



# **Understanding Interactive Capabilities for Skills Development in Sectoral Systems of Innovation**

A case study of the sugarcane growing  
and milling sector in KwaZulu-Natal

2015

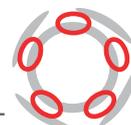
LMIP REPORT 8



# Understanding Interactive Capabilities for Skills Development in Sectoral Systems of Innovation

A case study of the sugarcane growing  
and milling sector in KwaZulu-Natal

Il-haam Petersen



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## ABBREVIATIONS AND ACRONYMS

AADP	African Agricultural Development Programme
ADA	Agricultural Development Agency
AET	agricultural education and training
AgriBEE	Agricultural Black Economic Empowerment
AgriSETA	Agricultural Sector Education and Training Authority
BEE	black economic empowerment
CAPEX	capital expenditure
CBD	central business district
CCMA	Commission for Conciliation, Arbitration and Mediation
CELT	Centre for Excellence in Learning and Teaching
CETA	Construction, Education and Training Authority
CEU	Cooperative Education Unit
CEWG	Community Engagement Working Group
CHE	Council on Higher Education
CHET	Centre for Higher Education Transformation
CHIETA	Chemical Industries Education and Training Authority
COMESA	Common Market for Eastern and Southern Africa
CPUT	Cape Peninsular University of Technology
CSIR	Council for Scientific and Industrial Research
CV	curriculum vitae
DAFF	Department of Agriculture, Forestry and Fisheries
DEDT	Department of Economic Development and Tourism
DHET	Department of Higher Education and Training
DoA	Department of Agriculture
DoE	Department of Education
dti	Department of Trade and Industry
DUT	Durban University of Technology
DVC	deputy vice chancellor
E&T	education and training
EAC	East Africa Community
ECA	Electrical Contractors' Association (SA)
ECSA	Engineering Council of South Africa
EDU	Education Development Unit
EIT	engineers in training
ETDP SETA	Education, Development and Training SETA

FAO	Financial Aid Office
FET	further education and training
FETC	Further Education and Training Certificate
FETCEO	Further Education and Training Colleges Employers' Organisation
FETI	Further Education and Training Institute
Fasset	The Finance and Accounting Services Sector Education and Training Authority
GDP	gross domestic product
GETT	General Education Task Team
GIBS	Gordon Institute of Business Science
GSO	grower support officer
HDI	historically disadvantaged institution
HEI	Higher education institution
HEQC	Higher Education Quality Committee
HEQF	Higher Education Qualifications Framework
HET	higher education and training
HR	human resources
HSRC	Human Sciences Research Council
IAC	Industry Advisory Committee
IP	intellectual property
IPAP	Industrial Policy Action Plan
IPTTO	Intellectual Property and Technology Transfer Office
IT	information technology
KPA	key performance area
KZN	KwaZulu-Natal
KZNDAE	KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development
KZNPI	KwaZulu-Natal Poultry Institute
LMIP	Labour Market Intelligence Partnership
merSETA	Manufacturing, Engineering and Related Services SETA
MNC	multinational corporation
MoA	memorandum of agreement
MoU	memorandum of understanding
MPO	Milk Producers' Organisation
MUT	Mangosuthu University of Technology
NAMB	National Artisan Moderating Body
NAMC	National Agricultural Marketing Council
NATED	National Technical Education
NCV	National Certificate Vocational
NDP	National Development Plan
NGO	non-governmental organisation
NGP	National Growth Path
NIPMO	National Intellectual Property Management Office
NMMU	Nelson Mandela Metropolitan University
NQF	National Qualifications Framework
NRF	National Research Foundation
NSB	National Standards Body
NSDS	National Skills Development Strategy

NSFAS	National Student Financial Aid Scheme
OFO	Organising Framework for Occupations
OHSA	Occupational Health and Safety Act
OSCA	Owen Sitole College of Agriculture
PR	public relations
PSET	private-sector education and training
QCTO	Quality Council for Trades and Occupations
QPA	Quality Promotion and Assurance
RPL	recognition of prior learning
RV	recoverable value
SACGA	South African Cane Growers' Association
SACPO	South African College Principals Organisation
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAQA	South African Qualifications Authority
SARCHI	South African Research Chairs Initiative
SASA	South African Sugar Association
SASCE	South African Society for Cooperative Education
SASMAL	South African Sugar Millers' Association Limited
SASRI	South African Sugarcane Research Institute
SASTA	South African Sugar Technologists' Association
SESD	Support to Education and Skills Development
SETA	Sector Education and Training Authority
SGB	Standards Generating Body
SIC	Standard Industrial Classification
SIPS	Strategic Integrated Projects
SITFE	Sugar Industry Trust Fund for Education
SKA	Square Kilometre Array
SMMEs	small, medium and micro-enterprises
SMRI	Sugar Milling Research Institute
SNA	social network analysis
SSACI	Swiss-South African Co-operation Initiative
SSI	sectoral system of innovation
STC	Shukela Training Centre
TETA	Transport Education and Training Authority
THRIP	Technology and Human Resources Programme
TIA	Technology Innovation Agency
TLDC	Teaching and Learning Development Centre
TTI	technology transfer and innovation
TUT	Tshwane University of Technology
TVET	Technical Vocational Education and Training
UCT	University of Cape Town
UFS	University of the Free State
UIL	University–industry interaction
UKZN	University of KwaZulu-Natal
ULTO	University Learning and Teaching Office

Unisa	University of South Africa
UniZul	University of Zululand
UoTs	universities of technology
USA	United States of America
USM	Umfolozi Sugar Mill
UWC	University of the Western Cape
VC	vice chancellor
VET	vocational education and training
VHP	Very High Purity
W&RSETA	Wholesale and Retail SETA
WBE	workplace-based experience
WIL	work-integrated learning

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Il-haam Petersen of the HSRC 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. She was also responsible for overall project management.

Glenda Kruss and Il-haam Petersen 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.

Stuart Ferrer of the University of KwaZulu-Natal prepared a background paper on the sugar sector that shaped the empirical focus on the sugarcane growing and milling segments of the value chain and the KwaZulu-Natal region.

Il-haam Petersen conducted interviews with firms, farmers and sectoral intermediaries. Luke Muller (consultant) also conducted interviews with firms.

Vanessa Taylor conducted research on the agricultural colleges, private training provider and growers.

Tim McBride and Joy Papier of the Further Education and Training Institute (FETI) at the University of the Western Cape conducted the research and drafted the initial analysis of the three focus further education and training (FET) colleges. Il-haam Petersen and Glenda Kruss conducted telephonic interviews with the other colleges in the province.

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

Jessica Paulse (HSRC) tirelessly scheduled interviews with universities and FET colleges.

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

Lastly, thank you to the individuals at the milling companies, engineering firm, farmers, Sector Education and Training Authority (SETA), agricultural colleges, universities, universities of technology, FET colleges and private training providers who gave of their time to contribute to the research. A special thanks to the individuals at the South African Sugar Association (SASA), the South African Cane Growers' Association (SACGA) and the Sugar Milling Research Institute (SMRI) who also assisted with gaining access and who provided valuable insight into the sector.

# 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 7: 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.* By Simon McGrath (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 PROJECT<sup>1</sup>

## **Problem statement: The need to build interactive capabilities**

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 Department of Higher Education and Training (DHET) is to build a credible institutional mechanism for skills planning, with the assumption that this will enable government to encourage education and training organisations and industry to work together more effectively for their mutual benefit and to address national skills priorities for the purpose of economic development.

We can identify strategies and mechanisms that have been used in other countries, particularly in the advanced developed economies. However, if we identify and adopt such strategies, a problem remains, and that is: 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 small, medium and micro-enterprises (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.

For this project, we propose to develop a framework to analyse existing interaction and interactive capabilities in key SSIs in South Africa as a basis on which to proceed. For instance, a further education and training (FET) college may have well-qualified engineering lecturers, but no way in which to communicate with local firms or no support to change the curriculum in response to changing technology in firms in a key sector in its immediate location. The intervention required is to find dynamic internal and external interface mechanisms. However, another college may lack the qualified lecturers, which means that we need different interventions here so as to improve their 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.

## 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 **skilful 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 the skills and interactive capabilities of 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, 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.

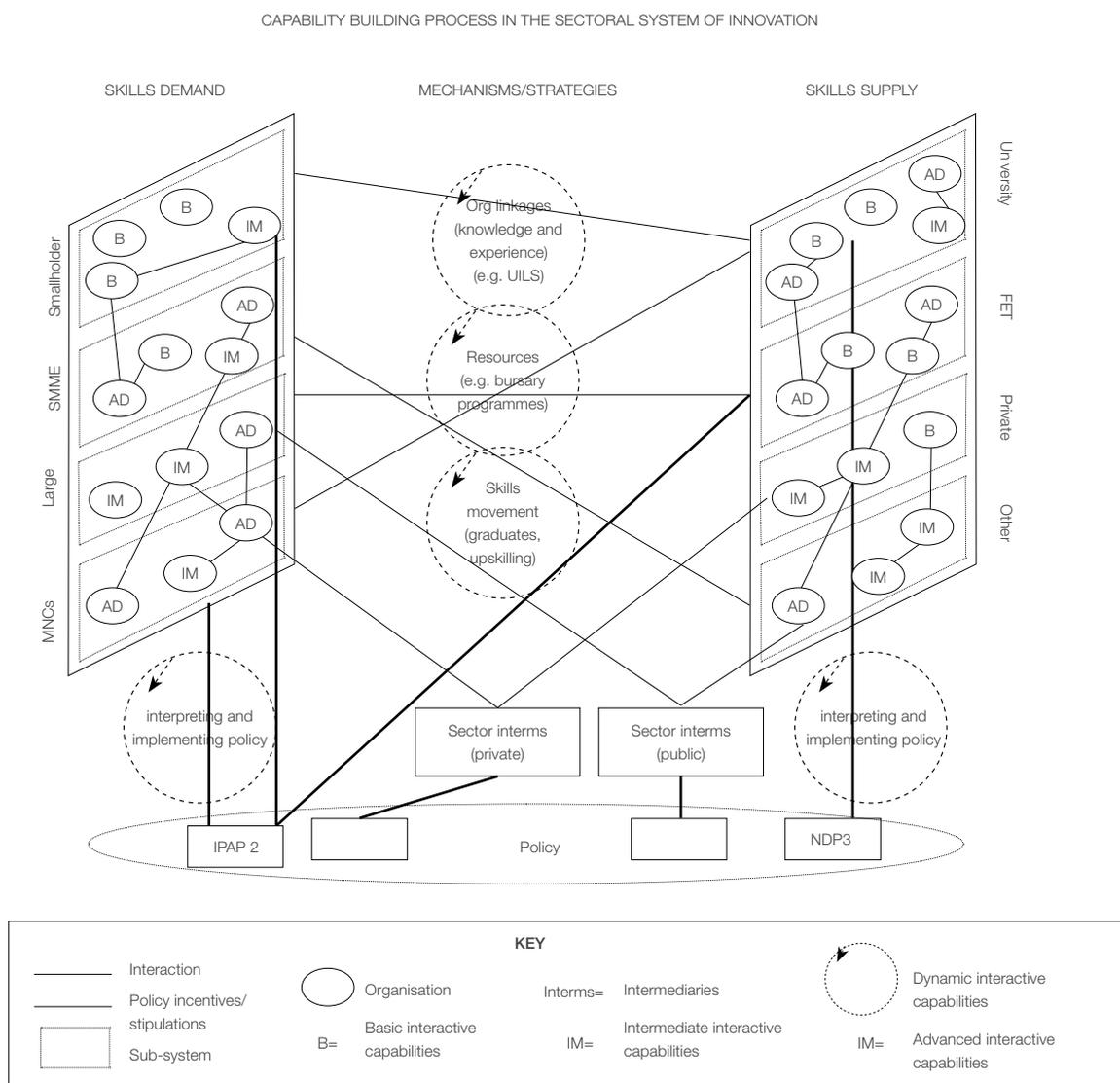
Each of the actors – firms and education and training organisations – is embedded in wider institutional environments, which shape, and are shaped by, actors’ activities. Hence, at the very bottom of the diagram, we map out the key global, national or regional policy mechanisms that could be shaping 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 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**

The capacity to sense changes in the business and education environment relevant to the organisation and 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 the 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), and 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 situating processes under consideration historically 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 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

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: sugarcane growers and 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
<b>Sector level</b>			
Sector background paper	Interviews with policy-makers	Network analysis report	
<b>Firms</b>			
Desktop research and secondary data	Interviews with firms	Narrative report	
<b>Universities</b>			
Desktop research and secondary data	University interviews (core to SSI)	Narrative report	
Desktop research and secondary data	University interviews (not directly active in SSI)		
<b>FET</b>			
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	
<b>Private providers</b>			
Desktop research and secondary data	Interviews with private providers	Narrative report	
<b>Intermediaries</b>			
Desktop research and secondary data	Interviews with private intermediaries	Narrative report	
	Interviews with public intermediaries		

that was commissioned for each of the 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 the 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 the 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 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 sugarcane growing and milling SSI** was prepared.

## **The sugarcane growing and milling sectoral system of innovation**

The South African sugar industry is often described as one of the world’s leading cost-competitive producers of high-quality sugar (SASA 2013a). According to the NAMC (2013a), the sectoral agricultural and research platforms have contributed to the sector being ranked as the fourth-lowest cost producer of white sugar out of 22 countries over the period from 2006 to 2010. Its export infrastructure, world-renowned agricultural and industrial research platforms, and efficient industry organisation are key drivers of excellence.

Sugar production in South Africa involves two very distinct activities: the production of sugarcane and the milling of sugarcane to extract sugar, which also produces a host of by-products, including molasses and electricity, among others. These industries, in turn, support tertiary processing, such as the production of soft drinks and confectionary (see Figure 2). In this report, the focus is on the primary industry (sugarcane farming) and secondary level of processing (sugar milling and its by-products).

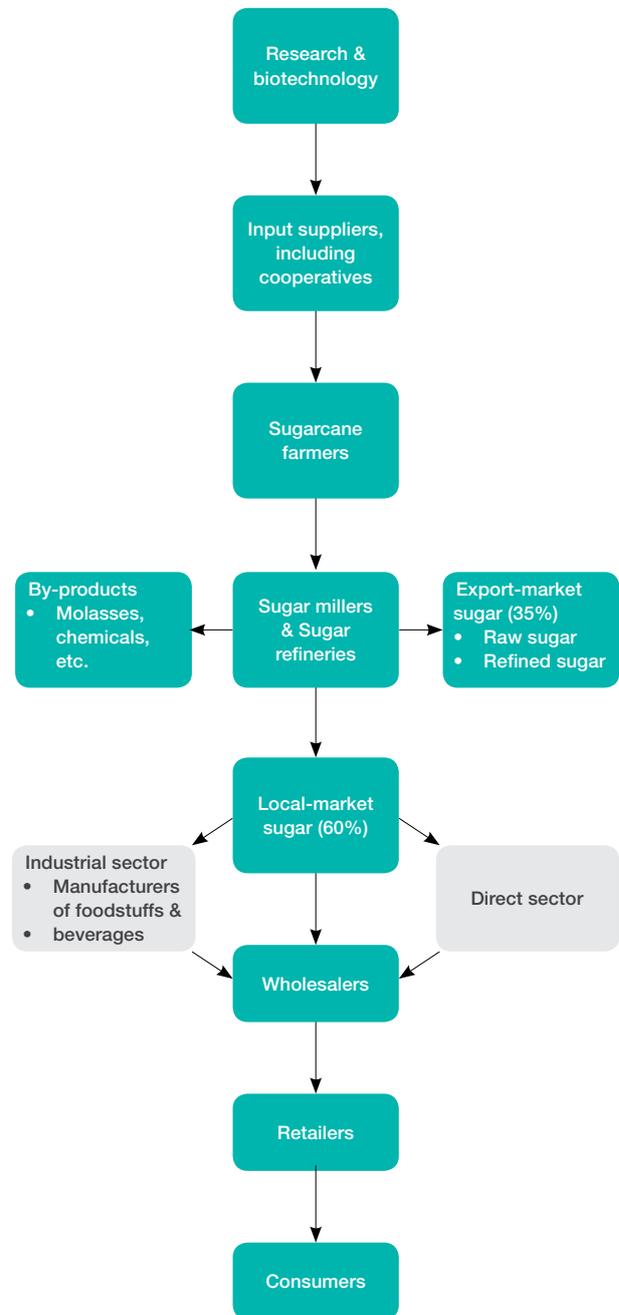
Owing to the bulky, perishable nature of sugarcane, sugar mills must be located close to a supply of sugarcane, and vice versa<sup>2</sup>, that is, growers and millers of sugarcane have a mutually dependent relationship. Around this symbiotic relationship, a structure exists that not only governs and administers this relationship, but also supports the sector through the provision of training, research and development, extension, advocacy, and sugar marketing. This structure includes the organisational structure of the sector as well as the policies and agreements that shape the sector, including relevant trade agreements. The structure has evolved over time, for example the cane quota system was

deregulated in the early 1990s and the cane payment system changed in 1999. However, the broader structure within which the industry operates has remained in place and relatively unchanged (NAMC 2013a). Historically, the sector has been allowed to operate relatively independently, with a group of private-sector intermediary organisations mandated to support and coordinate activities. As a result, the sector has developed a self-sufficient system for meeting its skills needs. It is the self-sufficient nature of the sector that makes it an interesting case to study for the purposes of the research. Of specific interest is the current (and potential) contribution of public and private education and training organisations to economic sustainability and growth in the sugar sector, which sector depends on the availability of suitably skilled human resources at all levels of production.

Specifically, the report explores the skills needs and skills development activities in the sugarcane growing and milling sectoral system of innovation (SSI) in KwaZulu-Natal where sector activities are concentrated. The six main research questions that the report aims to address are the following:

4. What is the nature and strength of interaction and network alignment in the sugar SSI?
5. What are the main components in the sugar SSI that address skills needs?
6. 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?
7. 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 sugar SSI?
8. What are the interactive capabilities of public and private post-school institutions to address the routine-skills needs, and changes in such needs, of firms in the SSI?
9. What is the nature of misalignment/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?

Figure 2: The sugar industry supply chain (adapted from NAMC 2013a)



These research questions are informed by a theoretical framework based on an SSI approach. The SSI approach informs the conceptualisation and research design of the overall project, of which this case study is one component. It is thus necessary, firstly, to provide an overview of the conceptualisation, design and methodology of the overall project.

## Structure of the report

In order to address the research questions, the report is divided into five sections. *Chapter 2* firstly provides an overview of the sector, including a description of the current and changing technology and knowledge base in the SSI acting as drivers of firms' and growers' skills needs. Secondly, a map of the main organisations and institutions relevant for skills development is provided, followed by a brief description of the extent of alignment between dynamic skills demand and supply in the SSI. The report then goes on to elaborate on, and explain, the nature of the misalignment/alignment between

skills demand and supply by examining the skills needs and strategies of firms and growers in the SSI (*Chapter 3*). The crucial role of the sectoral intermediary organisations for supporting skills development in such a self-sufficient system is thereafter examined (*Chapter 4*). *Chapter 5* discusses the interactive capabilities of public and private education and training organisations (E&T organisations) in KwaZulu-Natal by explaining how E&T organisations are meeting skills needs in the SSI. Where there is misalignment, possible reasons for the misalignment are discussed and the potential for greater involvement is explored. The *last chapter* (*Chapter 6*) concludes the report.

## 2. OVERVIEW OF SUGARCANE GROWING AND MILLING

Sugarcane growing and milling are capital- and labour-intensive, with the main activities taking place in rural areas. The sector thus contributes significantly to economic and social development. This chapter provides an overview of the sector's contribution to gross domestic product (GDP) and employment in South Africa, as well as of the main institutions and major challenges in the sector.

### **Contribution to gross domestic product relative to other related sectors**

The sugar sector makes an important contribution to the national economy and, in particular, to sustainable economic development in rural areas of KwaZulu-Natal and Mpumalanga (NAMC 2013a). KwaZulu-Natal accounts for approximately 85% of the sugar produced in the country (NAMC 2013a). Since there are strong linkages between the sugar sector and other sectors of the economy – such as manufacturing, trade, financial and business services, community services, transport, and communication – the sugar industry has one of the largest multipliers in the economy and the agricultural sector in particular<sup>3</sup> (NAMC 2013a).

According to the National Agricultural Marketing Council (NAMC 2013a & 2013b) and McCarthy (2008, cited in NAMC 2013a), the sugar industry's contribution to the South African economy can be described as follows:

- Sugarcane ranks as the second-largest field crop in South Africa, accounting for 17.4% of gross value of field crops in 2011;
- The industry usually contributes between 0.5 and 0.7% of national GDP, and

approximately 1.4% of the combined provincial total GDP of KwaZulu-Natal and Mpumalanga. The industry accounts for 0.9 % of total merchandise exports by value, 0.5% of total income tax, 3.6% of total fixed capital stock of business enterprises, and 0.3% of salaries and wages;

- The estimated national multiplier for the sugar industry is 3.2, implying that, for every R1 increase in output from sugar farming, milling and refining combined, national GDP will grow by R3.20; and
- The industry directly contributes an estimated average R2 billion to the country's foreign exchange earnings on an annual basis. However, the full impact of the industry on South Africa's balance of payments is in the region of R5.8 billion.

Approximately 75% of the 2.2-million tons of sugar produced by the industry annually is marketed in the Southern African Customs Union. The remainder is exported to markets elsewhere in Africa, as well as Asia and the United States of America (USA) (SASA 2013a).

### **Contribution to employment**

The sugar sector is relatively labour-intensive. Importantly, it creates jobs in rural areas, which are generally poverty-stricken and characterised by high rates of unemployment. Not surprisingly, unemployment in sugar-milling towns and sugar-farming areas is much lower than in other small towns and rural areas in South Africa (NAMC 2013a). The sugar sector also lends itself to being a starter industry for emerging farmers

because it does not entail complex farming practices. Land reform policy has also encouraged growth in the number of emerging farmers in the sector.

Tables 3, 4 and 5 show that the sugar sector sustained about 113 009 jobs in South Africa in 2010, 107 807 of which were located in KwaZulu-Natal and the Mpumalanga Lowveld. This employment impact represents about 0.9% of the total employment in South Africa and about 5.1% of the total employment in the KwaZulu-Natal and Mpumalanga Lowveld regions. These proportions are higher than those of GDP mainly because of the relative labour intensity of the sugar industry.

It is evident from Table 3 that the major contributor to employment in the sector is sugarcane production, with 85 921 employment opportunities nationally in 2010. The sugar industry makes use of various inputs directly and indirectly, such as fertiliser, fuel, and even consumption by labourers involved in one way or another in the value chain of the sugar industry. Some of these inputs originate from KwaZulu-Natal and Mpumalanga, but others are sourced from outside of the sugarcane growing regions. This additional demand outside KwaZulu-Natal and Mpumalanga prompts economic activity

in other provinces of South Africa. Consequently, only parts of the economic impacts of the sugar sector are experienced in regions where sugar cane is grown and milled. For a detailed breakdown of the economic impacts of the sugar sector on provincial economies, refer to NAMC (2013b).

Direct employment attributable to the sugar sector is reported at just under 94 000 job opportunities, as shown in Tables 4 and 5. This is broken down into 4 941 skilled jobs, 63 412 semi-skilled jobs and 25 638 unskilled jobs. According to SASA (2013), the sugar sector directly employs about 79 000 people, with 7 000 being employed in sugarcane milling (including employment at the milling companies' administrative offices), 70 000 being employed in sugarcane growing and about 1 600 being employed by the private-sectoral intermediary organisations [the South African Sugar Association (SASA), the South African Cane Growers' Association (SACGA), the South African Sugar Millers' Association Limited (SASMAL), and the Sugar Milling Research Institute (SMRI)]. The NAMC's (2013b) estimate of 93 990 direct job opportunities includes 1 671 industry support jobs, 1 438 large-scale farmers, 13 871 small-scale farmers and 70 010 workers on farms.

**Table 3: Employment impact in 2010 allocated to the main organisations comprising the sugar industry**

Main component	RSA national		KwaZulu-Natal & Mpumalanga	
	Employment (numbers)		Employment (numbers)	
	Total	%	Total	%
Sugar millers	22 759	20%	20 743	19%
Cane farmers (growers)	85 921	76%	83 793	78%
SASA industry	4 329	4%	3 271	3%
<b>Total</b>	<b>113 009</b>	<b>100%</b>	<b>107 807</b>	<b>100%</b>

Source: NAMC (2013b)

**Table 4: Employment impact of the sugar industry on the South African economy in 2010**

Macroeconomic aggregates	Direct impact	Indirect impact	Induced impact	Total impact
<b>Impact on employment (numbers)</b>	<b>93 990</b>	<b>7 356</b>	<b>11 663</b>	<b>113 009</b>
Impact on skilled employment (numbers)	4 941	1 483	3 167	9 591
Impact on semi-skilled employment (numbers)	63 412	4 102	6 023	73 537
Impact on unskilled employment (numbers)	25 636	1 772	2 437	29 881

Source: NAMC (2013b)

**Table 5: Employment impact of the sugar industry on the KwaZulu-Natal and Mpumalanga economies combined for 2010**

Macroeconomic aggregates	Direct impact	Indirect impact	Induced impact	Total impact
<b>Impact on employment (numbers)</b>	<b>93 990</b>	<b>7 441</b>	<b>6 369</b>	<b>107 807</b>
Impact on skilled employment (numbers)	4 941	1 072	1 012	7 025
Impact on semi-skilled employment (numbers)	63 412	4 593	3 917	71 928
Impact on unskilled employment (numbers)	25 638	1 776	1 440	28 855

Source: NAMC (2013b)

SASA, the main private-sectoral intermediary organisation, employs mainly highly skilled and unskilled workers and requires skills ranging from high-level specialists to unionised industrial and agricultural labourers. SACGA, SASMAL and the SMRI primarily employ highly skilled workers. Sugar milling employs a wide range of highly skilled and semi-skilled employees, and sugarcane farming primarily employs semi-skilled and unskilled workers. Skills needs in the sector are discussed in more detail later.

### Local and global trends, threats and challenges

Despite its comparative production efficiencies, the South African sugar industry finds it difficult to export profitably to the world market, as the global sugar price is severely affected by subsidy-induced overproduction in some major sugar-producing countries. Access to the major markets for raw and refined sugar is further restricted by high tariffs and preferential trade arrangements in the form of tariff-rate quotas. According to the NAMC (2013a), the *Landell Mills Commodity Study Report* of 2008 showed a 58% distortion<sup>4</sup> in world sugar prices over the previous ten years. The NAMC (2013a) found that, if this distortion did not exist, the South African sugar sector would show a strong comparative advantage in respect of sugarcane production. In the presence of the distortion, however, only one out of five sugarcane-producing regions have a comparative advantage with regard to sugarcane production. As a consequence, and despite its comparative production efficiencies, the South African sugar industry finds it necessary to protect its domestic market by way of tariffs and often finds it challenging to export sugar profitably. The industry is in discussions with government to find a solution.

Furthermore, the historical real (inflation-adjusted) sugar price weakened over the period 1996 to 2010, which was a major contributing factor to a decline in the profitability of the sector. The South African producer has been under financial strain in recent years, caused by production inflation, product prices not keeping pace with increasing production costs, and a very dry period in the KwaZulu-Natal coastal areas in the 2010 season (NAMC 2013a). Declining profitability of sugarcane farming is probably an important factor in explaining why the area under sugarcane production has declined from a peak of over 431 000 hectares in 2001/2002 to 378 000 hectares in 2011/2012. It is also an important reason why the numbers of registered small-scale growers has declined to approximately half of what it was 15 years ago.

The absence of an enabling legislative framework currently precludes the milling companies from selling electricity for the national grid and fuel-grade ethanol, a by-product of milling. These potential 'new' products may revive the profitability of the industry. This is discussed in the next section.

### Policy environment

#### Industrial policy

The South African sugar industry is regulated within the wider context of, inter alia, the following legislation, agreements and protocols (NAMC 2013a; NAMC 2013b):

- the Subdivision of Agricultural Land Act 70 of 1970;
- the Marketing of Agricultural Products Act 47 of 1996;
- the Sugar Act 9 of 1978;

- the Sugar Industry Agreement of 2000;
- ANNEX V11 of the Sugar Protocol of 1978 Concerning Trade in Sugar of 2010, as amended; and
- the SASA constitution.

Other protocols currently affecting the industry or under consideration include the following:

- the Southern African Development Community (SADC) Sugar Cooperation Agreement;
- the proposed COMESA-EAC-SADC Tripartite Free Trade Area; and
- the envisaged SADC Customs Union.

The NAMC (2013a) concludes, based on a recent review of the sector, that the regulatory environment is well structured and organised and recommends that the sector continue to operate in a highly regulated environment. Domestically, the sugar sector is governed by the Sugar Act 9 of 1978, as amended, in conjunction with the Sugar Industry Agreement of 2000 as drafted in accordance with section 4(ix) of the Act. Two important functions of the Sugar Act are that it serves to exempt the South African sugar sector from the scope of the Marketing of Agricultural Products Act 47 of 1996 as well as certain provisions of the Competition Act 89 of 1998, particularly with regard to the allocation of market shares, surplus removal, price determination and revenue sharing.

The Strategy for the Optimal Development of the Sugar Industry in the SADC and Southern African Customs Union (SACU) contexts, as updated in 2009, forms part of the National Industrial Policy Framework of the Department of Trade and Industry (dti) and serves as reference for approved areas of intervention, tariff protection against disruptively low world sugar prices, provisions for the establishment of equitable export obligations for growers and millers alike, and the implementation of Annex VII of the SADC Protocol on Trade (NAMC 2013a; NAMC 2013b).

The Sugar Act is in the process of being revised, with the draft Sugar Bill currently under review.

The published commentary on the revision process indicates that the 'review of the Sugar Act aims to optimise the level of competition that can be generated within the policy restrictions imposed by a severely distorted global market for sugar' (NAMC 2013a).

### **Agricultural policy and skills development**

Since the sugar sector operates within the institutional environment of the agricultural sector, it is necessary to describe key policy mechanisms impacting on its environment.

The policy environment for the agriculture sector in South Africa is currently dominated by three issues: land reform, black economic empowerment, and the strategic vision for agriculture (DAFF 2011). As discussed below, these issues have a significant impact on skills development in the sugar sectoral system of innovation (SSI). Agricultural education and training are seen as an 'indispensable cornerstone of all three [of] these strategic policy issues'; hence the introduction of the Agricultural Education and Training Strategy to regulate and improve provision (DAFF 2011).

#### ***The Agricultural Education and Training Strategy 2005***

The Agricultural Education and Training (AET) Strategy was introduced in 2005 in order to improve 'agricultural production through quality agricultural education and training' (AET Strategy 2005: 1). The AET strategy was informed by the Education White Paper 4, the White Paper on Higher Education (1997), Strategies for South African Agriculture and Integrated Rural Development, the Skills Development Act (1998) and the South African Qualifications Authority (SAQA) Act (1995). The strategy aims to support the objectives of some of the key programmes implemented in response to the Strategic Plan for Agriculture in South Africa [e.g. Agricultural Black Economic Empowerment (AgriBEE) and the African Agricultural Development Programme (AADP)].

