The total skills levy income from the sector is R600 million. At the provincial level, it has a well-staffed central office and a network of client liaison officers that link it closely to employers. Although the AIDC is aware of being financially constrained, it employs 88 staff and has a strong track record of partnerships. The ECSECC has been involved for more than a decade in skills development issues in the province.

Self-ratings for dynamic interactive capabilities were not forthcoming from all intermediaries. Table 11 reports what was gathered:

There was a general sense of capabilities in sensing change in what is a highly turbulent sector. Intermediaries' relatively good self-perception of their sensing capability was reflected in a mean of 2.9 on this measure. The CDC's labour market forecasting capacity has already been mentioned, as has the insights that the merSETA gains from the sector skills planning process. Others, too, have some important capabilities in this regard. Nonetheless, some of the interviews also reveal clear concerns that there was more awareness of the nature of the challenges faced by the sector than of viable solutions.

It can be argued that several of the intermediary organisations have shown themselves to be capable of learning new approaches to support sectoral alignment. However, there was less confidence in their own capabilities in this respect, with a mean of 2.5 being recorded for the learning capability.

There is much evidence of the intermediary organisations being very active in bringing together other actors. This relies heavily on their own internal ability to coordinate themselves. Indeed, coordinating capabilities were generally seen as high by intermediaries, with a mean of 3 being recorded. However, there was some sense that this reflected their own self-image about their own work and worth. Moreover, this was the capability for which the variance of responses was greatest (standard deviation 0.81).

From the interviews, there was some sense of competition and duplication between the intermediaries, and some sense of a division between the public and private organisations. Nonetheless, given that a major strike had not long ended, it was noteworthy that there was a generally positive sense about interactions within the sector. Some particular partnerships stand out, none more so than the partnership that merSETA and the AIDC have had with NMMU.

Conclusion

The automotive sector as a whole is characterised by a rich set of public and private intermediaries that reflect both the sector's own internal organisation and the priority placed on it by national and provincial governments. This has resulted in a complex network of relationships and activities, with significant additional resourcing for skills development. In keeping with the analysis of the previous chapter, much of this is directed at short courses and internal skilling of existing staff, with the AIDC playing the central role here. Along with merSETA, the AIDC also supports more high-profile partnerships involving public post-school providers and initial education and training programmes, something that is a weakness of the private intermediaries. As with the previous chapter, the overall impression is of activity and interaction, which is mostly positive but of limited strategic importance given the realities of the sector.

Table 11: Intermediaries' self-ratings of their dynamic interactive capabilities

Intermediary	Sensing capability Mean	Learning capability Mean	Coordinating capability Mean	Dynamic interactive capability Mean
AIDC	3.5	3.7	4.0	3.7
EC Premier's Office	3.0	2.3	3.6	3.0
ECSECC	2.8	2.0	2.2	2.3
ELIDZ	2.0	2.0	3.0	2.3
merSETA	3.0	2.65	3.3	2.95
NAACAM	1.5	1.7	1.8	1.7
NAAMSA	4.0	3.0	4.0	3.7
NUMSA	3.0	2.3	2.2	2.5
Total	2.9 (SD 0.74)	2.5 (SD 0.63)	3.0 (SD 0.81)	2.8 (SD 0.67)

Scale: 1 = not effective; 2 = somewhat effective; 3 = effective; 4 = very effective
Source: Project survey data

6. POST-SCHOOL EDUCATION AND TRAINING AND THE EASTERN CAPE AUTOMOTIVE SECTOR

The Eastern Cape education system reflects the legacies of an apartheid past, with massive disparities between educational experiences in rural, homeland areas; very large urban townships; small white towns; and large metropolitan areas. Almost all of its public post-school institutions have experienced mergers (often between historically advantaged and disadvantaged institutions) and all have undergone transformations of student body, governance, staffing, curricula, etc. There are also several private providers, although these are largely concentrated in the urbanised coastal strip between East London and Port Elizabeth.

In this chapter, the focus is primarily on what can be termed the core education and training actors in the automotive SSI. Some attention is paid to the four public higher education institutions, as all interact with other actors in the sector, directly or indirectly. However, the focus of the first substantive section of this chapter is predominantly on the university that has engineering provision and is located at the heart of the SSI: Nelson Mandela Metropolitan University. The second, and longest, section of this chapter then turns attention to the public further education and training colleges. Three of the eight colleges stand out as the core institutions with respect to the automotive SSI: Buffalo City, East

Cape Midlands and Port Elizabeth, and these are the overwhelming focus in this section. In the third section, the private post-school sector is considered. There are more than 150 registered organisations within this sector but very few of them interact strongly within the automotive SSI. In the final substantive section of this chapter, two private institutions are examined: the Production Management Institute, which straddles the further and higher education and training bands, and the Eastcape Training Centre. The chapter concludes with a section that highlights key themes that emerge across the three segments of the post-school sector when their competences and capabilities to interact with other actors in the automotive sector are considered.

The provincial public higher education system

Context

The public higher education sector in the Eastern Cape comprises four very different institutions.

As Table 12 illustrates, there is a huge variation in institution size. The mixture of institution type has clear implications for both visions for, and practices of, industry engagement. Moreover, differentiated

Table 12: Basic provincial public higher education typology, 2011

	Students (±)	Academic Staff	Other descriptors		
UFH	11 144	291	Not merged	Research	Rural (HDI)
RU	7 278	319	Not merged	Research	Rural–urban (non-HDI)
NMMU	26 256	579	Merged	Comprehensive	Urban (non-HDI)
WSU	27 029	607	Merged	Comprehensive	Urban–rural (HDI)

Note: HDI = historically disadvantaged institution

Source: DHET (2013b)

historical status clearly still has a legacy, as does the mixture of merged and non-merged institutions. As will be argued below, success to date of mergers has implications for capacity to engage with the SSI. Finally, place matters, with rurality significantly constraining institutional interactive capabilities with respect to the automotive sector.

Table 13: Student numbers disaggregated by level, 2011

	Undergraduate students	Postgraduate students (ALL)
UFH	83%	17%
RU	73%	27%
NMMU	87%	13%
WSU	96%	4%

Source: DHET (2013b)

Table 13 shows that all four HEIs are predominantly undergraduate universities, but there are significant differences between the 27% postgraduate component at Rhodes and the 4% at Walter Sisulu. Both are far away, though in opposite directions, from the national average of 16% (HEMIS database 2012). Again, this has implications for the nature of industrial engagement, as does the programme mixes at each institution (Table 14).

Table 14: Student numbers disaggregated by programme area, 2011

	Science, Engineering and Technology (SET)	Business and Management	Education and Humanities
UFH	22%	18%	12% + 48%
RU	27%	22%	11% + 40%
NMMU	34%	35%	14% + 17%
WSU	31%	28%	17% + 23%

Source: DHET (2013b)

Proportions of enrolments in Education and Humanities remain high with both 'research' universities well above the national average of 41% and Rhodes' 51% Humanities being more than double the national average of 24% (HEMIS database 2012). However, and more pertinently for this study, both NMMU and WSU are above the national average of 28% for SET. Again, these characteristics profoundly influence the nature of institutional engagement with the provincial and national skills systems in general and the automotive sector in particular. Only these two universities have

Engineering programmes. For the other universities, their engagement with the SSI must come through different routes.

Brief institutional summaries give a further sense of the distinct natures of the four institutions.

The **University of Fort Hare** (UFH) has a rich history, from its early start (1916) as an African university of scholarship excellence to the tumultuous struggles through the apartheid years and on to its journey to recovery and redefining itself as a 'vibrant, equitable and sustainable African university, committed to teaching and research excellence at the service of its students, scholars and wider community' (<http://www.ufh.ac.za/?q=about-university-0>). With a stable leadership, UFH is one of the few rural HDIs not to have been placed under administration. However, the university does struggle to recruit qualified academic staff because of its rurality, and concerns about the inadequacy of health-care and education facilities. With three campuses – one in rural Alice, one in rural Bhisho and one in urban East London – the university offers programmes in five faculties: Education; Law; Social Sciences and Humanities; Science and Agriculture; and Management and Commerce.

Nelson Mandela Metropolitan University (NMMU) arose in 2005 from the merging of the University of Port Elizabeth, Port Elizabeth Technikon and the Port Elizabeth campus of Vista University, bringing together the industry relationships and engagements associated with the technikon and the academic scholarship of a traditional research university. The university tells a story of having carefully crafted the merger so as to create a comprehensive university that today positions itself to 'offer a diverse range of quality educational opportunities that will make a critical and constructive contribution to regional, national and global sustainability' and, in so doing, become 'a dynamic African university, recognised for its leadership in generating cutting-edge knowledge for a sustainable future' (<http://www.nmmu.ac.za/About-NMMU/Management---Identity/Mission,-Vision---Values>). It has seven faculties: Arts; Business and Economic Sciences; Education;

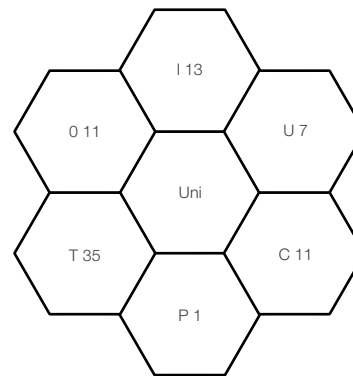
Engineering, Built Environment and Information Technology; Health Sciences; Law; and Science.

Rhodes University (RU) is one of the oldest universities in the country, established in 1904. It is also one of best-performing universities in South Africa in terms of undergraduate pass and graduation rates, and having amongst the highest research output per academic staff member. Based in a small university town, situated in one of the poorest provinces, Rhodes stresses the importance of traditional academic values and disciplines, although these have been refreshed by a strong social-justice vision driven by the vice-chancellor, Professor Saleem Badat. His vision is one of producing ‘graduates who are knowledgeable intellectuals, skilled professionals, and critical, caring and compassionate citizens who can contribute to economic and social development and an equitable, just and democratic society’ (www.ru.ac.za). **Walter Sisulu University** (WSU) is one of the youngest institutions in the country, created in 2005 from the merger of the University of Transkei (UNITRA) in Mthatha, Border Technikon in East London and the Eastern Cape Technikon in Butterworth. Its intent is to be a ‘developmental university, ascribing to itself the imperative of making a significant contribution to regional, national and continental development’ (http://www.wsu.ac.za/about_us/aboutus.php?id=about). The merger is still largely unfinished and the university has been under administration since the end of 2011, following a long period of financial distress and weak leadership and governance. WSU has four faculties: Health Sciences; Education; Science, Engineering and Technology; and Business, Management Sciences and Law.

The network analysis suggests that the universities diverge very strongly in their network density with the sector. The two universities with Engineering faculties have large numbers of linkages to other network actors, whilst the other two universities have very limited linkages that are mainly to the public intermediaries and the other universities. NMMU and WSU have an average of 33 Tier 1 linkages and seven OEM relationships each but around four-fifths of these are characterised as

being isolated instances of cooperation. These interactions are presented graphically in Figure 8.

Figure 8: Network interactions of public universities



Note: I = intermediaries; U = public universities; C = public colleges; P = private providers; T = Tier 1 firms; O = OEMs.

Institutional competencies

All four HEIs are engaged in the Eastern Cape automotive SSI in a loose sense but NMMU is the only one that is a core, rather than a peripheral, partner. Therefore, the primary focus throughout this section will be on NMMU, although the other HEIs will be referred to regularly. It should also be noted that much of what follows will highlight generic institutional competences, which need to be distinguished from their competences to be part of the SSI and their specific engagement with the Tier 1 segment. Moreover, it is necessary to stress that contributing to the SSI is not necessarily part of these organisations’ visions, nor should it be.

Strategy

Given the range of contexts (from a historically white university that did not experience mergers after 1994 to an institution with a strong differentiation of previous universities and technikons serving different communities – and now under administration), it is unsurprising the sense of strategic vision varies across the four. As regards engagement within the SSI, there is a radical difference between the strong academic and social justice vision of Rhodes, which downplays industrial engagement and vocational preparation, and the far more vocational and industry-oriented vision of NMMU, including its strong articulation within the SSI.

