An outcomes-based training model for textile technologists

by

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DECLARATION

I, Marianne Bester, hereby declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification.

Opinions expressed in this thesis and conclusions arrived at, are those of the author and are not necessarily to be attributed to the Cape Technikon or the National Research Foundation.

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Signature

12 January 2004

Date

ABSTRACT

The textile industry in South Africa is regarded as a labour intensive industry with high capital investment. Presently, the textile industry is facing the impact that globalisation will have on the local industry, which emphasises the importance of training and development in the face of decreasing levels of human resources. These decreasing levels of employment will result in the loss of highly technical expertise with no replacement source in the labour market, unless textile technologists are educated to compensate for the loss.

The White Paper on the Transformation of Higher Education (1997) indicates that one of the purposes of higher education is to provide the labour market, in a knowledge-driven and knowledge-dependent society, with the high-level competencies and expertise necessary for the growth and prosperity of a modern global economy. The establishment of the National Qualifications Framework in South Africa has diluted the rigid boundaries between education and training, requiring of Higher Education to establish programmes that are responsive to the needs of industry.

The focus of this research project is to develop and evaluate an outcomes-based textile technologist curriculum based on the education and training needs of the Western Cape textile industry in particular, as a result of environmental changes impacting on the South African textile industry in general. The development and evaluation of an outcomes-based qualification in textile technology take place within a world of constant change, where work and education are becoming increasingly interwoven, stressing the importance for higher education in South Africa to transform by developing learning programmes in harmony with industry and by specialising in making knowledge useful and applicable.

The thesis is divided into **five** sections:

- A synopsis of the textile industry in South Africa using a macro- and meso-level environmental scanning approach to identify the main trends, problems and challenges facing the textile industry in a global context, which is empirically

supported by semi-standardised qualitative interviews conducted with key industry role-players.

- An overview of the legislative framework, structures and concepts of skills development, training and Higher Education applicable to the development of outcomes-based qualifications in South Africa as well as the impact of transformation on the higher education sector in South Africa.

- A report, supported by theoretical models on curriculum design and curriculum-orientated evaluation, on the curriculum development process of an outcomes-based textile technologist learning programme developed by Peninsula Technikon is presented. The curriculum-orientated evaluation consists of a quantitative analysis of the learning outcomes designed for the outcomes-based textile technologist learning programme implemented at Peninsula Technikon.

- The empirical study consists of a qualitative and quantitative analysis to support the literature review:

    - The researcher undertook a qualitative analysis based on interviews conducted with key role-players in the textile industry, with the view to support the environmental scanning exercise.

    - A quantitative analysis based on questionnaires distributed to textile manufacturing companies, textile auxiliary suppliers and textile retailers in the Western Cape, with the view to evaluating the factors impacting on environmental change in the textile industry, key competencies of textile technologists and subject-specific knowledge and skills required by textile technologists of the future concludes the empirical study.

- A report on the findings of the qualitative and quantitative data analysis is presented with recommendations for future research, and conclusions.

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Chapter 1

Outline of the research project

1.1 INTRODUCTION

Many countries, all over the world recognise the crucial role of an effective system of education and training as part of their national plan for social and economic development. Education and training systems are being reorganised to enable countries to gain the edge in an increasingly competitive economic global environment. The liberalisation of trade and the rapid technological advances of the new millennium are placing education systems under extreme pressure "as they try to adapt and incorporate these changes in an effort to produce more creative, effective and adaptable people" (Coetzee, 2002: 3). International trade is becoming more market-orientated as a result of deregulation, and in the process labour markets are being restructured to meet the challenges of being competitive, productive and innovative. Survival in the global marketplace demands an effective national education and training system that provides quality learning, is responsive to the ever-changing influences of the external environment and promotes the development of a nation that is committed to lifelong learning (SAQA, 2000a: 3).

1.2 BACKGROUND TO THE RESEARCH

There is general agreement among stakeholders of the clothing and textile industries in South Africa that if these industries are to survive in the next millennium, they will have to be internationally competitive. The opportunity for success of the textile industry in South Africa resides in its ability to adopt world class manufacturing principles and practices, to engage in a process of restructuring, modernisation and technological progress, and improve competitiveness by concentrating on higher value-added products. In highly specialised products and processing methods, skills become a critical element. Middleton, Ziderman and Van Adams (1993: 1) underscore the fact that "the higher a country's labour productivity and the more flexible its work force, the better able that country is to acquire and adapt the technology needed to produce better quality goods and services at lower cost and to shift the structure of production to new markets and products".