The AET system spans the further education and training (FET) and higher education and training (HET) landscapes. The AET system in South Africa consists of 12 agricultural colleges, as well as public

universities (15) and FET colleges (11), non-governmental organisations (NGOs), and private training organisations providing training in agriculture. The strategy aims to address:

- Inequities in the AET system, including inequities in the provision of AET, in the distribution of resources among AET organisations, and in access to curriculum offerings;
- Poor articulation and coordination among the education and training (E&T) organisations (especially regional coordination);
- Poor and inconsistent quality of education offered by the E&T organisations; and
- The mismatch between skills demand and supply in the agricultural sector by improving curriculum responsiveness to national and regional priorities.

Challenges that the AET curricula should address include the lack of coordination and harmonisation between AET policy and curricula, land reform, globalisation, technology development, and scarce and critical skills in the agricultural sector (DAFF 2008). The specific policy shifts to which the strategy responds include:

- A change in the dualistic nature of the agricultural landscape where the commercial farming sector, which made up 20% of the sector and produced 78% of the total production, coexisted with a large number of subsistence/communal farmers that made up 80% of the sector and produced 22%;
- A change in focus from commercial agriculture to rural development and poverty eradication;
- A more holistic and problem-solving approach to agricultural teaching, which was particularly needed at the FET level where the curriculum traditionally focused on technical production and neglected management issues; and
- Greater coordination between the agricultural programmes and institutions provided by the national departments of Agriculture and Higher Education.

According to an evaluation of the AET curricula conducted by DAFF (2008), significant progress has been made to address each of these objectives.

Progress has been made in the public FET college sector, which has introduced set subjects and standard assessment guidelines with the introduction of the National Certificate (Vocational) (NCV): Primary Agriculture.

A recent cabinet decision was taken to move Agricultural Colleges under the DHET, to integrate the post-school education and training system. This will have implications for the alignment of agricultural colleges to agricultural strategies.

#### ***Agricultural Sector Education and Training Authority***

The Skills Development Act of 2008 is the main policy mechanism guiding skills development activities at the Agricultural Sector Education and Training Authority (AgriSETA), which coordinates all skills-development-related activities in the agricultural sector. A major change in the skills development grant regulations impacts on firms and farmers in the sugar industry. A change in regulation regarding the skills development grants coordinated by the SETAs, as set out in the Skills Development Act of 2008, was implemented as from 2013. Employers can now only claim back 20% of the levy if they do not use AgriSETA-accredited training providers for their training (this percentage used to be 50%). The discretionary grant was increased from 20% to 49.5%. AgriSETA now has more control over the discretionary grant. The aim of the change is to incentivise the use of public training providers and formal qualifications. However, the challenge is that this involves more paperwork on the part of employers, because they have to complete additional forms and an annual training plan in order to provide evidence of the use of training providers. Human resources staff at the sugarcane-milling companies have complained that the new regulations create more hurdles to claiming back funds for training. As stated, there is now much more paperwork to be completed, which is time-consuming. The change may thus actually discourage the use of the discretionary fund and of public training providers.

Such is the institutional environment in which each of the actors involved in the SSI is embedded, which clearly has a significant impact in shaping

their activities, as illustrated in Figure 4. The main institutions shaping skills development in each of the subsectors are discussed in the next section as part of the analysis of each subsector.

### Main actors involved in skills development in the sugar sectoral system of innovation<sup>5</sup>

The main actors involved in skills development in the sugarcane growing and milling SSI are shown in Figure 3.

#### Sugarcane production

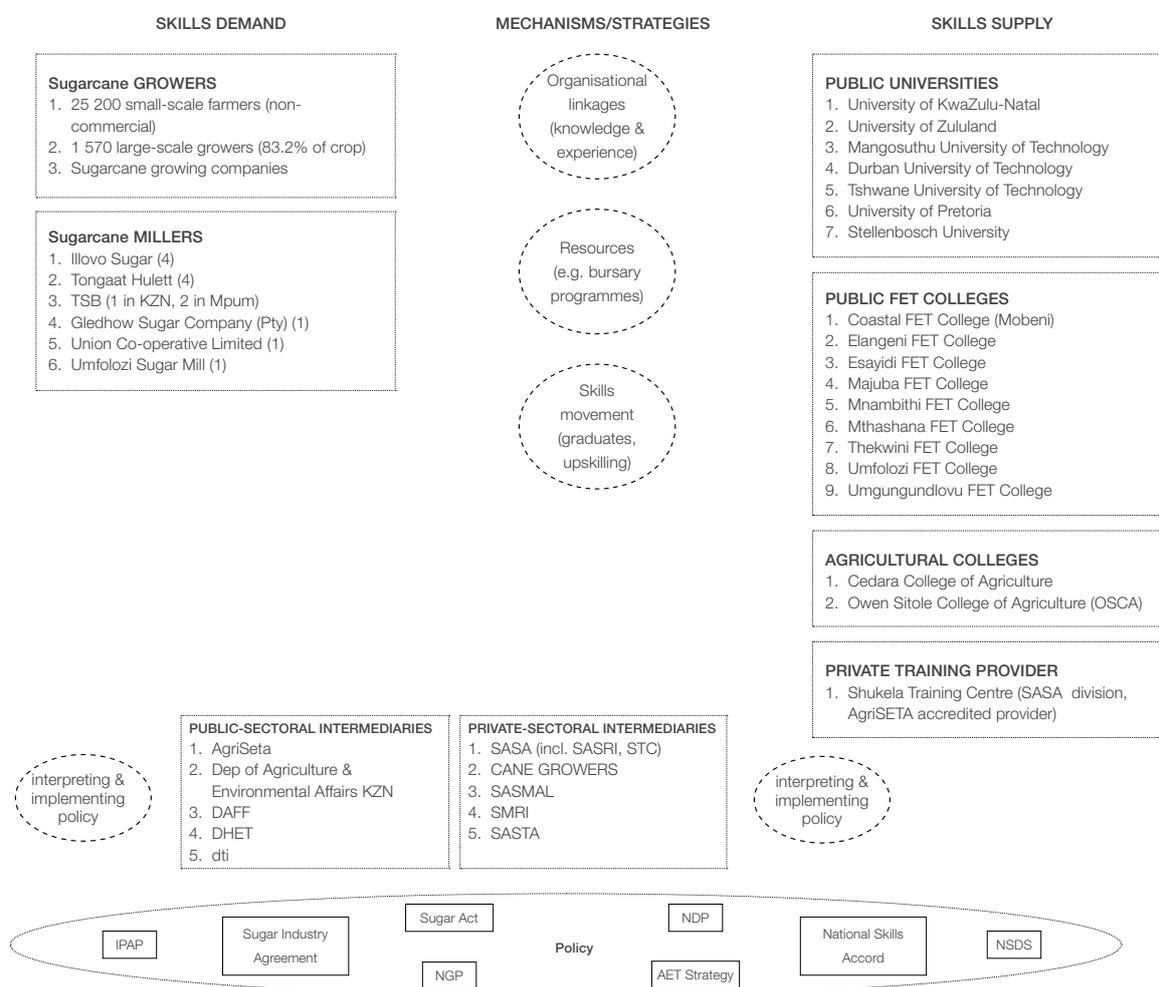
In South Africa, sugarcane is grown in 14 mill-supply areas that extend from northern Pondoland in the Eastern Cape province through the coastal belt and KwaZulu-Natal Midlands to the Mpumalanga Lowveld. According to SASA (2013), there are

currently 27 000 registered sugarcane growers who produce, on average, 20-million tons of sugarcane. Approximately 25 200 of the growers are classified as small-scale growers.<sup>6</sup> This cohort includes predominantly black smallholder farmers farming in tribal-tenure regions. There are 1 570 large-scale growers, including 385 new freehold growers,<sup>7</sup> who operate relatively large farms in regions with freehold title. In 2012, the small-scale growers produced 9.3% of the crop, the large-scale growers produced 83.2% of the crop, and the sugar-milling companies produced 7.5% of the crop on their estates (SASA 2013).

#### Sugarcane milling

Sugarcane is milled at 14 mills that are owned by six sugar-milling companies. Illovo and Tongaat Hulett are the largest sugar-milling companies in South Africa, with market shares of 45% and

Figure 3: Map of actors involved in skills development in the sugar SSI in KwaZulu-Natal



31.7%, respectively, in 2006 (DAFF 2006). TSB had a market share of 17%, while the other three companies were considerably smaller. The sector produces a wide range of products from sugarcane, reflecting diversification in the highly integrated sugar-milling operations. In addition to raw and refined sugar, by-products include molasses, alcohols, animal feeds, agricultural chemicals, and electricity (SASA 2013).

Illovo Sugar presently operates four sugar mills in South Africa, one of which has a refinery and two of which have packaging plants. It has three Cane growing estates and, in addition to producing specialty sugars and syrup, also produces a variety of high-value downstream products. Tongaat Hulett Sugar operates four sugar mills in South Africa (two of which have packaging plants), a central refinery in Durban that has its own packaging plant, various sugar estates, and an animal feed operation. TSB Sugar RSA operates three sugar mills (two of which have refineries), a packaging plant, sugar estates, cane and sugar transport, and an animal feed division. Gledhow Sugar Company's ownership is comprised of supplying-growers with 25.1% equity; a long-established miller (Illovo Sugar) with 30% equity; a paper manufacturer (Sappi) with 10% equity; and a black economic empowerment (BEE) partner (the Sokhela Family Trust) with 34.9% equity. Gledhow Sugar was established in 1912 and was under the ownership of Illovo Sugar until 2004. Gledhow's mill has a 35-ton-per-hour refinery. The UCL Company was founded in 1924 as a bark-milling company. Today, it operates a sugar mill, a wattle-extract factory, two sawmills, a number of mixed farms and a trading division. It specialises in Very High Purity (VHP) brown sugar and has been producing sugar since 1966. The company started the sugar mill as a way of diversifying the products it manufactures in order to survive in the marketplace. Since energy can be produced as a by-product of the milling process, sugar milling provides the company with a way to produce the energy it needs for its operations. This is a strategy for improving sustainability rather than profitability. The Umfolozi Sugar Mill is owned by a group of four investors comprising a large cane growing company, the largest cane grower in

northern KwaZulu-Natal, an unlisted public company whose shareholders grow sugarcane, and an alcohol-producing company. Umfolozi Sugar Mill, too, was previously owned by Illovo (from 1992 to 2004).

Two mills (both owned by TSB Sugar RSA) are in Mpumalanga and the rest are in KwaZulu-Natal. There are five refineries producing white sugar. Four of these are annexed to sugar mills, including one in Mpumalanga, whilst Tongaat Hulett Sugar operates a stand-alone refinery that is located in Durban. Sugar that is not sold in the domestic market by milling companies is delivered to the SASA for export. Some sugar-milling companies export raw-bagged and refined sugar to countries that do not form part of the domestic market. Approximately 35% of sugar produced by the sector is exported.

### **Sectoral intermediary organisations**

The growers and millers have formed two sectoral intermediary organisations through which their skills development activities are coordinated and supported. Sugarcane production is coordinated and represented by the SACGA, and the milling subsector by the SASMAL. The two organisations cooperate in a partnership in and with the SASA, which coordinates and supports activities common to the partnership.

Several government departments support and coordinate aspects of skills development in the sugar SSI, with the AgriSETA playing the role of the main public-sectoral intermediary organisation.

### **Education and training organisations**

Figure 3 includes all of the agricultural colleges and the public universities and FET colleges in KwaZulu-Natal. Since the present research focuses on the growers and millers, it is necessary to pay attention to primary agriculture-related qualifications and milling-related qualifications (i.e. engineering and refining). Furthermore, critical and scarce skills in the sector tend to be in the agriculture and engineering fields. Hence, all of the E&T organisations providing education and training in agriculture and/or engineering in KwaZulu-Natal are included in the



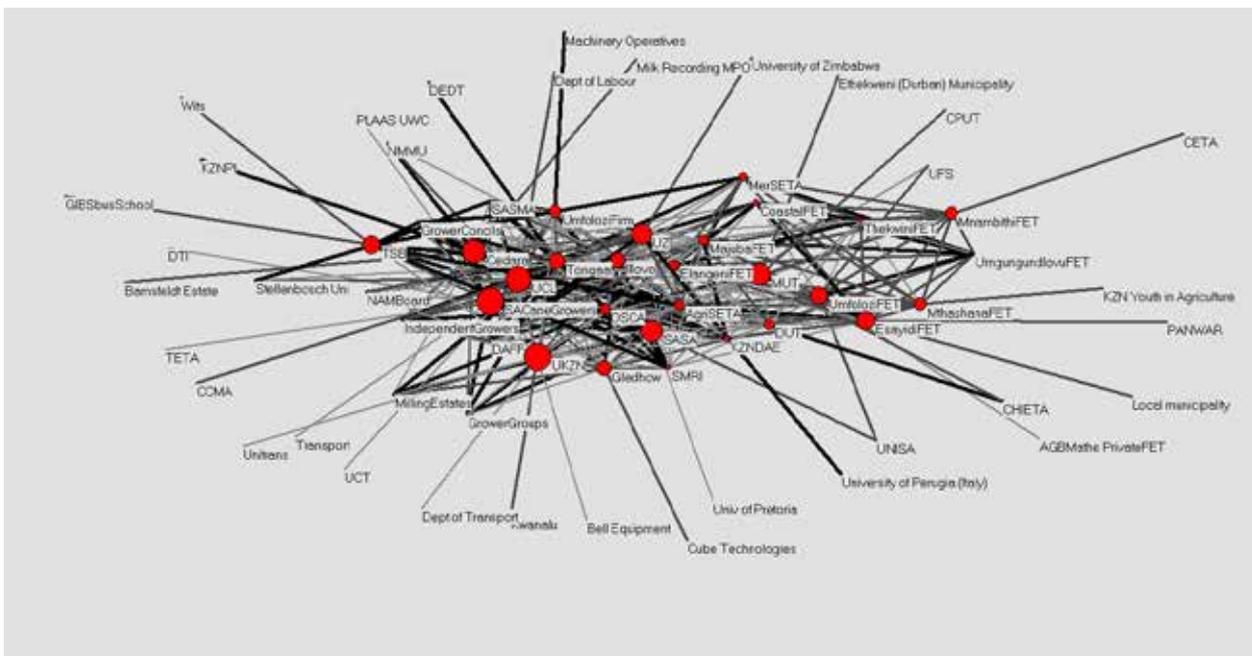
includes the private- and public-sectoral intermediary organisations, sugarcane growers, milling companies, and the agricultural colleges (see the large red circle on the left-hand side of Figure 4). The two universities in KwaZulu-Natal are also included in the core network.

Of note is that the FET colleges and the two universities of technology (UoTs) appear to be ‘clumped together’ on the right-hand side, with weaker linkages to the core network. Some of the FET colleges are relatively more inserted into the network (Majuba, Elangeni, Coastal and Umfolozi to some extent) than others (Thekwini, Esayidi, Mnambithi and Umgungundlovu). The FET colleges and UoTs appear to interact more with one another and some of the public intermediary organisations and are not strongly connected with the main sugar industry actors. The network analysis thus points to a misalignment between the skills produced by the FET colleges and UoTs on the one hand, and skills demand in the sugarcane growing and milling sector on the other.

Further investigation revealed that the University of KwaZulu-Natal (UKZN), two main private-sectoral intermediary organisations (SACGA and SASA), the two largest milling companies (Tongaat Hulett and Illovo), the agricultural colleges and the UCL, in this order, report the highest number of interactions in the network (between 31 and 25 interactions). These actors also had the closest relations in the network, with the SASA and the UKZN showing the closest ties. The number of ties and the ‘closeness’ of ties among actors point to the ease with which knowledge and other resources can be shared, which is essential for sensing change in the environment and for learning.

An SNA was also used to identify key channels through which resources can be shared, as well as the actors linking groups of actors that would not otherwise have been connected, with the former (linking actors) thus functioning as bridging actors in the network. As shown in Figure 5, again, the UKZN and a private-sectoral intermediary, SACGA, are found to be central actors in the skills development network.

**Figure 5: Network map illustrating bridging actors in the skills development networks in the sugarcane growing and milling SSI**



Source: Project data

Notes:

1. See note for Figure 4.
2. The size of the circles (vertices) corresponds with the extent to which the actor links groups of actors, such that the larger the circle, the greater the role played (i.e. the larger the circle, the higher the degree of ‘betweenness centrality’).

The size of the circles corresponds with the extent to which the actor links groups of actors, such that the larger the circle, the greater the role played. However, there are several different channels through which resources for sugar-specific agricultural and engineering skills development can be shared. Hence, there are a number of different types of actors playing bridging roles in the network, such as Cedara Agricultural College or even a firm like UCL, and these functions are not restricted to the sectoral intermediary organisations.

In the following chapters, we attempt to understand how the network and pattern of interaction illustrated in Figures 4 and 5 came into being and operate currently. We consider the strategic goals and interactive capability of each set of actors in order to elaborate on the reasons for the core alignment between firms, intermediaries and universities, and for the misalignment between firms and TVET actors. The analysis starts with an exploration of the strategies that firms and growers use for meeting their skills needs.

### 3. FIRM/GROWER STRATEGIES TO ADDRESS ROUTINE AND NON-ROUTINE SKILLS NEEDS

#### Skills needs in the sector – challenges and drivers

Other than the technology changes due to the downstream production of by-products, the process of producing and milling sugar has, as in other agricultural sectors, not changed much over the years. When asked to what extent they agreed that technology, marketing practices, customers’ needs and skills needs change rapidly in the sector, human resources (HR) staff interviewed at the milling companies reported that they only ‘somewhat agreed’ (see Table 6). The perception is that there is not a great deal of environmental change in the sector to which firms are required to respond.

**Table 6: Perceptions of environmental change in the sector**

Firm	Number of participants	Index (average) score
Gledhow	1	2.5
Illovo	3	2.4
Tongaat Hulett	2	2.1
UCL	2	1.6
TSB	1	1.75

Source: Project data

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

Table 7 provides a more detailed breakdown, reflecting variability in responses to specific dimensions. The greatest change is perceived in relation to technological, marketing and environmental aspects (above the average of 2.06). Sector-specific skills were assessed to be the aspect *least* subject to change.

The HR staff at the milling companies were also asked to rate the effectiveness of their own units for sensing and responding to changes in the business and education environment related to skills development. As shown in Table 8, the participants rated their units to be ‘effective’ in sensing and learning from changes in the environment, as well as in integrating and coordinating the knowledge gained within the company in order to effect a response. These four capabilities together provide an indication of the dynamic interactive capability of firms in the sector to respond positively to rapid change and turbulence in a strategic manner.

**Table 7: Perceptions of environmental change in the sector, per item**

	N	Min.	Max.	Mean (average)	Std dev.
The technology in this product area is changing rapidly.	9	1	4	2.33	1.000
Technological breakthroughs provide big opportunities in this product area.	9	1	4	2.22	0.972
In our kind of business, customers’ product preferences change a lot over time.	9	1	3	1.78	0.972
Marketing practices in our product area are constantly changing.	8	1	4	2.75	0.886
New product introductions are very frequent in this market.	8	1	4	1.88	1.126
The environment in our product area is continuously changing.	8	1	4	2.25	1.035
Environmental changes in our industry are very difficult to forecast.	8	1	3	1.88	0.835
Skills needs change frequently in our sector and are therefore difficult to forecast.	8	1	2	1.38	0.518
<b>Environmental turbulence scale overall</b>	<b>8</b>	<b>1.13</b>	<b>3.13</b>	<b>2.06</b>	<b>0.658</b>

Source: Project data

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

**Table 8: Perceptions of the milling companies' dynamic interactive capabilities**

		Sensing capability	Learning capability	Integrating capability	Coordinating capability	Dynamic interactive capability (overall)
Firm	N	Index (average) score	Index (average) score	Index (average) score	Index (average) score	Index (average) score
Gledhow	1	3.3	2.8	2.8	3.4	3.1
Illovo	3	3.3	3.5	3.3	3.4	3.4
Tongaat Hulett	2	3.0	2.6	3.5	3.5	3.2
UCL	2	2.9	3.2	3.1	3.0	3.0
TSB	1	3.0	2.8	3.2	3.6	3.2

Source: Project data

Note: Scale: 1 = Not effective; 2 = Somewhat effective; 3 = Effective; 4 = Very effective.

These indicators suggest that the milling companies are able to forecast and meet both their *routine* and *non-routine* skills needs. Interviews further indicated that the sugar industry has been complacent to some extent. However, this has changed recently. There is a widespread realisation that a lack of foresight and planning has resulted in current and looming skills shortages, especially at the levels of artisan and upper management, due to an ageing skilled workforce.

Since sugarcane growers make up a group too large to survey in a representative manner and tend to rely heavily on the capabilities of the milling companies and sectoral intermediaries for meeting their skills needs, the analysis does not include primary data collected from sugarcane growers. Information gathered from the milling companies and private-sectoral intermediary organisations provides insight into the skills needs and strategies of sugarcane growers. Currently, the major driver of skills needs in the grower sector include the significant growth in the number of new farmers. Each of these changes and challenges in the milling and grower sectors is discussed next.

### **New products and by-products**

The production of downstream by-products such as ethanol and electricity offers the potential to increase profits and may lead to process and technology changes in this very traditional sector. Millers produce electricity from bagasse to meet their own needs, but there are growing opportunities for biofuels and renewable energy sources. The increase in new products and processes with regard to renewable energy and electricity production has given rise to new

technology and related skills needs. However, what is required to exploit opportunities for new products and processes is a change in mindset towards the more sustainable use of energy and producing electricity and renewable energy for sale [Manager 1 at the Sugar Milling Research Institute (SMRI)]. The sector has not yet been allowed to sell the electricity it produces.

### **Ageing workforce and competition from other industries for skills**

A major challenge is the loss of highly skilled staff at the mills, especially at the supervisor level, due to an ageing workforce. Supervisors require specific skills. Plans were in place to develop a programme for training at the supervisor level. The plan included training at the Shukela Training Centre (STC) and/or the Sugar Milling Research Institute (SMRI). The milling companies, however, preferred to develop their own independent plans for training at the company level. According to one of the key stakeholders, the traditional 'long-term' approach to training at the mills, where staff are trained up through the ranks, may no longer be suitable due to increasing levels of skills movement as a result of increasing competition from other industries nationally and globally. Recently (i.e. since 2010), competition presented by other industries for artisans, especially riggers, and engineers has contributed to skills shortages. For example, the current shortage of riggers is due to competition from the Medupi Power Station Project, which offers a more attractive salary package [Manager 1 at the South African Sugar Association (SASA)]. Tongaat Hulett has also reported a problem of competing with Eskom for electrical engineers.

According to a manager at the SMRI, about 35 years ago, the then Durban Technikon offered a chemical engineering course in sugar technology. The course was later terminated due to an oversupply of sugar technologists. The sector currently reports a shortage of highly skilled individuals suitable for taking up supervisor positions. A shortage of agricultural and biological scientists with ten to 15 years of experience has also been identified. According to an HR manager at a key sectoral intermediary organisation, relatively good-quality graduates are currently coming through the system, but they do not have work experience. The shortage of high-level skills is thus expected to change in the next 15 years once recent graduates have gained experience. This points to the need for the sector to develop short- and long-term strategies to ensure that it has a steady pipeline of both the *routine and non-routine* skills that are needed.

### **Lack of training expertise**

Linked to the problem of an ageing workforce is the growing problem of finding trainers for the main sugar-specific training programmes offered at by STC and South African Sugarcane Research Institute (SASRI). Some of the stakeholders at the private-sectoral intermediaries have reported that, recently, growers have complained about the trainers at the STC not being experienced enough as farmers to further their farming skills. The complaint is that courses taught by trainers with no or little practical experience are limited to textbook knowledge. This situation is problematic considering that 95% of the learners attending the STC courses are already in employment at farms (and mills). With regard to the SASRI courses, on the other hand, the trainers are experienced and highly regarded scientists, but many do not have the necessary skills to teach. SASA is thus currently working on identifying collaborative arrangements [with the University of KwaZulu-Natal (UKZN), for example] to source educator training for its trainers.

### **Significant growth in 'new' entrants and modes of organisation**

Historically, the sugarcane growing sector has included a large number of small-scale black farmers, but with the larger proportion of the sugar being produced by a much smaller number of

'white, very experienced, long-standing, generations-old mostly white and to some extent Indian commercial farmers' (Manager 1 at SASA). The sugarcane growing sector has faced major changes in recent years, with a rapid increase in land-reform farmers and cooperatives in recent years, two groups that present new skills development challenges.

Government's rural development plan has focused on land redistribution, resulting in significant growth in 'new' growers who often do not have any training or experience in sugarcane farming. A large proportion of the new growers generally do not survive in the sugarcane growing business, which presents a problem. The land-reform farmers also often have low levels of numeracy and literacy and thus tend to perform poorly on SASRI's courses. The skills required by land-reform farmers thus go beyond sugar-specific technical skills, which the sector is well equipped to teach. The SASRI has teamed up with the South African Cane Growers' Association (SACGA) to have its grower-support officers, who work with growers on a regular basis, sit in on the SASRI classes and conduct tutorials (in Zulu) with the land-reform growers after class. The land-reform growers have reported the need to learn farm-management skills. Owing to the low levels of basic skills, trainers also need to have expertise in adult basic education. Language differences are another challenge, as many land-reform farmers do not speak English very well and thus also prefer to be taught in Zulu. Teaching in Zulu does, however, become more challenging at higher levels of training, because some key concepts cannot be translated.

The significant increase in cooperatives in recent years presented a similar challenge of shifting, *non-routine* skills needs. In 2012, there were about 120 cooperatives in the industry and that number grew to 184 in 2013 (Director 1 at the SACGA). The increase in cooperatives is partly due to government incentives and partly because cooperatives are more sustainable. Sugarcane farming is costly and is becoming more risky owing to climate change. It is thus no longer profitable to farm a single small-scale plot of land. Small-scale farmers have realised this and are drawing on

economies of scale for survival by developing cooperatives. The growers involved in cooperatives have reported the need for a different set of skills from those required for managing a single plot. There is now growing demand for training in financial management, bookkeeping and leadership, which are all necessary skills for successfully running a commercial business.

### **Changes in education and training legislation**

Finally, we discussed above how increasing regulation in the education and training (E&T) sector in recent years has been identified as a major challenge. The legislation has brought in new requirements for registered private training providers and workplace training provided at firms. In response to the changes, the SASA transferred agricultural training to the STC so that the STC would be the only division tasked with keeping up with legislation and complying with changing regulations.

### **Diverse skills demand and challenges**

Even within this clearly defined sector, there is diversity in skills demand. Sugarcane-milling companies and growers differ in their skills needs and the challenges they face in meeting those needs. The two groups thus report different strategies for meeting their skills needs, strategies that are related to their individual levels of technological capability. The strategies that the milling companies use are reported next. Considering that the growers, especially the small-scale growers and land-reform farmers, tend to have lower levels of technological capabilities, they rely heavily on the support and training services of the private-sectoral intermediaries. The main strategies that growers use are discussed in more detail in the next section, which focuses on the role of sectoral intermediary organisations in the sectoral system of innovation (SSI).

### **Milling companies' strategies for meeting their skills needs**

We have shown that the milling sector is dominated by Illovo and Tongaat Hulett. Illovo not only accounts for a large share of the sugar market in South Africa, but also owns part of Gledhow and previously owned Umfolozi Sugar Mill (USM) and

Pongola Sugar Mill, which are smaller firms in the sector. Interestingly, as reported by the HR and/or skills development managers, the strategies established by Illovo at these firms have simply been continued. Except for TSB, the milling companies tend to have a standard approach to skills development, offering long-term training informed by learning pathways developed by the firm. Emphasis is placed on in-house training in order to ensure that the company has control over the training and that trainees are 'groomed' well for the job. Trainees are expected to have developed specific competencies at the end of each programme. Learning pathways have been developed for engineers and artisans. The standard approach to producing engineers and artisans for the sugar mills include engineers-in-training (EIT) and apprenticeship programmes. These programmes are used to ensure that the company has a steady supply of critical skills. These mechanisms, together with in-service training and bursaries/study assistance, are used for meeting the firms' *routine* skills needs.

The firms offer learnerships on a limited scale, depending on whether they are approached by E&T organisations or the Agricultural Sector Education and Training Authority (AgriSETA) to run the learnerships with AgriSETA funding. Learnerships are typically in agriculture and other fields such as accounting. Learnerships have been found to be inappropriate for training in engineering (Manager 3 at SASA).

### **Engineers-in-training programme**

All of the milling companies offer bursaries to engineering students enrolled at universities and universities of technology (UoTs) in KwaZulu-Natal. The focus is on chemical/process, mechanical, electrical and instrumentation engineering. Considering that sugar production involves very specific chemical processes, chemical engineers are especially important. The students are required to spend some of their holidays at the milling company to gain work experience while studying. This is part of their 'grooming' to take up jobs at the level of middle management at the milling companies. The students are assigned mentors and the HR managers hold regular feedback meetings with

the students and mentors to gain a sense of the challenges that they face and of areas for development. The EIT students are also required to attend courses offered by the STC and the sugar technology course offered by the SMRI in order to gain sugar-specific theoretical knowledge to complement their training at university. The EIT students, typically, are offered a position at the milling company on successful completion of their university studies and the EIT programme and on registration with the Engineering Council of South Africa (ECSA).

A problem reported by the HR staff at the firms is the poor communication and presentation skills of the students, which are linked to low confidence levels and language differences. These 'soft skills' are essential for managers. The Zulu-speaking students tend to have greater difficulty. This problem persists despite the fact that the university courses include modules on presentation and communication skills. Tongaat Hulett, for example, has attempted to address this problem by including short courses on assertiveness and management in its EIT programme. The company uses private training providers to conduct the courses. It has developed a database of private training providers that includes providers who have approached the company to inform them of the training services they offer. TSB has taken a similar, but more structured, approach (described later).

Each of the milling companies, except UCL, has been running an EIT programme for a long time. The programme has been described as being effective in ensuring a pipeline for engineering skills. UCL only recruited an HR manager about five years ago and has been running the programme since then. A challenge that the company faces is that it does not have a steady supply of engineers as yet. The HR staff thus emphasise the use of careful recruitment and on-the-job training in order to meet the firm's skills needs.

### **Apprenticeships**

Apprenticeship training for artisans is a long-standing tradition in the sector. The apprenticeship programmes are three years in duration, are aimed at ensuring a pipeline of artisans with mechanical engineering, fitter-and-turner, millwright, electrical

engineering and boiler maker skills. Apprentices entering the programme typically hold a matric qualification. Similar to the EIT students, the apprentices are assigned a mentor and regular feedback meetings are held to assess performance and identify problems. The apprentices are also required to attend courses offered by the STC in both theoretical and practical training. Stakeholders report that the current artisan shortages are partly due to the change from apprenticeships to learnerships, and then reintroducing the apprenticeship system in the national education and training domain. The apprenticeship programmes offered by the milling companies are partly funded by AgriSETA. Illovo, for example, reports having received funding from AgriSETA for 11 of the 22 apprenticeships it offered in 2013.

### **In-service training**

Another skills development programme typically offered at the milling companies is in-service training that they offer to students from UoTs. The training is offered in a range of fields, including engineering and administration. UoTs typically approach the milling companies to place their students at the company in order to gain work experience as part of their work-integrated learning programme. HR managers emphasised that the extent to which they provide in-service training for university students depends on whether or not they are approached by the universities or AgriSETA. This suggests that the success of the work-integrated learning programmes at the UoTs depends on the responsiveness of the universities and AgriSETA. The Durban University of Technology (DUT) stands out as the most proactive in arranging work placements for students at the milling companies.