Resourcing

Senior management of all four HEIs speak of resourcing constraints and understaffing of both academic and administrative units. Table 15 gives some sense of academic staffing limitations.

Table 15: Key characteristics of academic staff by institution

	UFH	RU	NMMU	WSU
Total academics	223	317	558	574
% of professors	13	21	13	4
% of assoc. professors	11	14	12	2
% of senior lecturers	28	24	26	15
% of lecturers	48	41	49	80
With doctorates	85	168	204	58
% of professors	74	94	91	68
% of assoc. professors	55	72	58	86
% of senior lecturers	47	50	45	25
% of lecturers	14	27	12	3
Publication units produced	121	323	219	31
Units per total academics	0.5	1.0	0.4	0.1
Units per total academics with doctorates	1.4	1.9	1.1	0.5
% of new SET doctoral entrants graduated	44	73	50	0

Source: DHET (2013b) supplemented by institutional data

Huge variations are again apparent across these characteristics. Student to academic staff ratios vary hugely, with Rhodes approximately half that of the others (24:1 as opposed to 47–50:1 for the other institutions). Rhodes also possesses significantly more senior-level academics (35% at associate or full professorial level as compared to 6% at WSU). These disparities are even more dramatic when a student to staff with doctorates ratio is calculated. At 45:1, Rhodes is more than 10 times better than WSU. This ten-fold difference is also present in the output to academic staff ratio. The level of doctoral student wastage in science, engineering and technology subjects is high (more than one-quarter at Rhodes; half at NMMU and more than half at Fort Hare).

Institutional planning

Unsurprisingly, too, Institutional planning capacity varies across the four institutions. As the most SSI-oriented of the four institutions, it is noteworthy that NMMU appears to have a relatively strong Institutional Planning Department. This has oversight of:

- Strategic and academic planning;
- Management information;
- Quality advancement; and
- monitoring and evaluating progress with institutional transformation.

It serves as an interface between the different departments and the external world, and informs both management and academics.

Teaching and learning policies

There are relative strengths in this core academic competence across all four institutions in terms of general policy structures. Fort Hare has a Teaching and Learning Centre, a Planning and Quality Assurance Directorate and a Teaching and Learning Policy. At Rhodes, the Centre for Higher Education Research, Teaching and Learning influences the strategic direction for teaching and learning. A policy and process for curriculum review is in place, and all proposals for curriculum review go through the Office of the Dean: Teaching and Learning and on to the Senate Teaching and Learning Committee before submission to the Higher Education Quality Committee. While WSU has a curriculum review policy in place, there is no institutional mechanism for institutional curriculum review, and there is no academic planning component in place to manage this. Nonetheless, for new programmes to be accredited, there is an exacting 11-point procedure in place (as at Rhodes). Four criteria have been adopted by the Senate for programme accreditation and approval: technological, scientific, innovative and responsive.

Both WSU and NMMU acknowledged that in the process of determining what type of programme would be an effective replacement for the BTech and for work-integrated learning (WIL), there had been substantial dialogue with industry partners through structures such as Industry Advisory Boards (IABs). Both WIL and IABs will be explored in more detailed later in this section.

Being a comprehensive university, NMMU has spent considerable effort in defining what type of graduate it wishes to produce, and this vision guides the teaching and learning strategy for the university. Industry and academics were engaged in the

process of detailing the graduate attributes NMMU is seeking to develop. In Engineering in particular, there is a bias towards industry-responsive programmes.

The Quality Advancement unit does programme reviews for each programme in place every six years and, for some programmes (particularly those with external accreditation processes such as Engineering), reviews may take place more often. The Institutional Planning division assists by facilitating some of the reporting for the external quality assurance.

The Curriculum Development Centre supports programme developments, particularly the use of case studies; the introduction of problems from industry into coursework materials; and the adaptation of the types of projects on which the students are working.

Sector-specific competences

Both Rhodes and UFH contribute to the SSI at the level of supporting management skills, including specific links between Rhodes Business School and Mercedes-Benz, as detailed below. WSU has one of the DST technology stations, in tooling, which supports the engineering sector in general, including the automotive cluster. However, the reason that NMMU is the most central HEI partner to the SSI is that its Faculty of Engineering is located geographically close to the heart of the sector and is a significant generator of sector-specific skills and knowledge.

Internal capability-building mechanisms

The importance of academic development to overall institutional capability development is clear as staff are at the heart of institutions' ability to engage with other stakeholders. Inevitably, the building of academic capacity is a stated goal of all four HEIs. Both Fort Hare and Rhodes offer a postgraduate diploma in higher education and training. At WSU, the Centre for Learning and Teaching Development (CLTD) provides opportunities for professional development for staff (offered to all faculties), curriculum development support, and student academic support for those students at risk. The CLTD also offers a two-day induction programme for all staff, which is followed up by the opportunity

for academics to enrol in a professional excellence programme (three or four modules over three years).

The rewarding of performance is an important element of academic development. Fort Hare makes promotions dependent on teaching and research performance, whilst both Rhodes and NMMU also consider community engagement as a criterion in promotions. Both universities have developed guides for building a portfolio for this purpose. Awards for distinguished teaching and/or contributions to engagement activities are used as incentives at both Rhodes and NMMU. While there is no performance management system in place that rewards teaching and learning, WSU does have a Vice Chancellor's Teaching Excellence award system.

These generic attempts to build institutional capability inevitably strengthen any interactions within the SSI.

Interactive capabilities

Three aspects of interactive capabilities emerge strongly from the fieldwork: employability, research and knowledge transfer and external engagement. All of these areas require interaction with outside actors but the four universities are more or less capable in these interactions.

Employability promotion

One element of some universities' approaches to employability promotion is a clear enunciation of what they consider to be the core graduate attributes that they are seeking to develop. At one extreme in the province is the position of Rhodes, which downplays the notion of the employable graduate in favour of a vision of 'cultivating humanity'. Fort Hare takes a more pragmatic position. The university has introduced a student training programme for various soft skills identified by industry stakeholders, so that students are more prepared for the workplace. It espouses a strong entrepreneurship vision for its future approach to graduate employability. The Centre for Enterprise Development hosts workshops and courses on entrepreneurship and new venture creation and the university intends to bring such content into all undergraduate and postgraduate programmes. At WSU, it is acknowledged that a vision for graduate

attributes and employability is constrained by the broader challenge of agreeing on an overall university mission. Nonetheless, the Institute for Advanced Tooling, one of a series of national technology stations under the Technology Innovation Agency (TIA), does incorporate a strong focus on ensuring that Mechanical Engineering graduates from WSU have the skills required for employment.

NMMU has clearest employability-driven view of graduate attributes and most developed approach in practice. The university has developed a graduate attributes framework in consultation with students and employers and has a clear corporate statement about the type of person it is seeking to produce: a 'graduate prepared for work and for life'.

The technikon tradition has generated a legacy of work-integrated learning, which closely binds students and departments to industry. However, the national move away from the BTech degree and the development of the Higher Education Qualifications Sub-Framework were seen as undermining the WIL approach.

A crucial element of the WIL tradition was the requirement for Programme Advisory Boards/Committees (PABs). These were central mechanisms through which technikons interacted with industry and became more responsive to industry needs and trends. NMMU retains a strong emphasis on such external interface structures. Its policy on PABs states the following:

The Nelson Mandela Metropolitan University as an engaged university offering a comprehensive range of programmes, aims to facilitate communication and discussion on academic matters between the University and its external stakeholders. Programme Advisory Boards serve as one of the vehicles that may be used for ensuring that programmes offered by the University are responsive to the community it serves. (NMMU 2008: 1). In its diploma programmes, PABs provide input on the knowledge and skills gaps of the graduates, and make recommendations for curriculum review. This

is particularly evident in departments directly related to occupations needed in the SSI, such as Mechanical and Electrical Engineering, where representatives from the automotive cluster are represented on the advisory structures.

The Institutional Planning Department then works with the relevant academic departments to enable curriculum decisions. Increasingly, some of the other academic departments without a PAB tradition have requested support in establishing similar structures where these are likely to add value to the programme offering.

Career and placement services are another important element of codified competences for employability promotion that are an indication of interactive capabilities in the organisation. Common elements of such programmes include:

- Career counselling;
- Careers fairs;
- Skills workshops for students;
- Internships;
- Graduate placement programmes; and
- Graduate employment surveys.

In terms of developing the ability to respond to labour market trends, graduate employment surveys are most important. WSU, for instance, has used data from a tracer study supported by a Dutch agency, NUFFIC, to inform the development of two different programmes in academic literacy and academic writing, some of which was subsequently embedded in the core curriculum for undergraduates. NMMU runs a biennial Graduate Destinations Survey and also makes use of data from national surveys such as that conducted by the South African Graduate Recruiters Association. Both WSU and NMMU have developed strong and integrated skills, internship and placement programmes. Key employers targeted in the placement programmes, and career fairs, include both Tier 1 firms and OEMs.

Research and knowledge transfer

Whilst much research can take place independent of industry or other stakeholders, all four universities

in the province acknowledge the importance of industrial partners in their research strategies. All four HEIs have identified a set of research priorities and these include central structures dedicated to attracting industrial funding for research and ensuring effective technological transfer with appropriate intellectual property (IP) provisions. At Fort Hare, the Govan Mbeki Research and Development Centre (GMRDC) facilitates academic linkages to the TIA and the National Intellectual Property Management Office (NIPMO). NIPMO funds the Eastern Cape Technology Transfer Office, hosted by NMMU but constituted as a partnership of the four universities. NMMU also has a Technology Transfer and Innovation Support Directorate, whose mandate it is to provide support for contract and grant management, prototyping and proof of concept development; IP awareness; IP identification, protection and management; and IP commercialisation.

Large numbers of research and knowledge transfer partnerships exist between the HEIs and external partners. Fort Hare has more than 600 relevant MoUs in place; graduate students in its Institute of Technology are predominantly industry-sponsored; and a wholly owned company, Fort Hare Solutions, commercialises prototypes and offers executive education and research and advisory services. WSU's Institute for Advanced Tooling was established as part of a national scheme that explicitly aims at building interactivity:

[The] purpose of IAT is to transfer technology to industry, support SMMEs, provide skills development, conduct technology demonstrations, conduct research and development, provide product development and prototyping services, conduct technology audits amongst other things. The IAT is in fact a high level technology enabler. (<http://www.prlog.org/12128214-walter-sisulu-universitys-institute-has-the-right-tools-for-the-job.html>)

External engagement

All four universities also acknowledge external engagement as a central element of their mission. As in other areas, however, their visions for this vary radically and the apparent agreement on a language

of 'community engagement' obscures fundamental differences regarding its interpretation.

Community engagement in these four university environments is a broadly inclusive term describing a planned, elective process by which the university interacts with people external to the university for specific purposes at a collective or organisational level. As NMMU is both the closest in alignment to the other actors in the SSI and the institution where engagement most strongly includes an orientation towards working with businesses, the focus will be on its programmes.

NMMU's core structure for engagement is the Centre for Academic Engagement and Collaboration (CEAC). This manages a four-part approach to engagement:

1. Community engagement, service and outreach;
2. Engagement through discipline-based service provision (consulting services);
3. Engagement through teaching and learning; and
4. Engagement through research.

For each of these types of engagements, there are guides for building and evaluating an engagement portfolio. The university has created a number of different unit types (research entities, engagement entities and hybrid entities) to deliver engagement. A system of regular reporting and quinquennial review is in place.

The NMMU Engagement Entities Policy, for instance, states:

Engagement entities are intended to develop and strengthen existing engagement and scholarly activities through the development of mutually beneficial partnerships with external communities that are consistent with the University's strategic direction and priorities. The engagement activities of entities should enrich the educational environment of staff and students, the curriculum and the scholarly activities of the University. The establishment of engagement entities [is] therefore intended to enable, develop and support the engagement

activities of the NMMU. (NMMU 2012: 1) NMMU offers over 600 short courses annually as part of its engagement programme and this generates an annual income of R50–60 million. This does not include the large, typically rural, programme of more conventional community development activities carried out by the university. Indeed, the Community Development Unit has also developed a short learning programme in community development for on-campus and off-campus practitioners and academics.