The critical need to develop high-level technical skills and knowledge, associated with a value orientation of world-class manufacturing performance and international quality standards, has been recognised by the textile industry in South Africa in general, and the Western Cape in particular. This can only be developed through education and training, which requires a long-term strategic teaching and learning plan or curriculum that is based on the development of employability skills, high-level technical subject knowledge and holistic outcomes.

1.3 PURPOSE OF THE RESEARCH

The focus of this research project is to present an outcomes-based training model for textile technologists, consisting mainly of the development and curriculum-orientated evaluation of an outcomes-based textile technologist programme at the Peninsula Technikon. The development and curriculum-orientated evaluation of an outcomes-based qualification in textile technology take place within a world of constant change, where the worlds of work and education are becoming increasingly interwoven, stressing the importance for higher education in South Africa to transform by developing learning programmes in harmony with industry and by specialising in making knowledge useful and applicable.

1.4 OBJECTIVES OF THE RESEARCH

The research project has the following objectives:

- To provide a general overview of the main trends, problems and challenges confronting the South African textile industry by using a macro- and meso-level environmental scanning approach.

- To relate legislative processes governing higher education, training and skills development in South Africa to curriculum development and implementation of a high-level textile technology qualification at the Peninsula Technikon.

- To identify the need for the establishment of a high-level textile technology qualification at the Peninsula Technikon.

- To identify challenges and opportunities in the development, implementation and evaluation of an outcomes-based qualification in textile technology, with specific reference to Peninsula Technikon.

- To develop an outcomes-based curriculum design model for high-level textile technology education.

- To conduct an outcomes-based curriculum-orientated evaluation based on the enabling outcomes or subject-specific knowledge and skills of a high-level textile technology programme developed and implemented at the Peninsula Technikon.

1.5 CONCEPTS

For the purpose of this research project, the following concepts are clarified:

- "**Education**, is concerned with the development of sound reasoning processes to enhance one's ability to understand and interpret knowledge ... it is the deliberate, systematic and sustained effort to transmit, evoke or acquire knowledge, attitudes, values and skills and sensibilities, and any learning that results from the effort, intended or unintended" (Van Dyk *et al.*, 1997: 227).

- "**Training** is a learning experience in that it seeks a relatively permanent change in an individual that will improve his or her ability to perform on the job" (De Cenzo & Robbins, 1994: 255) "Consequently, training must be result-orientated, it must focus on enhancing those specific skills and abilities to perform the job, it must be measurable and it must make a real contribution to improving both goal achievement and the internal efficiency of the organisation" (Van Dyk *et. al.*, 1997: 227).

- "A **model** of a system or process is a theoretical description that can help you understand who the system or process works, or how it might work" (Collins COBUILD English dictionary for advanced Learners, 2001: 992).

- **Outcomes-based education** is not just about changing the curriculum, it is about changing the nature of how the education system works in South Africa. In recognising the need for systemic change, it is likely that old practices of curriculum development and delivery will be affected. In order for South Africa to respond to the need for transformation at the systemic level, the National Qualifications Framework was established to address problems in the system regarding relevance, integration, coherence, access, articulation, progression, portability, credibility and legitimacy. The National Qualifications Framework determines that a system organised around the notion of learning outcomes will drive education and training in South Africa, indicating that decisions of learning programme design, development, delivery and assessment need to consider constantly the learning outcomes that learners need to demonstrate as achievement of competence. According to Spady (1994:10), at the heart of an **outcomes-based educational system** are **four principles**, which work together to strengthen the conditions enabling learners and educators to be successful. These principles are:

- **A clarity of focus on the learning outcomes** that ultimately students need to demonstrate, which are reflected in the critical cross-field outcomes formulated by SAQA.
- **Expanded opportunity and support for learning success**, which requires institutions to move beyond the rigid blocks of time and traditional organisation of learning institutions.
- **High expectations for all to succeed**, which indicates that it is necessary for those who work in the system to behave and structure what they do in working with learners, in such a way that learners are enabled to achieve these outcomes.
- **Design down/build-back approach to building the curriculum**, which starts with the abilities, skills, knowledge and attitudes that learners should ultimately be able to achieve and to focus assessment on what the learner has achieved in relation to these outcomes, rather than to focus merely on what was presented in the course of delivery.

Van der Horst and McDonald (2001: 5-6) describe **outcomes-based education** as a learner-centred, results-oriented approach to learning, which is based on the following underlying beliefs:

- All individual learners must be allowed to learn to their full potential, regardless of background, previous achievements, age, sex, learning style or other factors.
- Success breeds further success, which focuses on the importance of positive and constructive ongoing assessment to enable learners to reach their full potential.