The firms have not experienced a need to form collaborative linkages with the universities, UoTs or further education and training (FET) colleges to recruit students for their training programmes. The usual approach is to advertise online and at universities and UoTs. It is apparent that the firms emphasise long-term, on-the-job training complemented by the more structured training programmes offered by private training providers, including the training programmes of the private-

sectoral intermediaries. All of the firms also provide funding opportunities for their staff to attend courses and to upgrade qualifications from universities and UoTs.

Since TSB has a somewhat different skills development model from that of the other milling companies, its strategies and mechanisms are described separately. The training strategy has been described by stakeholders in the sector as 'far superior' to that of any other milling company.

### **TSB Sugar's skills development model**

TSB's skills development model is structured, formalised and personalised to individual staff members' training needs. Similar to the other milling companies, TSB has divided its skills development activities into management- and leadership-level skills development, and artisan, operational-level skills development. The former is coordinated by the Organisational Development and Recruitment Department and the latter by the TSB Learning Academy. The Learning Academy has been recognised by AgriSETA as an Institute of Occupational Excellence. Essentially, all staff at TSB are assessed regularly as part of their performance appraisal in order to identify their training and skills development needs. TSB has developed a menu of competency-based programmes aimed at developing generic skills. A tailor-made training programme is then developed for staff members at all levels, including a selection of the programmes on the menu. What is interesting about this approach is that TSB has endeavoured to offer virtually all of its routine training in-house as far as possible. It also invests in developing trainers.

TSB also works with private training providers and universities in meeting 'new' skills development needs. In these cases, trainers at TSB work with the private training providers to develop training programmes suited to their needs. The private training providers also conduct much of the training on-site, minimising time away from work. For example, TSB staff at all levels undergo management and leadership training. The company has developed this strategy to address the problem of the lack of adequately skilled supervisors to occupy positions when the current supervisors

retire. TSB has entered into a collaborative arrangement with the Production Management Institute of Southern Africa to provide training in production management (energy and process). The company has also entered into a collaborative arrangement with Stellenbosch University for leadership and management training, for this university has a reputation for providing excellent training in this area.

External training providers are selected according to the quality of their expertise. When *non-routine* skills needs arise, staff conduct 'research' into the 'best' providers and seek alternative providers when organisations are found to no longer produce quality E&T. As part of the personalised training strategy, staff members are also provided with funding to study at universities to increase their academic standing.

The menu of training programmes made available to TSB staff includes all occupational levels, namely:

- Transformation recruitment project – additional roles;
- Engineer in training in all sugar industry-related disciplines;
- Junior engineer development programme;
- Graduate-in-training programme (for non-engineering graduates);
- Young talent development programme;
- Foremen in training;
- Production manager in training;
- Bursary and study grant allocations;
- Learnerships;
- Production learners;
- Formalised mentoring programme;
- Maintenance workers development programme; and
- Apprenticeship programmes.

Staff typically progress from one level to the next and may be sent to firms in other industries. For example, students completing the EIT programme go on to complete the Junior Engineer Development Programme before being appointed as engineers, or staff undergoing boilermaker training may be sent to Eskom to gain more exposure in boilermaking.

### **A model of long-term, on-the-job training prevails**

The milling companies have used these mechanisms for meeting their *routine* skills needs. The HR and skills development managers thus report that they generally have a steady skills pipeline for meeting their *routine* skills needs. However, the approach of emphasising long-term, on-the-job training is not as effective for keeping up with *non-routine* skills needs.

The traditional approach of grooming staff for upper-management level is becoming less effective because of a lack of emphasis on supervisor training and a loss of skills due to increasing competition from other industries. The traditional mindset, which assumes that staff will stay at the company and work their way up the ranks, has been a constraint. The milling companies have now realised the need to tackle the problem and have developed different strategies. One strategy is to collaborate with universities to ensure that engineering students are provided with some kind of exposure to the sector. The SMRI and the South African Sugar Millers' Association Limited (SASMAL) have begun to work closely with the UKZN to ensure that the sector has input into undergraduate and postgraduate courses.

Since the success of sugarcane-milling companies depends on reliable and quality yields of sugarcane, each of the milling companies has a department/division dealing with issues related to sugarcane production and thus sugarcane growers supplying the mills. These departments provide a range of services for the growers, including advice and training.

### **Cane growers' strategies for meeting their skills needs**

Cane growers take a completely different approach to meeting their skills needs. Since the sector is dominated by small-scale growers who do not have the capacity in-house to do their own training or collaborate with E&T organisations, they rely mainly on the services of the milling companies and private intermediary organisations, namely the SACGA and

the SASA through the Land Reform Division, the SASRI and the STC. Both millers and growers have invested in developing effective skills development programmes for meeting the *non-routine* skills needs presented by these new entrants.

The SASA's Grower Development Account has been used to fund development interventions aimed at improving the livelihoods of all black sugarcane growers, particularly the small-scale growers. Over the past ten years, approximately R37-million has been invested and seed-cane schemes established as demonstration plots for teaching sugarcane husbandry (SASA 2013b).

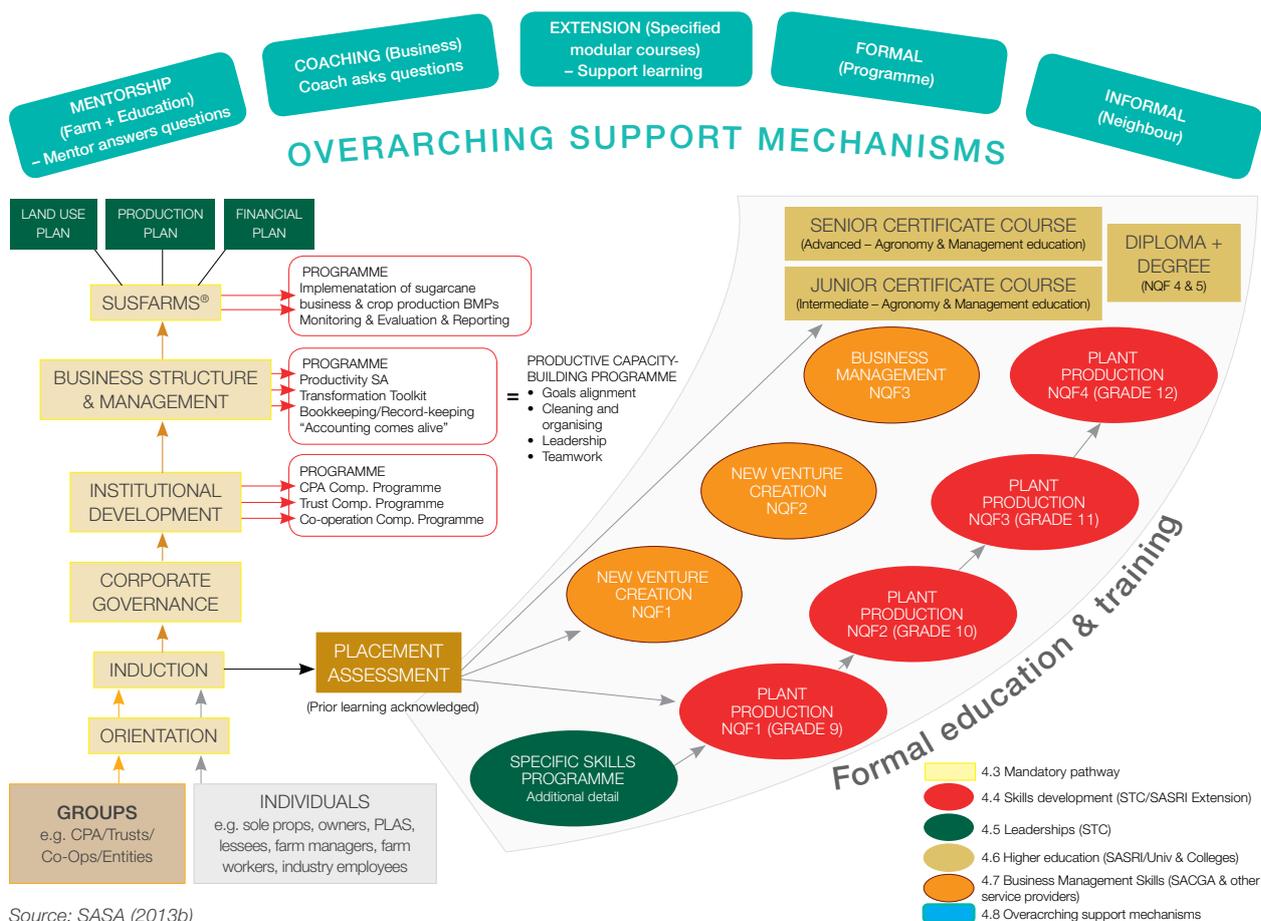
### **Sugar Industry Development Pathway**

In 2013, a proposal for a Sugar Industry Development Pathway for growers was developed in response to shifting skills needs. The SASA has identified major bottlenecks in grower development:

*The industry currently has 342 land reform growers who own 70 627 hectares of land under sugarcane production. Whilst there is support for the established growers, there is an increasing number of entrant growers who require training. This need is reflected in the current demand for SASRI Junior and Senior Certificate Courses where there [were] 165 applications in 2013. In addition there were 535 applicants [for STC courses]. SASA was able to provide 42 growers with access to Junior and Senior Certificate Courses, and 368 growers had access to the STC courses. The demand for education and training is constantly increasing, and as the pace of land reform gains momentum, there will be further pressure to provide greater access to education and training opportunities. (SASA 2013: 1-2)*

The proposed structure sets out a range of strategies and pathways for cooperatives and individual growers. Each grower's skills levels will be assessed in order to determine training needs and the level at which the grower will enter the pathway (see Figure 6).

Figure 6: Sugar Industry Development Pathway for growers



The pathway for cooperatives (and grower groups generally) focuses on training in governance and farm management. The pathway for individual growers includes a range of skills from National Qualifications Framework (NQF) Level 1 to NQF Level 5. The qualifications provided by the preferred training providers in the sector are included in the development pathway. Training will be provided by the STC, the SASRI, private training providers, universities and UoTs, which is elaborated on in the following chapters.

### Summary: Firm-interaction for meeting skills development needs

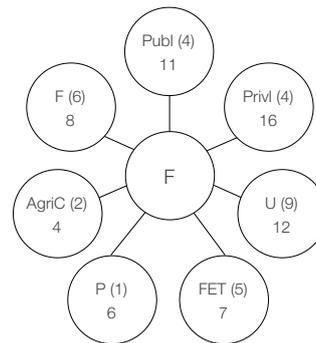
In sum, while sugarcane growers rely heavily on support from the milling companies and the sectoral intermediary organisations, the milling companies have taken an independent approach to meeting their skills needs. Since the milling companies have the necessary capabilities to develop and coordinate their own skills development

programmes, the main strategies they use involve on-the-job training. Training programmes are competency-based and are informed by specific learning pathways in order to ensure a steady supply of skills *routinely* needed. The millers do, however, make extensive use of training programmes provided by sectoral intermediary organisations.

The interactions of the firms with other actors in the sugarcane growing and milling SSI are depicted in Figure 7 in order to elaborate on the network pattern mapped in Figure 6. The highest frequencies of interaction reported by firms are with private-sectoral intermediaries and selected public intermediaries [notably, the national and provincial departments of agriculture, AgriSETA and the Manufacturing, Engineering and Related Services SETA (merSETA)]. They also report a high frequency of interaction with one another and the two agricultural colleges, from which they recruit students. The four universities and UoTs in

KwaZulu-Natal are included in their skills development networks, but mainly to recruit students for their EIT and bursary programmes. Universities outside the province, including the Stellenbosch University, Wits University and the University of Pretoria, are brought in mainly to provide training in leadership and management skills. Private training providers are used to a great extent because they provide training that is tailor-made to fit the firms' training needs. FET colleges play a very small role in milling companies' skills development networks. Majuba, Coastal and Umfolozi are the three FET colleges with which a few of the firms reported interaction. Interaction with Esayidi and Thekwini was reported by one or two of the firms. The interaction reported refers mainly to the 'isolated instances' where the FET colleges have sent their students to the firms to gain work experience. Some of the firms did, however, report interaction on a 'wide scale' with Coastal FET College. Since Coastal was under administration at the time of data collection, we were unable to include it in the research so as to elaborate on these linkages.

Figure 7: Average interaction with firms



Notes:

1. F = Firms; Publ = Public Intermediaries; Privl = Private Intermediaries; U = Public Universities; FET = Public FET Colleges; P = Private Training Provider; AgriC = Agricultural Colleges.
2. The number of organisations included in each subgroup is indicated in brackets.
3. 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. The calculations do not take into account the number of organisations identified as partners. It is thus important to interpret the calculations in relation to the number indicated in brackets.

The next section therefore focuses in greater depth on the critical role played by the sectoral intermediary organisations.

## 4. THE ROLES OF PUBLIC AND PRIVATE INTERMEDIARY ORGANISATIONS IN BUILDING NETWORK ALIGNMENT AROUND SKILLS DEVELOPMENT

In this section, we examine the roles of public- and private-sectoral intermediary organisations in building network alignment and addressing misalignment in relation to skills development in the sectoral system of innovation.

The main private- and public-sectoral intermediary organisations differ in terms of the roles they play in supporting firms to meet their skills needs. Using the Intarakumnerd and Chaoroenporn (2013) distinction, we can show that, in the sugar SSI, the focus of the private intermediaries is on responding to industry- and firm-specific issues, whereas the public intermediaries tend to focus on 'public good' objectives that are important for the upgrading of firms in the sector. The discussion in this section shows how the two groups of intermediary organisations complement and support each other in facilitating capacity development of firms. While both firms in the milling sector and farmers in the primary-production sector are supported, the intermediary organisations tend to focus more on the growers, simply because the needs of the large number of small-scale farmers are greater.

The strategic roles of the main intermediary organisations are first described, followed by a discussion of how they support education and training (E&T) organisations and firms to meet skills needs in the SSI. The strategies used are analysed in relation to capabilities to adapt and sense changes in skills needs.

### **The role and strategies of the main intermediary organisations for addressing *routine* skills needs**

It is evident that the sugar sector is highly structured from grass-roots levels up, with representative bodies

that form part of the South African Sugar Association (SASA), which coordinates and addresses issues common to both millers and growers.

#### **South African Sugar Association**

The council of the (SASA) administers the partnership between the sugarcane growers and millers on behalf of the South African Cane Growers' Association (SACGA) and the South African Sugar Millers' Association Limited (SASMAL). As equal partners, each member elects 11 councillors to the SASA council. The chairpersonship and vice chairpersonship of the council usually alternate every two years between a grower and a miller. The SASA is an autonomous organisation and operates free of government control. In terms of the Sugar Act and the Sugar Industry Agreement, statutory powers of self-governance are granted to the sugar industry.

The SASA's organisational structure is illustrated in Figure 8. The cane growers are organised into 13 local growers councils as part of the SACGA; and the six milling companies are organised into the SASMAL.

The SASA includes several divisions that are responsible for responding to and coordinating different needs in the sector.

The Industry Affairs Division is responsible for administering and facilitating adherence to the Sugar Act, the Sugar Industry Agreement and the SASA constitution. Among other functions, this division has responsibility for Umthombo Agricultural Finance, which provides savings facilities and administers loans for small-scale growers.

Figure 8: Structure of the South African sugar industry

ORGANISATION OF THE SOUTH AFRICAN SUGAR INDUSTRY		
INDIVIDUAL GROWERS		MILLING COMPANIES
13 LOCAL GROWERS COUNCILS		6 MILLING COMPANIES
SOUTH AFRICAN CANE GROWERS' ASSOCIATION (SACGA)		SOUTH AFRICAN SUGAR MILLERS' ASSOCIATION (SASMAL)
<b>SOUTH AFRICAN SUGAR ASSOCIATION (SASA) COUNCIL</b> Comprising representatives of the growers and millers		

Adapted from SASA (2013a)

The South African Sugarcane Research Institute (SASRI) is the leading sugarcane agricultural research organisation in Africa. SASRI is world-renowned for its research into the development of new sugarcane varieties, as well as for improved crop management and farming systems that enhance profitability. Effective delivery of new knowledge and technology make a significant contribution to the sustainability of the industry. Research is clustered within four multidisciplinary programmes: Variety Improvement, Crop Protection, Crop Performance and Management, and Systems Design and Optimisation.

The SASRI's extension service provides the essential link between SASRI researchers and growers through consultation and feedback. Its primary role is to facilitate the adoption of technology and best management practices that encourage responsible and sustainable land use and delivers optimal productivity and profitability. A range of services is provided for the industry on a user-pays basis, including specialist advice on growers' problems, as well as soils and leaf analyses through the Fertiliser Advisory Service. The SASRI also runs two courses on sugarcane farming.

The External Affairs Division works in a range of areas that require specialist external communication skills, with a focus on international and regional trade issues, publications, communications, renewable energy, the environment, development, and nutrition. The division also administers the Sugar Industry Trust Fund for Education (SITFE). It is responsible for the building of governmental relationships and the monitoring of local, regional and global trade policies affecting the South African sugar industry.

Historically, the sugar industry has been proactive in ensuring that it has effective mechanisms in place for training in 'core industry or strategically

important industry skills' (Manager 1 at the SASA) or 'sugar-specific' skills. The SASA thus operates as a 'one-stop shop' for *routine*, sugar-specific training and development (Manager 1 at the SASA). *Routine* (and *non-routine*) skills required in the sector are developed through several mechanisms housed within key SASA divisions, namely:

- The SASRI's agricultural-training programmes;
- The Shukela Training Centre (STC);
- Internships; and
- Bursaries.

The courses administered by the SASRI and the STC are made available to growers and millers at cost, which is additional motivation for growers and millers to use the SASA's programmes instead of approaching other private-sector education and training (PSET) organisations. The SASA's training programmes are not, however, seen as competition for PSET organisations, because its programmes focus on sugar-specific skills development. The SASA thus does not identify linking growers and firms with PSET organisations as a key function, as one of the managers explained:

*SASA is not responsible for managing the relationship between other employers in the industry and those 3rd parties; each milling company, for example, and each grower is running a business. They're individual business entities and they will source their providers as they wish. We have no say over that. However, we are a one-stop shop [for] training and development needs in respect of core industry or strategically important industry skills ...*

Hence, the SASA's response to addressing *routine* skills needs was to develop the capability to train

in-house, rather than seeking partnerships with PSET organisations. Developing the internal capabilities to train was also motivated by political restrictions during the apartheid years that restricted the training of black artisans at public organisations (Manager 1 at the SASA).

#### ***Bursaries***

The SASA administers two types of bursary programmes which act as internal interface mechanisms for coordination across sectoral networks. Bursaries for postgraduate students are offered to MSc and PhD students in the agricultural, chemical and biological sciences (e.g. agronomy, soil science or biotechnology). The recipients of the bursaries are seconded to the SASRI for a period of time to conduct research in the fields of science in which the SASRI has the necessary expertise. The bursary candidates are selected according to the relevance and importance of their research to the sugar sector.

The SASA also administers the SITFE study assistance/bursary programme. The External Affairs Division is responsible for administering the programme on behalf of industry. The SITFE 'was launched in 1965 as a private-sector initiative and is one of South Africa's longest running educational and training support organisations' (SASA 2013: 8). Bursaries are offered, on an annual basis, to South Africans residing in the sugarcane growing provinces (KwaZulu-Natal and Mpumalanga). The bursaries are offered to individuals who have registered or applied for undergraduate studies in science, engineering or agriculture at a university, university of technology or agricultural college. For 2014, a maximum of six University Merit Bursaries, six University of Technology Merit Bursaries and 18 Agricultural Bursaries were offered (SITFE brochure 2014). In addition, a maximum of six bursaries were advertised for students planning to study engineering at the Tshwane University of Technology (TUT), and five for the UNITE programme at the University of KwaZulu-Natal (UKZN), which is a foundation programme for engineering students. Preference is given to applicants from rural communities who plan to work in those communities on completion of their studies. In addition to the bursary programmes, the SITFE also provides funding for education-and school-

development programmes and for early-childhood development programmes.

#### ***Internships***

A second internal interface mechanism is the internship programme launched in 1996 in order to address the critical shortage of agricultural and biological scientists who are essential for the effective operation of the SASA's research and training services. Scientists make up a large proportion of employees at the SASA, but only a small proportion in the industry. The purpose is to provide work experience opportunities for agricultural and biological science graduates. The programme has a wider reach that extends beyond the sugar sector. Each year, eight to 20 year-long internships are made available to BSc graduates, with fewer internship opportunities being given to BTech graduates. Top achievers are offered an extension and can do a second year. The interns are assigned to research projects run by the SASRI.

Since the SASRI is renowned nationally and internationally, these internships are in demand. Internships are advertised online and through universities (but this interaction with universities does not form part of a formal or collaborative arrangement). Since the internships are highly regarded nationally, interns completing the programme often find employment soon thereafter at research organisations such as the Agricultural Research Council and the Medical Research Council, as well as with local and provincial government or the SASA itself.

According to a manager at the SASA, offering work experience is a key mechanism to groom scientists for the sugar sector. Research is highly regarded in the sector for technological advancement and innovation (SASA 2013a). The SASA also offers internship opportunities for office management and financial accounting. These graduates generally come from the universities of technology.

#### ***South African Sugarcane Research Institute education and training programmes***

A third internal interface mechanism is the training offered by the SASRI as part of its mandate to conduct research into sugarcane growing and

thus contribute to innovation in the sector. For over 60 years, the SASRI has provided formal and informal training aimed at grower development. According to Cleasby (1963), the need for formal training in sugarcane farming was identified as a result of the realisation that sugarcane growers required the skills to interpret and use the research and technical knowledge produced by the SASRI.

The *formal training* programmes include certificate courses offered at Junior and Senior Certificate levels. The courses encompass all of the disciplines and activities required to grow sugarcane. The certificate courses are well established and have a good market reputation. The SASRI thus does not see the need to have the courses accredited. Extension specialists who do not have expertise in sugarcane growing are required to attend courses. In general, there is a shortage of extension specialists with training and experience in sugarcane farming (Manager 2 at the SASA). According to a manager at the SASRI, the content and practices have been amended over the years, based on the outcomes of research and the needs of industry (e.g. the inclusion of GIS mapping). The courses include 11 modules and are offered on a full-time basis (from 8am to the afternoon) at different times of the year. The Junior Certificate course is three weeks in duration and the duration of the Senior Certificate course is five weeks. In order to gain entry to the Junior Certificate course, candidates are required to hold a matric qualification. Most of the attendees do, however, tend to be farm workers (e.g. junior farm managers and farm clerks) and do not hold a matric or equivalent qualification. The entry requirement for the Senior Certificate course is a degree or diploma.

An advantage of the certificate courses is that they are taught by specialists at the SASRI who have the level of knowledge required to deliver the courses effectively. The SASRI specialists are researchers conducting cutting-edge research in the sector and are thus well informed with regard to the subject matter. Owing to the SASRI's reputation as an internationally renowned research centre and the reputation of the courses, the courses are in high demand despite the lack of accreditation. As one of the managers at the SASA pointed out, completion of

the SASRI certificate courses is sometimes stipulated as a requirement for employment in the sector. The courses are advertised at career fairs, through flyers, and on the SASA's website. Many of the attendees include employees on farms and at milling companies, and students at agricultural colleges. Land-reform beneficiaries are recruited through the SASA's Land Reform Department, which assesses farmers' skills needs. The Land Reform Department identifies skills needs and evaluates levels of numeracy and literacy, which relates to students' capabilities to complete the courses. Relevant applications are then forwarded to the SASRI.

Another challenge is that the researchers teaching the certificate courses generally do not have teaching expertise. The SASA is thus trying to identify an appropriate strategy for ensuring that the lecturers on the certificate courses (and on the courses offered by the STC) receive training as educators.

The SASRI also offers *informal training* in the form of two- to three-day modular courses aimed at growers, especially small-scale growers. The courses are issue-focused and are not assessed in any way (i.e. there is no certificate of attendance and no other form of certification). The modular courses form part of the extension programme and are taught by the extension specialists. The extension specialists play a key role in informing the content and delivery of the courses. The course content is adapted annually in response to the main issues raised and the skills needs identified by the extension specialists through their interaction with sugarcane growers in all of the sugarcane growing regions. The modular courses are thus tailored to the needs of cane growers in the cane growing regions, which needs differ according to geographical location, climate and demographics. The modular courses are thus more flexible and more responsive to sugarcane growers' needs than the certificate courses.

#### ***South African Sugar Association competencies***

In order for the SASA to implement these mechanisms effectively, it has to have the necessary competencies. The SASA does psychometric screening of all graduates applying for jobs. The SASA started psychometric testing as part of its recruitment strategy in 2000 because a degree

qualification was no longer found to be a reliable measure of competency.

### **South African Cane Growers' Association**

The SACGA administers the interests of independent sugarcane growers who are members, through the mediation of 26 local grower groups. An executive director, management team and staff administer the day-to-day business of the SACGA in order:

- To ensure that cane growers receive fair value for their sugarcane;
- To provide cane growers with relevant research, data and support services to facilitate successful farming regions; and
- To ensure that the SACGA is recognised by all stakeholders as the duly mandated and effective representative of all cane growers in South Africa.

The range of functions and services of the SACGA include extension services, training, statistical services, production-cost surveys, and negotiations in respect of recoverable value (RV) price determination.

The mechanisms that the SACGA uses for supporting the development of growers are complementary to those offered by the SASRI and the STC. The SACGA focuses on addressing the economic and institutional sides of agriculture development, whereas the SASRI and the STC focus on the technical side. The SACGA is the only organisation in the sector that specialises in farm management and farm economics (Director 1 at the SACGA). On an annual basis, the SACGA develops benchmarks for economic development and runs a skills assessment initiative. It thus has the necessary expertise in-house to provide farm management support, including the development of course curricula. The direct link between the SACGA and individual growers is through grower development/support officers (GSOs) who deal with growers on a one-on-one basis. The GSOs operate in each of the sugarcane growing regions and identify local grower-development needs, which tend to differ by region.

The SACGA uses different strategies to address growers' *routine* skills development needs, namely:

informal training provided by the GSOs, sending growers to attend the SASRI's certificate courses, courses offered by the STC, and the SMRI's one-week course. The SACGA identified a need to seek training support from other private training providers so as to address the skills needs of land-reform farmers and cooperatives. The strategies that the SACGA uses for supporting growers to meet *non-routine* skills needs are discussed later.

### **South African Sugar Millers' Association Limited**

The SASMAL represents the interests of all sugar millers and refiners in South Africa. The SASMAL's objectives cover partnership administrative matters, legislative measures affecting the industry, and support for training as well as for scientific and technological research.

We have shown that the SASA's direct involvement in supporting the milling companies to meet their skills needs is limited to the technical training provided via the STC (Manager 1 at the SASA). The six milling companies are described as 'major corporations' equipped with the capabilities to assess and address their own skills development needs (Manager 1 at the SASA). The SASMAL's role in supporting skills development in the sector is, however, somewhat different from that of the SASA. The only skills development strategy that the SASMAL uses is *providing funding* for various initiatives. The SASMAL's skills development initiatives are coordinated by the SMRI.

### **Sugar Milling Research Institute**

The SMRI was originally formed in 1949 to conduct research relevant to the sugar industry, including developing new products as well as exploring new processes and ways to improve optimisation. The Council for Scientific and Industrial Research (CSIR) and the UKZN were two of its founding members. The SMRI is funded mainly by the sugar industry through the SASMAL. All of the milling firms are members of the SASMAL and each pays a levy to the SASMAL, which is then passed on to the SMRI. The milling companies are the main voting members of the SMRI. The UKZN is also on the SMRI's board and provides the premises for the SMRI. The SMRI is basically located on the UKZN's premises rent-free. The SMRI Library is also based at the UKZN,

although it is not used very often by the SMRI. Since the SMRI is based on a university campus, it falls under the Education, Development and Training SETA (ETDP SETA). The SETA provides a relatively small amount of funding for training.

The SMRI provides a range of training programmes aimed at management levels, including a 10-week sugar technology course aimed at engineers, short courses for anyone wanting to become familiar with the processes of sugar milling, and analytical training for laboratory workers. The SMRI serves 'the factory side', whereas the SASRI serves 'the agricultural side' (Manager 1 at the SMRI). Furthermore, the SMRI collaborates with the SASRI in research, but not training. The students attending the 10-week course at the SMRI are, however, taken on a tour at the SASRI as part of the half-day agricultural training that is part of the course.

All of the engineers involved in the engineers-in-training (EIT) programmes at the milling companies participate in the 10-week sugar technology course offered by the SMRI. This is a very intensive course. On average, 24 students complete the course per year. Since the milling companies are voting members of the SMRI, industry has input into the curriculum and lecturers teaching on the course are often part of the staff at the mills. For the 10-week course, the students (even those from other countries in Africa) come to the SMRI to complete the course.

The short courses offered at the SMRI include one-week and two-week courses. The one-week course is targeted at staff at the mills as well as staff at suppliers and customers of the mills. One-week courses can be conducted on-site at the mills. The SMRI also provides analytical training for staff working in laboratories at the mills. This is a form of upskilling.

In addition to the courses, the SMRI collaborates with the universities of technology (UoTs), that is, the Mangosuthu University of Technology (MUT) and the Durban University of Technology (DUT), in order to provide in-service training for their students. Each year, five or six students are accepted for in-service

training. The in-service training is mainly in analytical chemistry, but a few engineers have been accepted over the years. The SMRI has identified the need for providing engineers with work experience. It thus aims to increase the number of engineering students included in the in-service training programme and recently launched new research projects that engineering students could work on.

The biggest facilitator of the SMRI's work is its connections with the industry. Industry has input into the curriculum, and staff at the mills lecture on the courses free of charge, which ensures that they provide quality training. The SMRI usually has about 30 external lecturers teaching on its courses. Since the industry is small, lecturers from one firm may teach trainees or staff from another. The milling companies do not perceive this practice as a threat and view it as indicative of the collective nature of the industry. According to a manager at the SMRI, the collective nature of the industry strengthened over time as millers found the need to work together in responding to global competition that has threatened the sector.

### **South African Sugar Technologists' Association**

The main purpose of the South African Sugar Technologists' Association (SASTA) is to assist technologists in industry, transfer knowledge to industry, and assist industry with knowledge. The SASTA falls under the aegis of the SASA, but is run independently. The SASTA is involved in knowledge transfer in respect of skills through conferences for which the SASA provides some funding. The main activity is to hold a three-day congress on an annual basis in order 'to promote the interchange of scientific knowledge and discussion' (Manager 1 at the SMRI). At the congress each year, posters and papers on issues relevant to sugarcane growing and milling are presented. A congress has been held each year for about 90 years and has been described as one of the best in the world. The congress attracts about 450 people each year, 150 from the milling subsector and many of the rest from the agricultural subsector. As an interface mechanism for knowledge transfer, the congress serves as an informal training and discussion forum for addressing skills development challenges.

Academics from universities and researchers from research organisations also participate in the congress.

The private intermediaries and firms thus work closely in a symbiotic and self-sufficient manner. Yet, Figure 4 and 7 do reflect interaction with public intermediaries. The next section shows that the role of these public intermediaries is complementary and is mainly related to funding support and accreditation of training.