These programmes are not intended to be simply one way in which the university provides knowledge, skills and services to business and the community. Rather, NMMU policy stresses the need for the university to learn from the encounter. As part of CEAC, the Engagement Advancement team are responsible for feeding back learning from the engagement programme into teaching and learning and research activities.

Much of this overall external engagement is directly related to the automotive SSI. Moreover, there is a range of further engagement activities that exist within the Faculty of Engineering, many of which are directly concerned with partnership with the automotive cluster.

External engagement in the Faculty of Engineering is most visible in its set of named chairs. These demonstrate partnerships with Volkswagen, General Motors and merSETA. Moreover, a deeper look at these chairs' activities demonstrates a rich and international set of interactions between the Faculty actors and other actors in the SSI.

The VW International Chair in Automotive Engineering is funded by the German Academic Exchange Service (DAAD) and is centred on a partnership with both Volkswagen and German universities. It is intended to support increased innovation and international competitiveness of the Eastern Cape automotive sector and to provide appropriate human resource development that will ensure an adequate number of high-level trained specialists in engineering with high-level skills. The focus is on materials and

manufacturing technology and processes to enhance technology transfer opportunities from the university, mainly into the small and medium enterprise automotive component supplier segment.

The GMSA Chair of Mechatronics was established in 2009. The agreement between NMMU and GMSA is for a period of five years with the total funding being more than R3.6 million. The original agreement was set to expire in March 2014, and an extension of the agreement, with revised conditions, was anticipated beyond this date. Its mission is: 'Through research and innovation, facilitate cooperation between industry and academia with the aim to enhance human capital development in the automotive sector'. The GMSA Chair has ongoing collaboration in the field of Robotics and Metrology with Aachen University in Germany and links to the University of Luxembourg, a partner of Adam Opel AG (part of General Motors) and the Institute of Industrial Technologies and Automation (ITIA) of the Italian National Research Council. A large number of GMSA employees and their children are studying at the university on GMSA bursaries. Student bursaries are also funded by the VWSA/DAAD Chair.

The merSETA Chair in Engineering Development has a range of projects. These include collaboration with Port Elizabeth, Eastern Cape Midlands and Buffalo City FET colleges to increase their capacity in Mechanical Engineering, Industrial Engineering and Mechatronics. The merSETA also collaborates with the Chair to promote engineering in schools, provide student bursaries and support industrial placements in its member companies. A particular focus of the partnership is on women in engineering and there are plans to establish an Association of Women Engineers, hosted by NMMU.

The Advanced Mechatronics Technology Centre (AMTC) was established with support from the AIDC, merSETA, VWSA and the South African National Roads Agency. It provides training for engineering students and industry employees in advanced factory automation and drives technologies. Courses include training for electricians in the service and maintenance aspects of the technology; advanced programming; industrial networking and supervisory control; and

techniques of data acquisition for technicians and engineers. Much of its delivery is through short courses accredited by Siemens, delivered to almost 500 individuals from industry over the first six years. Siemens now underwrites the operational costs of the centre through the income generated from its accredited training programmes and the unit is entirely funded from this and external income generation.

eNtsa is the NMMU technology station for the automotive industry, with a specific focus on automotive components. Funded by TIA, its primary aim is to transfer technology to local small and medium enterprises. It also offers a range of testing and design services to enterprises that could not afford the specialist equipment and staff to conduct these in-house.

All of these units have strong automotive industry engagement in their management structures. Moreover, they all contribute to NMMU's interactive capabilities through income generation and the provision of capital investments that add significantly to the university's research capacity and reinforce its ability to interact with industry as a provider of high quality services.

Whilst NMMU is the principal university partner with the automotive sector, the other HEIs also have a number of engagements with firm actors in the SSI. The Rhodes Business School partners with Mercedes-Benz South Africa (MBSA) to provide management and leadership training for technical managers moving upwards through the organisation. It also supports talent development at a junior level

in MBSA, and provides tailored training for the retail and marketing divisions at MBSA, Barloworld Motor Retail and the VW Sales and Marketing Academy. In the case of programmes for MBSA, the coursework and learning materials were developed in collaboration with Mercedes-Benz in Germany. The Business School also provides broader organisational development support to MBSA through running workshops, strategy sessions, team-building, surveys, and so on. As was noted earlier, the Rhodes–MBSA partnership evolved from initial work commissioned by the AIDC. The IAT at WSU (also supported by the AIDC) has formed close working relationships with key stakeholders in the tooling industry in the province, which contributes to the capacity of the automotive sector.

Dynamic interactive capabilities

The university respondents self-reported their dynamic interactive capabilities as follows.

There is some evidence of the development of dynamic interactive capabilities that emerges from the interview data and internal documents explored above. The self-reporting of dynamic interactive capabilities is broadly consistent with this.

There is almost no variation in the mean sensing capabilities that the universities self-report, which vary by less than 0.1. All can be described as moderately confident with this capability (mean 2.56; standard deviation 0.86), but it is clear that all acknowledge that there is considerable room for improvement. All the universities are very aware of the need to interpret and implement national policy. This is particularly obvious in the case of DHET

Table 16: Universities' dynamic interactive capabilities (self-reported)

University	Sensing capability		Learning capability		Integrating capability		Coordinating capability		Dynamic interactive capability	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
NMMU	2.57	0.75	2.43	0.69	3.40	0.42	3.34	0.53	2.94	0.32
WSU	2.58	1.23	2.11	0.84	2.33	0.92	2.47	0.70	2.37	0.90
Rhodes	2.50	1.09	2.44	1.35	2.93	1.01	3.13	0.42	2.75	0.91
UFH	2.56	1.01	2.58	0.96	3.10	0.84	3.15	0.57	2.85	0.80
Total	2.56	0.86	2.41	0.83	3.06	0.76	3.11	0.59	2.78	0.64

Note: The figures in the total row are for all interviews rather than for aggregate institutional scores. Therefore, they are not simply the mean values for the four rows above them.

Source: Project survey data

policy, but engagement with a range of DST and dti initiatives is also in evidence, particularly in the area of technology transfer. A wider global scanning process is in evidence at NMMU where the Institutional Planning Department undertakes environmental scanning, including watching policy trends and economic influences (local, national and global). The university reports that this process informs the decision-making of senior management.

There is some evidence, too, of understanding provincial priorities. For the rural universities, the public sector remains the key labour market destination and considerable attention is paid to understanding trends in local and provincial government. However, WSU staff reported that the university is increasingly scanning the sectors of the economy that the old technikon used to serve to ensure that it remains responsive and relevant.

NMMU is strongly embedded in the provincial skills development system. It is a member of the Provincial Skills Development Forum and of the ECSECC. Provincial level linkages with merSETA are also in evidence, as illustrated by the Engineering Development chair. AIDC support for the AMTC has already been noted and NMMU has a range of linkages with the AIDC through which it is able to scan more effectively policy and sectoral trends and their potential implications for training engineers.

The universities are less confident that they have effective capabilities to learn from such scanning, with a mean response of only 2.41 (standard deviation 0.83). The interviews painted a picture of institutions that were largely struggling to develop new structures around matters such as institutional and academic planning. There was also a clear sense of concerns about programme and qualification mixes and the degree of responsiveness that they could achieve in the face of environmental change. Nonetheless, there are good examples of learning. NMMU has used international academic partnerships with European universities that themselves are partners of the German plants of the three provincial OEMs as a means of strengthening its capacity. Equally, both through IABs and individual partnerships with automotive firms for bespoke courses, it has a relatively strong capability

to translate new knowledge into programme elements. There is also evidence that the universities are responding to a changing labour market. Their focus on graduate destinations has already been noted and examples given of how this informs new teaching and learning initiatives.

There is somewhat more confidence in the universities' capability to integrate their activities (mean 3.06; standard deviation 0.76), notwithstanding strong traditions in some institutions of relatively individualised academic working. Moreover, their coordinating capabilities were seen as the strongest of the four elements, in three institutions. The one exception was WSU and this is consistent with interview data that spoke consistently of internal tensions in building a new post-merger institution.

The coordinating capability of NMMU was the highest of any self-rating across the four categories (mean 3.34; standard deviation 0.53). Again, this reflects much of what has been explored above about its structures and partnerships. NMMU's three partnership chairs (with merSETA, Volkswagen and General Motors) appear to act as strong coordinating mechanisms both in focusing internal activities and in engagement with external partners.

There is other evidence of institutional responses to the overall sectoral and provincial skills needs. Both WSU and NMMU are engaged in support to the public FET college sector. WSU has a strong focus on the rural colleges and provides programmes for FET staff and curriculum development, and quality management, as well as addressing issues of articulation between FET and HE. The NMMU Centre for Integrated Post-School Education and Training (CIPSET), the AMTC and the merSETA chair are all involved in partnerships with colleges.

There is also evidence of a degree of coordinated engagement with the needs for sectoral innovation. A large number of the projects taking place under the chairs and centres are directed at innovation in the sector. This includes research with VWSA and GMSA on electrical vehicles; and work with S&N Rubber, a supplier of rubber parts for all automotive manufacturers in the country, on innovations in

rubber injection processes. Research has been conducted to develop a low-cost production cell for manufacturing of moulds and dies; on improving the resource efficiency of paint shops; and on cheaper electrical carts for transporting vehicles under assembly within manufacturing plants.

The provincial public further education and training system

Environmental turbulence at the national policy level

Like all other education institutions in South Africa, FET colleges have emerged from an apartheid history. Until 1994 white and black technical colleges were separate, with different levels of resourcing and degrees of decision-making powers. Post-1994 colleges became a shared competence between the national and provincial departments, a decision that made sectoral development problematic (McGrath 2004). A further challenge for the sector came from the split between vocational education under the Department Education and skills development under the Department of Labour (Akoojee et al. 2005).

Since 1997 there have been numerous policies that have impacted upon the sector, giving a sense of almost permanent change and turbulence. In 1997 the Skills Development Act established a new set of awards – learnerships, which were intended to replace apprenticeships, once the mainstay of white technical colleges. At this point, colleges' main programmes were the Nated 191 awards designed to provide the theoretical parallel to the enterprise-based learning of the apprenticeship model. However, it was to be another decade before a replacement award, the NCV, was brought in. Although intended initially to replace Nated programmes, NCVs are now intended to exist as an alternative to Nated. At the same time, the intention to replace apprenticeships with learnerships has itself been replaced by a dual economy of both programmes co-existing.

In 1998 the Further Education and Training Act provided for a post-apartheid institutional structure for the college sector and, over the next five years, the new, multi-campus and non-racial public further

education and training colleges were planned. In almost all cases, these were formed from mergers of existing institutions, both historically black and white, as in the cases of the three core colleges in this study.

As well as institutional transformation and new curricula, colleges have seen changes in their internal governance regimes, staffing, lecturer qualifications, funding, student recruitment, etc. Since the establishment of DHET in 2009, FET has largely moved to being a national competence, although some provincial oversight remains. This centralisation, as in the higher education sector, has resulted in a wave of institutions being placed into administration as the Minister attempts to drive transformation and delivery.

The future points to further turbulence, with the current *White Paper on Post-school Education and Training* (DHET 2013b) suggesting a raft of major changes to the sector, including a restated ambition to grow the overall post-school sector very rapidly. Whilst this growth is intended to come in part from new adult-focused community institutions, it is clear that the colleges will be expected to grow rapidly, whilst at the same time improving pass rates significantly and building far stronger links to employers.

Building interactive capabilities has been very challenging for colleges in the face of this turbulence. Two illustrative examples of difficult decisions required of college leadership in the past 15 years may be useful.