- The learning environment is responsible for creating and controlling the conditions under which learners can succeed, emphasising the importance of promoting a culture of learning.
- All the different stakeholders in education share in the responsibility of learning, requiring participation in curriculum development, implementation and review.

- **Curriculum development** in an outcomes-based educational context is an ongoing educational process that involves the following aspects as defined by Bellis (SAQA, 2000b:6):
  - Determinign the values and purposes of learning.
  - Analysing the needs and the nature of the learners.
  - Deciding on the outcomes of learning.
  - Deciding on the tasks which will support achieving the outcomes.
  - Deciding on the content which will support achieving the outcomes.
  - Planning assessment.
  - Planning evaluation for continuous change or improvement.

- **Curriculum-orientated evaluation** as defined by Carl (1995:177) could be regarded as "a broad and continuous effort to inquire into the effects of utilizing educational content and process according to clearly defined goals". In an outcomes-based educational context, curriculum-orientated evaluation would determine to what extent the objectives of the curriculum have been achieved and would hence be concerned with the value or effectiveness of the curriculum and the outcomes [output] of the curriculum.

- A **textile technologist** is a person who has a theoretical knowledge of textile products and processes, with specialist knowledge of a particular area of the textile industry (dry or wet processing) in order to specify, evaluate and develop new textile products. Based on sound knowledge and skills in applied mathematics, science, engineering, production organisation, quality, management and business practice, a textile technologist is able to apply critical and analytical thinking skills, problem solving ability and high-level technical skills across the textile spectrum (Barnard, 1998:2).

1.6 SEQUENCE OF THE RESEARCH

This research project consists of **three** elements:

- Literature review
- Qualitative research
- Quantitative research.

Chapter 2 begins by presenting a macro- and meso-level environmental scanning approach to provide a general overview of the main trends, problems and challenges confronting the South African textile industry viewed from a macro perspective. This chapter outlines the segmentation of the textile industry in South Africa and describes the production processes associated with the textile industry. It will also include aspects of the industry's vision, long and short-term goals and objectives with the purpose of informing the curriculum development and evaluation process of a textile technologist programme at the Peninsula Technikon.

The chapter is divided into **three** sections:

- The **first section** outlines the importance of the textile industry to the South African economy and its contribution to the manufacturing sector specifically, while also considering its contribution to socio-economic conditions in South Africa in general. This outline provides quantitative information of textile production output, the utilisation of production capacity, employment numbers, textile trade performance and international trade agreements as well as industry support programmes.

- The **second section** considers locational aspects of the industry, industry segmentation and processes involved in textile manufacture as well as new developments in textile manufacturing.

- The **third section** focuses on the industry's vision, strategy and long and short-term goals until 2010. Conclusions will be drawn from the environmental scanning process to be incorporated into the curriculum development and evaluation process of a textile technologist programme.

Chapter 3 outlines the legislative framework and structures of skills development, education and training in terms of implications for curriculum development, implementation and evaluation of a learning programme for textile technologists in the Western Cape.

Chapter 4 focuses on the development and evaluation of a high-level textile technology curriculum model at the Peninsula Technikon.

The purpose of this chapter is three-fold:

- **Firstly**, to provide a historical background on textile technology education during the transitional phase (1997 – 2000), before the implementation of an outcomes-based textile technologist programme in 2001.
- **Secondly**, to conduct a literature review on curriculum development models, to introduce curriculum development in a National Qualifications Framework context at technikons and to explore the different phases of a curriculum development model, by elaborating on the nature and processes associated with each phase of development, which underpinned the curriculum development process of an outcomes-based textile technologist programme at the Peninsula Technikon. In this respect, it is also important to develop an understanding of the terms and concepts that underpin the National Qualifications Framework and outcomes-based education.
- **Thirdly**, to describe the curriculum development process, focusing mainly on the curriculum design and the curriculum evaluation phases of this process. The **curriculum development phase**, which led to the implementation of the outcomes-based National Diploma in Textile Technology at the Peninsula Technikon in January 2001, is described in this chapter, while the **curriculum-orientated evaluation phase**, which is supported by an evaluation of the enabling outcomes or subject-specific knowledge and skills of the programme, is outlined in **Chapter 6** of this thesis.