### **The role and strategies of the main public-intermediary organisations in the sugar sectoral system of innovation**

Chapter 2 identified the government departments that, to a varying extent, support and coordinate activities related to skills development in the sector, namely: the provincial and national departments of agriculture, the Department of Higher Education and Training (DHET) and the Department of Trade and Industry (dti). AgriSETA acts as the main sectoral intermediary supporting skills development in the sector to ensure that public-good goals as set out in the National Skills Development Strategy are met.

#### **Agricultural Sector Education and Training Authority**

Sugarcane farming and sugarcane milling (including the manufacture of golden syrup and castor sugar) fall under the Agricultural Sector Education and Training Authority (AgriSETA) [Standard Industrial Classification (SIC) code: 30420] (AgriSETA 2010). Some alternative uses of sugarcane (such as biofuels) and some by-products of sugarcane milling (such as co-generation of electricity) may fall under other SETAs. Only 73 employers in the sugar sector are registered with AgriSETA, including 45 small employers (less than 50 employees), six medium employers (50–149 employees) and 22 large employers (150+ employees). These employers have registered 10 478 employees (AgriSETA 2010). Thus, only a small proportion of employers and workers in the sector are registered with the SETA.

As set out in the Skills Development Act of 2008, AgriSETA is mandated to collect the skills development levy from firms in the primary- and secondary-agricultural sectors. Each firm is expected to pay a skills development levy that amounts to 1% of its payroll. Firms complete a workplace skills plan and training plan annually, which they submit to AgriSETA. The workplace skills plan should be based on an audit of their skills needs. The firm can claim back a certain percentage of the skills levy paid for the training it undertakes. Training can take any form and does not have to lead to a full qualification or include the use of any public or private E&T organisations. Most of the training funded through AgriSETA is aimed at lower-level skills. AgriSETA also has a discretionary fund that firms may access. However, if the firm wants to claim funds from the discretionary fund, the training it provides has to include training providers accredited by AgriSETA. The firm can claim 49.5% back through the discretionary fund.

A total of 4 761 employees in the sugar sector received training from the AgriSETA in 2009 (AgriSETA 2010). Twelve sugar-specific or relevant learnerships are registered with the AgriSETA, as reflected in Table 9.

AgriSETA's organisational structure includes subsector committees, including a dedicated 'sugar subsector' committee. For the sugar subsector, the committee includes a representative from each of the milling companies and the private-sectoral intermediary organisations, as well as the unions. The committee meets on a quarterly basis. A skills planning manager from AgriSETA participates in each of the meetings. The meetings provide a forum to discuss general issues faced in the subsector and to gain support and advice from AgriSETA. The representatives assist in developing lists of skills needs in the sector, including routine skills needs and critical/scarce skills needs.

In terms of its public-good mandate, there are a number of general initiatives that may benefit the sugar SSI. For instance, AgriSETA has placed coordinators in each of the provinces to support local government, to promote government's

**Table 9: Relevant learnerships registered with the AgriSETA**

Learnership	NQF level	SAQA registration no.
<b>Sugarcane growing</b>		
Sugar Industry Technical Maintenance Worker	2	22 Q 220011 39 128 2
National Certificate: Sugar Manufacturing and Refining Technical Maintenance	3	30 Q300003 23 146 3
Further Education and Training Certificate (FETC): Manufacturing Technical Maintenance: Produce Components by Performing Engineering Turning Operations	4	30 Q 3000 1321 173 4
FETC: Manufacturing Technical Maintenance: Produce Components by Performing Milling Operations	4	30 Q 3000 1521 173 4
FETC: Manufacturing Technical Maintenance: Develop and Fabricate from Complex Drawing	4	30 Q 3000 1420 173 4
<b>Sugar processing</b>		
National Certificate in Sugar Technology	5	22 Q 220036 22 140 5
Further Education and Training Certificate: Sugar Processing	4	22 Q 220035 31 144 4
National Certificate in Sugar Technology Processing: Sugar Refining	2	22 Q 220037 28 124 2
National Certificate in Sugar Technology Processing: Juice Preparation	2	22 Q 220038 28 124 2
National Certificate in Sugar Technology Processing: Crystallisation	2	22 Q 220039 27 122 2
National Certificate in Sugar Technology Processing: Laboratory Practice	2	22 Q 220040 25 124 2
National Certificate in Sugar Technology Processing: Extraction	2	22 Q 220041 28 122 2

to the strengthening of networks through the Sugar Committee.

**Other public-intermediary organisations**

In order to address the *non-routine* skills needs of new growers and cooperatives, the SACGA has begun to seek funding from the provincial Department of Agriculture, AgriSETA and the dti. The SACGA is in discussions with the provincial Department of Agriculture for funding support to start formal certificate courses (modelled on the Junior and Senior Certificate courses offered by the SASRI) focusing on training in finance and farm management.

Training for cooperatives is supported by the dti and the Department of Agriculture, Forestry and Fisheries (DAFF). Naturally, the SACGA has the

responsibility for training growers who are organised into cooperatives. A challenge that the SACGA is currently facing is that it lacks the skills required to offer training to cooperatives. The SACGA thus approached the dti and the DAFF for funding to train its staff. However, it did not succeed in obtaining such funding, because the funding can only be used for training growers and not the trainers of growers. The SACGA thus had to raise its own funds and hired a German organisation to conduct the training.

**Intermediaries and interaction in the sectoral system of innovation**

The growers and millers are very well organised into a strong and well-aligned network, from grass-roots levels up. The sector has a ‘strong collective structure’ and thus discusses growers’ and millers’

**Table 10: Sugar-sector-specific skills qualifications registered at the basic and intermediate levels**

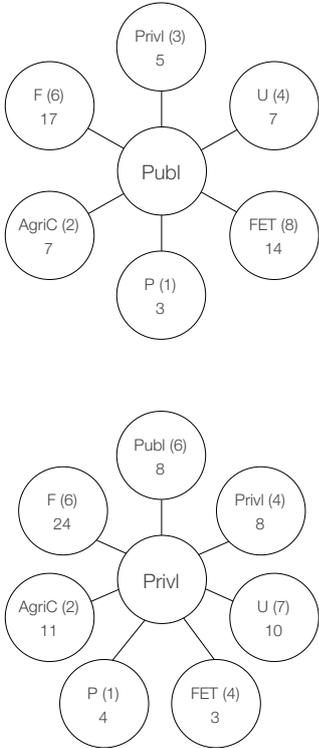
SAQA ID	Title (qualification view)	Level	Credits	Learning subfield	SGB	NSB
48399	Further Education and Training Certificate: Sugar Processing	4	140	Secondary Agriculture	SGB for Secondary Agriculture: Processing	Field 001 – Agriculture and Nature Conservation
21244	National Certificate: Sugar Industry Technical Maintenance	2	128	Secondary Agriculture	SGB for Secondary Agriculture: Processing	Field 001 – Agriculture and Nature Conservation
48727	National Certificate: Sugar Manufacturing and Refining Technical Maintenance	3	164	Secondary Agriculture	SGB for Secondary Agriculture: Processing	Field 001 – Agriculture and Nature Conservation
48400	National Certificate: Sugar Processing	2	120	Secondary Agriculture	SGB for Secondary Agriculture: Processing	Field 001 – Agriculture and Nature Conservation
48395	National Certificate: Sugar Technology	5	138	Secondary Agriculture	SGB for Secondary Agriculture: Processing	Field 001 – Agriculture and Nature Conservation

skills needs informally on a 'day-to-day basis' (Manager 1 at the SASA). The growers have farmers' associations and local growers councils that focus on the needs of the area. The SASA and the SACGA have specialists designated to each region to identify grower needs. They have structures in place through the SASMAL and the SACGA, who have people on the ground feeding information back to the associations and to the SASA. Information comes back to the SASA through the Land Reform Division, extension officers and specialists, as well as through interaction with the SACGA. The intermediary organisations also have a formal, structured approach to needs assessment through regular planning meetings and workshops. This labour market information is then used to inform their programmes and to ensure that they respond to demand from millers and growers.

The roles of the public- and private-intermediary organisations in the SSI have been described in detail. We discern five main functions and summarise the functions of each intermediary in Table 11. It is evident that each type of intermediary can play multiple roles, but, nonetheless, there are distinct concentrations of functions for the private and public intermediaries. The public intermediaries play a role in funding, accreditation, and bridging

supply and demand, while the private intermediaries are more directly involved in training provision, knowledge transfer and diffusion.

Figure 9: Average interactions of public- and private-intermediary organisations



Notes: See Figure 7.

Table 11: Summary of the roles played by public- and private-intermediary organisations

	Public	Private
<b>Main function</b>		
<b>Funding (and other resources)</b>	AgriSETA DAFF Dept of Agriculture, KZN dti DHET ETDP SETA	SASMAL SASA
<b>E&amp;T accreditation</b>	AgriSETA DHET	
<b>E&amp;T provision</b>		SASA-SASRI, STC SMRI SACGA
<b>Bridging between E&amp;T organisations and firms/growers</b>	AgriSETA DAFF Dept of Agriculture, KZN DHET	SASA-SASRI, STC SASMAL SASTA
<b>Knowledge transfer and diffusion</b>		SASA-SASRI SACGA SMRI SASTA

The patterns of interaction of the public- and private-intermediary organisations reflect these complementary roles. The private-intermediary organisations, on average, show higher levels of interaction with firms, other private providers and agricultural colleges than the public-intermediary organisations. The public intermediaries' role in building competences in the FET colleges is evident in the strength of those linkages.

### **Summary: The critical role of intermediary organisations**

The analysis in this chapter has highlighted the critical role of private intermediaries in aligning and linking firms and E&T providers for sugar-specific

skills development, a distinctive feature of the SSI. It goes some way to explain the dense network we identified in Figure 4 above and the self-sufficient nature of skills development. Significantly, this chapter has identified interface mechanisms and strategies developed by private intermediaries that could be extended to other sectors, or could be adopted by other actors, to ensure responsiveness.

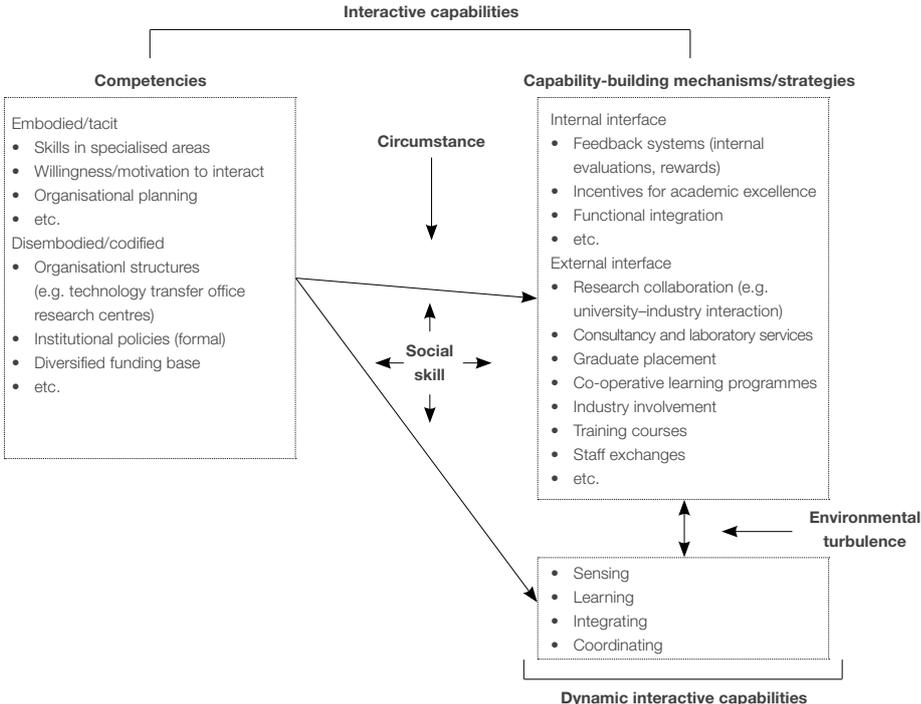
# 5. INTERACTIVE CAPABILITIES OF EDUCATION AND TRAINING ORGANISATIONS

It is apparent that public education and training (E&T) organisations have, to varying degrees, contributed to meeting skills needs in the sugar sector over the years. Some types have played an integral role, while others have tended to be more peripheral. This section of the report investigates and compares the university, further education and training (FET) and private E&T organisations' involvement in the sugarcane growing and milling sectoral system of innovation (SSI). The chapter forms the core of the report and we go into greater detail than for firms or intermediaries. The extent to which E&T organisations are responsive to skills needs depends on their capacity for learning and accumulation of new knowledge and on the effectiveness of their responses to changes in the business and education environments relevant to the organisation. The analysis thus focuses on identifying the competencies and interactive capabilities of each type of E&T organisation,

illuminating the strategies and mechanisms they use to respond to the routine and changing skills needs of the sugarcane growing and milling SSI. Figure 10 illustrates the key conceptual dimensions investigated within E&T organisations, with *possible features of each for illustrative purposes*.

The analysis uses these conceptual distinctions to investigate what they teach, how they teach it, and how they support and facilitate their students' transitions to the labour market. We identify good practice, gaps and bottlenecks within and between different E&T subsystems. The chapter begins with an analysis of the university system, followed by the FET college system, the agricultural college system, and, lastly, the private training system. Considering that capabilities are shaped by the institutional contexts and historical trajectories of an organisation, the discussion of each subsystem starts with a brief outline of the context.

Figure 10: Capability-building processes in E&T organisations – a generic framework



## Networks within the sugar sectoral system of innovation

### Historic links to the sugar sector

Each of the universities in KwaZulu-Natal (KZN), except for the University of Zululand (UniZul), has historic links to the sugar sector. As shown in Figures 11 and 12, from as early as the late 1920s, private-sectoral intermediary organisations collaborated with the then technical training organisations to develop certificate and diploma courses in sugar technology. The strength and purpose of the linkages between these education and training (E&T) organisations and the sector have, however, changed over time. For example, the sugar technology courses were stopped during the early 1980s in response to complaints from students that the courses were too specialised and produced qualifications restricting their ability to move to other sectors (Oosthuizen & Dunsmore 1998). Owing to the oversupply of sugar technologists at that time, not all graduates could be accommodated by milling firms. The certificate and diploma courses were also not as highly valued among employees at the milling companies in comparison with university degrees. Since sugar technologist skills are essential in the sector, it was decided that the training would be provided by the Sugar Milling

Research Institute (SMRI) instead. The short sugar technologist courses were then offered to university students and graduates in engineering.

During the late 1970s and early 1980s, the SMRI also collaborated with the University of KwaZulu-Natal (UKZN) to provide sugar-specific training for students in applied chemistry in order to meet demand for skills in chemical process technology for sugar milling. The SMRI provided teaching staff for the modules, which were included in the general applied chemistry programme. The modules were, however, stopped during the 1994/1995 period of political turbulence (Oosthuizen and Dunsmore 1998).

These examples show how industry collaborated with certain types of public E&T organisations to meet skills needs. Initially, the public E&T organisations provided the physical facilities, with industry providing the expertise for teaching the specialised courses. It can be seen from Figure 12 that the relationship between industry and E&T organisations has evolved over time.

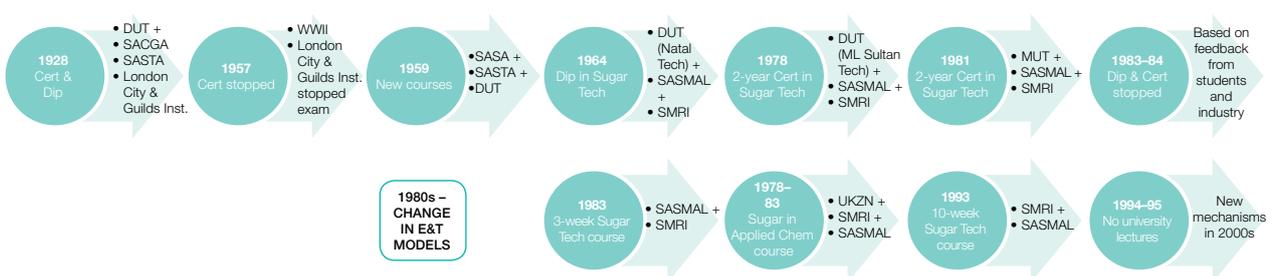
### Current links to the sugarcane growing and milling sectoral system of innovation

Currently, the four public higher education institutions in the province are involved in the SSI, namely: the University of Zululand (UniZul) (a comprehensive

Figure 11: Timeline showing the main organisations involved in skills development



Figure 12: Timeline showing the development of sugar-specific E&T for sugar-milling skills



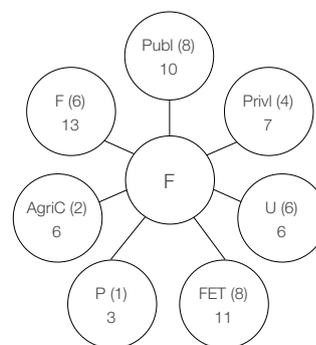
university), the University of KwaZulu-Natal (UKZN) (a traditional academic, research-intense university), and the two universities of technology, that is, the Durban University of Technology (DUT) and the Mangosuthu University of Technology (MUT). Figure 13 reflects that, on average, the universities report moderate levels of interaction with other actors in comparison with firms or intermediary actors.

Higher levels of interaction occur with public-intermediary organisations. Most of the participants interviewed engaged with the Sector Education and Training Authorities (SETAs), either the Agricultural Sector Education and Training Authority (AgriSETA) or the Manufacturing, Engineering and Related Services SETA (merSETA), with regard to bursaries and/or student placements. Interaction with the KwaZulu-Natal (KZN) Department of Agriculture and the Environment and the Department of Agriculture, Forestry and Fisheries (DAFF) were also reported by all of the universities, except UniZul, but to a lesser extent. UniZul and the UKZN reported the highest frequency of interaction with other universities, with research, moderation/external examination, project collaboration and shared teaching being among the types of interaction reported. Much of the interaction with FET colleges tended to be referred to as 'isolated instances' of interaction, with the main form of interaction being meetings. The universities of technology (UoTs) reported moderate levels of interaction with FET colleges.

Most notable in the network diagram are the higher levels of interaction with firms in the sector. The highest levels of interaction tended to be with Illovo and Tongaat Hulett. UniZul seems to be an anomaly, as very little interaction with firms was reported. Isolated to moderate interaction takes place between the universities and the private-intermediary

organisations, with the UKZN and the DUT reporting the highest frequencies of interaction, corroborating the pattern described by these intermediaries.

**Figure 13: Average interaction of universities with other actors**



Notes: See Figure 7.

Thus, it is evident that two universities are more involved in skills development in the sugarcane growing and milling SSI than the others, namely the UKZN and the DUT. While UniZul is involved in some of the networks, its reported involvement with the sugar industry is marginal. The question is: *How much does this relate to the competences and interactive capabilities of the universities themselves.* The following section investigates the interactive capabilities of the universities in detail.

### Interactive capabilities and dynamic interactive capabilities of the public universities in KwaZulu-Natal

#### Strategic mandates of the four universities in the province

We begin by describing key features of the four universities (Table 12). The universities have undergone significant changes in recent years, including mergers, changes in orientation and rapid growth.

**Table 12: Key statistics and comparative notes on the four universities**

	Students (+/-)	Academic staff (1)	Other descriptors		
UKZN	44 000	1 444	Merged	Academic/research	Urban (2)
UniZul	16 000	246	Not merged	Comprehensive	Rural (HDI)
DUT	25 000	562	Merged	University of technology	Urban
MUT	10 000	135	Not merged	University of technology	Peri-urban (HDI)

Notes:

1. Taken from Centre for Higher Education Transformation (CHET) Open Data (Table 2, 3-year average 2008–2010).
2. Both the UKZN and DUT are merged institutions: the UKZN came about as a result of a merger between the University of Natal (non-HDI) and the University of Durban-Westville (HDI), whereas the DUT was formed following a merger of the Natal Technikon (non-HDI) and the ML Sultan Technikon (HDI).

### *University of Zululand*

UniZul was established in 1960 as a homeland university with only 41 students. Over time, its graduates have served a growing range of professional industries, the political movement and government (local, provincial and national). In terms of its geographic location, the university finds itself positioned deep within the agricultural hub for sugarcane growing and midway between two of the bigger milling firms – Tongaat Hulett and Umfolozi Mill. Like the other universities in the province, the interactions built with the industry have arisen through interpersonal networks and, in the case of UniZul, have remained limited to small-scale, project-based engagements at department level. Currently, there is no purposeful, driven intent to engage with the sugar industry at any level and the absence of policy leadership in this area is significant.

Like other South African universities, UniZul has undergone a period of being under administration. With the appointment of an administrator for a two-year period, the university was able to focus on issues of governance and management and to review and prioritise the academic enterprise. With this drawing to a successful close at the end of 2013, the university executive management and the newly appointed council are now in a position to deliver on the Academic Renewal Project and on infrastructure developments approved by the Department of Higher Education and Training (DHET). UniZul's vision is to become a 'leading comprehensive university providing quality education' by producing 'globally competitive graduates, relevant for the human capital needs of the country, [and by] providing quality education which upholds high standards of research and academic excellence' (<http://www.unizulu.ac.za/about-us/future-of-richards-bay-campus/mission-vision/>). Across the Faculties of Arts, Education, Science/Agriculture and Commerce/Administration/Law, the university now offers 252 accredited degree, diploma and certificate courses across two campuses. According to CHET data (2010), 89% of the students are at undergraduate level, which is on a par with the other comprehensive universities. Less than 15% of these students are in the Faculty of Science.

Embracing its identity as a comprehensive university, UniZul has targeted the achievement of a 60% technical, 40% conventional programme offering over the years 2011 to 2021, introducing strategies such as advisory boards and work-integrated learning over time as it undergoes a re-curriculation process. As part of this strategy, the university is working towards putting in place interface structures in all faculties that will facilitate the development of more vocationally oriented programmes aligned to those of a comprehensive university. Having been a teaching and research university, the shift has necessitated a change in mindset among staff that is rolling out slowly across the university. Through the Academic Renewal Project, which places emphasis on creating and maintaining curricula programmes that attract and graduate quality professionals, the university will establish centres of excellence within faculties and across disciplines (at least four, as indicated in the UniZul Strategic Plan 2011–2013), as well as flagship programmes and research foci for growth, all of which will consolidate its positioning as a comprehensive university.

So, while the university has undergone fairly significant changes over the past two to three years, which has created some turbulence and forced an inward focus, it aims to use its focus on community engagement to further enhance and build its interactive capabilities with industry and the broader community and society in which it is located.

### *University of KwaZulu-Natal*

Spread over five campuses across KwaZulu-Natal, the UKZN is the result of the merger of two traditional academic universities, one of which had already incorporated a teacher training college. Currently enrolling approximately 44 000 students in contact programmes, approximately 79% of whom are at undergraduate level, the university is one of the largest in the country. Since the merger, the university has been through two distinct phases of re-engineering: the first was to embed the new merged institution among the staff and students from the two universities, and the second more recent re-engineering was to redesign, consolidate more thoroughly, and realign the university programme offerings to become the 'premier university of African scholarship' ([www.ukzn.ac.za](http://www.ukzn.ac.za)). The university

structure is an internationally benchmarked model in which faculties and departments are reorganised into colleges and schools, across multiple sites, with professional support services rendered centrally. It is aimed at achieving structural and functional efficiencies, streamlining reporting lines, and effectively removing one layer of bureaucracy.

From as far back as 1946 when the first discussions between the University of Natal, the Council for Scientific and Industrial Research (CSIR) and the forerunner of the South African Sugar Millers' Association Limited (SASMAL) began, the UKZN has had ongoing interaction with other actors within the milling industry. Over time, this has continued to grow. Across the College of Agriculture, Engineering and Science, there is ongoing engagement and collaboration between the university, the millers and the growers, and private-sectoral intermediary organisations. This has arisen as a result of a 'couple of people who knew each other very well, or moved from industry to academics or vice versa, and were given the freedom to explore and try out different things' (UKZN academic during an interview). There are high levels of collaboration in research, especially at the postgraduate level. Sugar production is no longer formally part of the syllabus for Applied Chemistry as it was in the 1970s and 1980s. There have, however, been efforts recently, especially on the part of SASMAL and the SMRI, to increase the exposure of engineering and chemistry students to sugar production in order to address the need for high-level skills in chemistry and engineering owing to the problem of an ageing population.

#### ***Durban University of Technology***

The DUT arose from the merging of two technikons, ML Sultan Technikon and Natal Technikon, in 2002. Initially named the Durban Institute of Technology, it changed to a university of technology in 2006 to align itself with the naming conventions of the other universities of technology. The university's linkages with the sugar sector date back to the 1900s. ML Sultan was founded after having followed a process of acquiring a training facility for settlers from India who arrived in Durban to work in the sugarcane plantations. The need for a technical training facility for the sugarcane workers and their families pushed private donors, the Durban City

Council and the government to build what ultimately became the ML Sultan Technikon. From this humble base, the university in its present form now accommodates over 25 000 students across six faculties, on seven campuses in both Durban and Pietermaritzburg. Only 2% of students progress to postgraduate level and undertake the MTech programmes. The remainder fall into the national diploma and certificate programmes characteristic of universities of technology.

From its beginnings as a technikon, the DUT has placed significant emphasis, in both its vision and mission statements, on its intent to 'develop leadership in technology' through excellence in teaching and learning, technology transfer and applied research, and the critical importance of external engagement that 'promotes innovation and entrepreneurship through collaboration and partnership' ([www.dut.ac.za](http://www.dut.ac.za)). At the highest level within the institution (namely that of vice chancellor and chancellor), an undertaking to participate as actively as possible in all industry engagements demonstrates the university's commitment to these goals. In his inauguration speech in 2011, the vice chancellor made a key strategic commitment:

*Universities are constructed in a local space from which they reach out into global spaces... There is a specific responsibility that rests with our universities to produce knowledge that is contextually defined... DUT will be an institution embedded in its context but able to reach beyond it.*

#### ***Mangosuthu University of Technology<sup>8</sup>***

As one of the relatively younger universities in South Africa, the MUT was borne out of a proposal by the chief of the area at the time to specialise in technical training, filling a gap in industry for technicians. From these early days, infrastructure investment in the university by the sugar industry (notably the SASMAL and the SMRI) allowed the university to include engineering as one of its core focus areas. The MUT, during the 1980s, offered a diploma in sugar technology. Arising from its geographic location within the Umlazi township south of Durban, the university offered technical programmes to students from disadvantaged communities. Noting its core purpose

as ‘contributing to the advancement of vocation-based education and training (E&T) that will enhance the country’s skills and competitiveness’, the MUT aims to provide ‘advanced, technology-based programmes and services that are career- and business-oriented in the broad fields of engineering, natural and management sciences’.

The MUT is unique in KwaZulu-Natal in that it is the only single-campus university. It serves approximately 10 000 students, all of whom are at an undergraduate level. It is also categorised as a rural university, as it serves predominantly poor students, yet it is located within the greater urban area of Durban. Limiting its academic programmes to three faculties (Management Sciences, Natural Sciences and Engineering), the MUT has been able to identify niche areas for research relevant to these faculties and to the communities it serves, namely: renewable energy, algal biotechnology, ethno-botany, food security, service delivery, English as a second language, and radio communication in rural areas.

Following a period of being under administration, the university appointed an entirely new executive-management structure.<sup>9</sup> It is hoped that this executive-management team, formed from a wide diversity of institutional backgrounds, will bring a stronger intellectual-resource base to the university. A 2012 strategic plan clearly outlines the intention to increase knowledge production outputs through research and other collaborative projects. The MUT has identified the potential to exploit links with industry, develop a technology transfer system, and to further industry consulting and research. A dedicated executive in the office of the vice chancellor has been appointed to be responsible for partnerships and has identified industry stakeholders as a key partner.

These brief summaries show that the four universities differ not only by type, but also in respect of historical trajectories, both of which shape their current capabilities to respond to the needs of industry in their local contexts.

### Organisational competences and interactive capabilities

Basic institutional competence to offer relevant programmes is a necessary but not sufficient

explanation of why firms choose to interact with a specific university. Table 13 provides comparative proxy indicators of the competence of the academics in the four universities in terms of the relative proportion of staff with doctoral degrees, the number of research publications they produced, and the percentage of new doctoral entrants in science and technology that were graduated. UniZul has a relatively similar profile of academic staff with doctorates to that of the UKZN, as both were traditionally academic universities. Most of these staff are at the level of professor or associate professor, and more than half of the senior lecturers have a doctoral degree. The overall percentage of staff with doctorates is much lower at the UoTs, given that, historically, their emphasis was on vocational and technical training and less on academic scholarship. With the recent spotlight on university performance indicators and increased competitiveness for students, third-stream income and rankings, this profile of the UoTs is changing.

The similarities between the UKZN and UniZul in respect of academic scholarship end there. With significantly lower publication units per academic, being located in a rural area, and with very little in place to manage the performance of academic staff, rigorous scholarship has been lacking at UniZul.

**Table 13: Staff qualifications and publications, across the four universities**

	UniZul	UKZN	DUT	MUT
<b>Total academics</b>	246	1 444	562	135
% of professors	9%	11%	3%	0%
% of associate professors	6%	12%	8%	6%
% of senior lecturers	20%	19%	27%	8%
% of lecturers	65%	57%	62%	86%
<b>With doctorates</b>	83	515	56	6
% of professors	97%	80%	35%	0%
% of associate professors	93%	70%	42%	8%
% of senior lecturers	53%	51%	16%	12%
% of lecturers	14%	14%	2%	4%
<b>Publication units produced</b>	69	1 057	43	5
<b>Units per total academics</b>	0.3	0.7	0.1	0.0
<b>Units per total academics with doctorates</b>	0.8	2.1	0.8	0.7
<b>% of new SET doctoral entrants graduated</b>	19%	47%	26%	0%

Source: CHET Open Data (2008–2010)

The time allocated to research (and, therefore, the competence to undertake research) is much lower at UniZul and on a par with the UoTs. Table 14 compares the distribution of time over key activities. The MUT's commitment to growing its research output is clearly reflected in the allocation of time.

**Table 14: Distribution of lecturers' time, across the four universities**

	UniZul	UKZN	DUT	MUT
Teaching	60	45	60	50
Research	20	40	20	30
Private activities	0	0	5	0
Community engagement	10	10	5	10
Administration	10	5	10	10

Source: Project data

### **Teaching and learning – policy, strategy and structures**

Each of the universities has distinct competences in respect of formal teaching and learning structures and strategies, including curriculum review and industry input. Over and above these formal measures, academic and management staff across all of the universities acknowledged the critical role of industry engagement in informing the content and methodology of their teaching and learning activities, yet reflected various levels of motivation for and commitment to their industry partners. In this section, we review these structures and strategies, as well as the willingness to interact with industry.

UniZul has only recently introduced a teaching and learning strategy and is in the process of developing a teaching and learning charter for all staff and students. There was general agreement among academic staff that the curriculum should be sensitive to the need for change, as well as informed and approved through faculty board meetings and industry inputs, so that the university continues to teach courses that remain relevant. On a less formal basis, individual tweaking of content and delivery (e.g. the use of smart boards and online content) could certainly be done easily. An example reported is a recent visit to Umfolozi Mill by a senior lecturer in physics with the intent of finding ways to make learning more engaging and relevant through both experiential learning and innovative, joint problem solving of class-work

examples. However, such initiatives depend on the motivation of the individual academics. This particular lecturer commented that 'industry is very open ... it all depends on you'.