First, college principals were enjoined to be responsive to labour market needs in their programme offering. This led some of them to seek to maintain Nated programmes, which they knew to be popular with many employers, and/or to introduce learnerships and build links with the SETAs. However, this often met with disapproval from the then Department of Education, which channelled its core funding and large sources of infrastructural investment towards NCV delivery. Thus, external engagement was a highly risky strategy and several colleges risked bankruptcy over the decision to take engagement seriously.

Second, colleges were given the power to increase their staffing through making council-sanctioned appointments. This was typically the way to get more management posts and to build key engagement units such as placement offices. However, the lack of core funding and equivalent terms of service for these additional appointees opened up both the colleges and these staff to risk as it was unclear how sustainable such roles could be. Since the FET Colleges Amendment Act of 2012, the employment status of all college staff has shifted again (Republic of South Africa 2012).

The Eastern Cape public further education and training sector

There are eight multi-campus FET colleges in the Eastern Cape spread across the province and covering both highly industrialised urban areas and deeply rural, former homeland settings.

Table 17: Eastern Cape public FET colleges – central office location and number of campuses

College name	Central office	Number of campuses
Buffalo City FET College	East London	4
East Cape Midlands FET College	Uitenhage	6
Ikhala FET College	Queenstown	8
Ingwe FET College	Lusikisiki	5
King Hintsa FET College	Butterworth	4
King Sabata Dalindyebo FET College	Umtata	6
Lovedale FET College	King Williams Town	3
Port Elizabeth FET College	Port Elizabeth	4
Eastern Cape Total		40

Source: HSRC (2007) and college websites

Colleges in the Eastern Cape are typically small to medium-sized in South African terms, enrolling between 2 000 and 8 000 learners (headcount) and 1 500 and 3 600 (full-time equivalent, or FTE). Ikhala is the smallest college nationally in terms of headcount, whilst Lovedale is the smallest in FTE terms. None of the colleges is in the top quartile in terms of headcount or in the top half in terms of FTEs (DHET 2013a: 16, 20).

Table 18: Student headcount and full-time equivalent by college in the Eastern Cape, 2011

College Name	Headcount	FTE
Buffalo City	6 614	3 525
East Cape Midlands	6 862	3 167
Port Elizabeth	7 826	3 547
Ikhala	2 128	1 715
Ingwe	2 810	2 302
King Hintsa	2 818	1 765
King Sabata Dalindyebo	5 506	2 536
Lovedale	2 394	1 500
Total	36 958	20 057

Source: DHET (2013a: 16, 20)

The three most urban colleges are the largest, at over 6 500 learners each, whilst four out of five of the more rural colleges have fewer than 3 000 learners each. The overall headcount enrolment of the province of nearly 37 000 in 2011 was 9% of national headcount (DHET 2013a: 16). In FTE terms, the province has 11% of national numbers (DHET 2013a: 20). This difference reflects the relative size of the province's enrolments in the full-time National Certificate (Vocational) (NCV). Table 19 provides a breakdown of student enrolments in 2011.

Table 19: Headcount number of Eastern Cape public FET college students by qualification type, 2011

Programme	Headcount	% of provincial
NCV ⁷	16 072	43%
NATED 191 ⁸	16 259	44%
Occupational Qualifications	1 670	5%
NATED 550/NSC ⁹	837	2%
Other	2 120	6%
Total	36 958	100%

Source: DHET (2013a: 19)

8 National Certificate (Vocational) introduced in 2007 and intended to replace the existing Nated 191 programmes, although the two continue to operate in parallel.

9 National Education Certificate programmes – the N1 to N6 courses that were the basis of theoretical education for apprentices prior to 1994.

10 National Senior Certificate – the old academic school-leaving certificate ('matric'), which is being phased out. Port Elizabeth College was one of only three colleges nationally to offer this award in 2011 (DHET 2013a: 18).

It is noteworthy that whilst the national NCV to Nated ratio is nearly 1:2, the two programme types are almost at parity in the Eastern Cape. Overall, the urban colleges are only slightly more likely than the rural ones to have kept up enrolments in Nated programmes. However, East Cape Midlands is striking for its engagement with occupational qualifications, its 1 267 learners on such programmes amounting to 18% of its headcounts, more than three times the national average (DHET 2013a: 19).

Although there are eight colleges in the province and all were sampled for this project, the discussion that follows concentrates on the three large urban colleges (Port Elizabeth, East Cape Midlands and Buffalo City), each of which is situated close to automotive manufacturing plants and most directly involved in the SSI. Brief institutional summaries of the three core colleges show their complex histories and diverse current situations. All three were formally established in 2003 through mergers of existing institutions.

Buffalo City Public FET College was formed through the merger of two historically disadvantaged technical colleges (Border Technical College and John Knox Bokwe in Mdantsane), a historically white technical college (East London College) and two technical centres (Vulindlela Technical Centre and Border Technical Centre). The college currently has four campuses in East London and Mdantsane. Engineering is offered at John Knox Bokwe and the St Marks campus in East London. It is one of only two Eastern Cape colleges not currently in administration, but has an acting principal.

East Cape Midlands Public FET College resulted from the merger of two urban, historically white technical colleges (Uitenhage and Grahamstown), a township-based, historically disadvantaged technical college (KwaNobuhle) and the satellite of Bethelsdorp Technical College in Graaff-Reinet. The college's head office is located in Uitenhage. Currently there are six campuses, four in Uitenhage plus the Grahamstown and Graaff-Reinet campuses. Charles Goodyear and Park Avenue campuses in Uitenhage deliver Engineering programmes. East Cape Midlands is the only college to have an established principal. Indeed, he is nearing the end

of his second term as the chairperson of the South African College Principals' Organisation.

Port Elizabeth Public FET College arose out of the merger of the urban, white, former technical college at Russell Road, Port Elizabeth, township colleges in Iqhaya and Bethelsdorp, and the Zinedeni training centre. The college currently has four campuses: two in the central business district of Port Elizabeth and the two township campuses in Iqhaya and Bethelsdorp. Engineering provision is concentrated in Iqhaya, near to the core of the Eastern Cape automotive cluster. In spite of its strong history, the college is currently under administration.

Institutional competencies

Strategy and planning

Since the inception of the merged colleges, there has been a strong central focus on the need for strategic planning. All colleges received external support in developing their initial strategic plans a decade or so ago, and all are expected to produce regular updates according to a structured template. There are considerable merits in this approach but it can make it difficult to judge how much local ownership there actually is of strategy. As it seeks to come out of administration, Port Elizabeth is currently revising its strategy. The current Administrator has been very active in trying to build new relationships with industry and it is likely that this will be made a key part of the job description of a new principal, when the college comes out of administration.

Prior to the reallocation of responsibilities between the provincial and national levels, the province funded vice-principal posts for Planning, Research and Institutional Development (PRAID) at every college to strengthen linkages with industry. College PRAID leaders met regularly to coordinate their efforts. The funding for PRAID has now gone, with the reorganisation of oversight, but East Cape Midlands has retained its VP: PRAID position. Although this role is no longer officially in existence at Buffalo City, the VP: Academic there had previously been in a PRAID position at another college and was seen as bringing that experience, those networks and that orientation to the new role.

This is expected to lead to a revitalised strategy for industrial engagement.

All three colleges have identified a range of particular sectoral niches on which to concentrate, with some campuses being focused solely on delivery of a single occupational suite of programmes. All three have identified the automotive sector as an important focus for their work. In addition, East Cape Midlands has placed considerable emphasis on occupational qualifications, as was noted above. This is reflected in its School structure, with it being a separate School of Occupational Training, which manages learnership programmes (largely in Engineering) as well as a School of Engineering, which focuses on the NCV programmes. Buffalo City and Port Elizabeth have a similar internal structure. For all three colleges, one challenge that arises is avoiding Engineering and Occupational Training operating in silos, particularly where they are located at some physical distance from each other.

East Cape Midlands articulates a strong strategic vision regarding industrial engagement and student placement, although this is still in the early stages of implementation. Its 2013–15 Strategic Plan contains a strong notion of advancement, which it defines as ‘the structures, processes and approaches to engage with the internal and external environment and to position [East Cape Midlands College] to attract investment and support’. As part of this strategic thrust, it is establishing a Student Advancement Centre and a Career Development Centre at its new Brickfields Campus (the details about these are explored later in this chapter). As part of its development of new campuses, the

college requires the campuses to enter into memoranda of understanding with local communities and industries.

Resourcing

Although the college sector has significant resource constraints, there was very significant investment by the Department of Education at the time of the NCV’s introduction, whilst the extension of the National Student Financial Aid Scheme (NSFAS) to colleges has also supported the generation of considerable fee income for colleges. The financial position of East Cape Midlands, for instance, is relatively healthy, with an operating surplus of R32 million being declared in 2010 on an income of R71 million.

Nonetheless, funding remains a concern across all three colleges and there is a widespread view that the capacity to implement strategic initiatives is limited due to inadequacies of funding.

Staffing has been seen as a major concern in the sector. Table 20 shows the number of staff by college for the province.

Taken together with the headcount data presented above, significant disparities in staffing are evident across the sector. Lovedale has a student to lecturer ratio of 23:1, whilst Ingwe stands at 45:1. Interestingly, with the exception of Ingwe, it is the rural colleges that enjoy lower ratios than the urban colleges, all of which have ratios of between 36:1 and 40:1. Whilst these ratios lead to concerns within the core colleges that staff were typically too busy to engage fully with industry partners, the

Table 20: College staff in the Eastern Cape, 2011

College name	Lecturers	Management	Support	Total
Buffalo City	174	4	108	286
East Cape Midlands	171	18	95	284
Port Elizabeth	220	4	124	348
Ikhala	63	12	35	110
Ingwe	62	11	47	120
King Hintsa	90	3	80	173
King Sabata Dalindyebo	226	5	175	406
Lovedale	103	3	121	227
Total	1 109	60	785	1 954

Source: DHET (2013a: 21)

Eastern Cape has the lowest average ratio of any province (DHET 2013a: 21).

The relative size of management cadres as a proportion of staff and in comparison to headcounts is also hugely varied. Most striking in this dimension is the data from East Cape Midlands, which has the largest management cadre and one that is significantly bigger than the other two urban colleges both as a proportion of total staffing and in comparison with student headcount. Whether this has contributed to the college being the one with the most leadership stability is unclear.

There are long-standing concerns about the qualification levels of FET lecturer staff nationally. The DHET does not capture accurate data on the occupational qualifications of lecturers, a major gap in our understanding. What is available in the Eastern Cape is survey data on lecturer academic qualifications, generated in a provincial process. This indicates that more than 40% of lecturers in the three colleges have at least a BTech qualification and more than one in seven have postgraduate qualifications. It appears that roughly half of the lecturers at these three colleges have teaching qualifications.

Teaching and learning policies

All colleges have policies about teaching and learning, and internal management and quality assurance structures are in place. However, the nature of lecturer contracts means that there are limitations in how performance management operates. East Cape Midlands reports having a set of awards for excellent teaching but such approaches are rare.

Whilst the HEIs reported being very much constrained by national decisions regarding the programmes and qualifications mix, public FET colleges have more autonomy in practice in this area, in contradiction of the stereotypical view of the relative levels of HE and FET autonomy. The weaknesses of NCV introduction; the continuation of Nated; and the possibility of working with learnership and apprenticeship programmes allow colleges to make choices about which programmes to offer, even if there are considerable constraints

to, and risks arising from, these choices. All three colleges see the automotive sector as a key partner and maintain Engineering as a key subject area. This is reflected in each having a School of Engineering as one of their three to four main academic units. However, each has taken a rather different approach to qualifications mix. East Cape Midlands has focused very strongly on occupational awards, whilst maintaining a strong Nated presence. Port Elizabeth has largely pulled out of learnerships and currently prioritises NCV. Buffalo City retains the largest Nated cohort, although it has plans to prioritise growth in occupational qualifications in the medium term.