Chapter 5 presents the qualitative research based on interviews conducted with key role-players in the textile industry, with the view to support the environmental scanning exercise described in **Chapter 2**. This chapter focuses mainly on the qualitative research method selected as most appropriate to achieve the objectives of this research project. The suitability of the method is substantiated and the methods of data collection and sampling are discussed. An outline of the data obtained from the interviews is also provided.

The purpose of the qualitative research is:

- To determine the factors impacting on the changing environment of the textile industry and to what extent these factors would impact on curriculum-orientated evaluation of an outcomes-based textile technologist-learning programme at Peninsula Technikon.
- To confirm the rationale/need for the establishment of an outcomes-based textile technologist learning programme at Peninsula Technikon in January 2001.

Chapter 6 presents the quantitative research based on questionnaires distributed to textile manufacturing companies, textile auxiliary suppliers and textile retailers in the Western Cape, with the view to conduct a curriculum-orientated evaluation. The curriculum-orientated evaluation consists of an evaluation of the factors impacting on environmental change of the textile industry, key competencies of textile technologists and subject-specific knowledge and skills required by textile technologists of the future. Subject-specific knowledge and skills are informed by the enabling (learning) outcomes-based modular curriculum model as illustrated in **Figure 4.15** as well as the academic structure of the National Diploma Textile Technology programme developed and implemented at Peninsula Technikon as presented in **Appendix N** of this thesis. This chapter focuses on the quantitative research method selected as most appropriate to achieve the objectives of this research project. The suitability of the method is substantiated and the methods of data collection and sampling are discussed. A description of the data obtained from the questionnaire is also provided.

The purpose of the quantitative study is:

- To detect the latest trends regarding the challenges facing the textile industry in the Western Cape.
- To critically evaluate the employability skills of textile technologists as defined by the industry at the contextual workshop, which led to the development of a National Diploma in Textile Technology at Peninsula Technikon.

- To critically evaluate the enabling outcomes or subject-specific knowledge and skills of the National Diploma in Textile Technology implemented by Peninsula Technikon in 2001-2003, with the view to:
    - Inform the review process of the National Diploma in Textile Technology currently being offered at Peninsula Technikon.
    - Inform the curriculum development process of a BTech degree in Textile Technology at Peninsula Technikon.

Chapter 7 introduces the limitations and findings of the research, offers a reflection on the methodology used, and presents conclusions on the research project. Recommendations for future research and implications for the development of higher education programmes are also included.

1.7 RESEARCH METHODS

The **qualitative research** consists of "one-on-one" semi-standardised qualitative interviews with key role-players of the textile industry based on judgement sampling. The complexity of the textile industry requires the use of a research method to gauge effectively the knowledge, views, understanding, interpretations and experience of a range of key role players and subject experts regarding the changing needs of the textile industry in South Africa.

The **quantitative research** consists of a mailed questionnaire, which is aimed at measuring the knowledge and opinions of human resource managers, production managers or subject specialists of the Western Cape textile industry regarding the objectives of the research project by using the Likert Scale as response scale.

1.8 LIMITATIONS TO THE RESEARCH

The availablity of key role-players for the **qualitative research**, as well as time and cost constraints might impact negatively on obtaining a balanced view of the challenges facing the textile industry. The selection of questions to be included in the interviewing schedule could also influence arguments presented by interviewees, which might impact on the findings of the research project.

Due to time and cost constraints the **quantitative research** is only conducted by drawing a sample of Western Cape textile manufacturers and retailers, textile auxiliary producers, suppliers & commissioners as well as knitwear manufacturers. The volume of data that will be obtained from the questionnaires could present problems regarding effective analysis and interpretation of the data.

1.9 OUTLINE OF THE RESEARCH

Figure 1.1 on the next page presents the outcomes-based training model for textile technologists developed by the researcher, which comprises on the one side of the "world of work", consisting of an outline of the textile industry in South Africa (**Chapter 2**), focusing on the trends, challenges and problems facing the textile industry in general and the Western Cape in particular (**Chapter 5**), while on the other side it consists of the "world of Higher Education" with its associated legislative framework, structures and requirements (**Chapter 3 & 4**).

These two "worlds" and their associated structures, processes and needs underpin the curriculum design model for textile technologists training at Peninsula Technikon as presented in **Figure 4.8** of this thesis, which culminated into the development of an outcomes-based modular curriculum structure as presented in **Figure 4.15** and the academic subject structure as presented in **Appendix N** of this thesis.