The university agronomy programmes do teach about individual crops, of which sugar is one, but in no more detail than for any other crop, with there being no crop specialist in the department. This mirrors the view expressed by many academics across the four universities, namely that universities do not teach students to be specialists, but rather to be generalists so that they can work in any industry.

In comparison, the UKZN showed high levels of structural organisation and functional integration in the manner in which it manages teaching and learning within and across the schools, at college level, and across the colleges. In terms of internal interface structures, teaching and learning is led administratively by the Deputy Vice Chancellor: Teaching and Learning and guided by a Teaching and Learning Strategy Group made up of the Dean: Teaching and Learning in each of the four colleges. Within the schools, each school has a teaching and learning leader (broken reporting line to the dean of the relevant faculty) who is responsible for leading the teaching and learning committee at school level. This is further devolved to cluster leaders across subprogrammes of the school. In respect of the curriculum, the school teaching and learning committees are responsible for making recommendations on curriculum changes and qualification structures, which recommendations are then submitted to the College Academic Affairs Board for internal approval before external accreditation and approval are sought. In addition to this, programmes offered through the School of Engineering have to be accredited by the Engineering Council of South Africa (ECSA), and, in the course of this process, a range of industry partners is robustly engaged. There is a University Teaching and Learning Office (ULTO) that supports the Strategy Group, running workshops and presentations on an ongoing basis.

A similar body, the Centre for Excellence in Learning and Teaching (CELT), is the DUT's key internal interface structure across all faculties for the

coordination of academic development activities – among which are those centrally managed and administered and those designed and implemented at department level. As a support unit, it does not directly intervene in curriculum development and review or programme issues, but provides support with regard to broad areas of e-learning and multimedia in teaching, as well as other interventions related to teaching, learning and assessment. The realm of programme development and review remains the mandate of traditional industrial advisory boards, which constitute a key external interface structure. These are mandatory across all departments. In the engineering departments, as is national practice, programmes are validated by the ECSA as the professional body through an ECSA accreditation process. The ECSA sets the outcomes and structures for the qualifications offered and the Industry Advisory Board determines the detail in the programmes to be offered. Guided by the ECSA, the departments make recommendations concerning the qualifications to be offered by the university. With the current move from BTech programmes to BEng Tech, the ECSA is responsible for restructuring so that industry still ‘buys in’ to the value of the programmes. Like the UKZN, the ECSA also undertakes regular reviews of the engineering programmes. To prepare for this review, the DUT has an internal review one year before the ECSA review.

In addition to these organisational structures, a General Education Task Team (GETT) was established to lead the process of curriculum renewal at the DUT – a process intended to move the curricular programmes towards achieving a specific set of graduate attributes developed by the DUT.<sup>10</sup> This task team works through the Curriculum Renewal Champions designated within each faculty to drive the curriculum renewal process. Similar to the UKZN, teaching and learning are coordinated to some extent at all levels of the university.

While there is no clear evidence of a teaching and learning strategy, the MUT articulated its expectations in respect of teaching and learning in its 2012 institutional strategic plan. Among the key activities listed is the establishment of a teaching and learning unit. Based on feedback received from

industry advisory committees, the Teaching and Learning Development Centre (TLDC) is actively looking at ways to make the curriculum more relevant (e.g. by including more communication skills and by focusing on improving the computer literacy skills of students before they move on to work-integrated learning programmes and/or graduate).

#### ***Professional support and development – policy, strategy and structures***

Related to, and feeding into, the teaching and learning ethos at these universities is the capability demonstrated by the universities to support and develop academic staff professionally.<sup>11</sup>

At UniZul, there was a sense that the university does a fair job in keeping staff updated and on board regarding developments within broader education policy and teaching practice. An example noted on the website was the hosting of a Council on Higher Education (CHE) workshop on the proposed undergraduate structure. This workshop was open to all UniZul academics, support staff and the student community. Since there is no performance management system currently in place, academics are promoted on the basis of teaching and learning experience and not performance. This is currently under review, with proposals being considered to look at recognising teaching and learning, research, and community engagement.

The UKZN has a performance management system in place which measures both research outputs and the extent to which staff commit to community-engagement programmes. The ULTO offers quarterly seminar series for academics and an annual conference for staff. In the School of Agriculture, Earth and Environmental Sciences, staff from industry teach short courses. Through this, UKZN staff benefit by having access to real-time research tools, equipment and materials from industry, with there being some two-way learning and skills transfer taking place.

The CELT at the DUT provides ongoing academic and professional development for all staff across all faculties and aims to engage staff in debates and workshops about the scholarship of teaching and

learning. However, the university has had difficulty in implementing a performance management system, and the extent to which this happens is highly dependent on the deans of faculty and the heads of department. The Faculty of Engineering and the Built Environment also reported that a skills budget from the Skills Levy is provided for each department and so supports individuals undertaking continuous professional-development programmes as required by the ECSA. The Enterprise Development Unit (EDU) has a role in continuing education, with one of its delivery pillars being lifelong learning.

While information on professional development at the MUT was limited, it was noted that recent funding was secured for the Department of Analytical Chemistry to embark on an industry exchange programme that will not only professionally challenge academics who enter the workplace, but will also provide students with 'real-world' learning.

#### ***Community engagement – policy, strategy and structures***

'Community engagement' is a broadly inclusive term describing a planned, elective process by which the university interacts for specific purposes with actors external to the university – generally at a collective or organisational level. Across the four universities, the activities, the approach and the scope of community engagement differ. An element of two-way learning between the university and its community is evident in many of the examples cited by these universities.

In UniZul's annual report for 2012, community engagement is described as an integral part of its mandate. While no formal policy for community engagement is currently in place, a proposal for a new policy was developed by the Community Engagement Working Group (CEWG) in 2013 as part of the university's transformation to a comprehensive university. Funding has been secured for a 'distinguished community-engagement practitioner' recognition award. However, it was not clear from the documents reviewed that the university has a clear definition of the community it is wishing to engage, nor whether this includes industry broadly and the local sugar sector specifically.

A comment that was made by more than one academic was that industry 'needs to know that we are here'. As an example, one of the significant stakeholders of the university agriculture department is the provincial Department of Agriculture. In this regard, it was stated: '(we) have tried to (involve them), but (they) just do their own thing'. It was also suggested that with their own internal capacity, entities such as the SASRI 'don't need people from the outside' and, as a result, have never engaged with the university. However, one of the departments in the university acknowledged that a network map of potential stakeholders with which to engage had not been drawn up. Opportunities to work with communities which are planting sugar had also not been considered. In addition, it was suggested that, as sugarcane needs lots of space in which to grow, it was difficult for the university to embark on such a crop-specific programme independently of working with firms or through small growers.

The establishment of the second campus in Richards Bay is intended to strengthen ties with industry and the business community in the area. The business plan for this satellite campus was co-developed with industry and includes the local authority and the local FET college.

The UKZN views its communities as including both professional and social groupings, non-governmental and community-based organisations, government, business and industry. As with teaching and learning, the function of community engagement is not centralised at the university, but rather part of each college, and led within each school. Over and above direct formal links to the sugar sector through the SMRI and the South African Sugarcane Research Institute (SASRI) [governed through memorandums of understanding (MoUs) and memorandums of agreement (MoAs)], the UKZN liaises closely with the ECSA, local chambers of commerce, AgriSETA, the South African Chemical Institute and the South African Institute for Agricultural Engineering. On the recommendation of the ECSA, the university has adopted the industrial advisory committee structures of the UoT model to guide and inform curriculum development and research. It was reported that the ECSA is increasingly paying

attention to the extent to which the universities (and the UKZN specifically) are engaging industry. The ECSA also maintain a presence for the purpose of quality assurance and undertakes audits.

In view of the close links with industry required by work-integrated learning (WIL), the Cooperative Education Unit (CEU) is the dominant department at the DUT that works with and through industry. Its mandate is to 'build relationships' with industry, and, although its key focus is WIL and casual-student employment placements, the CEU also facilitates linking specific firms with academic departments for research purposes. Tongaat Hulett, Illovo, the South African Sugar Association (SASA) and, more recently, the SMRI are all key partners. The EDU also has community engagement as one of its key mechanisms for liaising with industry. Key individuals at the SASA have described the DUT as their preferred university for recruiting students for some of their internships and bursaries, because the DUT responds to their calls for assistance.

In its most recent Higher Education Quality Committee (HEQC) audit, community engagement at the MUT was described as fragmented and underreported, and, as a result, a structure and framework within which community engagement will happen in the future has been approved by the university Senate. It was reported that 'MUT needs to sell community engagement to all stakeholders to attract more resources to address social challenges through specific interventions' (Manager at the MUT during an interview). Thus, the MUT will be looking to work with firms that are seeking ways to spend their corporate social responsibility budgets. The MUT engages staff through academic research that is community-based, and students through student volunteerism.

#### ***Research, innovation and technology transfer – policy, strategy and structures***

UniZul has few mechanisms for maintaining a robust commercialisation element from its academic output. The portfolio of the Deputy Vice Chancellor: Research and Innovation has been filled recently, and projects and programmes are still being developed. At an academic level, projects co-evolved

and undertaken with industry are on an ad hoc basis, driven through personal networks. Examples cited included an entomology project on the rehabilitation of land back to sugarcane from a heavy metals mining plant (with the SASRI), and the impact of climate change on sugarcane production. However, academics interviewed from both the agriculture and physics departments expressed the view that research undertaken in partnership with industry has multiple benefits – not only does industry benefit by finding a solution to a current issue, but the university also benefits from using equipment supplied by the firms and from physical-resource allocations. Moreover, staff from both industry and the university learn from each other and from the project itself.

At the UKZN, the appointment of a senior executive (Pro-Vice Chancellor: Innovation, Commercialisation and Entrepreneurship) gives credence to this element of work for the university. The mandate of the Intellectual Property and Technology Transfer Office (IPTTO) is to manage all intellectual property for the university according to its Commercial Initiatives Policy that determines a 40%/40%/20% split for any intellectual property developed (inventors/university/UKZN Innovation Centre). The UKZN Innovation Centre was established over 20 years ago and is a precursor to the new business incubator, INCUBATE, for promoting commercialisation, entrepreneurship and research at a postgraduate level that can unlock possible third stream revenue. Structures such as the Technology Innovation Agency (TIA), the Technology and Human Resources Programme (THRIP) and the National Research Foundation (NRF) were also cited as intermediaries used by the university to connect academics with research funding (particularly in engineering).

In departments such as chemical engineering and mechanical engineering, research links with the sugar industry are maintained mostly through formal networks with the SMRI, the SASMAL and Tongaat Hulett. These research projects are not limited only to students undertaking postgraduate studies, but include those students who are in their final year of undergraduate study. In chemical engineering, the projects are either in the laboratory (processing)

sphere or in design: three to four laboratory projects per year are directly linked to the sugar industry, based on industrial problems that need solving, with design projects being focused on optimisation of the plant. In addition, these two departments also have part-time Masters students employed at the SMRI for research purposes, and it was noted that, in the future, there will be an SMRI Chair in the School of Engineering. In terms of the SASRI's commitment to the university, the full salary of a professor for the UKZN's agricultural engineering programmes is paid by the sugar industry. There is also a South African Research Chairs Initiative (SARChI) Chair in Rural Agronomy and Development, which may link with small sugarcane growers in the future. The SASA will also be sponsoring a research chair in the School of Agriculture. These formal agreements reflect a degree of interactive capability on the part of departmental and university management.

At the DUT, a Technology Transfer and Innovation Office was established in 2008. This office has developed a set of policies relating to the intellectual property of the university and has links into the National Intellectual Property Management Office (NIPMO). InvoTech is a recent development. Established in 2011 as an innovation incubator by the Enterprise Development Unit, it serves as an external interface structure for facilitating interaction with small, medium and micro-enterprises (SMMEs) and industry.

Within the Faculty of Engineering, there is a technology station (focused on moulded and reinforced plastics), which employs 11 staff.<sup>12</sup> Only one project involving the sugar industry was cited. This technology station is intended to design, make and test products for industry, and this generates additional revenue from industry problem solving. The technology station is predominantly focused on consulting and joint research projects with industry.

With no postgraduate programmes in place, the core of the MUT's research and innovation is staff projects. The 2012 strategic plan identified opportunities for the university to explore potential links with industry through a technology transfer platform and industry consulting. A recent appointment of an executive director: partnerships

was made in the Office of the Vice Chancellor and one of the first priorities in the 2014 academic year was to develop a framework for partnerships (and industry linkages specifically). Since the university is fairly small, the technology transfer and intellectual-property functions are currently carried out within the Research Directorate. There are a number of distinct niche areas which have been identified for the MUT's research drive, and funding is directed towards these niche areas. One of these is algae biotechnology and there is a tenuous link into sugar through biofuel production. It was noted that the TIA is looking at establishing a platform for sugar biotechnology/biofuel in KwaZulu-Natal, and this will promote stronger linkages among all public providers and industry. The MUT is proud of its improved ranking in respect of research outputs and is leading a drive to improve the capabilities of its academic staff by insisting on a Masters degree as a minimum qualification for teaching. Currently, the university is negotiating the details of an MoU with the CSIR to participate as part of a consortium in more science and innovation research, with the CSIR actively looking to engage 'rural universities'.

#### ***Transition to the workplace – policy, strategy and structures***

WIL is the most common strategy for universities to ensure that the graduates which they produce are 'prepared for the world in which they will live and work' (CHE 2011). WIL is intended to 'foster university learning that is less didactic and more situated, participative, and "real world"-oriented.' (CHE 2011: 4)

Across the four universities, different levels of WIL, cooperative learning, service learning, work experiential learning and internships were evident. In the UoTs, these were much more structured and were administered by a directorate solely responsible for securing the placement of students in industry (the Cooperative Education Unit), with guidelines for assessment and performance review of the student while placed in industry (logbooks, projects and presentations). For three-year-diploma students, WIL is a compulsory requirement for the accreditation of the qualification.

The engineering departments at the DUT consider themselves as having a much stronger relationship

with industry than traditional universities because of WIL. While the WIL placements are coordinated by the Cooperative Education Unit, the academic staff within each department are expected to play a central role in monitoring, supervision and support of students during their placements. Industry advisory committees (liaison committees) continue to operate and are comprised mostly of stakeholders from industry. Sugar is represented on all of the industry advisory committees (IACs) for engineering and the sciences through a technical expert or engineers employed at the firm. However, while the DUT invites input on curriculum review from the industry stakeholders through the IACs, it is firmly of the view that curriculum programmes are not tailored for any one industry.

At the MUT, the Cooperative Education Unit leads the process of WIL, using a formal policy and procedure. Each staff member is expected to supervise between two and four students annually in their placements, which facilitates direct contact with the industry supervisor. The MUT is encouraging all departments in which WIL is not mandatory to introduce it as part of their academic programme. The Cooperative Education Unit also plays a role in assisting students with career placements, supported by a Student Counselling Centre. An annual careers fair was launched in 2012, with many industry stakeholders exhibiting, including Tongaat Hulett.

In the comprehensive- and research-university environment, WIL is not as highly structured, is less rigorous, and, where it is in place, is not enforced through university policy, but through professional bodies responsible for programme accreditation.

At UniZul, there is a policy for WIL in place, but it is not implemented evenly in all faculties. The minimum participation requirements are programme-specific and are dependent largely on the policy laid down by professional bodies, as well as the accreditation requirements of the HEQC or even of the South African Qualifications Authority (SAQA). The Deputy Vice Chancellor: Teaching and Learning is the interface with the HEQC, but it is the responsibility of the faculty or department to network with industry and find appropriate placement

opportunities for students. A unit for cooperative education exists within the Faculty of Education, as teacher training and in-situ placements constitute the core of its teaching and learning programmes. On account of it being a rural university, and one which has not had a reputation for excellence in the past, it was reported that many companies are reluctant to accept students for placement. Greater collaboration between the academic staff and the industry supervisor will need to be built over time for this to become more successful.

In an interview with management, it was revealed that students studying agriculture have expressed an interest in undergoing self-funded, voluntary experiential training during their vacation time. Without a formal mechanism in place to obtain feedback from industry on the quality of its graduates and, as such, its academic programmes, the university falls back on informal professional settings such as conferences. The head of the agriculture department commented that most industries with which the department interacts generally do not have a developmental approach – they expect the university to ‘deliver’ students who are experienced. Generally, firms that offered bursaries ‘took care of’ the students.

There is no WIL programme formally in place at the UKZN, nor is it required by the university. IACs are in place within each of the engineering programmes, and, although, this varies across programmes, there are representatives from the sugar industry on each. IACs meet once a year, with a focus on curriculum reform. Representatives from industry provide valuable critique on where graduates may need additional support. Communication skills are identified as the leading area for development. Reflections from these meetings are fed back at programme level and are integrated into materials development and review or the development of elective modules (e.g. a new elective on has just been developed). One of the significant feedback loops for the university is that many of the members of this IAC are alumni of the university and are thus able to use their knowledge and experience of both the university and the workplace to make informed recommendations. From this structure, many joint research projects have arisen.

Other mechanisms and strategies outlined by the universities include student counselling and career guidance, vacation recruitment, graduate recruitment through a university-run recruitment office, graduate tracer studies and/or research on workplace learning. The selection of students for company-sponsored bursaries (with or without work-back options) was also reported. For example, at the DUT, within the Student Support Team, the Student Financial Aid Office manages a range of financial assistance programmes, including the Sugar Industry Trust Fund for Education (SITFE).

#### ***Mechanisms/strategies for interaction***

As shown in Appendix table 4, among the four universities, different internal and external interface structures and mechanisms to support interaction with external actors and for learning through interaction, are evident. Some of these trends can be attributed to institutional differentiation. For example, the UoTs have a higher number of formal, external interface mechanisms with industries (through structures such as the advisory boards and the WIL coordinated jointly by cooperative education structures and academic departments). The traditional academic-research university has a higher number of informal networks established through years of collaborative research and project work. However, the comprehensive university is struggling to realise its potential to straddle both these types of networks.

The formal mechanisms in place at the DUT and the MUT have facilitated ongoing engagements between the two universities and industry. However, with the limited interview information from the MUT, it is difficult to compare how the two UoTs have capitalised on these interfaces. What was evident is that the DUT has both formal mechanisms and informal networks (such as representation on committees, professional associations and networks), which increase the university's capacity for learning and linkages.

The UKZN has built on the solid legacies of the pre-merger institutions through its bilateral partnerships with different stakeholders in the sugar industry for the purpose of research, shared teaching, joint projects, and infrastructure, among others.

Despite its geographic positioning, UniZul does not seem to have the same confidence in its own capacity for developing linkages, systems and processes with industry. It is growing an internal resource base which will explore these avenues in future years. Although it has already begun exploring some of the internal and external mechanisms necessary for this, it has far to go in this sector in terms of its interactive capabilities.

#### **Sensing and learning capabilities – keeping up with changes in the environment**

In order for these interactive capabilities to be manifested in responsiveness to changing skills needs, the universities have to possess the capabilities to sense and respond to changes in the environment and to integrate what has been learnt into their teaching and learning activities. The effectiveness of the universities to sense and respond to relevant changes in the sugar SSI was assessed through a self-reported measure of dynamic interactive capabilities (see Table 15).

Overall, the UKZN and the DUT scores reflect a sense that the universities believe that their ability to collaboratively integrate and share their knowledge within their departments is effective, and that their ability to coordinate their activities with one another is dependent on their individual skills, ability and knowledge. UKZN Management was slightly more critical than DUT Management of their ability to sense changes in the business environment and to learn from these changes (in both industry-specific and broad-based education contexts), although, at academic level, these scores are more on a par with each other. UniZul has demonstrated, from the responses of both management and academic staff, that its ability to sense changes and to learn from these changes is poor, but that, despite this, the extent to which it is able to integrate and coordinate with one another is somewhat more effective. Similar to UniZul, respondents at the MUT reported low levels of capabilities to sense changes in the environment, but considerably higher levels of learning, integrating and coordinating capabilities. Although these scores may seem surprising, they may reflect the entrepreneurial organisational culture that the MUT is attempting to develop.

**Table 15: Dynamic interactive capabilities index score of the universities**

		Sensing capability	Learning capability	Integrating capability	Coordinating capability	Dynamic interactive capability (overall)
University	Number of participants	Mean (average)	Mean (average)	Mean (average)	Mean (average)	Mean (average)
UniZul	3	1.92	1.56	2.33	2.33	2.03
DUT	4	3.19	2.67	3.00	2.85	2.93
UKZN	4	2.56	2.75	3.90	3.80	3.25
MUT	2	2.00	2.83	3.60	3.20	2.91
<b>Overall scores</b>	13	2.52	2.46	3.22	3.08	2.82

Source: Project data

Notes:

1. Scale: 1 = Not effective; 2 = Somewhat effective; 3 = Effective; 4 = Very effective.
2. The data reflect (average) responses of individuals at the level of management at the university and in selected departments relevant to the sugar sector.

The extent to which each of these universities assessed its own dynamic interactive capabilities correlates well with its relative functional and organisational competencies.

The universities can be ranked on a continuum from low to advanced levels in terms of the extent to which functional integration and organisational routines within the university and effective linkages with outside stakeholders has advanced the development of interactive academic capabilities (see Appendix tables 1 and 2).

**Summary: Differing levels of interactive capabilities among the universities**

It is evident from the analysis above that the UKZN and the DUT have an advantage over the other two universities in terms of historical links with the sugar sector and their interactive capabilities (see Appendix tables 1 and 2). These universities are the oldest, most established and most well-resourced universities in the province. Both the UKZN and the DUT have formal technology transfer functions in-house, which functions lead and manage the intellectual property of these two universities. The UKZN, however, leads in respect of the diverse mix of programmes it offers, the high publication rate per academic, and the extent of its functional integration. The UKZN’s appointment of a Pro-Vice Chancellor: Commercialisation, Entrepreneurship and Innovation is testimony to this. An important advantage enjoyed by the UKZN is its close ties with industry, which ties are facilitated by individual academics and through formal linkages with the main private-intermediary organisations.

Overall, both the MUT and UniZul ranked low in terms of their functional competencies to build linkages with industry and promote integration across faculties. Although UniZul has a greater mix of programmes and a higher publication output than the MUT, this is only by virtue of it being a comprehensive university with postgraduate programmes and a longer expectation of research performance. Positioned closer to sugarcane growing and milling areas, the MUT and UniZul could play an important role in contributing to skills development needs in the sector and could, in turn, benefit from industry support (which could contribute to building their functional and organisational competencies). They however need to build the capabilities to do so. The analysis suggests that the lack of motivation to engage at UniZul is a major drawback. Strong leadership and an entrepreneurial organisational culture, supported by formalised structures, were found to be essential in facilitating linkages with industry.

**Interactive capabilities and dynamic interactive capabilities of the public further education and training colleges in KwaZulu-Natal**

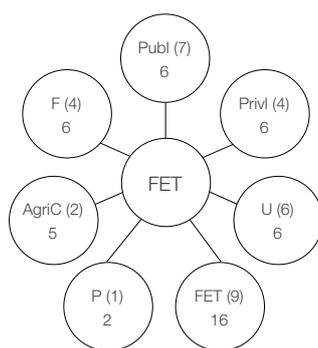
In contrast to the public universities, the public FET colleges in KwaZulu-Natal are largely excluded from the skills development networks in the sugarcane growing and milling SSI. The focus of this section is thus to explore the interactions of the FET colleges in greater depth and to investigate their capabilities to interact and respond to skills needs. We attempt to identify the factors facilitating and constraining

the development of interactive capabilities in the FET colleges. In-depth primary data was gathered at three colleges located close to sugarcane growing and milling areas, namely: Thekwini, Elangeni and Majuba. Documentary analyses and telephonic interviews were conducted with the other five colleges in KwaZulu-Natal (excluding Coastal FET College, which was under administration at the time of data collection).

### Current linkages of the further education and training colleges to the sugarcane growing and milling sectoral system of innovation

FET colleges are reported to have the fewest linkages of all the actors in the sugarcane growing and milling SSI (see Figure 14). This is despite the fact that some colleges offer agricultural programmes, all offer engineering programmes, and some are located on the Sugar Belt. For example, the Head of Academics at one college reported that she drove past sugar mills on her way to work every day, but it did not occur to her to form collaborative linkages with milling companies or growers. Only 'isolated instances' of interaction were reported between the college and the major sugar-milling companies, with such interaction involving the sporadic placement of students who relied on the efforts of a lecturer in agriculture.

Figure 14: Average interaction of the FET colleges



Notes: See Figure 7.

Figure 14 shows that the highest frequencies of FET college interaction are with other public E&T organisations, especially other FET colleges and public-intermediary organisations. The focus colleges reported 'wide- to moderate-scale' interaction with the other FET colleges in the province and with the two SETAs. Principals and

management regularly interact in formal and informal forums in order to discuss issues related to the college sector. It was reported by most of the participants that the colleges use the interactions to learn from the experiences of other colleges, especially the more well-resourced colleges and the colleges involved in donor-funded college development programmes. Some of the colleges also reported interaction with the agricultural colleges in the province. For example, an agriculture lecturer at Elangeni reported 'wide-scale' interaction with the Cedara College of Agriculture, as Elangeni does not have all the facilities required to run its agriculture centre and thus uses Cedara's facilities and equipment.

SETAs have been a valuable ally in establishing contact with companies. The Manufacturing, Engineering and Related Services SETA (merSETA), for example, included the colleges in its road shows. AgriSETA actively set up connections between Elangeni and the Cedara College of Agriculture, the municipality and local farmers. AgriSETA has also played a large role in graduate placement.

Hardly any relationships were reported with firms. Those that do exist are mainly 'isolated instances' where lecturers (or the staff responsible for student placements) contact firms/farmers to request opportunities to place students who are interested in sugar production specifically. At Elangeni, the placement officer indicated that he had contacted Illovo and Tongaat Hulett with regard to student placements, but had not received a response. A common perception conveyed in the interviews with the milling companies and private-sectoral intermediaries is that FET colleges offer education and training at a very basic level, not much different from that offered at matric level. Some industry participants also indicated that, since the FET colleges have undergone major restructuring, they are unsure of which qualifications the colleges provide and of the quality of their qualifications.

There were 'isolated instances' of interaction around artisan training involving Majuba FET College. Lecturers reported that Illovo and Tongaat Hulett on occasion send their workers to Majuba for artisan training, particularly trade-test preparation.

The Shukela Training Centre (STC) sends its students to complete their trade tests. Umfolozi and Majuba are the only colleges that have an artisan training centre. In terms of the policy of the Quality Council for Trades and Occupations (QCTO), providers cannot be both trainer and trade-test centre for the same students. The STC and Majuba therefore exchange students for training and testing. STC students travel for four hours from Durban to do trade tests in the various disciplines offered (e.g. boilermaking, rigging, fitter and turner, instrumentation, hydraulics, instruments, refractories, and bricklaying).

Some interaction related to learnership placements with grower councils, the South African Cane Growers' Association (SACGA), the SASMAL, the SASA, the SASRI, the SMRI and universities, was also reported.

Table 16 tabulates the summarised responses received from the colleges via telephonic or personal interviews. A range of possible reasons were provided for the lack of involvement in the sugar SSI, particularly the college not seeing itself as part of the Sugar Belt, and the fact that the curriculum is determined centrally. The National Certificate (Vocational) (NCV) curricula provide general foundational programmes, so that sugarcane growing and milling are not specifically included. In short, colleges do not view the sugar sector as a potential partner, despite its economic prominence in their local region.

**Table 16: KZN FET college interactions with the sugar sector**

Coastal KZN	No data
Elangeni	Does not work with the sugar industry – is willing to, but requires industry to invite it
Esayidi	Not involved in the sugar industry – curriculum is prescribed by government
Majuba	Engineering section works with Swazi Sugar and the STC (a site for training and trade testing)
Mnambithi	Not involved in the sugar sector – is situated far from the industry
Mthashana	Not involved in the sugar sector – is not on the Sugar Belt
Thekwini	Not involved in the sugar sector – perceives the Sugar Belt to be further north, although it is close to sugar-related industries
Umfolozi	Not much interaction with the sugar sector, although it is close to sugar mills
Umgungundlovu	Not involved in the sugar sector – college has other priorities

These trends suggest that the lack of involvement of the FET colleges in the sugarcane growing and milling SSI is related to both the competencies of the colleges to contribute and to the openness of the private sector and colleges to form collaborative linkages. In the sections that follow, we highlight how changes in the FET institutional context have impacted on activities at the colleges and explore the interactive capabilities of the colleges in detail.

### **Changes in the further education and training sector**

FET colleges have had a troubled history as a result of their genesis within a racist, unequal dispensation. Their association with institutions of training for preferential white labour in the apartheid era resulted in a stigma which has been difficult to overcome, and perceptions of vocational training as 'inferior' still persist in a society which appears to value university education as 'first prize' (see Sooklal 2005; Badroodien et al. 2004).

Only after 1994, when the new and democratic government turned its attention to public FET colleges, has there been sustained interest in growing the vocational-education system. Consequently, since 1998 and the implementation of the first FET Act, FET colleges have been subjected to ongoing turbulence in their environment (see McGrath 2004). Policy initiatives have affected all aspects of college operations, including curricula, staffing, staff development, student recruitment, funding, and employment conditions. While colleges anticipated moves towards autonomy, it became clear from policy enactments that the limits of autonomy were being very clearly defined, at least in matters of staffing, curricula and funding, as described below.

The new FET Colleges Act of 2006 instituted changes in employment arrangements: staff moved from provincial departments of education into the employ of college councils, except for top management. This process was not yet completed when the DHET was created in 2009 and a decision was taken to centralise FET colleges under the control of the new national department. The FET Colleges Amendment Act of 2012 started a process of migration from provincial departments of

education (DoEs) to the national DHET, whereby college staff were shifted back from the employ of the college councils to the national DHET. These rapid institutional changes have created a climate of uncertainty and insecurity for individuals.

In terms of curricula, the National Technical Education (NATED) programmes, particularly in business studies and engineering, were widely considered to be outdated and in need of modernisation. The DoE in 2006 therefore undertook a massive curriculum development process intended to replace the N programmes with new National Certificate (Vocational) programmes. These were rolled out from 2007 across 11 fields, ranging from construction to hospitality. The new programmes, which were acknowledged to be cognitively more challenging than previous college programmes, were hastily implemented, with lecturers trained via a 'cascade' methodology. A complex system of assessment and moderation was set up with which lecturers had to comply. Colleges were instructed to recruit large numbers of students into these nationally funded 'flagship' programmes. In such an institutional context, the first cohorts of NCV students proved to be hugely disappointing, with high failure and dropout rates.

Some colleges shifted all their provision towards NCV because of the instruction to phase out N programmes and therefore no longer offered this popular route to potential artisan certification. Other colleges that faced a huge demand from students for N programmes, and which were unwilling to shift to the unfamiliar NCV, found themselves on the edge of bankruptcy without funding and experienced precarious financial times. From 2010, the new DHET reinstated and funded the NATED programmes alongside the NCV, based on calls from industry, pending a more thorough process of re-curriculum. These FET curricula are all centrally determined and colleges have very limited space (and, it seems, capacity) for input or localisation.