Internal capability-building mechanisms

Staff development

College lecturer competence has long been a subject for national concern. Previously, many lecturers were educated at technikons but many of the relevant programmes have been discontinued in the reorganisation of higher education, another aspect of the concerns about recirculation noted in the public higher education section above. Some universities historically did offer programmes of vocational teacher education but these had died out by the time of the college mergers. Some initial vocational teacher education has taken place in some universities since then but its status has been unclear in the face of a stated Departmental ambition to develop a new qualification framework for vocational educators. Finally, in 2013, the DHET gazetted a new suite of college lecturer qualifications (DHET 2013c). At present, HEIs and the DHET are still in the process of designing the new qualifications.

In the face of this policy and delivery gap, colleges have had to try to find ways of upgrading their staff qualifications. East Cape Midlands has set an ambitious goal of ensuring that all staff have appropriate qualifications by 2016. It requires that Engineering lecturers should, at a minimum, be qualified artisans with Grade 12 or an N3 qualification. In practice, this means that a condition of appointment, where necessary, is that staff members obtain a National N-Diploma within two years and a teaching qualification within four years. The college has also invested heavily in published and online materials to develop staff competences,

for instance in mathematics. Buffalo City has used its international partnerships with colleges in OECD countries to develop its staff in teaching methodologies and practical training for new areas such as Mechatronics. Port Elizabeth management feels that its staff component is generally well qualified. Nonetheless, it agrees with its counterparts at the other colleges that it is a challenge to recruit and retain good-quality engineering staff due to uncompetitive salary packages. As discussed earlier in this chapter, the merSETA Chair in Engineering Development at NMMU is collaborating with Port Elizabeth, Eastern Cape Midlands and Buffalo City FET colleges to increase capacity in Mechanical Engineering, Industrial Engineering and Mechatronics, whilst WSU is partnering with the rural colleges in this aspect.

Organisation

Something of the organisation of the colleges has been outlined above. However, it is necessary to consider the extent to which that organisation contributes to the development of the institutions' capabilities. Here, it is clear that there are some challenges.

There is a sense in which the complexity of a large, modern, multi-site and multifunction college was only dimly perceived by those establishing the new system; colleges have often struggled to develop effective and sustainable internal structures. The lack of core funding for many of the central services of colleges has been an issue since their mergers. This has led to a view that college organograms were generally inadequate.

The need to keep sources of income separate has been the driver behind establishing separate Schools of Occupational Training. Whilst this can make for a strong industry focus in these schools, it can also have the unfortunate consequence of insulating other schools from industrial engagement.

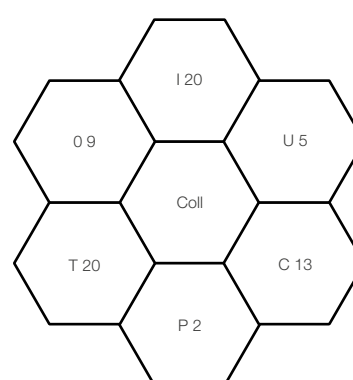
Interviewees at the colleges also noted a number of ways in which internal structures became too rigid and undermined internal interaction. Placement (as will be discussed below) is a key element of college engagement and employability strategies but there were reports of demarcation disputes between

marketing and placement teams. Similarly, it was noted at Buffalo City that work-based education was misplaced as part of the student support services portfolio. Internal coherence has been a key theme identified by the Administrator at Port Elizabeth.

Interactive capabilities

The network analysis shows that the three core public colleges have very few linkages with other key actors that can be characterised as very strong, although their integration within the network is far greater than for Rhodes or Fort Hare (see Figure 9). The links they have are strongest with intermediaries, reflecting the work that some intermediaries, such as the AIDC and merSETA, have done in supporting the sector. They have an average of nine relationships with Tier 1 firms and three with OEMs, but three-quarters of these were described as occasional. What is most striking here is that although Port Elizabeth College rated all of its partnerships as occasional, four Tier 1s rated their linkages to the college as being wide-scale. How this relates to the college's integrating and coordinating capabilities will be shown below. The colleges all reported relatively strong links with NMMU, although NMMU saw them as less strong, perhaps reflecting the relative statuses of those involved.

Figure 9: Network interactions of public colleges



Note: I = intermediaries; U = public universities; C = public colleges; P = private providers; T = Tier 1 firms; O = OEMs.

Two aspects of interactive capabilities emerge strongly from the fieldwork: employability and external engagement. Both of these areas require interaction with outside actors but colleges may be more or less capable in these interactions.

Employability promotion

In contrast to an emerging discourse of graduate attributes in the public higher education sector, there is no real sense of a college-level debate on the nature of the employability skills, knowledge and attitudes set of college graduates. Rather, the primary foci of employability promotion are on work-based education (analogous to the work-integrated learning debate in HE) and placement (also a key element of the HE employability approach, as discussed above).

Work-based education has historically not been an issue for the college sector, which had its primary origins in service to industry. From the Apprenticeship Act of 1922 onwards, colleges' core business was to provide theory programmes to complement on-the-job learning in firms. These programmes evolved into the current Nated awards. However, by 1994 there had been a massive decline in the number of apprenticeships nationally. This was linked to neo-liberal reforms in the 1980s that had led to an end of the overproduction of apprentices by the parastatals as well as to the effects of recession and the training and labour market reforms that were brought in as a response to the labour unrest of the 1970s (McGrath et al. 2004). The effect on colleges was that they had to replace apprentices with 'private candidates': learners without an apprenticeship contract. Thus, college-based learning became largely delinked from work experience, with serious pedagogic and placement impacts.

The two main post-apartheid qualifications reforms in the FET band have not solved this issue effectively. Learnerships were intended explicitly to replace apprenticeships and were designed to marry theoretical learning with workplace learning. However, learnerships have never attained the scale of take-up that would have made them the default mode of vocational or occupational learning, and the lack of articulation between the departments of Education and Labour limited the involvement of public FET colleges in the learnership provision that did emerge. NCV was designed to replace Nated. However, a realisation that work placements could not easily be guaranteed on a meaningful scale led to NCV being designed to be largely theoretical,

albeit supported by improved practical facilities within colleges. More recently, the DHET has sought to address the issue through setting a 70% placement target for NCV students.

All three colleges have traditions of work-based education to draw upon and are in the process of revisiting these to respond to the national policy imperative. Buffalo City intends to mainstream work-based education across the whole of its provision. At present, it offers placement opportunities to all students but this is on a voluntary basis and within vacations. The target is for NCV Level 2–3 learners to get three days' work experience a year and Level 4 learners to get 10 days. The scale of the challenge can be seen in a take-up by only 160 students in 2013.

East Cape Midlands currently places much emphasis on work experience after finishing the academic component, in order to help students to pass trade tests and/or achieve final certification on non-artisanal programmes. To this end, it operates a 'finishing school', targeted at meeting the requirements of these certification routes. Other internal mechanisms it draws upon to make up for the paucity of external labour market opportunities include a training with production concept,¹¹ whereby the college has established production plants in order to give learners workplace experience. In addition, the marketing department (and subsequently the planned Career Development Centre) arranges placement for some students during their programmes.

Port Elizabeth is developing a new work-based education policy. Presently, the college encourages vacation-time placements and has even offered some stipends and negotiated successfully with some employers to do the same. However, this initiative is not seen as scalable or even sustainable at the current, limited scale. The college placement officer runs an induction programme prior to

¹¹ Interestingly, the college acknowledges its partnership with Walsall College in England as the source of this notion, which is somewhat ironic given the long-standing and well-documented southern Africa tradition in this area, centred on the work of Patrick van Rensburg.

placements. Students in placement are visited by lecturers or the placement officer, and students and employers are surveyed after placements to collect data on the effectiveness of the programme and any emergent issues.

One notable success the college had in simulating workplace learning is that it negotiated a sponsorship from 1Time, a budget airline. The airline provided the college with a bespoke airline booking office with the industry-standard Galileo system (knowledge of which is not part of the official NCV curriculum). Students then handled all the college's flight bookings. This is a prime example of what McGrath et al. (2010) describe as the work of the 'employable college' in 'going beyond' the requirements of the curriculum to deliver industry-critical knowledge and skills to learners.

Learnerships and apprenticeships are both means by which work-based education is delivered in a way that is much more integrated than these attempts to make up for the limitations of the NCV and Nated programmes regarding work experience. There are good examples of strong partnerships here with the automotive sector. For the development of its Mechatronics and Autotronics learnership programmes, Buffalo City formed a public-private partnership with the Office of the Premier of the Eastern Cape, Mercedes-Benz (in Germany and South Africa), the State of Lower Saxony in Germany and merSETA. This partnership funded lecturers to attend training in Germany. The college and Mercedes-Benz South Africa also have participated in merSETA's Advanced Artisan Training Programme (AATP). In 2012, 21 workers at MBSA completed their N2 at Buffalo City with a 100% pass rate.

East Cape Midlands' NCVs in Engineering and Related Design are organised in part around a partnership with garages in the Uitenhage area. Its programmes also include learnerships and other training contracts with OEMs (Volkswagen and General Motors) and Tier 1 firms (such as Behr, Formex, Lumotech and Shatterprufe).

Port Elizabeth is less focused on learnerships, as was noted previously. Nonetheless, it does provide

theoretical training to Volkswagen apprentices and has a good relationship with Nissan on work-based education (and graduate recruitment, as will be explored below).

However, there are clear limitations to work-based education initiatives at all three colleges, often reflecting wider systemic issues. It was argued that there was a lack of clarity about how well integrated work-based education is into the overall curricular, pedagogical and assessment regime. There was a strong sense that additional funding and support to colleges and staff would be required for staff development, work liaison, staff replacement and the liability costs involved in expanding learner work experience.

The intention to grow work-based education was seen as bringing challenges for all relevant stakeholders at the local level. For learners, it was noted that there was no timetabling of work-based education in the national 2014 calendar for NCV. Equally, Nated students' timetables were too full for placements to be included. For lecturers, there was a concern that the policy on work-based education had not been factored into the lecturer conditions of service for those working on NCV programmes. It was argued that the regulations contained in the Public Administration Manual tied lecturers into school hours too tightly. Moreover, it was reported that lecturers were already overworked and had no incentives to support work-based education. Indeed, it was noted that lecturers were likely to be out of pocket for expenses if they went out to workplaces as this was not an activity that was easily covered by current financial regulations. For colleges, work-based education was just a further responsibility to be given to already busy managers. Challenges in accessing the tacit knowledge and networks of individual lecturers were also noted, with one placement officer noting that such knowledge was treated by many staff as personal rather than corporate, a clear example of a limited integrative capability. Finally, there were concerns, too, about employer willingness and capacity to support a massive increase of work experience opportunities.

The notion of placement as used in public FET colleges incorporates three main aspects: getting

work experience for students whilst on course; getting work experience after programmes to get artisanal status; and securing employment for graduates. This triple function leads to a tendency both for placement teams to be overstretched and for placement to be seen as part of other aspects of colleges, such as work-based education, marketing or student support. For the purposes of this report, this means that some discussion of placement has already occurred under the previous examination of work-based education. Nonetheless, further points need to be made.

Specific graduate placement work includes the proposed Student Advancement Centre, whose functions include graduate placement, and the Career Development Centre, which, according to its website, 'aims to engage [East Cape Midlands College] students in meaningful work-readiness workshops and consultations, whereby they can be exposed to part-time jobs, career fairs and industry talks on campus' and 'focuses on establishing and maintaining meaningful partnerships with industry to support their students in finding sustainable career opportunities'.

All three colleges have particular strategies for supporting graduate recruitment. Each has a student CV database for employers. At East Cape Midlands there is a centralised telephone number for student employment so that employers can phone the college and liaise with a central person about their recruitment needs. Port Elizabeth has close working relationships with Nissan and Volkswagen for graduate recruitment. The college advertises these firms' vacancies internally and provides shortlists of suitable names, often after pre-interviewing. The college also deals with requests from other sectoral actors, such as Coega, to provide names of suitable candidates for interviews. Port Elizabeth funds a placement officer post from its own resources and this manager, with intern support, conducts telephonic tracer studies of recent graduates.

External engagement

It will be evident from the discussion above that the three colleges have a range of external engagements both with the automotive cluster and

with the wider Eastern Cape labour market. Buffalo City's flagship partnership with Mercedes-Benz brought capital investment to the college as the St Marks campus was refurbished to host the learnership programme. The partnership is reflected also in a series of bursaries. In addition, the college hosts a number of business breakfasts and open days for firms. East Cape Midlands' new structures are intended to grow its external relations in ambitious ways. Already, it is negotiating with various companies around Business Unity South Africa's concept of 'adopt a college'. The college and Volkswagen have entered into a 'Model of Synergy' agreement around their interaction. This is intended to regulate the duplication of training interventions, the sharing of resources and cross-pollination of expertise. One aspect of the partnership was that the college consulted the firm on the requirements for its Engineering workshop before equipping it. The college intends to replicate this model with other companies. Port Elizabeth's historical relationships with the local OEMs continue though examples given above.

Across all three colleges there is also evidence of broader engagement with the provincial skills system. Buffalo College staff participate in the Provincial Skills Development Forum and Provincial Artisan Forum, and the college has MoUs with the Office of the Premier, merSETA and the ELIDZ. East Cape Midlands has relationships with the ECSECC and the AIDC. It sees one of its important roles in the provincial skills system as being its involvement in upgrading the qualifications of people in industry, through such schemes as the Engineering Certificate of Competency and delivery of pre-tests to those attempting Section 28 trade tests.¹² It also operates a small business incubator. One clear example of a relationship to the automotive components sub-sector was a partnership with the Master Artisan Academy of South Africa, a local merSETA-accredited training provider with strong sectoral connections. This saw six students going to Poland for further training to help upskill component firms.

¹² Section 28 refers to the process by which a person who is not formally indentured as an apprentice can apply to write a trade test after gaining sufficient work experience.

There are strong links to merSETA in each college, with merSETA offices being located in both Buffalo City and Port Elizabeth colleges. All three participate in various merSETA schemes such as accelerated artisan and dual apprenticeship initiatives.

There are also examples of linkages to the higher education sector. East Cape Midlands has participated in the Siemens Junior Cyber Junkyard Challenge, managed in the province by the Advanced Mechatronic Technology Centre at NMMU. NMMU is also providing some upskilling of staff at all three colleges, as was noted earlier.

Dynamic interactive capabilities

Table 21 presents the self-rated dynamic interactive capabilities of the three core colleges.

The average self-ratings for the three institutions provide little evidence of the development of dynamic interactive capabilities amongst the core public FET colleges. There has not been a sectoral tradition of this, with decision-making remaining largely at levels above the colleges. However, the self-ratings of East Cape Midlands stand out as far higher than those of the other two colleges. This reflects evidence already presented. It is the one college with stability of leadership and, indeed, with a principal who is also a major figure in the sector nationally. There is evidence that the college is strong on sensing its environment (mean 3.25; SD 0). Indeed, all three colleges are embedded in metropolitan and provincial skills systems, with good links to government and agencies such as merSETA. However, like the other colleges, East Cape Midlands finds integrating its own practices harder.

Overall, the ability to learn from any scanning (mean 2.11; SD 0.77) remains severely constrained within the public FET college sector due to issues of capacity, resourcing and governance, as has been illustrated above. Moreover, when it comes to engagement with the Tier 1 firms, there is actually relatively little that the colleges can do given the nature of the skills needs of this segment.

Private further and higher education and training providers

Whilst there are over 150 private education and training providers accredited with merSETA in the province, it is apparent that most of these are providers that are on the outermost margins of the SSI, providing generic management and soft skills, as well as statutory training in health and safety, often in very small volumes. Two private providers, however, do stand out for their more significant direct engagement with firms in the sector, and feature strongly in the network analysis maps.

Established in 1976, the **Eastcape Training Centre (ETC)** offers training for a range of engineering apprenticeships, often in the automotive sector. It has accreditation from nine SETAs. Between 2006 and 2012, ETC was involved in a massive MerSETA–CDC project. As part of this project, ETC provided 350 learnerships and arranged the workplace training component for these learners. In the end, 60 learners were employed by the employers who hosted them for their workplace training. It is currently not offering learnerships as it sees more demand for apprenticeships.

Table 21: Public FET colleges' self-ratings of their dynamic interactive capabilities

College	Sensing capability		Learning capability		Integrating capability		Coordinating capability		Dynamic interactive capability	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Buffalo City	1.55	0.21	1.47	0.3	2.12	0.87	2.16	0.77	1.83	0.43
East Cape Midlands	3.25	0	3.2	0.18	2.92	0.52	3.2	0.37	3.14	0.21
Port Elizabeth	1.75	0.53	1.67	0.47	1.6	0.45	1.76	0.79	1.7	0.47
Overall	2.18	0.76	2.11	0.77	2.21	0.54	2.37	0.61	2.22	0.65

Scale: 1 = not effective; 2 = somewhat effective; 3 = effective; 4 = very effective

Source: Project survey data

ETC is a well-equipped artisanal training provider with excellent facilities. It has a strong overall strategy and a well-functioning quality management system. Staff upgrading takes place in part through industrial placements, for instance at VWSA for welding.

Short courses are developed to meet the specific needs of each customer. Each course or programme offered is based on registered unit standards and put together using materials the centre has on file. This approach allows the college easily to package its training in a way that accommodates employer requirements whilst conforming to national standards. One example was a programme for Willard Batteries to train operators to improve their technical capabilities so they would be able to repair machines. The ETC has a very flexible approach to programme delivery. Programmes are structured and taught at times that accommodate the operational requirements of employers, including constraints like shift work.

It scans the environment through its participation in a variety of for a – for instance, the MerSETA regional committee; the Nelson Mandela Bay Metro HR committee (this includes firms, training providers, the business chamber and CDC); and the AIDC.

The **Production Management Institute (PMI)** is a national organisation that is 27 years old and is a registered HEI that has programme approval with a number of SETAs. The PMI is a member of Adcorp Holdings Group, an employment services company. It has five sites, one of which is in Port Elizabeth. PMI provides a variety of qualifications and programmes from NQF Level 1 to 7. These include full HE qualifications (Levels 5–7), learnerships (Levels 1–5) and apprenticeships (Levels 1–4). A total of 48 of these programmes are included in the PMI's programme list, as well as a number of short customisable programmes.

Other than apprenticeships and one learnership (the GET Certificate in Manufacturing, Engineering and Related Activities), the PMI does not provide engineering programmes. Most programmes are management-, financial- and administration/logistics-related. There is also a focus on contact centre operations, which is supported by simulation

centres. 80% of the programmes provided are for the automotive sector. These focus on production, logistics and quality management training.

The learnership activities are primarily driven by corporate social responsibility considerations rather than for their contribution to the SSI.

The PMI has a comprehensive set of academic policies and procedures, focused on management and quality assurance of programmes. They deal with things like course development, course updating, assessment, regulations for running and managing courses, facilitator appointment, code of conduct, and facilitator and learner relations. It essentially has a sales mentality to its interaction with employers: it seeks to identify products that are attractive to the market; to market these; and to maintain a loyal customer base.

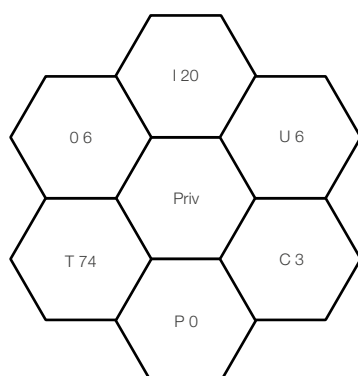
There is a national academic committee that includes all academic managers (four), the academic director and the heads of academic administration (two national appointees). Requests and requirements are tabled at meetings of this committee, where decisions are made about whether they have the facilitators they need or if an amendment or revision needs to be made to a programme, for example. Programme revision / development could be contracted to a facilitator or might outsource it. Its strength is flexibility of delivery. The PMI rents an office at Volkswagen and uses the company's training facilities to provide on-site training.

Each of the PMI's HE programmes ends in with an Integrated Application Project (IAP), which is like a mini-dissertation. Students complete a project in their workplace on a real problem in their work area. They are required to do research and to try to get to the root cause of the problem and come up with a solution that could save company costs. The PMI then selects the top learners to present their projects to management.

As part of the network analysis, the two core private providers also report themselves to be well linked with the intermediaries, but are strikingly poorly linked with the public colleges or with each other

(Figure 10). However, it is in their claimed linkages with industry that they stand out in comparison to the public colleges. Each claims an average of 28 Tier 1 firm partnerships, with most of these rated as regular in their activity. They also self-report as being slightly better linked to OEMs than the public providers. However, it is striking that the perception of close articulation with the Tier 1 firms is unreciprocated, with only one Tier 1 reporting a strong relationship to the core private providers. Indeed, most responses indicate occasional linkages to private providers and very few stable relationships. This reinforces a sense that much of the interaction between tier 1 firms and private providers is about routinised (indeed, often statutory) training, with little evidence being presented about more strategic engagement with skills that could transform innovation and competitiveness.

Figure 10: Network interactions of private providers



Note: I = intermediaries; U = public universities; C = public colleges; P = private providers; T = Tier 1 firms; O = OEMs.

Conclusion

It is clear that the turbulence experienced in the South African economy more generally, and the automotive sector specifically, is further exacerbated by a number of changes and unresolved tensions within the post-school education and training sector. Whilst some policy interventions in the past decade, such as recapitalisation and the extension of NSFAS to public colleges, have clearly benefitted the responsiveness of the sector, other issues remain problematic. These include the scale of the envisaged growth of the post-school sector and its likely impacts on often-fragile institutions; the

continued turbulence around public FET college governance; and the unintended consequences of key decisions regarding programmes and qualifications. This latter issue led to frequent comments from a variety of stakeholders. There are concerns that the core programmes of both technikons and technical colleges, BTech and Nated, have not been successfully replaced and this is linked to larger concerns about the inconsistencies in the DHET's approach to encouraging work-based education. Across the public post-school sector, there are also concerns that the policy drive towards responsiveness is not sufficiently backed up by financial support or new contractual arrangements.

There is also a strong sense within higher education that any drive towards employability and responsiveness needs to be seen as simply one aspect of a broader set of higher education missions. Higher education institutions are clear that they are not just about servicing a sector and the wider economy. Particularly in the case of Rhodes, there is a strong notion of graduate attributes and external engagement that is at clear variance with the employability-responsiveness agenda. Moreover, the legacy of apartheid geography means that little of the public provision across the 12 post-school education and training institutions¹³ is focused strongly on industrial partnerships and that engagement with the automotive sector specifically is highly concentrated in four urban-based institutions.

An assessment of both general and sector-specific institutional competencies must start with an acknowledgement of fragility. All of the public colleges and most of the public universities have experienced mergers and most are effectively only a decade old. Several are in administration or have acting leadership. Nonetheless, all have longer traditions that they can, at least to some extent, draw upon, particularly in the case of the urban campuses, many of which have long-standing industrial partnerships. This is the case, for example, in Port Elizabeth, both at the university that incorporates a former technikon and at the

¹³ The province also has other public post-school institutions for agriculture, nursing, etc. that are excluded from this study.

Russell Road campus of the public college. Indeed, the network analysis shows 10 instances of Tier 1 firms reporting wide-ranging links to either of these two institutions.

All the public providers share concerns about their human resources, both in terms of understaffing and underqualification. There are issues, too, about changing institutional cultures and the obstacles to this that result from national contracts that are inconsistent with policy messages about college missions. Moreover, the lack of a clear policy on higher education teaching qualifications and the considerable delays in developing and delivering college lecturers' qualifications have limited the development of new staff competences.

There is evidence of valuable policy development at all of the core public institutions, although there are questions, still, regarding genuine institutional ownership of FET college strategies. The informational basis for some policies, however, is weak. There has been limited use of tracer studies, for instance, and no mention of the strong work done by the CDC on labour market forecasting. NMMU's engagement strategy stands out as an example of a strong policy both in terms of its internal coherence and its implementation.