Regarding student matters, colleges have had difficulty with student retention and success, especially in the NCV programmes. Reasons cited include inadequate levels of schooling, poor student

discipline, underprepared lecturers and the socio-economic conditions of learners (see Papier 2009). Some colleges resorted to restricting their intake to learners who had passed matric, but this led to problems of duplication and lack of progression. Students do not want to repeat subjects like languages and life orientation. A national discussion thereupon ensued on an 'accelerated NCV' for post-matric students. Since 2011, FET college students have enjoyed funding from the National Student Financial Aid Scheme (NSFAS), to which they had no access previously, but, due to high demand for bursaries, there has been student unrest annually when funds are depleted or transport and accommodation allowances are not available. The Ministry has come under fire for continuing to publicly advocate that students enrol at FET colleges with the assurance of bursary funding when colleges are struggling to accommodate students or their bursary allocations are not forthcoming.

The White Paper for Post-school Education and Training of 2013 places FET colleges at the heart of skills development and proposes to grow the sector so that it caters for a million learners by 2030. It also signals greater cooperation between colleges and SETAs, including that SETAs establish offices at colleges and fund public qualifications to a larger extent.

The impact of this policy turbulence and instability in the college sector is still being felt. The migration from provincial DoEs to the national DHET is still in process and has not yet been finalised. Many councils established under the 2006 Act have reached the end of their terms of office and have yet to be replaced. A Human Sciences Research Council (HSRC) audit of colleges (see Cosser, Kraak & Winaar 2012) indicated serious problems regarding management, governance and other issues in colleges. As a result, the DHET initiated a 'turnaround' strategy in the most affected provinces, in terms of which several colleges were placed under administration. This institutional context impacts on the competences and interactive capabilities of the colleges in general, and in relation to the sugar SSI specifically – an issue that we explore in the following section.

## Interactive capabilities of colleges in KwaZulu-Natal: The provincial context

### 5.3.3.1 Size of the system and programmes offered

With 88 166 headcount students (DHET 2013), KwaZulu-Natal has the second-largest public FET college student population, accounting for 22% of students nationally (see Table 17). Colleges vary in size from 3 276 to 22 176 headcount students. Coastal and Majuba are the largest colleges.

There are nine multicampus colleges, with central offices in Amanzimtoti, Pinetown, Port Shepstone, Newcastle, Ladysmith, Vryheid, Dormerton, Richards Bay and Pietermaritzburg. Excluding the central offices, in 2011 there were 66 campus delivery sites, from five to 12 per college. Each campus has a campus manager who typically works with management at the central office to implement programmes and projects. In 2013, of the nine colleges, four had acting principals, two were under administration, and three had serving principals (the three female rectors were all in acting positions).

Table 18 disaggregates the programmes per college, highlighting variation. For instance, Thekwini and Umgungundlovu have a comparatively large NATED contingent, whereas Elangeni and Umfolozi have moved further toward NCV provision. The low percentage of occupational programmes is evident, with the exception of Majuba which accounts for 78% of headcount enrolment for occupational qualifications in the province. There is generally a heavy emphasis on formula-funded programmes, with limited diversification in the form of contract or occupational programmes (see Table 17). Colleges are therefore dependent on the funding norms linked to the DHET programmes. This appears to limit staffing and development options available to colleges, as they report that college–industry linkages and WIL are ‘unfunded mandates’. It should be noted that the definition of ‘occupational qualifications’ and ‘other’ qualifications may have been pre-coded at the data collection stage and therefore could potentially have been conflated in the DHET’s data-gathering process.<sup>13</sup>

**Table 17: Provincial FET college students by qualification type in 2011 (DHET 2013)**

Programme	Headcount	% of national	% of provincial
NCV	25 393	20%	29%
Report 191/NATED	53 007	24%	60%
Occupational qualifications	4 109	20%	5%
Other	5 657	18%	6%
	88 166	22%	100%

Source: DHET (2013)

**Table 18: Student headcount by college and programme type in KwaZulu-Natal for 2011**

Programme	Elangeni	Thekwini	Majuba	Coastal	Esayidi	Mnambithi	Mthashana	Umfolozi	Umgungundlovu	KZN
NCV	2 949	1 486	4 951	6 139	2 247	2 081	1 033	3 409	1 098	25 393
NATED	1 925	6 330	13 983	8 209	5 908	2 067	2 083	4 668	7 834	53 007
Occupational qualifications	46	219	3 242		374			154	74	4 109
Other	495	645		757	394	492	160	1 445	1 269	5 657
<b>Total</b>	<b>5 415</b>	<b>8 680</b>	<b>22 176</b>	<b>15 105</b>	<b>8 923</b>	<b>4 640</b>	<b>3 276</b>	<b>9 676</b>	<b>10 275</b>	<b>88 166</b>

Source: DHET (2013)

### ***Agriculture and engineering programmes in KwaZulu-Natal colleges***

Agriculture and engineering (electrical and mechanical) programmes are pertinent to the sugar SSI. Table 19 shows college offerings in these programmes. Three colleges, Thekwini, Mnambithi and Umgungundlovu, do not offer agriculture. In 2009, with the exception of Mnambithi (which only offered the NCV option), all of the colleges offered engineering as both an N4–N6 and NCV programme.

### **Interactive capabilities of colleges in KwaZulu-Natal: The focus colleges**

#### ***5.3.4.1 Elangeni Further Education and Training College***

Elangeni was established in the Durban South area as a result of the merger of three technical colleges: the Pinetown Technical College (ex-House of Assembly) located in the Pinetown central business district (CBD), Ntuzuma (ex-KwaZulu Administration) in Ntuzuma, and Sivananda (ex-KwaZulu Administration) on the periphery of the greater Kwamashu area. Currently, it has eight campuses: Kwamashu, Mpumalanga, Ndwedwe, Pinetown, Qadi (in Botha’s Hill), Kwadabeka, Ntuzuma and

Inanda, plus the central offices in Pinetown. Elangeni currently has an acting principal and an acting deputy principal: academic. With 5 415 headcount students in 2011, Elangeni could be considered one of the smaller FET colleges in KwaZulu-Natal, despite it being in the Durban centre.

Elangeni reported a R56-million surplus in 2012. The college is a beneficiary of a Danida SESD (Support to Education and Skills Development) project. The bulk of Elangeni’s funding is based on the DHET funding formula, with relatively few occupational programmes being offered.

A distinguishing feature of Elangeni is its strong policy base. Elangeni has a Work Placement Policy which has extended placement for the NCV programme to all programmes, including, for example, on-course placement for all NATED students (not just N-Diploma students). There is also a WBE (workplace-based experience) monitoring tool, programme development, and skills programmes. The college has made new staff appointments in order to respond to the emphasis on work placement, but these have been self-

**Table 19: Agriculture and engineering programmes by college in 2011**

<b>FET colleges in KwaZulu-Natal</b>	<b>Agriculture programmes</b>	<b>Engineering programmes (electrical, mechanical)</b>
Coastal FET College (Mobeni) Under administration until 1 September 2014	<ul style="list-style-type: none"> <li>• NCV (Primary Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical, mechanical)</li> </ul>
Elangeni FET College	<ul style="list-style-type: none"> <li>• NCV (Primary Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical)</li> </ul>
Esayidi FET College	<ul style="list-style-type: none"> <li>• NCV (Primary Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electromechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical, mechanical)</li> </ul>
Majuba FET College	<ul style="list-style-type: none"> <li>• General Studies (Agriculture)</li> <li>• NCV (Primary Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical, mechanical)</li> </ul>
Mnambithi FET College		<ul style="list-style-type: none"> <li>• NCV (electrical, mechanical (ERD))</li> </ul>
Mthashana FET College Under administration	<ul style="list-style-type: none"> <li>• NCV (Primary Agriculture)</li> <li>• Skills programmes (Organic Farming)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical, mechanical)</li> </ul>
Thekwini FET College		<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical)</li> </ul>
Umfolozu FET College	<ul style="list-style-type: none"> <li>• NCV (Primary Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical)</li> </ul>
Umgungundlovu FET College		<ul style="list-style-type: none"> <li>• Engineering Studies N4–N6 (electrical, mechanical)</li> <li>• NCV (electrical, mechanical (ERD))</li> <li>• Skills programmes (electrical, mechanical)</li> </ul>

funded. For instance, the college has appointed an accreditation manager, a learnerships co-coordinator, and a placement officer (assisted by Education, Development and Training SETA interns).

Elangeni has put a number of structures and processes in place to support and mainstream placement. The college provides student stipends for NCV WBE students and other students from college funds. Its Student Support Services had a database of companies for internships or WBE (interview with Student Support Services' staff).

The SETA was seen as having a certification function and that of quality assurer. The college had obtained ISO9001 status and adheres to Occupational Health and Safety Act (OHSA) standards as a college. The council has also approved, in addition to the additional staff and the student stipends, that the college investigate liability insurance for students entering the workplace, both as protection for the students and in response to concerns expressed by companies concerning compliance with the OHSA.

#### ***Thekwini Further Education and Training College***

Thekwini in the northern Durban area was established as a result of a merger of the Central Technical College (ex-House of Assembly) in the previously white area of Durban, Cato Manor Technical College (ex-House of Delegates) operating from two campuses ten kilometres apart, and LC Johnson Technical College (ex-House of Representatives) situated in the CBD. In 2011, Thekwini FET College had seven campuses: Cato Manor, Centec, Melbourne, Springfield, Umbilo, Asherville and the Skills Centre. The principal has been in the position since the establishment of the college after the merger in 2003. A Deputy Principal: Academic was recently appointed.

According to the engineering manager, sugar production is not a focus of the college, as 'Sugar Country' was considered to be more to the north around the Richards Bay area. In the engineering field, the college was more likely to work with the harbour, Toyota, Behr Engineering and Lever Bros.

At this college, there is an awareness of the need to interact with industry, but there appears to be limited capacity. The college is in the process of developing a WBE policy, which the placement officer anticipates will be largely based on the SSACI (Swiss-South African Co-operation Initiative) guidelines introduced through SSACI's ongoing work with the college. There is also a policy and process for offering contract training. The college offers accredited SETA programmes, which have to be substantiated via a proposal and accepted before implementation.

There are currently three channels of interaction with firms:

- The *Skills Manager* heads the Skills Unit, which is largely responsible for contract training and contracting staff to teach on the programmes;
- The *Placement Officer*, who is responsible for finding graduate placements, setting up linkages with firms, tracking students and maintaining a student CV (curriculum vitae) database, and managing WBE and other forms of WIL.
- *WBE committees* at each campus help organise the logistics at their campus and work with ETDP SETA interns.

#### ***Majuba Further Education and Training College***

Majuba was established in the Newcastle region from the Newcastle Technical College (ex-House of Assembly), which also took over a large ex-Eskom training centre, St Oswalds Technical College (ex-House of Delegates) outside of Newcastle, and the growing Madadeni Technical College (ex-KwaZulu Administration) in the sprawling township of Madadeni. The principal at Majuba is well established, with a long history at the college that predates the merger.

With 22 176 headcount students in 2011, Majuba is one of the largest colleges in KwaZulu-Natal. In 2011, there were seven campuses: the Centre for People Development, Dundee, the IT & Business Campus, the Majuba Technology Centre, the Newcastle Technology Centre, the Newcastle Training Centre and the Open Learning Unit. According to its website, the college attracts students from Dundee, Dannhauser, Newcastle and the Vryheid to Pongola area in Northern KwaZulu-Natal. It also has students

from the Free State, Gauteng and the Southern African Development Community (SADC) countries, including Mozambique, Swaziland, Lesotho and Botswana. The major industries in these areas are iron and steel manufacturing, mining (mainly coal), textile and clothing production, cement and chemical manufacturing, tyre production, engineering workshops, and primary agriculture, with ArcelorMittal being a major employer in the area.

Majuba differs markedly from the other two colleges in that it has diversified its funding base and is endowed with a trade-test centre. The college inherited a training centre from Mittal and some of the staff. This history resulted in the college inheriting a culture of being self-sustaining (interview with College Manager). Majuba responds to market demand from industry on an entrepreneurial basis and offers programmes accordingly. Within the sugar sector, the college has enjoyed productive relationships. For example, the college had an 'excellent relationship' with the Swaziland Sugar Association, predominantly in engineering (training of millwrights, welders, fitters, operators, electricians). Majuba is thus not completely dependent on DHET subsidy funding. In fact, recapitalisation funding formed only a fraction of its budget and the college had a capital fund of R100 million annually (interview with College Manager). Participants at the interviews attributed the success of the college to the innovative financial management and leadership style.

Key objectives set in the college strategic plan drive industry linkages:

- WBE – staff and students;
- Placement during training;
- Post-training – placement of students in employment; and
- College linkages/partnerships.

The college has developed a College Improvement Plan for each campus and for the college as a whole. This involves identifying the weak subjects, and campuses identifying how to address critical issues. Generally, the plan involves monitoring, more practicals, workplace exposure and stronger lecturers, supported by awards and training driven by the Academic Liaison Department.

The respondents noted that WBE was still driven from the campuses that were engaged with companies on their own initiative. As this was not synchronised from the central office, it resulted in a scattered approach, though the group believed that some very good work had been done in this unstructured way. Majuba is now liaising with relevant SETAs for work placements and has engaged local farmers and the Department of Agriculture (DoA) (according to a Manager in Agriculture), which has required working in a more structured way. The group was of the opinion that the college had failed to implement its current strategic plan in terms of meeting its WBE targets. Consequently, Majuba has set up a WBE Committee as part of its Academic Board and as part of the restructuring of the Academic Board itself, which is an innovative step. The WBE Committee is currently investigating policy, structure, strategy, targets, and objectives for 2014. The Committee is expected to table a draft policy in the near future. The opinion of the WBE Committee was therefore that a central structure and central driving force would enable 'stumbling blocks' to be addressed through the Academic Board (interview with Manager).

Current WBE initiatives include work with the SSACI around structuring WBE and developing a policy, and a R4 million Council provision for WBE. Majuba is planning a Linkages and Partnerships College Conference to which it will invite participation from SETAs and government departments in order to compare practices and to assist the college to drive WBE. This will include inviting colleges from India to share international best practice where 100% placement has been achieved.

#### ***Sensing and learning capabilities – keeping up with changes in the environment***

The three focus colleges reported using the scarce and critical skills lists of the National Skills Authority, but also more localised lists such as the Strategic Integrated Projects (SIPS) and local-government planning documents to inform their programme offerings. Colleges appeared to be working more in conjunction with state planning systems than interfacing with industry planning systems and were led by national priorities rather than industry-specific priorities.

This attempt at relevance is, however, a moving target for the college because ‘every day there are changes’ (interview with Manager at Thekwini College). Cited in this regard were new legislation, the third National Skills Development Strategy (NSDSIII), the second Industrial Policy Action Plan (IPAP2), the New Growth Path and SIPS. This awareness of changing policy suggests that the colleges are willing to keep abreast of policy developments, but that the rapid shifts in policy make this difficult.

The colleges also tended to define ‘responsiveness’ as being broader than responsiveness to industry demands. For example, the colleges tended to use students’ needs as their point of reference, rather than references to ‘skills shortages’. The focus colleges all indicated that they undertook curriculum review processes to determine the relevance of the programmes offered at particular campuses for the surrounding communities. For example, according to a manager at Elangeni, if the college ‘does not get numbers, or where the pass rate is low’, the college would consider discontinuing the programme. Elangeni periodically and informally polled industry or students returning from WBE about the relevance of the curriculum and fed this

back to lecturers in meetings (interview with Management). Majuba, on the other hand, reportedly responds to demand from industry on an entrepreneurial basis and offers programmes accordingly. Majuba’s diverse funding base and relatively large number of occupational programme offerings allow for greater flexibility in order to respond to industry needs than is the case with the other colleges.

The focus on state priorities and student evaluations suggests a limitation in the dynamic interactive capability to sense changes in skills needs in their local economic contexts and respond accordingly. According to self-report assessments, the colleges generally show low to moderate levels of effectiveness in sensing changes in the environment, in learning from the knowledge gained and in effectively integrating the changes into teaching and learning at the colleges (see Table 20). On average, participants reported low levels of capabilities to develop effective routines to adapt and use knowledge gained through interaction with external actors. The colleges were reportedly more effective at working as a team and coordinating activities among themselves.

**Table 20: Self-reported dynamic interactive capabilities of the FET colleges**

		Sensing capability	Learning capability	Integrating capability	Coordinating capability	Dynamic interactive capability (overall)
FET college	Number of participants	Mean (average)	Mean (average)	Mean (average)	Mean (average)	Mean (average)
Elangeni FET overall	7	2.79	2.62	2.8	3.26	2.87
Thekwini FET overall	2	2.00	1.50	2.60	2.20	2.08
Majuba FET	group	2.00	3.00	2.00	4.00	3.00
Umgungundlovu FET management	1	3.00	2.00	3.00	3.00	3.00
Mnambithi FET management	1	3.00	2.00	3.00	2.00	3.00
Umfolozi FET management	1	2.00	2.00	3.00	2.00	2.00
Mthashana FET overall	3	2.67	2.78	3.20	3.07	2.93
Esayidi FET overall	2	2.25	2.33	2.60	2.70	2.47
<b>FET colleges in KZN (overall)</b>	18	2.53	2.41	2.79	2.98	2.67

Source: Project data

Notes:

1. Scale: 1 = Not effective; 2 = Somewhat effective; 3 = Effective; 4 = Very effective.
2. ‘Overall’ scores could not be calculated for some of the FET colleges, as only one questionnaire was completed per college. These scores should therefore be interpreted with caution.
3. The self-reported measures were completed by individuals in college management positions and by lecturers and managers in engineering and/or agriculture.

Overall, Elangeni ranked itself as effective across all of the categories. Majuba completed the questionnaire as a group by consensus prior to the interview. The self-critical ranking that the focus group reported is surprising given the positive view of the college depicted in the focus-group discussion. The group acknowledged that there were obstacles and personalities at the college that hindered work, but indicated that these could be addressed by establishing stronger formal structures and policies. Work tended to be informal and unstructured, limiting the ability of the college to adopt a college-wide response.

Participants ranked Thekwini more self-critically, with responses ranging between 'somewhat effective' and 'effective'. This seems to be fairly consistent with the interviews where the participants indicated that there were internal capacity problems that translated into a limited capability to respond to changing conditions.

### Constraints to developing interactive capabilities at the public further education and training colleges

#### *Funding limitations and reliance on funding from the Department of Higher Education and Training*

Some participants complained that the DHET sometimes disbursed funds late or did not pay the full allotment based on student numbers submitted. When the DHET is late in disbursing the funds, the colleges bear the brunt of student protests. Having to manage NSFAS bursary payments to students also places an additional burden on college capacity (interview with Manager at Elangeni). The DHET also did not fund some activities that it required colleges to engage in, for example WIL and issues like the

DHET's requirement that colleges use the SITA systems for its information technology (IT) framework. Colleges that have the means cover the shortfalls created.

#### *Limitations in staff capacity, and high workload*

College lecturer competence has long been a subject of national concern. College lecturers historically entered teaching with a range of qualifications from various providers and no nationally approved professional qualifications existed. After a process of some four years, the DHET in 2012 gazetted a new suite of college-lecturer qualifications with a view to professionalisation of vocational teaching. Higher education institutions were to design new educator qualifications in line with this policy, which colleges and other stakeholders regarded as urgently needed. The emphasis in the new policy is on a 'vocational pedagogy', which distinguishes the training of vocational lecturers from that of teachers in academic schools.

The finalisation of a DHET staffing organogram for colleges is in process, which, it is hoped, will define and stabilise the staffing situation.

In 2011, there were 15 744 college staff members nationally, of which 3 154 were in KwaZulu-Natal, the second-largest cohort after Gauteng. In KwaZulu-Natal, the number of lecturing staff is relatively low and is dispersed across programmes. The size and shape of the lecturer complement varies across colleges, as shown in Table 21. Staff numbers at the colleges range from 173 to 639, with lecturing staff ranging from 85 to 348<sup>14</sup> and considerable variation in the ratio of support staff to lecturing staff.

**Table 21: Staff numbers by college and staff type for KwaZulu-Natal in 2011**

College	Lecturers	Management	Support	Total
Coastal	346	38	255	639
Majuba	348	2	141	491
Umfolozi	204	1	168	373
Esayidi	192	3	172	367
Elangeni	205	3	136	344
Umgungundlovu	165	18	107	290
Thekwini	195	6	82	283
Mthashana	85	8	101	194
Mnambithi	114	5	54	173
<b>Total</b>	<b>1 854</b>	<b>84</b>	<b>1 216</b>	<b>3 154</b>

Source: DHET (2013)

Besides the problem of low numbers, there is concern about the level of formal qualifications and about the balance of teaching qualifications and industry experience. Wedekind and Watson (2012) conducted a survey of lecturers in KwaZulu-Natal and Gauteng.<sup>15</sup> They found that 43% of the sample had both industry experience and qualifications and 24% had neither. Moreover, 37% had both teaching qualifications and experience and 29% had neither. Only 20% of NCV lecturers were engineering subject specialists, suggesting limited capacity in the colleges for delivering engineering programmes. They suggest that, since the colleges are no longer simply technical colleges and have a broader array of programmes with additional foundational competences (language, life orientation), engineering competence is not the strongest focus.

In KwaZulu-Natal, most college lecturers are not highly qualified. National diplomas and teaching certificates or diplomas are the most common qualifications, with a small proportion of postgraduate degrees or diplomas. Table 22 shows the percentage of lecturers at each college with a range of qualifications, based on aggregated figures supplied by the DHET in 2013. The number of survey returns ( $n =$ ) is shown per college. Majuba's qualifications pattern appears to be different, with lower levels of postgraduate and teaching

qualifications. This is possibly due to recruitment issues in the area or to the heavily technical emphasis of the programmes and the recruitment of artisans. Majuba has placed a premium on staff development and the attainment of formal qualifications (with an emphasis on postgraduate and teaching qualifications). A relatively small percentage of lecturers have N4–N6 qualifications.

Participants at the colleges reported that there were 'not enough warm bodies' to do the work that was required by the DHET. It was indicated that they were awaiting the finalisation of the DHET organogram for the colleges so that various 'vacancies' could be filled.

Staffing across colleges for WBE specifically, is limited. As mentioned, WBE is said to be 'an unfunded mandate' of the FET colleges. It is a new reporting requirement and is still in its embryonic stage. It is encouraging that the focus colleges have taken the initiative in this matter and have appointed their own placement officers, within the means available to them.

All colleges reported that the placement of the entire student population by a single placement officer was a daunting task, especially when added to the need to establish firm-linkages that do not exist as yet and because of the expanding, diversifying and

**Table 22: Lecturer qualifications in KwaZulu-Natal (adapted from DHET 2013)**

College	Matric (levels 3 and 4)	Degree BTech	National diploma/advanced diploma	Education diploma	Education/ABET/teaching certificate (level 4)	N4 to N6 certificate	Postgraduate degree/diploma	N
Coastal FET College	97%	28%	57%	59%	8%	20%	13%	278
Elangeni FET College	79%	37%	51%	35%	11%	12%	11%	186
Esayidi FET College	89%	29%	43%	39%	11%	18%	11%	28
Majuba FET College	81%	20%	50%	22%	1%	11%	3%	159
Mnambithi FET College	71%	38%	51%	37%	12%	16%	11%	126
Mthashana FET College	97%	25%	53%	36%	9%	20%	8%	96
Thekwini FET College	94%	40%	49%	46%	7%	25%	12%	162
Umfolozzi FET College	83%	32%	34%	47%	15%	0%	17%	53
Umgungundlovu FET	84%	34%	35%	54%	8%	26%	15%	123
<b>Grand total</b>	<b>86%</b>	<b>31%</b>	<b>47%</b>	<b>42%</b>	<b>9%</b>	<b>16%</b>	<b>11%</b>	<b>1 211</b>

Source: DHET (2013)

shifting nature of the role. Building WBE into the college culture, as well as timetabling and mainstreaming it within an often hostile labour market, makes the task seem likely to fail.

At Thekwini, which showed the lowest levels of interactive capabilities, it was reported that staff workloads made it difficult for staff to engage much outside of their teaching obligations (interview with Management). It was thus difficult to timetable WBE time for staff, and WBE students and staff had to do so during their holidays on a voluntary basis (interview with staff member). It was reported that Thekwini focused on DHET subsidy-programme passes, not on workplace training or graduate placement.

#### ***Difficulty in engaging with firms***

Participants at the focus colleges reported difficulty in securing work placements for students. Reasons identified include the fact that industry is not familiar with what the colleges are doing, that firms do not prioritise training, that firms expect students to have some level of work experience, and that the NCV and NATED programmes offered by the colleges had fixed curricula and examinations and thus could not be adapted to firms' needs. Another issue, reported by participants at Elangeni, is that firms sometimes poached lecturers who go for WBE or who work with companies.

#### ***Centralised curricula***

College students write national examinations and are nationally certificated. Curriculum review therefore occurs at a national level and colleges' discretion is limited to which programmes they will offer, and at which campuses. The centrally developed curricula for the DHET programmes has been reported to be a major restriction for responding to skills needs in some regional or local industries like the sugar industry. For instance, sugar production is not included in the agriculture curriculum. Hence, the qualifications provided may not be of great relevance to the sugar sector, especially since actors like agricultural colleges offer more specialised programmes at the intermediate skills levels. Colleges could, however, offer occupational programmes that are more tailored to the needs of industry in their local contexts, as Majuba has done.

#### **Facilitators of interactive capabilities**

##### ***Effective leadership and organisational culture***

Key facilitating factors enabling the colleges to overcome the challenges include an effective leadership style and entrepreneurial organisational culture (for which teamwork is essential). These characteristics were crucial for the successes reported by Majuba and Elangeni.

The participants at Majuba attributed the success of the college to a visionary rector and an innovative approach to finance. It was argued that finance should support teaching and learning, and that finance and management could not be two divisions. The rector and the college council have also taken up active positions on national structures, with the Majuba Council chairperson being a leadership figure in the Further Education and Training Colleges Employers' Organisation (FETCEO) (the national body for college councils) and the principal being a leading figure in the South African College Principals Organisation (SACPO) (the national body for college principals). This, in the view of the focus group, bears testimony to the sound leadership of the college and provides Majuba with access to national networks and processes.

The group spoke favourably of the culture in the organisation. It noted that Majuba was not an organisation without challenges and 'difficult people'. However, it did attempt to create the means and a culture that was 'entrusting and empowering' and that 'allowed people their own space based on the idea that people are not always driven by money'. The Council had also decided, as part of that recognition, to ensure that College Council staff received the same remuneration and benefits as state-employed staff. At the same time, the college had carried out results analyses, training and support activities, post-performance appraisals, and disciplinary action where needed.

At Elangeni, senior management has sought to engage businesses directly for placements. The rector hosts business breakfasts and dinners at which the college is introduced, advocacy is done around the NCV programmes, and the rector makes an appeal for WBE placement opportunities for the students to gain experience. Similarly, the rector

holds a 'high tea' for future alumni and graduate student functions to encourage ex-students to provide opportunities for college linkages in their future workplaces. The college also made use of its own business status to acquire WBE opportunities. Students were placed at the college as a workplace for both WBE and for N-Diploma internships. The college also encouraged its service providers to offer WBE opportunities to its students and had increasingly made this a contractual condition.

#### ***Formal structures and access to resources***

Majuba staff reported that infrastructure enhanced the relationship with industry because the colleges needed to convince industry that they had the requisite high standard of buildings, teaching and learning. The college reportedly spends millions on upgrades to buildings and equipment annually. This includes acquiring the latest technology and teaching- and learning-support infrastructure for developing facilities. The quality of the college's facilities is reportedly endorsed by industry. The reason that this college could invest in this way, according to the focus group, was that it did not rely on programme-based DHET subsidy funding as a college, and 'drove the [programme funds] as if [they were] going to end'. It is due to Majuba's state-of-the-art trade-test centre that firms and the preferred training centre in the sugar sector seek collaborative linkages.

A weakness at Majuba is that the college is still working on developing formal policy promoting more formalised interaction with industry and the placement of students to improve their employability. The advantage of formal structures is evident at Elangeni, which displays relatively high levels of interactive and dynamic interactive capabilities in general, although it does not show high levels of interaction with the sugar sector specifically.

#### ***Work-integrated learning as a mechanism for interaction***

The DHET now requires colleges to report on their WIL activities, that is, the placement of their students in industry for work exposure, experience or practice. WIL incorporates work-based learning programmes like apprenticeships and learnerships,

work experience (as with the N- Diploma), and shorter work-based exposure stints (as with the work experience provided for NCV students). WIL has been incorporated into college documents such as the annual strategic plans, college improvement plans and annual reports. Learnerships and apprenticeships, by definition, require that students spend a considerable amount of time at the workplace (up to 70%) as part of a contractual relationship involving the student, college and employer/s. The NATED programmes also include a workplace component called the N-Diploma. The N-Diploma effectively makes the N4–N6 a three-year programme with a theory and a workplace component. So, in the case of the trimester engineering courses, students do one year of theory (N4–N6) plus two years of workplace experience. In other (semester) programmes, students do one-and-a-half years of theory (N4–N6) and one-and-a-half years of work experience. Work-based exposure for NCV students is a growing practice and colleges are now attempting to place their students, often during holidays. Table 22 summarises work-placement activities at the FET colleges in KwaZulu-Natal.

Engagement with companies around WIL placements is, however, still in an emergent phase. Colleges that reported high levels of interactive capabilities in general referred to the DHET's requirement to formalise WIL at the colleges as a driver of interaction.

#### ***Formal policy push by the Department of Higher Education and Training***

Recently introduced requirements of the DHET – such as the formalisation of WIL as well as more structured engagement with SETAs – have been identified as constraints in that the additional requirements have not been accompanied by additional funding. However, these targets provide motivation for colleges to organise themselves more effectively. For example, participants at Elangeni reported that the college would not have formalised work placements for students without the push from the DHET to do so. At Majuba, the focus group noted that the DHET emphasis on certification rates had alerted the college to a weakness. The new DHET approach, as they now perceived it, was that

**Table 23: Work-placement activities at the FET colleges in KwaZulu-Natal**

Coastal KZN	<ul style="list-style-type: none"> <li>No information on the existence of a WIL policy</li> </ul>
Elangeni	<ul style="list-style-type: none"> <li>Has a placement policy</li> <li>Has appointed a placement officer</li> <li>Has a database of firms</li> </ul>
Esayidi	<ul style="list-style-type: none"> <li>No policy on WIL</li> <li>Has a database of firms</li> </ul>
Majuba	<ul style="list-style-type: none"> <li>No policy on WIL</li> <li>Has established a WBE Committee as part of the Academic Board</li> <li>Has a database of firms</li> <li>Has placement arrangements with firms for staff and students</li> </ul>
Mnambithi	<ul style="list-style-type: none"> <li>Is trying to form linkages, especially with Apollo Tyres and Defy</li> <li>Has a Business Linkages Unit (staffed by three people)</li> </ul>
Mthashana	<ul style="list-style-type: none"> <li>Placement is coordinated through Student Support Services</li> <li>W&amp;RSETA discussion on centre of excellence in Ngoma District with three other FET colleges</li> <li>Approached by Pick n Pay and Spar for placements and graduate placements</li> </ul>
Thekwini	<ul style="list-style-type: none"> <li>No policy on WIL</li> <li>Has placement officer and WBE committees at each campus</li> <li>Relationships with firms in other industries (e.g. Toyota and Behr)</li> </ul>
Umfolzi	<ul style="list-style-type: none"> <li>No information on the existence of a WIL policy</li> <li>Close relationships with Sappi Limited and Bell</li> </ul>
Umgungundlovu	<ul style="list-style-type: none"> <li>No information on the existence of a WIL policy</li> </ul>

the college should plan for and achieve high certificate rates, otherwise it should ‘pack its bag and go’. The college was therefore required to develop a College Improvement Plan. Part of this plan was the recognition that ‘you are only as strong as your weakest subject’, particularly in the NCV sphere, and in this the college ‘realised that we did not brag accurately’ (interview with Manager). The college now has a system of results analysis. It has also developed tools to monitor lecturers, train them as needed, and hold them accountable.