Policies on the specific issue of employability vary greatly. The range of understandings of this notion has been highlighted. Whilst NMMU has a well-developed graduate attributes framework and a notion of a 'graduate prepared for work and for life', both public and private colleges are much more reactive in their approach to employability. Indeed, this only really becomes an issue for the private providers when some scheme is paying them to train those who are not yet employed, their preferred market being those already in employment. Where the private providers are particularly strong is in their practice of work-based education. Whilst this is something of which many public college staff are highly supportive, it appears that neither of the two large-scale programmes of these institutions allow for a good practice of work-based education. This was a very strong part of the work of technikons and has continued into the practices of the universities of technology,

although it is threatened by the shift away from the BTech. Career and placement services are developing across most of the public institutions, but it appears that the notion of placement is being used too loosely and broadly, leading to some overloading of placement services.

Internal structures of the public providers are uneven in their effectiveness. A considerable number of new structures has been developed in the past decade. Whilst some are working effectively, others are not, and there are cases of duplication. These are most pronounced where pre-merger structures have not been effectively rationalised. This is particularly the case with career and placement services, as noted above.

The decision by public FET colleges to establish Schools of Occupational Training owes much to the unintended consequences of the earlier development of rival funding schemes from the Departments of Education and Labour. These structures have the merit of being typically more industry-focused than other parts of the colleges. However, this has the counter-effect of leaving the rest of the engineering provision more isolated from industry influence and engagement. Private providers tend towards a level of industry engagement in that programmes are typically employer-commissioned. However, the strongest employer-provider interactions come through the industry advisory boards at the comprehensive universities that incorporated former technikons. Nonetheless, there are some excellent examples of partnerships between public colleges and industry, often facilitated by intermediary organisations such as the AIDC and merSETA.

Overall, although there are frequent complaints about the skills being generated and concerns about shortages and gaps, it is clear that the Eastern Cape post-school education and training sector provides a considerable quantity of skills for the automotive sector. Indeed, there is some evidence that its graduates are gaining employment both nationally and internationally.

A large set of interactions is taking place between providers and employers. There are numerous

examples of learnerships, apprenticeships (including AATP) and training contracts at the public and private colleges. Both WSU and NMMU deliver short courses for SMMEs. Both work placements and graduate placements are common, even if they cannot meet the demand.

A set of sectorally specific interactive capabilities have been developed. The DAAD-VW, GMSA and merSETA chairs at NMMU are important examples of the expanded capability of the education and training system to engage with the automotive sector. There is evidence of capabilities regarding strengthening innovation, quality systems and human resources management in a range of firms, including components manufacturers. The AIDC, merSETA and NMMU are at the heart of these interactions, but a number of other actors is also involved.

The capacity of public providers to work with the automotive sector has been built through external engagements. These include international partnerships, particularly with Germany; income generation from short courses and training contracts; and infrastructural, materials and staff development. As in other areas, much of this has been supported by intermediary organisations.

There is some evidence of scanning capabilities, although these tend to be more reactive than proactive, and are very uneven across the seven core public providers. There is strong policy awareness amongst the public providers and strong market awareness in the private providers. There

are some signs of proactivity, moreover, particularly in higher education, with NMMU's institutional planning capacity being noteworthy. The universities also consider themselves relatively strong on the integrating and coordinating capabilities. However, learning capabilities are particularly weak across most of the public providers.

What is evident is that there is a real sense of a provincial skills system, even if it is not fully functioning and shows a strong bias towards the coastal industrial corridor. This is in contrast to several other provinces. There is a range of metropolitan and provincial structures; relatively strong involvement from provincial government and its agencies, most notably the AIDC; and proactivity from the two large IDZ initiatives. Through and beyond these, representatives from industry, government and providers meet regularly and have some sense of a shared understanding of, and commitment to, the SSI.

However, this largely positive story of valuable efforts to interact to build capabilities is constrained by the global logic of the automotive sector that places limitations on the skills needed at the provincial level, particularly for component firms. Thus, the capabilities of the provincial post-school education and training system to interact within the sector is directed primarily at OEMs, rather than at the Tier 1 firms. Indeed, it can be argued that the capabilities to support the sector are in some ways in advance of what the sector actually can make use of, given South Africa's marginal place in automotive global innovation networks.

7. REVISITING THE SYSTEM FOR SKILLS AND INNOVATION IN THE TIER 1 AUTOMOTIVE COMPONENTS SECTOR

The report has outlined considerable levels of activity within and between the different groups of actors in the sector but it is time, now, to bring the separate analyses together and to explore the extent to which the whole amounts to a coherent SSI supported by a skills development architecture.

The nature of the network

The first issue to consider in analysing this overall question is the nature and strength of interaction and network alignment in the SSI. This was explored in Figures 7 to 13. These suggest that there is a complex network at play. However, closer analysis of the data reveals great variations in the nature of the interactions within and between the different groups of actors. As has been noted, the Tier 1 firms reported far fewer average interactions with other actors than did other groups. Their most common interactions were reported as being with sectoral intermediaries, particularly employer and trade union organisations, although merSETA and the AIDC were also important. They tended to have concentrated relationships with one or two OEMs, but typically lacked connections to other Tier 1 firms, with the exception of the catalytic converter sub-sector. Tier 1 firms' links to education and training providers tended to be occasional, although a small number reported strong links, almost entirely with NMMU and Port Elizabeth College. This reflects the relative strength of the Port Elizabeth-Uitenhage cluster as opposed to that centred on East London.

Intermediary organisations do appear to play a large role in articulation. In the area of skills, the key roles are played by the AIDC and merSETA, who work closely with both firms and education and training

providers. In the overall network analyses, the AIDC was the leading bridging actor and third in the number and closeness of its relationships, with merSETA and NUMSA rated highly in all three categories. Although it was mentioned infrequently in the interviews, NUMSA clearly plays an integral role in workplace skills development negotiations. NMMU is by far the most important education partner for most intermediaries, although the AIDC and merSETA have sought to support public college development.

There clearly are considerable interactions between post-secondary education and training institutions and the automotive sector and the Tier 1 segment specifically. NMMU is the most connected organisation in Figure 7, closely followed by WSU. Both the Eastcape Training Centre and the PMI are also in the top 10 network actors by number of connections, as are East Cape Midlands and Port Elizabeth colleges. Buffalo City has a third fewer connections than either of these, reflecting its location in the less densely networked East London area. Although this location makes for fewer network connections, Buffalo City's relationships with other actors are typically strong, and it clusters with the other two urban colleges in the measure of closeness of relations. In this measure, too, NMMU and WSU are the key players in the network.

When we look at a third element of the network analysis – how far organisations work as bridging actors, linking different groups of actors not otherwise connected – NMMU and WSU slip to second and third, but are joined in the top 10 by the PMI, East Cape Midlands College (ECMC) and Port Elizabeth College (PEC).

However, there are very strong differences in the network presence of the different post-school providers. The two universities with engineering faculties have large numbers of linkages to other network actors, but Fort Hare and Rhodes are mainly only linked to public intermediaries and the other universities. Even for NMMU and WSU (especially for the latter), the links to industry are wide rather than deep. The three public colleges are relatively similar in their network patterns, linking mainly to other colleges (including the rural ones) and to the intermediaries, although with some links also to industry and universities. Buffalo City has the smallest and weakest set of linkages, again reflecting the relative size of the two spatial clusters. As was noted in Chapter 5, Port Elizabeth College appears to underrate itself in comparison to firms' perceptions of its network status, perhaps reflecting its weak integrating and coordinating capabilities. The colleges all reported relatively strong links with NMMU, although NMMU saw these linkages as less strong, perhaps reflecting the relative statuses of those involved. The data on the private providers' networks is the most problematic of that of any of the five actor groups. Their self-reporting of linkages is at huge variance with that of those they claim to be partnering. Strikingly, only one Tier 1 firm reported a strong relationship to the core private providers.

Although the network analysis suggests that there are a lot of interactions going on, caution is required regarding the strength of partnerships specifically between the post-school providers and the Tier 1 firms. Tier 1 firms reported 41 linkages to the 12 public institutions or the two core private providers, which were distributed in a 2:3:2 ratio between regular, moderate and occasional interactions. This only amounts to two interactions per firm. Given the questions about the private provider data, this will be compared only with the seven core public providers. These report 94 linkages, but only three are classed as regular and five as moderate. Thus, the firms tend to report fewer, more serious relationships.

When taken together with the interview data and the existing literature, the overall message is that the strength of alignment in the sector is relatively limited. This, often, may be for reasons that lie beyond the control of the immediate sectoral actors.

One of the most important conclusions of this report is that the provincial Tier 1 firms and public providers operate within the logic of, and are disciplined by, larger spatial dynamics. The Tier 1s are powerfully structured by the OEMs and this takes place primarily at HQ levels: in Germany and the USA for most of the Eastern Cape automotive sector. The South African automotive industry, and the Tier 1 segment thereof, exists in a particular position in a global chain that is not simply about core and periphery. Rather, plants within wider Tier 1 and OEM production chains are in competition with each other for larger roles in production and in process innovation and/or product localisation. South Africa's position far from both corporate headquarters and the largest emerging markets is clearly highly disadvantageous here and there is little sense, even, of process innovation activities from the firm fieldwork data. Moreover, the data suggests that there is segmentation in networking and ability to interact globally, with the MNC Tier 1 firms being better placed in this regard than the domestic firms.

For the public education and training providers, national policy decisions continue to limit local responsiveness. This is seen in governance and staffing issues but most particularly in terms of programme and qualifications mixes, especially through the gap between industry and department views of Nated and BTEch, the traditional points of articulation between public post-school providers and engineering sectoral skills needs. Overall, there is a sense of actors doing their best to work better individually and collectively but in an environment where skills and innovation needs and possibilities are actually quite muted. However, it must be stressed that this, in a context of routinised skills development and possibilities, would be far greater if there was a genuine project of transforming productive capabilities.

Addressing the skills needs of the sector

Skills needs within the sector are addressed through a number of mechanisms and organisations. Many immediate and specialised skills needs are catered for in-house by the Tier 1 firms, whilst statutory

training (largely health-and-safety-related) is a particular focus of private providers. A very small number of larger private providers have invested in engineering skills and equipment and are also involved in learnerships and apprenticeships (as is the Volkswagen Training Academy). This traditional artisanal skilling area, however, is one in which the public FET colleges are particularly strong. At a higher skills level, NMMU dominates the professional engineering initial qualifications market, with other universities producing some engineers (WSU) and managers (particularly Rhodes). There is also a small number of short courses and part-time qualifications offered by universities, especially by NMMU. Several of these programmes are linked to specific NMMU interactions with other actors in the SSI. Many of them are delivered through NMMU's VW, GM and merSETA supported chairs, and through its partnerships with the AIDC and Siemens. It also has strong firm involvement in its course planning. These are all good examples of NMMU's work on aligning skills in the sector, in which it has a set of fruitful partnerships – particularly with intermediary organisations and OEMs.

However, as has already been stressed in the network analysis, much of the skills delivery to the sector by the post-school institutions is occasional and/or small-scale. Apart from short-course provision by private providers in areas such as statutory training, the overall impression is of relatively low volumes: two or three apprentices here, a handful of interns there. Only occasionally, as in the 350 welding learnerships delivered by Coega and Eastcape Training Centre, is there any sense of high volume, and then as a one-off.

The public institutions do have a range of industry links around internship and graduate placement activities. OEMs and a number of Tier 1s recruit as a matter of course from public colleges and universities (when they do recruit – and this is a crucial caveat) and use them to source interns.

Capacity within the public post-school institutions has been enhanced by partnerships (particularly with OEMs, the AIDC and merSETA), and colleges' competencies have been supported by programmes run by WSU and NMMU. There is also a relatively

strong provincial skills architecture, which brings together employers, unions, government, providers and intermediary organisations.

Firms' skills needs

However, it must be remembered that the bulk of employment in the sector is at the lower-skilled end, whilst lean production approaches mean little investment in future human resources or skills development. This, and the low levels of innovation, suggests that routine skills needs are quite limited. The predominant operator group of staff are seen by employers as needing most input about work ethic and organisation, although they and artisans are also perceived as needing more diagnostic skills as a result of technological changes and the requirements of sequenced in-line production. At the artisanal and professional levels, there is an important emphasis on equity profiles. Skills are not seen to be in critical shortage, but attracting and retaining suitably qualified black staff is considered to be both challenging and essential.

Even the often-rapid technological change in the sector as a whole globally does not translate into radical changes in skills needs at the Tier 1 plant level. Rather, it is argued by HR managers that many of new requirements are embedded in machinery and new chemical formulae, which can be addressed largely through short in-house training, often provided by staff from head office, technology licensors or equipment manufacturers. However, our theoretical approach leads us to ask whether a more transformative approach to technological capabilities and innovation might be possible in which firms' skills needs would also be transformed.

The role of intermediary organisations

Public and private sector intermediary organisations can be seen to be playing positive roles in supporting network alignment within the automotive sector at large, with considerable impact at the Tier 1 level. The merSETA and the AIDC, in particular, are involved in a wide range of partnerships that identify skills gaps, generate funding and link sectoral actors. The two IDZs have supported the sector in their two locations and offer premises and services

to half of the Tier 1 firms in the province. The provincial government structures also do much to bring various actors together to discuss overall skills needs and strategies for the Eastern Cape, in which the automotive sector is seen as key. NUMSA is strong at a provincial level but the employer bodies are more national in the weight of their activities and are less engaged directly in addressing issues of skills articulation. Nonetheless, the new Auto Supply Chain Competitiveness Initiative – a partnership between NAAMSA, NAACAM, the dti, merSETA, NUMSA and firms – could be a major new support to skills needs in the Tier 1s. Whether it can kick-start a pathway to greater innovation, though, remains to be seen.

Post-school providers' interactive capabilities

The interactive capabilities of skills providers to contribute to skills and innovation needs are uneven. This unevenness is very apparent in the public university sector in ways that reflect these institutions' varied (and sometimes troubled) post-apartheid histories, their locations (sometimes far from industrial hubs) and their overall missions, not all of which are strongly directed at the sector or even the industry more generally. NMMU is the key interlocutor with the sector and has developed a relatively strong set of interactive capabilities. Three aspects of HEI interactive capabilities emerge strongly from the fieldwork: employability, research and knowledge transfer, and external engagement. However, the middle one of these is the least developed at present – again, largely relating to the sector's limited scope for innovation and hence absorptive capacity for knowledge transfer. Evidence for employability and external engagement

can also be found in the three core public colleges, but these are less developed in all three cases than at NMMU, given the turbulence of the public FET college sector since 1994 and the small artisanal skills segment required by the provincial automotive sector. Most private providers are engaged in small-scale, routinised delivery of general management, soft skills and health and safety training to firms. This makes a contribution to the sector and the firms appear largely to be capable. However, such capabilities are very narrow, with little sense of any wider vision. Such a vision is most evident in the Eastcape Training Centre (ETC), which is a major private source of artisanal skills training, including through apprenticeships and learnerships. The ETC has shown itself capable of scanning the skills market and investing successfully in major infrastructure to be able to develop practical training to industry specifications. It also is an active participant in metropolitan and provincial skills fora.

The dynamic interactive capabilities of the sector

The dynamic interactive capabilities of firms, intermediary institutions, universities and public colleges may be compared, as shown in Table 22.

These numbers need to be treated with considerable caution. However, triangulation with the other data suggests that it is reasonable to conclude that firms typically are effective in their dynamic interactive capabilities, with public FET colleges being less effective than the other institutional types. It is important to remember in that respect that these are three relatively advantaged colleges and that many in the province and sector are historically disadvantaged in multiple ways,

Table 22: Self-ratings of dynamic interactive capabilities by organisational type

Organisation type	Sensing capability		Learning capability		Integrating capability		Coordinating capability		Dynamic interactive capability	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Firm	3.5	0.44	3.3	0.52	3.2	0.46	3.4	0.44	3.3	0.4
Intermediary	2.9	0.74	2.5	0.63	n/a	n/a	3	0.81	2.8	0.67
University	2.6	0.86	2.4	0.83	3.1	0.76	3.1	0.59	2.8	0.64
College	2.2	0.76	2.1	0.77	2.2	0.64	2.4	0.61	2.2	0.65
Overall	2.8	0.47	2.6	0.44	2.8	0.45	3	0.36	2.8	0.39

Scale: 1 = not effective; 2 = somewhat effective; 3 = effective; 4 = very effective

Source: Project survey data

including their geographical and network distance from industry. However, the relatively large standard deviations for many categories point to high levels of unevenness within the institutional types. In the college grouping, for instance, East Cape Midlands considers itself, with some plausibility, to be a capable institution overall.

It appears that many institutions see themselves as relatively capable in terms of their ability to coordinate their activities. Learning appears to be the weakest capability for many institutions. This is pertinent given the powerful disciplining effects of both the global production chain (in the case of firms) and overall national policies in public education, and is significant given the centrality of learning to the technological capabilities account. Whilst the low learning capabilities of most of the public education and training institutions can lead to concerns about their responsiveness and their internal structuring to promote this, it may also be seen in terms of questions about the appropriate levels of autonomy that should be given to institutions.

A sectoral system of innovation and skills development?

What emerges from the interviews and network analysis is that there is little in the way of a sectoral approach to either technology or skills in the sense of a firm-level cooperation of the kind that would be found in some of the literature on innovative sectors globally. There is almost no evidence of cooperation on skills matters between the firms, the use of the Volkswagen Training Academy by some of the Tier 1 firms standing out as an exception here. Indeed, it can be seen as forming part of what is a relatively common vertical relationship in skills and technology transfer in which OEMs transfer technologies and skills to Tier 1s (directly or through the technology licensing or equipment purchasing that they bring about). However, there is a lack of horizontal relationships between the Tier 1 firms.

There is no crisis of misalignment between skills supply and demand in the sector. Rather, the sector is characterised by relatively low and stable skills demand to meet its routine production processes. The limited aggregate skills demand of the sector

is mirrored in a relatively limited level of requirement for skills upgrading, which can be characterised as focused on improvement rather than transformation of skills and processes. Nor is the sector rapidly growing in terms of employment. Indeed, the medium-term prospects are more towards a steady decline.

Overall, the sector can be characterised as one in which South Africa has been relatively successful at defending a continued presence in OEM and Tier 1 production, but also one in which the state, skills providers, intermediary organisations and firms appear unable to move to a situation of major employment growth and/or innovation. Rather than an SSI in a strict sense, what pertains is more a sectoral system of perseverance.

Policy implications

This rather pessimistic note is not the place to end the analysis. Rather, it raises the questions of whether there are prospects for a transformation of the situation, and what might be done in practice to make the network more innovative.

The South African automotive sector has been supported to survive by policy interventions, but not to flourish. Whilst South Africa's location brings considerable challenges, there may be scope for a more focused policy approach that seeks to concentrate volume in a smaller range of product lines at the OEM level. Whilst local content rules have sought to promote the Tier 1 sector, the real challenge for Tier 1s lies in becoming key members of global production chains. The few examples of South African plants being seen as sources of learning for other sites in their MNC's operations need to be built upon. Policy could play a role in incentivising Tier 1 activities in South Africa as more globally oriented.

If South African Tier 1 firms are to be more competitive locally and internationally, then there is clearly a role for skills development. Much of this is likely to be concentrated in short inputs and will not require partnerships with formal training providers. Nonetheless, even in this aspect of skills upgrading there is a role for external intervention; both the AIDC's existing work and the planned ASCCI have

the potential to raise the skills and competitiveness of South African component manufacturers. A particular focus here must be on domestic Tier 1 (and Tier 2) firms, which find it much harder to be part of global learning and innovation communities.

One of the benefits of an innovation lens is that it has a transformative imperative (Salazar-Xirinachs et al. 2014). Rather than settling for the conclusion that there is limited current demand for skills in the sector, the approach leads us to ask questions about how the sector could become more innovative and competitive and what role could be imagined for skills in this.

Indeed, there is scope for public providers to do more to support the sector, notwithstanding any limits to its skills needs. There are considerable strengths to build on in this regard. There has been promising work across the four HEIs on graduate employability development, student placements and industry involvement in course development. However, some of these are legacies of the past, particularly part of a dowry from the technikons, and there is a pressing need for developments in the programmes and qualifications mix and the funding formula to acknowledge and build on the responsive strengths of HEIs.

The public FET colleges are rather weakly linked to the Tier 1 firms. Numbers of learners in apprenticeships and learnerships are low and there is relatively little scope for radical increases. Nonetheless, colleges could grow this business to some extent. Recruitment of college graduates into the sector is also limited in scope, but improved college quality would help. Crucially, the planned reforms to both Nated and the NCV – and, particularly, the practical support to work-integrated learning components – could enhance the employability of college graduates. As has already been noted, much of the skills development in the sector is through upgrading the existing workforce. However, this is an area in which the public college sector is particularly weak, both at the level of individual institutions and at the level of national policies. Therefore, there may be merits in exploring how colleges could be more responsive to short-term skills upgrading needs. Important aspects of

an enhanced capability might include strengthened and expanded management cadres; new NQF Level 5 vocational programmes; and revised staff employment conditions and remuneration.

Private providers appear, largely, to be operating successfully in responding to some of the skills needs of the sector, although much of this is in necessary but not mission-critical areas such as health and safety. There is little sense, however, that they are contributing significantly to the innovative or competitive capabilities of the sector. There needs to be caution in attempting to intervene in the private training market. Some intermediaries, e.g. the CDC, have had positive partnerships with larger private providers and such relationships could be developed further. However, the most important driver of stronger private provider skills upgrading will be demand from the industry itself.

The approach taken in this report highlights the role of intermediary organisations. Apart from the new ASCCI initiative, it appears that the employers' organisations have not prioritised skills. It may be that the new initiative is going to mark a new phase here and that this is something that the public intermediaries and providers may usefully seek to engage with seriously, as should the DHET. The two IDZs are potentially significant players in the upskilling of the sector. This has been engaged with more robustly by Coega than ELIDZ but there is considerable scope for better articulation between the IDZs and the public post-school providers. The AIDC and merSETA have been identified throughout this report as key actors that integrate the sector for skills development. Both have established a range of strategic partnerships and, crucially, pull together industry and providers in vital ways. Continuing their positive roles will be important amid some concerns regarding their current fragility.

Looking across the case study as a whole, the technological capability approach also has significant messages for the government in terms of planning. Rather than a focus on central planning mechanisms and structures designed to ensure an equilibrium between supply and demand, the approach emphasises the need to build capabilities

within institutions, networks and systems to be able to innovate. It sees this innovation, and wider improvement, as being driven by learning and communicating. The building of these capabilities then becomes a central element of system development.

This requires greater capabilities for the state, too, and a shift in its focus towards the creation of a distributed process of capacity development and network enhancement in partnership with private and public intermediaries. Such a process is multi-scalar in nature and policy needs to become adept at locating decision-making powers at the appropriate scalar level.

For the DHET too, there is a challenge of shifting thinking about post-school education and training more towards the needs and possibilities of economic sectors and how the post-school system supports them. There are no guarantees that a more innovative automotive components cluster can be achieved given the constraints and disciplines under which it operates. Nonetheless, there is a pressing need to support the sector to continue as an important contributor of employment, exports and skills; and potential to support it further through enhanced national policies and improved local institutions. An innovation and capabilities focus offers a way forward for this process.

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LABOUR MARKET
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**Understanding interactive capabilities for skills development in
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About the LMIP

The Labour Market Intelligence Partnership (LMIP) is a collaboration between the Department of Higher Education and Training, and a Human Sciences Research Council-led national research consortium. It aims to provide research to support the development of a credible institutional mechanism for skills planning in South Africa. For further information and resources on skills planning and the South African post-school sector and labour market, visit <http://www.lmip.org.za>

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