Colleges use engagement with the SETAs, which are now based at college campuses, and the SETA scarce skills lists to keep their programme offerings up to date as regards skills needs. For example, interns provided via the ETDP SETA have provided relief to over-extended staff at the colleges. SETAs also play an intermediary role and provide opportunities to offer programmes beyond the centrally controlled programmes subsidised by the DHET.

**Summary: Differing levels of interactive capabilities among the public further education and training colleges**

A summary of the interactive capabilities of the three focus colleges is presented in Appendix table 5. The analysis suggests that FET colleges

have adopted a wide range of strategies to integrate with industry, with varying degrees of effectiveness. Majuba has apparently been successful in building strong links with industry, based on historical linkages. The college merits further investigation of its unique set up. Certainly, access to a substantial third stream of income resulting in unencumbered funds is a huge benefit offering a large degree of flexibility to the college. A weakness at Majuba is the lack of formal structures for interaction. The existence of formal structures and policy is a strength at Elangeni, contributing to its interactive capabilities. Elangeni has been relatively successful in setting up internal interface mechanisms and policy around a range of issues, notably its Placement Policy and the active leadership role taken by management. Thekwini reported the lowest levels of interactive capabilities. Limited funding was identified as a major constraint. The college reportedly lacks the capability to effectively sense changes in the environment and to learn from knowledge gained through interaction. An effective leadership style and organisational culture was shown to be important for overcoming constraints experienced at the other two colleges. Thekwini does, however, have an interesting model of campus-based WBE committees, which requires further investigation.

The analysis in this section showed that FET colleges experience limitations in terms of funding constraints, inflexible programmes, curriculum uncertainty and turbulence, marketing of programmes, staff workloads, bureaucratic demands, and the like. There were few indications that colleges engaged industry generally, or the sugar sector in particular, directly on curriculum matters. The limited curriculum engagement with industry was reported as being due to staff workload, rigidity of the curriculum, a lack of connections with the sugar industry, and a lack of intermediaries.

### **Interactive capabilities and dynamic interactive capabilities of the agricultural colleges in KwaZulu-Natal**

As with universities and FET colleges, the agricultural colleges have been part of the process of restructuring of the education and training landscape over the past two decades. Prior to 1996, the agricultural colleges fell under the Department of Education (DoE), but were then move under the line management and coordination of the Department of Agriculture, Forestry and Fisheries (DAFF). A Cabinet decision was taken in 2012 to recentralise and to move the agricultural colleges to the DHET, but this change has not been effected as yet. This decision has not been well received by some actors in the network, especially considering that the colleges reportedly ‘suffered’ under the DoE due to a lack of understanding of the nature of agriculture and of the specific needs of agricultural colleges (Manager at AgriSETA).

Currently, the agricultural colleges are undergoing another wave of major restructuring as part of a national process to transform the agricultural sector in South Africa. In response to the Agricultural Education and Training Strategy 2008 (AET), DAFF conducted an investigation into the roles, needs and capabilities of the 12 agricultural colleges. The conclusion was that the agricultural colleges would need to be ‘repositioned, refocused and recapitalised’ in order to contribute to transformation in the sector (DAFF 2011). Historically, there have been significant inequalities in the levels of support for the colleges in terms of resources and attention, resulting in some colleges

being severely underresourced and exhibiting inconsistencies in the quality and levels of the training provided. Prior to 1994, the agricultural colleges also tended to have different roles, with historically black agricultural colleges focused on training extension, nature conservation and home economics officers, whereas the historically white colleges focused on training agricultural technicians (Rooyen et al. 2008, cited in DAFF 2008).

Attempts have been made to transform all 12 agricultural colleges into ‘agricultural training institutes’, that is, semi-autonomous organisations with the mandate to provide agricultural training. The revised mandate of the agricultural colleges, as part of the AET Strategy 2008 is to:

- Offer a range of AET qualifications at National Qualification Framework (NQF) Levels 1 to 7;
- Offer other AET qualifications (outside of the NQF system) on a contractual basis;
- Conduct relevant applied research;
- Contribute to the national Human Resource Development Plan by actively participating in the human resources development programmes of the relevant provincial departments of agriculture, as well as by aligning curricula to the human resource development needs as identified by public- and private-sector stakeholders in the agricultural sector;
- Train, retrain, upskill and provide in-service training for agricultural extension and research personnel (as part of the national Extension Recovery Plan);
- Develop strategic partnerships with relevant stakeholders and service providers so as to strengthen the colleges and thus enable them to deliver on their mandate;
- Contribute to the overall national extension programme and, specifically, provide technical backup for extension and research;
- Function as Centres of Rural Wealth Creation; and
- Function as Centres of Excellence within their respective agro-ecological zones (DAFF 2011).

In the absence of an Act and of regulations governing the colleges, the DAFF developed norms and standards for the training provided by the colleges in

order to even out disparities in accountability and access to resources. The mandate identifies three focus areas: farmer training, further education and training (FET) and higher education and training (HET). As part of their mandate concerning farmer training, the agricultural colleges are expected to continue to respond to farmer needs in the local contexts. Colleges are required to consult provincial departments of agriculture and local farmers to identify training needs and to develop programmes based on the needs identified. In the FET band, colleges are expected to play a role specifically in the training of farm workers and farmers. The colleges offer certificates at NQF Levels 1 to 4 and may select courses from the SAQA framework, but may need to upgrade training to FET standards. As part of the HET band, within the new Higher Education Qualifications Framework (HEQF), the colleges may continue to offer qualifications at NQF Levels 5 and 6. In addition, the colleges may now also offer qualifications at NQF Level 7 (Bachelor of Agriculture and BTech in Agriculture). The colleges may opt to partner with universities to provide NQF Level 7 qualifications or they could upgrade their programmes and facilities to offer the qualifications in their own right.

As Centres of Excellence and Centres of Rural Wealth Creation, each of the agricultural colleges is expected to develop programmes and strategies 'to foster widespread prosperity in rural areas within its reach' (DAFF 2011). Hence, attention should be given to community development and outreach, and teaching, research and extension should be well integrated. The colleges are expected to develop the capabilities to become centres of practical and theoretical learning in niche areas within the agricultural sector such that they become important sources of advice, support and assistance to industry in their respective agro-ecological zones.

The AET Strategy 2008 and the Norms and Standards for agricultural colleges (DAFF 2011) strongly emphasise responsiveness to provincial needs and consultation with provincial departments of agriculture and relevant industry stakeholders. The strategy explicitly foregrounds the development of interactive capabilities at agricultural colleges in order to respond to skills needs in the local context.

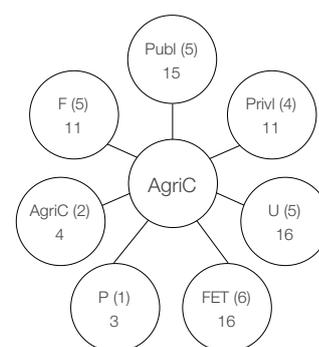
### The role of the agricultural colleges in the sugar sectoral system of innovation

Two agricultural colleges are located in very different regions of KwaZulu-Natal, namely the Cedara College of Agriculture in Hilton (Midlands, South-west Region) and Owen Sitole College of Agriculture (OSCA) in Empangeni (Zululand, North-east Region). The agricultural colleges have access to similar financial resources and facilities (e.g. each has a relatively large farm for practical training) and offer similar programmes. The colleges are still in the process of restructuring their programmes and governance structures in order to meet the objectives set out in the AET Strategy 2008. In direct response to their mandate, both have included sugar-specific training in their Diploma in Agriculture programmes. Cedara's new Diploma in Agriculture curriculum has been running since 2009/2010, whereas the OSCA's new curriculum was implemented only in 2014 (see Appendix table 6). The curriculum is the most effective mechanism that makes these colleges more responsive to the needs of the sector generally, and to farmers in the sugar SSI in particular.

### Current links to the sugarcane growing and milling sectoral system of innovation

Cedara and the OSCA have played a role in the sugar SSI to varying degrees over the years and are currently well inserted into skills development networks. Figure 15 shows that the agricultural colleges reported considerably higher average levels of interaction with other actors than the universities and FET colleges.

Figure 15: Average interaction of the agricultural colleges



Notes: See Figure 7.

The two colleges differ vastly with regard to historical background, context and management (see Table 24 below) and hence use different models in order to develop the necessary interactive capabilities to improve their competencies to produce employable graduates.

#### **Cedara College of Agriculture**

Cedara is a historically white college and is the second-oldest agricultural college in South Africa. It was opened in 1905 as a school of agriculture and forestry offering courses in forestry, horticulture, dairying, veterinary science, chemistry, elementary mathematics, bookkeeping, farm surveying, zoology and fish husbandry. The college moved into new areas of specialisation in 1998, namely animal and crop production. Chapters 2 and 3 showed that there are relatively strong linkages with actors in the sugar sector. The college has well-established research facilities and is the site for the Provincial Department of Agriculture.

As a long-standing, historically white college, Cedara is well resourced and has a well-established reputation for providing quality training in agriculture and thus for producing good graduates. The strategies and mechanisms it uses to ensure that its graduates are employable are mostly informal processes, drawing on formal mechanisms when necessary. It draws on in-house competencies – including its reputation for providing quality agricultural training, its innovative, competency-based curriculum, its facilities for practical training, and its staff relationships with firms and farmers – to attract interest from firms, farmers, and other E&T organisations. Interaction with these actors, in turn, informs and builds on their competencies through

learning. This learning is informal and is not formalised in any way. Members of the management team thus rated learning capabilities on the dynamic interactive capabilities scale as ‘very effective’, and as ‘effective’ overall for sensing relevant changes in the environment and responding accordingly (see Table 24 and Appendix table 6).

In general, Cedara prefers to develop its own competencies to train, rather than seek partnerships. For example, management emphasises the importance of students completing short courses accredited by industry in order to be more suitable for employment. Rather than seek partnerships, the college prefers to develop and teach courses that industry will accredit. This approach is not always used though. For example, Cedara sought to collaborate with the SASRI in order to include a sugar module in the Crop Production stream of the diploma course. Cedara now has a formal MoU with the SASRI whereby Cedara students attend the five-week Senior Certificate course offered by the SASRI during June and July each year at the SASRI’s premises in Mount Edgecombe. Cedara also has an MoU with the UKZN to deliver a BAgric in Extension. The students complete the undergraduate programme at Cedara and the postgraduate student registration, supervision and mentoring are offered at the UKZN’s Pietermaritzburg campus (UKZN website, accessed March 2014).

While the college appears to have a sufficient level of capabilities to interact, management has identified shortcomings in the college’s informal approach. For example, the college now plans to develop a WIL policy to formalise and expand its

**Table 24: Self-reported assessment of dynamic interactive capabilities at the agricultural colleges**

		<b>Sensing capability</b>	<b>Learning capability</b>	<b>Integrating capability</b>	<b>Coordinating capability</b>	<b>Dynamic interactive capability</b>
<b>Agricultural college</b>	Number of participants	Mean (average)	Mean (average)	Mean (average)	Mean (average)	Mean (average)
Owen Sitole	2	3.3	2.8	3.2	3.3	3.1
Cedara	2	3.1	3.5	2.9	3.1	3.2
Shukela	1	2.3	2.7	4.0	3.8	3.3
<b>Overall rating (excl. Shukela)</b>	4	3.2	3.2	3.1	3.2	3.2

Source: Project data

Note: Scale: 1 = Not effective; 2 = Somewhat effective; 3 = Effective; 4 = Very effective.

vacation-work placement programme, which has been found to be valuable for practical training. The college also plans to reintroduce an advisory Board to its organisational structure so as to formally involve external stakeholders in college activities and thus ensure that programmes meet industry needs. Management does, however, caution against teaching ‘recipes’ for agricultural practice rather than ‘principles’ that are more widely applicable.

#### 5.4.1.3 Owen Sitole College of Agriculture

Owen Sitole College of Agriculture (OSCA), formerly Cwaka Agricultural College, is less well established than Cedara. It was established in 1968 and classified as a historically black agricultural education training institute. From January 1990 to June 1991, the college was run by the then Technikon Mangosuthu as a satellite campus for training students in agriculture, nature conservation and home economics (OSCA Prospectus). Thereafter, all training was transferred to the main campus near Durban, which was used solely for in-service training of staff (OSCA Prospectus). The college reopened for the training of students in January 1996.

As a relatively young college, and after a period of turbulence, OSCA had to start off from a low base. OSCA has physical facilities similar to those of Cedara, but does not have the reputation or well-established linkages that Cedara has. The college thus uses the strategy of relying on formal collaborative arrangements and a culture of teamwork and consultation with external actors to ensure that the programmes it delivers are responsive to needs within the local context. For example, OSCA has identified the sugar industry as a major actor in the local context and has sought to collaborate with private-sector organisations in order to develop and deliver three modules providing sugar-specific training. In this way, the students graduating from the Crop Production stream will have the necessary competencies to produce sugar. Since OSCA lacked the competencies to develop and deliver the modules, an MoU was signed with Tongaat Hulett, which welcomed the opportunity to collaborate with the college as part of its social-development programme. Students in the Crop Production stream of the diploma programme are also required to complete the senior course in sugar production offered by the STC. Through these collaborative

**Table 25: Characteristics of the agricultural colleges in KwaZulu-Natal**

	Location	Main target groups	Higher Certificate (first 2 years of Diploma)	Diploma in Agriculture (3 years)	Sugar-specific training	Other full qualifications
<b>Owen Sitole (1968, 1996)</b>	<b>Farm size:</b> 670-ha farm in Empangeni  <b>Cane growing region:</b> Zululand region ('SugarCane World'); 326 large-scale growers; 13 793 small-scale growers (i.e. 14 120 growers in total) (NAMC 2013a)	Commercial farmers (a new focus in the past 5 years); local government	Crop production, animal production or consumer science	Crop production, animal production or consumer science	Sugar module included in the second year; completion of Senior Sugar Cane Production Course provided by the STC	Advanced Diploma in Agriculture will be offered from 2015 (NQF Level 7, equivalent to a BTech qualification); Masters (MTech in Agriculture) in partnership with UniZul from 2020; Doctorate (DTech in Agriculture) in partnership with UniZul from 2025
<b>Cedara (1905)</b>	<b>Farm size:</b> 1 000-ha farm in Hilton  <b>Cane growing region:</b> Midlands region; 362 large-scale growers; 2 368 small scale growers (i.e. 2 733 growers in total) (NAMC 2013a)	Commercial farmers; local government	Crop production, animal production or consumer science	Crop production or animal production	Sugar module included in the third year of the course (training provided by SASRI)	BAgric (Agricultural Extensions and Rural Resource Management) in partnership with the UKZN

linkages with the private sector, the college aims to develop itself into a Centre of Excellence for Sugar, since it is located in the region with the largest number of small-scale cane growers, and approximately 40% of the cane growers nationally (NAMC 2013a).

### Constraints to developing interactive capabilities

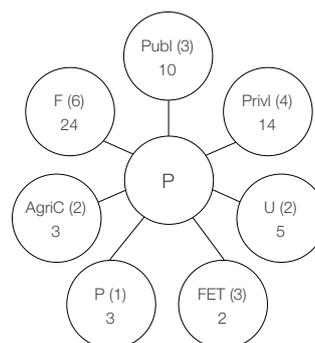
A major constraint reported by both agricultural colleges is the inappropriate organisation structure stipulated by the Department of Agriculture, which they report to be uncondusive for running a successful E&T organisation. The structure requires the vice-principal to manage all activities related to academics, which would result in overload and thus weakness at that level of college management. OSCA has developed informal positions within the college (Curriculum Champion, Liaison Officer and Head of Department) in order to overcome these constraints. Lecturers take on these management tasks without additional pay, but with a formal allocation of time. This is an example of how the innovative leadership and teamwork at OSCA reflect strong, dynamic interactive capabilities, which are essential for effectively responding to changes in the environment.

### Preferred private provider: Shukela Training Centre

Figure 16 reflects that the STC is a preferred private provider of training for the sugar sector, which is evident from the high average levels of interactions with firms and private-intermediary organisations. We have explained how in 1974, in response to the challenge of training artisans to work in rural areas, the sugar private-sector intermediaries created the Sugar Association Industrial Training Centre, which was later registered as a private company and renamed the STC. The training was developed to provide artisanal training specifically for the sugar-growing and milling sector. However, training was open to all and, significantly at that time, to individuals classified as black. The programmes have undergone several revisions over the years to suit the changing skills needs in the sector. Currently, the STC runs apprenticeships in engineering, learnership programmes in agriculture

and engineering maintenance training, and short courses. As a private provider established by the sector, it has strong, dynamic interactive capabilities. In this section, we highlight the structures, mechanisms and strategies that facilitate its role in the SSI.

Figure 16: Average interaction of the Shukela Training Centre



Notes: See Figure 7.

The STC is a revenue-earning division of the SASA, so it leases its premises from the SASA and pays the SASA for management services. It is required to report on its activities and consult the SASA Council, which promotes close interaction with the sugarcane growing and milling representatives. The SASA provides 50% of the funding for the STC's agricultural training services, but does not subsidise the engineering training. In order to make maximum use of its facilities and ensure the sustainability of the centre, the engineering training programmes are also offered to firms in other industries. Eskom and SAPPI are two of its top ten customers. The revenue received from other industries allows the STC to provide training for the sugar industry at cost. The large sugar-milling companies, namely Illovo, Tongaat and TSB, are the top three customers and sent an average of 31, 25 and 18 learners, respectively, per week for training at the STC during the 2012/2013 financial year. Significantly, the scale of provision has thus far been smaller than the average public FET college in the province. The small scale promotes a learning environment with intense attention to each individual student. Approximately 95% of the learners are indentured apprentices. The STC uses its relationships with industry to find work-experience opportunities for self-funded learners.

### **Interactive capabilities**

A summary of the STC's competencies and interactive capabilities is provided in Appendix table 7. The STC has been accredited by AgriSETA as a training provider. It has 27 qualified educators, who undergo continuous training to keep up with E&T standards. In the 2012/2013 financial year, an average of 239 learners received training in engineering, with an average of 82 coming from the sugar industry. During the same period, 669 apprentices took the trade test. The STC thus operates as a private FET provider in the province, although on a small scale. The engineering training offered includes 12 apprenticeship and artisan-training programmes with 80% practical training and 20% theoretical training. The courses conform to the national curriculum, as learners take the trade test at the end of the programme. Although emphasis is placed on ensuring that the courses offered meet legislative requirements, additional course material may be added to a learner's training programme if requested by a firm/farmer. A 14-week Sugar Manufacture Course is offered only to the sugar industry. Short courses are also offered and can be presented on-site. Recruiting learners from the area surrounding the firm or farm and ensuring a match between the job and the candidate are crucial to the success of training, especially the apprenticeships and learnerships.

In agriculture, a total of 392 courses were delivered to 2 845 attendees (an average of seven learners per course). Exactly 1 139 learners were trained for land-reform beneficiaries and 1 706 for large-scale growers. The agricultural training includes a comprehensive range of skills-based courses in sugarcane husbandry, from land preparation to harvesting, legislative courses, business skills and supervisor training. A learnership in Plant Production (NQF Level 4) is offered. Learners may complete the full training programmes or specific modules to fit their work area. Training can thus be tailor-made to an extent. In view of the productivity cycle of growers, the practical component of the agricultural training is taught on-site and the shorter theoretical component is provided at the STC's satellite campus in order to minimise disruption to the work of the growers.

Participants claimed that the STC has advantages over other E&T organisations offering intermediate-level skills training in engineering and agriculture, particularly the public FET colleges. The following were some of the advantages cited:

- The reputation built over the years as a division of the main private-sectoral intermediary for providing training for the sugar industry as well as other industries;
- The well-resourced and fully-equipped facilities for practical and theoretical training;
- A flexible approach 'to changing requirements of customers, learners and legislation' as the core of the STC's mandate (STC Annual Report 2013); and
- The availability of on-campus accommodation for learners.

### **Constraints to developing interactive capabilities**

Like the public FET colleges, the STC experiences difficulty in finding suitably qualified trainers who have the right balance of technical knowledge, experience, and teaching skills. Some industry stakeholders have complained about the quality of agricultural training conducted by trainers with relatively little work experience. In 2010, the STC, with the assistance of the SASA and through funding from AgriSETA, recruited and trained artisans to become agricultural trainers at the STC. Psychometric testing is also used in the selection process for recruiting staff. Another planned improvement is the implementation of computer-based assessment technology.

Changes in curricula and in the E&T policy environment over the past five or six years have resulted in more up-to-date curricula for the trades, but this has hindered continuity in the training provided. Another hindrance is the delay in implementing changes in policy. For example, the QCTO was introduced in 2012, but training providers are still accredited through the SETAs. Changes to the qualifications and trade tests have also been proposed. Such frequent and major changes in the E&T policy environment create instability in the system and affect the training provided.

Another challenge that influences the quality of training is the mentorship learners receive at their workplaces. Not all mentors are committed to the process, and, furthermore, most mentors are 50 to 60 years old and tend to overlay the learners' training with their own expectations, needs and wants. The STC has attempted to address the problem of poor-quality mentorship by offering mentorship training, but has found that mentors are not eager to learn – which is a widespread problem not restricted to this sector.

#### **Facilitators for building interactive capabilities**

As an industry-funded and -managed training centre, the STC thus has well-established formal and informal mechanisms to promote industry involvement in training. For example, trade working groups, including instructors, meet with industry twice a year to discuss the training and any changes proposed by the SETAs or the DHET. Industry members sending learners for training are described as 'customers', and, as part of the STC's 'sales agreement', instructors visit the milling companies twice a year to discuss learner progress with the

mentors, foremen and supervisors or engineers. The STC refers to this as a 'courtesy sales call' that provides guidance for improving workplace learning experience. Formal report-back meetings and consultations with industry stakeholders are also used as forums for providing and obtaining feedback on the training and on changes in skills needs.

In order to ensure that the needs of the sugar industry are taken into account as a result of changes in the policy environment, the STC liaises with government agencies and discusses any proposed changes with industry stakeholders. This practice facilitates the implementation of the changes required.

The STC is mandated to serve the needs of the sugar industry specifically, whereas, in the case of public FET colleges, serving the skills needs of industry is only one of their main functions. FET colleges can, however, learn from the strategies and mechanisms that the STC has developed for fulfilling its main mandate and thus enhance their responsiveness and relevance in the local context.

## 6. CONCLUSION

As one of the oldest agricultural sectors in South Africa, the sugar sector has developed a well-coordinated system for meeting its skills development needs. Very early on, the sugarcane growers and millers established overarching organisational structures for coordinating skills development, among other activities. Sectoral intermediary organisations sought collaborative linkages with existing public education and training (E&T) organisations in the province to ensure a pipeline of skills needed at all levels. The historic involvement of public universities, universities of technology and the agricultural colleges as suppliers of suitably qualified human resources is evident from the analysis presented in this report.

Initially, the sector relied mainly on skilled human resources from other countries, but this strategy was not sustainable. Thus, it was necessary to develop strategies for cultivating routine skills locally (Report of the Committee on Training of Sugar House Apprentices 1930). Hence, from the late 1920s to the early 1980s, E&T in the sugar sector was provided mainly by public E&T organisations in collaboration with the private-sectoral intermediary organisations. Typically, teaching expertise was provided by the intermediary organisations and the E&T organisations provided the physical facilities. The courses included theoretical training at the E&T organisations and practical training at firms in the sector. From the late 1980s, the sector developed a relatively self-sufficient system for meeting its skills needs at all levels, especially at the intermediate skills level. It is apparent from historical accounts that this was mainly in response to changes in the political and policy environment that occurred during and after the apartheid years.

### **Developing skills development strategies in the sugarcane growing and milling sectoral system of innovation – a self-sufficient system?**

With regard to innovation, research has always been highly valued in the sugar sector, especially for developing new cane varieties and improved ways to grow and mill sugar. Knowledge transfer and diffusion, as well as training for developing the necessary skills for adapting and using new knowledge gained, have been emphasised. As with other traditional agricultural sectors, innovation in the sugar sector is largely incremental. Emphasis is thus placed on routine skills. Sugarcane growers and millers in KwaZulu-Natal have, over several decades, developed and modified a well-organised and well-coordinated system for meeting their *routine* skills needs. The system has been shaped by changing skills needs, by the willingness and capacity of E&T organisations to respond, and by changes in the political sphere. Several models have been tested over the years, with the industry settling on the current model that includes foundational qualifications provided by universities, universities of technology and agricultural colleges and specialised sugar training provided by industry-led intermediary organisations. The main skills development strategies, particularly for engineering, involve long-term training together with workplace learning and experience. As a result, the sugar industry has a steady pipeline to meet its routine skills needs. Besides the odd shortages of specific types of artisans, for example, the sector has not reported major challenges in meeting its routine skills needs.

Recent changes in the business and policy environment have, however, brought about new challenges for skills development. Major drivers of changing skills needs include the development of

new products and by-products, the loss of skills due to an ageing population, competition from other industries, and new entrants to sugarcane growing, particularly land-reform farmers and cooperatives. The new grower entrants present the need for skills that the sector is not equipped to provide internally, that is, soft skills and business management. Consequently, the shape of the skills development network is changing. *Collaborative* linkages between firms and farmers in the private sector and universities and agricultural colleges are being revived in order to meet *routine* and *changing* skills needs. In turn, E&T organisations seek *collaborative* linkages with firms/farmers and sectoral intermediary organisations in response to a policy push to become more responsive and relevant and to improve the employability of their students.

The network analysis shows that some types of E&T organisations tend to play a more significant role in the sugarcane growing and milling sectoral system of innovation (SSI) than others. In particular, FET colleges tend to be included in isolated instances. The older, more well-established and well-resourced public E&T in KwaZulu-Natal have continued to be included, while younger organisations that happen to be situated closer to sugarcane growing and milling activities are increasingly involved, to varying degrees. The analysis in this report has demonstrated how the different degree and nature of interaction in the network were related to interactive capabilities, shaped by competencies, especially human resource capacity, reputation for producing good graduates, well-established physical facilities, and an effective leadership style and entrepreneurial organisational culture. Effective strategies, structures and mechanisms for forming linkages with external actors proved significant in differentiating those universities or colleges that interacted more actively and directly within the SSI. Older, well-established organisations also tended to rely more strongly on informal relations developed and strengthened over the years. Private providers relied on their in-house capacity to train rather than actively seeking collaborative linkages. These types of organisations seem to rely on the relationships between individuals and the reputation of the organisation.

Conversely, younger E&T organisations that have effective leadership and organisational cultures have shown how important formalised structures are for coordinating and systematising interaction for improving teaching and learning. They tend to emphasise linkages more, especially for the purpose of benefitting from the complementarity of assets. Moreover, formal policy is necessary for supporting the efforts of individual staff members. In the next section, we consider insights from the research for each type of E&T organisation.

### **Contribution of public education and training organisations to skill needs in the sugarcane growing and milling sectoral system of innovation**

#### **Universities: The critical role of individual dynamic interactive capabilities**

The history of each of the four universities in KwaZulu-Natal has been instrumental in shaping their current way of thinking about the impact on marketplace absorption of what they teach and how they teach, and on how they support graduate transitions into the marketplace. The centrality of the arrangements for teaching and learning at all of the universities to their interactive capability is clear. All four universities have a teaching and learning strategy/policy and structures in place to ensure the relevance of their curricula and to keep their pedagogical approach current and responsive (although different levels of complexity and differentiation are evident). All four universities also have a technology transfer or intellectual-property structure and process (influenced by government policy and legislation). The external interfaces of the two universities of technology with industry are dominated by the pre-merger technikon structures of industry advisory boards and the requirements for managing and monitoring work-integrated learning (WIL).

However, our analysis clearly showed that interaction had much more to do with the capabilities and competencies of individual staff within the university to use and explore these interface structures with industry. Among the dynamic interactive capabilities cited are motivation and willingness on the part of staff to learn and

unlearn, to take risks and become visible within the sector, and to be both an innovation leader and an early adopter of new technologies, both personally as a professional academic and within the teaching and learning spaces that they work in (in order to benefit students in what and how they learn). The overall sense was that opening up the spaces to do this would require freeing up more time for academics to engage, as well as creating funding mechanisms to encourage and incentivise universities and industry. However, it was acknowledged that this, in turn, requires systems for accountability and monitoring, which leads to greater administrative burdens and potentially less autonomy and less independence. Any systems and strategies developed in the future would need to balance both the need for space to be innovative and entrepreneurial, while ensuring accountability, relevance and responsiveness.

#### **Further education and training colleges: The need to build interactive capabilities**

In terms of providing intermediate-level skills, the universities of technology, agricultural colleges and the private training centre displayed significantly higher levels of interactive capabilities than the further education and training (FET) colleges. Most of the public FET colleges in KwaZulu-Natal are not involved actively in current skills development networks in the sugar sector, but this does not mean that they cannot be. Colleges have courses, equipment, facilities and staff that, with the necessary support, are able to contribute much. There are emergent processes and structures for colleges to reorient themselves to the sector. There are, however, a number of provisos to growing interaction. Firstly, the sugar sector still needs to be wooed, and large-scale involvement of the colleges needs to tie into the colleges' five core deliverables (Student Access, Management, Teaching and Learning, Throughput, and Certification) and needs to be of a sufficient scale to make a proposal viable. Such a relationship still has to be brokered.

Secondly, the sugar sector should ideally be tied into the nationally examined curricula if it wishes to be mainstreamed and not only project-based. This may require a curriculum review at a national level in the case of agriculture, but adaptations could be

made. The FET college sector could learn from the approach of the agricultural college sector, which emphasises responsiveness to skills needs of industry in the local and provincial contexts. Such an emphasis does not necessarily mean that the broader mandate of the FET colleges will be neglected. Alternatively, a proposal for Quality Council for Trades and Occupations (QCTO) qualifications as third-stream funding is a possibility, particularly since colleges already enjoy a relationship with the Agricultural Sector Education and Training Authority (AgriSETA) and the departments of agriculture. A potential point of contact would be around the emerging WIL placement function at colleges and around creating employment opportunities for college graduates. Relationships can be grown from there, preferably through a memorandum of understanding/ memorandum of agreement (MoU/MoA).

Thirdly, especially in the case of engineering, colleges may have difficulty delivering qualified artisans to scale due to low throughput rates. However, definite arrangements linked to employment prospects and WIL may assist to stimulate greater motivation among students and to stimulate demand for the programmes among a stronger cohort of students, attracting those with mathematics and science, for example

It is clear that the Department of Higher Education and Training (DHET), through its reporting requirements and strategic planning process deliverables, has galvanised the FET colleges into action. This has been ably supported by mechanisms such as the Swiss-South African Co-operation Initiative's (SSACI's) Work-based Exposure initiative. There are also signs that the emerging relationships with SETAs are beginning to bear fruit.

However, there are a number of considerations for improving the interactive capabilities of the colleges. There is a great deal more that can be done to facilitate and enable (and fund) the nascent attempts by colleges to engage more with industry. Hamstrung by being an unfunded mandate of the college, based on minimal and sometimes imagined capacity, the interactive capabilities of colleges

would be tremendously improved if fully funded. Colleges have teaching and learning as their primary focus. Whilst they have established capacity at the colleges to address integration with the workplace, their capacity to do so is limited and needs financial and sectoral support. The competence does exist, even if it is only emerging in some cases. The ability of colleges to put this competence to work varies by college, but the data does suggest that there are structural limitations for less financially able colleges. Urgent attention is required, for example, to determine what constitutes a complete organogram given the work-integration mandate of the college.

To some extent, colleges are junior partners in the SSI because they are dependent on the goodwill of others. Industry involvement in training in the South African political economy is voluntary, and the attainment of 'employability' has been individualised. Without industry, in particular, making a concerted effort to dovetail public colleges into their systems, there are limitations to what colleges can do. SETAs similarly have considerably more power than colleges and the nature *and scope* of the SETA relationship with colleges require further investigation. If, as this report suggests, the nature of the MoUs are SETA-centred, based on ad hoc SETA projects or deliverables, with accidental benefits to the college, then colleges' abilities are limited. Here, the AgriSETA appears to serve as a good example of how a SETA can provide a range of services, including work placements and industry linkages to the colleges. The DHET is responsible for setting targets and providing leadership. However, the DHET subsidy-funded colleges are dependent on the DHET as the employer providing sufficient staff for the organogram, a staff workload formula, national review and advocacy of the curricula, as well as timeous, reliable and sufficient subsidy payments.

### **Agricultural colleges: Flexibility and autonomy to be responsive**

The major role that the agricultural colleges are beginning to play in skills development in the sugar SSI is due to the relevance of their training programmes and graduates, grounded in high levels of interactive capabilities. Both colleges have developed competency-based diploma

programmes that include the technical and soft skills currently required by emerging farmers and cooperatives. They have actively sought collaborative arrangements with key actors in the SSI to draw on their expertise and capabilities. A major facilitator is the flexibility that the colleges have to develop their own curricula and run the colleges as semi-autonomous organisations, in contrast to public FET colleges.

Agricultural colleges are required to adhere to the Norms and Standards developed by the national Department of Agriculture. Similar to the FET colleges, the agricultural colleges are centrally coordinated. But, unlike the FET colleges, the agricultural colleges have a degree of control over the programmes they offer. The colleges are allowed to adapt their programmes, with 25% change allowed for courses to meet the needs of key stakeholders in the local context. In response to the Agricultural Education and Training Strategy, a standardised agricultural curriculum was implemented at 11 of the 50 public FET colleges. The structure of the curricula across all public colleges (FET and agricultural) tends to cover similar areas at the same levels (DAFF 2009). The agricultural colleges provide a more advanced level of training in terms of specialised courses and higher-level courses, and in terms of covering a wider range of fields. The programmes offered by the agricultural colleges include 55 to 60% theory. The agricultural colleges thus place greater emphasis on the practical component of the training in comparison with FET colleges and universities.

### **Complementary roles for a well-coordinated skills development system**

Above all, the analysis illustrates the benefit for the sugarcane growing and milling sector of a network of different types of actors performing complementary roles. The private intermediaries focus on responding to industry- and firm-specific issues, whereas the public intermediaries tend to focus on 'public-good' objectives important for the upgrading of firms in the sector. Universities and agricultural colleges provide foundational qualifications important for the sector, at high and intermediate skills levels. Specialised sugar training

at all skills levels is provided by private training centres run by the private intermediary organisations and supported by the public intermediary organisations. Professional associations, like the Engineering Council of South Africa (ECSA), also contribute to ensuring that high-quality qualifications are produced in relevant fields. Firms provide the space and expertise for workplace experience in order to ensure exposure to the sector and that relevant practical training is provided so as to enhance student employability. Largely missing

from the skills development network are the FET colleges, which, potentially, could contribute to the development of intermediate skills. A gap has been created by recent non-routine changes in the sector where FET colleges could play a role once they have shown that they possess the necessary competences and capabilities to contribute. FET colleges and universities that are located within or close to sugarcane growing and milling areas, in particular, could make a significant contribution.

## ENDNOTES

1. This section was authored by Il-haam Petersen and Glenda Kruss to set the conceptual framework for the project as a whole.
2. Typically, cane-haulage distances in excess of 50 km are not financially viable (NAMC 2013a).
3. The estimated national multiplier of 3.2 for the sugar industry compares very favourably with a national multiplier of 3.0 estimated for the wine industry in South Africa at 1996 prices (NAMC 2013a).
4. Prices in major global markets for sugar are eroded by subsidy-induced overproduction in some major sugar-producing countries. Access to global sugar markets is also restricted by high tariffs and preferential trade arrangements in the form of tariff-rate quotas.
5. References for this section are SASA (2013) and NAMC (2013a).
6. The sector definition of a small-scale grower is a grower who produces, on average, less than 325 tons of recoverable value (RV) per annum, which for dryland farms equates to an area under cane of less than approximately 40 hectares. The vast majority of this cohort has less than five hectares under cane.
7. The term 'new freehold grower' is a euphemism for 'black commercial farmer'. This cohort of large-scale farmers tends to be relatively new to farm management and accordingly require services such as training over and above the needs of established commercial sugar-cane farmers.
8. The analysis of the MUT is limited, as only three telephonic interviews were conducted (only one of which was with an academic head of department). This was largely due to the lateness of the ethics approval granted by the MUT. However, the inputs of the three managers were very valuable and provided much insight into the university. A fair amount of desktop research provided the balance of the materials and resources for analysis.
9. Article written by the vice chancellor (<http://www.mut.ac.za/vcmmessage>).
10. While these attributes have not yet been refined, the DUT outlines some of its core values on its website, and it is possible that these will lead naturally to the determination of these attributes. Included among these are the following: respect, recognition, loyalty, dignity, trust, transparency, openness, responsibility, accountability, collegiality, professionalism, honesty.
11. Performance management and review will be discussed here in relation to their roles in guiding and advising with respect to professional-development activities.
12. An additional technology station for energy efficiency was established in 2012.
13. In this case, Majuba would account for about one-third of the occupational headcount.
14. The Majuba group, however, indicated that there are now 712 lecturers at the college, which does not tally with the DHET's figure of 348. An explanation might be the massive expansion of the occupational programmes and council-paid staff where lecturers are employed on a contract basis and are not part of the DHET paid-staff establishment.
15. They indicated various complexities in the data that required further investigation.

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## APPENDIX TABLES

Appendix table 1: Functional competencies of the four universities

	Teaching and learning	Research, innovation and technology transfer	Community engagement	Functional integration
<b>Low</b>	<b>MUT</b> – has a limited mix of programmes, predominantly undergraduate; is engaging with industry on the changeover to BEng Tech	<b>MUT</b> has a limited reputation for research at undergraduate level, but is gaining ground with staff projects (and the niche areas); all research and commercialisation falls under one small directorate; only manages staff research	<b>MUT</b> – is still building its engagement portfolio; consulting and project work is occasional in nature <b>UniZul</b> – has linkages with industry on an ad hoc basis; some contract research; very little being done in terms of graduate placement	<b>UniZul</b> – little collaboration evident across or within departments within the faculty in respect of teaching, research or outreach (is moving towards establishing an interface structure); only has a single advisory committee with industry (Richards Bay campus)
<b>Intermediate</b>	<b>UniZul</b> – has a greater mix of programmes than <b>MUT</b> ; previously an academic university, so research-oriented teaching is evident; perception of quality not high <b>DUT</b> – previously a technikon, so offers limited postgraduate studies (> <b>MUT</b> , < <b>UKZN</b> ); curricula for engineering reviewed annually by industry advisory boards (keeps curricula current), but no industry-specific programmes in place	<b>UniZul</b> and <b>DUT</b> – both have the same ‘units per academic’ in terms of publication outputs, but with the <b>DUT</b> ahead of <b>UniZul</b> in terms of percentage of new SET doctoral entrants graduated; both have a reasonable national reputation for research <b>DUT</b> – is slightly more advanced: has business incubator called INVOTECH (Enterprise Development Unit); policies for IP in place		<b>MUT</b> – student volunteerism and staff engaging with civil society on key projects; WIL in place (CEU works across departments); industry–university exchange programme for academics <b>DUT</b> – some synergies between departments (e.g. Technology Station – energy efficiency and moulded plastics); CELT provides ongoing professional development across faculties; better referral systems between Student Affairs and Finance/Registrations
<b>Advanced</b>	<b>UKZN</b> – has a diverse mix of programmes (undergraduate, postgraduate, doctoral, etc.); FSET engages with sugar industry through the ECSA, SMRI and SASRI on curriculum review through a highly structured teaching and learning organisational structure (at college, school and executive level)	<b>UKZN</b> leads with the highest publication unit per academic across all four HEIs; Pro-VC for innovation in position; INCUBATE (collaborates with academics) – promotes commercialisation, entrepreneurship and postgraduate research	<b>DUT</b> – reputation for strategic alliances and industry collaboration; teaching and research-oriented towards successful transition to the workplace; WIL and IAC ensure responsiveness to market needs; many academics on professional boards and disciplinary forums; careers exhibition annually <b>UKZN</b> – has close partnership with the SMRI and the SASRI (research chairs, joint projects); each school has a communications officer and a community engagement team	<b>UKZN</b> – for all the reasons stated previously

Appendix table 2: Organisational competences

	Budgeting <sup>1</sup>	Management	Institution-building
<b>Low</b>	<b>MUT and UniZul</b> – mostly income from public grant and NSFAS funding for student fees; little contracting and consulting externally; commercialisation yet to be a regular undertaking; little private bursary money	<b>MUT and UniZul</b> – both have been under administration recently for governance- and management-related issues; however, both have highly specialised units besides the traditional faculties	
<b>Intermediate</b>	<b>DUT</b> – some own income from third-party sources (research locally); will still receive baseline DHET funding, but student fees allocation not enough; some private bursary money (pool growing smaller annually) – sugar industry does some funding; not enough funding for necessary infrastructure CAPEX; skills budget from Skills Levy used for professional development	<b>DUT</b> – has some limits in respect of the extent of its academic autonomy in so far as the consultative forum with industry is concerned	<b>MUT and UniZul</b> – evaluations undertaken by the Quality Assurance Unit, with some external evaluations conducted by the ECSA and the CHE
<b>Advanced</b>	<b>UKZN</b> – has the most diversified revenue base and own income from third-stream revenue; a number of industry and donor funds for bursaries and scholarships	<b>DUT and UKZN</b> – strong leadership and enterprising organisational structures; have administrative autonomy	<b>DUT</b> – held workshops on developing staff portfolios (2012); Policy on Academic Promotions; VC Teaching Excellence Awards; difficulty in implementing performance management; students carry out evaluations of subjects and teachers annually <b>UKZN</b> – academic development still needs more formalisation (post needs to be filled); MoUs and MoAs to be monitored; enrolment plan linked to quotas; research outputs measured too; QPA Directorate undertakes review of each programme

1 No evidence was found for this. One would need to verify this with the DHET data if one wanted to include this more formally.

Appendix table 3: Summary of capabilities and competencies

	UniZul	UKZN	DUT	MUT
<b>Competencies: tacit</b>	<ul style="list-style-type: none"> <li>DVC: Academic actively encourages industry activity</li> <li>Changing the mindset from traditional academic university to comprehensive university is difficult</li> <li>Engagements with industry – personal efforts</li> <li>Challenge – rural university</li> </ul>	<ul style="list-style-type: none"> <li>SASRI Research Fellow appointed in Department of Agricultural Engineering</li> <li>Pro-VC – innovation, commercialisation and entrepreneurship</li> </ul>	<ul style="list-style-type: none"> <li>Set of graduate attributes has been identified</li> <li>Good interconnections between faculties and with CEU</li> </ul>	<ul style="list-style-type: none"> <li>SWOT analysis and strategic and operational plan</li> <li>Community engagement fragmented</li> <li>Student volunteerism</li> <li>VC – political commitment</li> </ul>
<b>Competencies: codified</b>	<ul style="list-style-type: none"> <li>No interface structures for teaching and learning as yet</li> <li>Teaching and learning strategy and charter</li> <li>Policy on WIL</li> <li>Academic Renewal Project</li> <li>Senate approval for curriculum changes</li> <li>New community-engagement policy and framework</li> <li>Technology Transfer Office within DVC: Research &amp; Innovation (new proposal)</li> <li>Research Bites – publication</li> <li>Faculty committees on promotions</li> </ul>	<ul style="list-style-type: none"> <li>Structure for teaching and learning from DVC to academics in department (ULTO)</li> <li>Teaching and Learning Strategy Group</li> <li>IPTTO (technology transfer)</li> <li>Commercial Initiatives Policy</li> <li>INCUBATE</li> </ul>	<ul style="list-style-type: none"> <li>Developed WIL framework collaboratively with industry (engineering)</li> <li>Cooperative Education Unit</li> <li>Curriculum Renewal Champions (by faculty)</li> <li>TTI Office – IP policy, copyright policy, third-stream income policy</li> <li>Technology stations × 2</li> <li>CELT, EDU</li> <li>Academic Staff Promotions Policy</li> <li>Subject committees</li> </ul>	<ul style="list-style-type: none"> <li>Teaching and Learning Development Centre</li> <li>Intellectual Property Rights Policy, Research Policy</li> <li>Research Directorate for staff research only</li> <li>Enrolment plans</li> </ul>

Appendix table 4: Summary of capabilities and competencies (continued)

	UniZul	UKZN	DUT	MUT
<b>Interface mechanisms (internal and external capacity-building mechanisms)</b>	<ul style="list-style-type: none"> <li>Richards Bay campus was developed through industry collaboration (Advisory Board)</li> <li>Community Engagement Working Group</li> <li>Distinguished Community Engagement Practitioners – annual funds</li> <li>Workshops run by Director: Academic Development (student assessment methodologies)</li> <li>Seminar on extended undergraduate curriculum structure</li> <li>Guidance and Counselling Office</li> <li>Financial Aid Office (FAO) – mostly NSFAS</li> <li>No performance management system</li> <li>VC Senior and Emerging Teachers Awards (new)</li> <li>Weekly professional development seminar by faculty</li> <li>Links to Department of Agriculture</li> <li>UniZul Science Centre works with FET College and Chamber of Business</li> </ul>	<ul style="list-style-type: none"> <li>Friends of UKZN Agriculture Alumni</li> <li>College Academic Affairs Board</li> <li>SMRI/SASRI research collaboration</li> <li>College PR office – graduate placement</li> <li>KPAs measure research + community engagement</li> <li>Distinguished teacher</li> <li>Quality Assurance Office</li> <li>Staff exchange with industry (short-term)</li> <li>FAO – external bursaries</li> <li>Links to AgriSETA</li> </ul>	<ul style="list-style-type: none"> <li>Liaison/Industry Advisory Committee (biannual)</li> <li>WIL in all departments</li> <li>Graduate employment through CEU</li> <li>CELT offers training to staff</li> <li>VC Teaching Excellence Awards</li> <li>Graduate experience surveys on graduation</li> <li>ECSA</li> <li>SASCE – cooperative education</li> <li>World of Work careers fair</li> <li>Links to CHIETA</li> <li>Sugar Industry Trust Fund</li> <li>Other FAO funds</li> </ul>	<ul style="list-style-type: none"> <li>Cooperative Education leads WIL</li> <li>Research on graduate retention done by Institutional Planning</li> <li>MUT alumni on advisory boards</li> <li>Alumni Office – MCD</li> <li>Annual Research Awards</li> <li>Quality Management Directorate</li> <li>FAO – mostly NSFAS</li> </ul>
<b>Dynamic interactive capabilities</b>	<p>Very little indication of the capability of the university to sense changes in the environment or to respond to these changes by integrating them, coordinating with them or learning from them (even though motto is 'Restructured for Relevance'). Only significant capability is through the DVC: Research and his office</p>	<p>Strong commitment from the university to scan, work with and be responsive to changes in environment both from an education policy view and from an industry stakeholder engagement view. Structures are in place to manage this and there is a high-level strategic focus on this</p>	<p>Striving towards a more credible system for engaging with external stakeholders and using this to extend the value of the university within the broader university community. Commitment evident from VC to deans and senior academic staff</p>	<p>Pursuing a strategy for building the MUT brand by chasing publication output and by reviewing key policies and strategies that extend the university community beyond the buildings, staff and students (e.g. Community Engagement Portfolio, Partnerships Portfolio)</p>

Appendix table 5: Summary of interactive capabilities across the three FET colleges

	Elangeni	Thekwini	Majuba
<b>Codified competencies</b>	<ul style="list-style-type: none"> <li>• Placement Policy</li> <li>• Mostly NCV programmes</li> </ul>	<ul style="list-style-type: none"> <li>• No WIL policy –but uses SSACI WBE guidelines</li> <li>• Skills Manager – deals with external contracts</li> <li>• Placement Officer – deals with WBE</li> <li>• Staff complement</li> <li>• Programme mix (NATED focus)</li> </ul>	<ul style="list-style-type: none"> <li>• WBE Committee of Academic Board established (along with other committees)</li> <li>• Large number of occupational programmes (15% of country, 80% of province)</li> <li>• 80/50 policy for students (80% attendance, 50% average) for payment of NSFAS bursaries</li> <li>• Diversified funding base</li> <li>• State-of-the art equipment and centres</li> <li>• Major trade testing centre</li> </ul>
<b>Tacit competencies</b>	<ul style="list-style-type: none"> <li>• Placement Officer, Student Support Manager</li> <li>• Learnerships Officer, Curriculum Manager</li> <li>• Accreditations Manager</li> <li>• ETDP SETA interns (career guidance officers)</li> <li>• Offers NCV Agriculture</li> <li>• Offers NCV Engineering programmes</li> </ul>	<ul style="list-style-type: none"> <li>• Skills Manager and Placement Officer</li> <li>• ETDP SETA interns (career guidance officers)</li> <li>• Offers engineering programmes (N1–N3, N4–N6, NCV) – mainly NATED at engineering-focus campuses</li> <li>• Draws staff from industry; does not offer Agriculture. (newer staff have links with industry)</li> </ul>	<ul style="list-style-type: none"> <li>• Staff largely from industry; strong industry linkages</li> <li>• ‘Largest college in the country’</li> <li>• Strong commitment to industry linkages (income generation)</li> <li>• Proactive College Council (own funds; funds NSFAS bursaries and infrastructure development)</li> </ul>
<b>Internal interface</b>	<ul style="list-style-type: none"> <li>• Placement Officer organises all work placements</li> <li>• Incentives for lecturers linking Placement Officer to companies</li> <li>• Subject committees and programme committees</li> <li>• College stipend for WBE students; also built into NSF proposals</li> <li>• Monitoring of lecturer WBE per campus – encourages lecturers to go to industry</li> </ul>	<ul style="list-style-type: none"> <li>• Limited</li> <li>• Has difficulty ‘retooling’ if there is a change of course (especially lecturers)</li> <li>• Changes courses if it perceive there to be no jobs for students (even when there is student demand)</li> <li>• WBE committees</li> </ul>	<ul style="list-style-type: none"> <li>• Subject discussions</li> <li>• Open-door policy (of principal)</li> <li>• Commitment to buy what is needed (‘If you want the best, you must have the best’ policy) coupled with strong accountability (‘return on investment’)</li> <li>• Upfront funding of initiatives by Council; recoups costs later</li> </ul>
<b>External interface</b>	<ul style="list-style-type: none"> <li>• Business breakfasts, dinners, lunches</li> <li>• College placement of students at college</li> <li>• Alumni involvement</li> <li>• WBE placement partnerships (staff and students)</li> <li>• Database of students and student CVs</li> <li>• Work-based student excursions and/or projects</li> <li>• Feedback mechanisms from WBE stakeholders – management holds feedback discussions with lecturers</li> <li>• SETA links, especially road shows and recommending students</li> <li>• Presentations to industry (e.g. Durban Chamber of Commerce)</li> <li>• Requests to service providers, e.g. for WBE</li> <li>• Requests to companies</li> <li>• Interface with other companies for use of equipment/facilities (especially Agriculture)</li> </ul>	<ul style="list-style-type: none"> <li>• Limited to Skills Manager and Placement Officer (emerging space)</li> <li>• Some linkages with firms</li> <li>• Mainly linked to government initiatives, not the sugar sector</li> <li>• Lecturers have links</li> <li>• WBE placements</li> <li>• Graduate and apprenticeship placements</li> <li>• Database of students and student CVs</li> </ul>	<ul style="list-style-type: none"> <li>• Training contracts – strong links with industry</li> <li>• Historical links of lecturers</li> <li>• Trade-test centre</li> <li>• Responsive education and training programmes</li> <li>• Limited links with the sugar sector – proposal is in progress (following this research)</li> <li>• WBE placements (students and staff)</li> </ul>
<b>Dynamic interactive capabilities</b>	<ul style="list-style-type: none"> <li>• Emergent ability to place students for WBE, with feedback mechanisms</li> <li>• Is using existing networks to create opportunities for students</li> <li>• Limited ability to change curriculum (e.g. sugar not in Agriculture syllabus), but NCV curriculum is reviewed nationally</li> <li>• Limited ability to interact with the sugar sector (lack of contacts/champions)</li> <li>• Appears to have a stronger focus on communities that the campus serves and on supporting state initiatives</li> <li>• Uneven/limited access to SETA databases; uneven and inconsistent involvement by SETAs (in furthering college agenda), but this has increased</li> </ul>	<ul style="list-style-type: none"> <li>• Skills Manager able to respond to industry requests</li> <li>• Skills Manager hires in staff per contract – attempts being made to locate this in the college as a ‘third stream of income’</li> <li>• Staff workload at capacity</li> <li>• College has links with industry, but not with the sugar industry</li> </ul>	<ul style="list-style-type: none"> <li>• Companies send employees to Trade Testing Centre and Skills Centre</li> <li>• Conducts trade test for students from other E&amp;T organisations (e.g. Shukela Training Centre)</li> <li>• Enjoys strong (historical) links with industry; has a strong income-generation capability</li> </ul>

**Appendix table 6: Summary of the agricultural colleges' interactive capabilities and dynamic interactive capabilities**

	Owen Sitole College of Agriculture	Cedara College of Agriculture
<b>Competencies: tacit</b>	<ul style="list-style-type: none"> <li>Staff members are keen to participate in management structures; culture of working as a team to achieve college strategic objectives</li> <li>Culture of consulting with stakeholders in the local context to inform programmes at the college</li> <li>Management has developed an informal governance structure to effectively carry out the strategic plans of the college</li> <li>Emphasis placed on outreach</li> </ul>	<ul style="list-style-type: none"> <li>Reputation as a provider of good students and quality training (e.g. college often receives requests from the large milling companies to send students for training at the college and for graduates when jobs are available)</li> <li>Individual lecturers have good relations with industry</li> <li>Motivation to interact with industry in order to improve the employability of students, but relies on informal relations and relations of individual lecturers</li> <li>Lack of emphasis placed on outreach</li> </ul>
<b>Competencies: codified</b>	<ul style="list-style-type: none"> <li>Informal organisational structure conducive to achieving strategic objectives</li> <li>Extra time allocated to lecturers for additional tasks</li> <li>Governed by the Norms and Standards set by the National Department of Agriculture</li> <li>Teaching and Learning Policy</li> <li>Quality assurance</li> <li>Subject Advisory Committee (includes participation from industry and universities)</li> <li>WIL formal guidelines for assessment and cooperation between the lecturer, the student and the farmer</li> <li>Centre of Excellence for Sugar (in collaboration with Tongaat Hulett)</li> <li>Strategic Plan (2014–2025) including aggressive Strategic Collaboration Plan (conclude at least one MoU each year)</li> <li>Farm for practical training of students</li> </ul>	<ul style="list-style-type: none"> <li>No formal college-level policies</li> <li>Governed by the Norms and Standards set by the National Department of Agriculture</li> <li>Formal programme for students to engage in vacation work (two weeks per year; has been in place for about a year) funded by AgriSETA</li> <li>Farm for practical training of students</li> <li>Competency-based curriculum for the Diploma in Agriculture, which some other colleges are interested in copying (increases pass rates and employability of students)</li> <li>Well-equipped research facilities</li> <li>Except for the vacation work of students, WIL is not formalised as yet because Cedara does not see the need to place students when it has the facilities to do practical training at the college farm</li> </ul>
<b>Interface mechanisms (internal and external mechanisms)</b>	<ul style="list-style-type: none"> <li>6-month internship programme includes lecturer consultation with farmers</li> <li>Industry and universities in KZN are formally consulted in the annual evaluation of the curriculum, and in the comprehensive review of the curriculum every five years</li> <li>MoU with Tongaat Hulett and others in agricultural sector</li> <li>Students do a course at Shukela Training Centre as part of the Crop Production stream of the diploma programme</li> <li>Aggressive Strategic Collaboration Plan (concludes at least one MoU each year; included in the Strategic Plan)</li> <li>Lecturers present papers at conferences and symposiums</li> <li>International collaboration with two colleges in Reunion</li> <li>Academic Council includes representatives from UKZN and UniZul</li> <li>Bursaries from sugar industry</li> <li>In negotiations with UniZul to offer postgraduate studies (Masters and Doctorate) in agriculture in the future</li> </ul>	<ul style="list-style-type: none"> <li>Bursaries from sugar industry and AgriSETA</li> <li>Students do vacation work for two weeks per year</li> <li>Third-year examination is moderated by external moderators (e.g. firms), who also provide feedback on the content of the courses</li> <li>Emphasis placed on feedback from students to improve teaching and learning (no formal teaching and learning policy; no formal assessment of lecturer performance besides student feedback)</li> <li>Informal agreements with TSB, Illovo and Tongaat Hulett, which send students to Cedara as part of their training at the milling company</li> <li>10-day tours of firms and farms (including those in the sugar sector) is a component of the curriculum</li> <li>Lecturers assist third-year students to attend industry conferences, shows, symposiums, etc.</li> <li>MoU with UKZN to collaborate on providing a BAgric degree</li> <li>MoU with the SASRI, which teaches the sugar module part of the diploma programme</li> <li>Diploma students are required to do at least two short courses, which are certificated by industry or local government (thereby increasing employability)</li> </ul>
<b>Dynamic interactive capabilities</b>	<ul style="list-style-type: none"> <li>Management provides dynamic leadership, encouraging participation and teamwork at the college</li> <li>Mandate to engage with local government and industry to respond to local economic and social development needs</li> <li>Curriculum review every five years (curriculum is stable for 5 years, with some flexibility to change the content)</li> <li>Invites industry and universities to participate in subject advisory committees that meet at the end of each year to evaluate the curriculum</li> <li>Self-report rating: on average, staff rated the college to be effective in sensing changes in the environment, in learning from the knowledge gained, and in integrating and coordinating the knowledge</li> </ul>	<ul style="list-style-type: none"> <li>Keeps up with change in the sector through the informal linkages that the college and individual lecturers have with milling companies and farmers</li> <li>Values feedback from students – especially students who work on farms and whose families own farms – about the teaching and course content</li> <li>Self-report rating: on average staff rated the college to be effective in sensing changes in the environment, in learning from the knowledge gained, and in integrating and coordinating the knowledge. They rated themselves to be more effective (very effective) at learning</li> </ul>

Appendix table 7: Summary of the interactive and dynamic interactive capabilities of the Shukela Training Centre

	<b>Shukela Training Centre</b>
<b>Competencies: tacit</b>	<ul style="list-style-type: none"> <li>• Reputation as the preferred provider of sugar-specific training for the sugar industry</li> <li>• Held in high esteem as regards artisan training by other industries as well (provides training for firms in other industries)</li> <li>• Status of Institute of Occupational Excellence conferred by AgriSETA</li> <li>• Preferred training provider for Electrical Contractors' Association (ECA)</li> <li>• Flexible approach to training in order to meet needs of industry (trains on-site where possible; trains at different times of the year; includes additional course material requested by industry; recruits external contractors in order to offer additional courses when required)</li> </ul>
<b>Competencies: codified</b>	<ul style="list-style-type: none"> <li>• Business-model approach to running the training</li> <li>• Accredited by the National Artisan Moderating Body (NAMB) (in partnership with the QCTO) as a decentralised Trade Test Centre</li> <li>• One of the four FET providers in the province with a trade-test centre for engineering</li> <li>• Accredited by AgriSETA as a training provider</li> <li>• Accredited to conduct training and examinations for the NATED subject: Installation Rules</li> <li>• Has on-campus accommodation (including meals) for learners from outlying areas</li> <li>• Organisational structure – reports to the SASA Council, which includes representatives from the milling companies and cane growers (part of the private sector)</li> <li>• STC training system is 'tried and tested'</li> <li>• Internal assessment of learners to train at the most appropriate level</li> <li>• Offers engineering training to other industries, making use of the 'surplus' capacity of the centre and allowing for the reduction of training costs charged to the sugar industry and for the sustainability of the centre (diversified funding)</li> <li>• Two-year contract with the Agricultural Development Agency (ADA) to provide grant-funded training for growers</li> </ul>
<b>Interface mechanisms (internal and external mechanisms)</b>	<ul style="list-style-type: none"> <li>• Plays a key role in contributing to industry's cooperation with its SADC counterparts; offers training to SADC counterparts</li> <li>• Conducts regular benchmarking exercises with engineering and agricultural training organisations to compare its standards with others</li> <li>• Working group per trade that meets once or twice a year with milling companies to discuss their skills needs and any changes in the E&amp;T legislative landscape</li> <li>• Represented on AgriSETA working groups for different trades</li> <li>• Represented on AgriSETA sugar subsector committee</li> <li>• Visits milling companies twice a year to discuss learner progress with respect to the STC apprenticeship modules; provides regular feedback and guidance with mentorship for the work experience component of the apprenticeship</li> <li>• Culture of 'open' communication with industry</li> <li>• Well-networked to find work placements for self-funded learners (5% of learners)</li> <li>• As a SASA division, it is well positioned in the SSI to keep up with changing skills needs (has well-established relationships with milling companies, growers and sectoral intermediary organisations)</li> </ul>
<b>Dynamic interactive capabilities</b>	<ul style="list-style-type: none"> <li>• Meets with industry on a regular basis to discuss course content and changes in E&amp;T legislation</li> <li>• Has subject/trade working groups, including training instructors, that meet regularly and also meet regularly with industry</li> <li>• Self-report levels of dynamic interactive capabilities: 'somewhat' effective in sensing changes in the environment; 'effective' at learning; and 'very effective' at integrating and coordinating new knowledge</li> </ul>

## **LMIP – Labour Market Intelligence Partnership**

Cutting-edge LMIP research on skills planning, labour markets, the economy, the post-school sector, artisan training and more, may be found on the project website [www.lmip.org.za](http://www.lmip.org.za), where a specialised research repository holds all emerging research, including research reports, working papers, presentations and policy briefs as well as ‘grey’ literature on a range of topics relevant to skills planning.

### **LMIP Reports:**

- Report 1: Occupational Shifts and Shortages: Skills challenges facing the South African economy. By Haroon Borhat, Sumayya Goga and Benjamin Stanwix (2014)
- Report 2: Towards Understanding the Distinctive Nature of Artisan Training: Implications for skills planning in South Africa. By Nhlanhla Mbatha, Angelique Wildschut, Bongiwe Mncwango, Xolani Ngazimbi and Thembinkosi Twalo (2014)
- Report 3: Growth, Employment and Skills: The New Growth Path revisited. By Haroon Borhat and Nan Tian (2014)
- 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)
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**Understanding interactive capabilities for skills development in sectoral systems of innovation**

**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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