The curriculum-orientated evaluation process as outlined in **Chapter 6** of the thesis, involves, among others, feedback from industry on the enabling outcomes (subject-specific knowledge and skills) of the high-level textile technology programme to deliver competent learners that can operate effectively in a changing global economic and technological environment. The results obtained from the curriculum-orientated evaluation will be used to review the enabling outcomes of the National Diploma in Textile Technology currently offered at the Peninsula Technikon and to inform the curriculum development process of the BTech degree in Textile Technology still to be implemented in the near future.

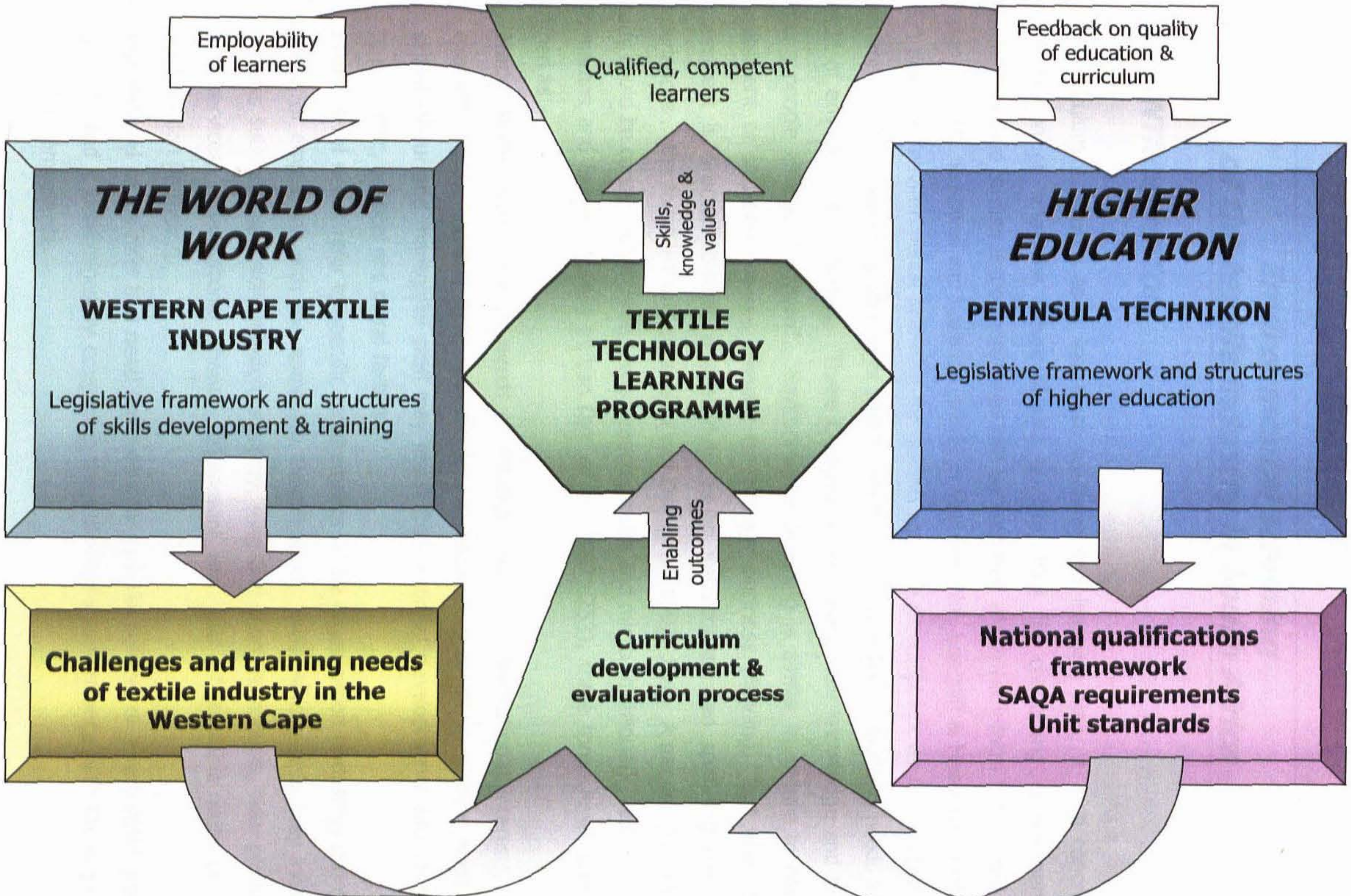


Figure 1.1: Schematic diagram outlining the outcomes-based training model for textile technologists

Chapter 2

Environmental scanning of the textile industry in South Africa

2.1 INTRODUCTION

If a curriculum is viewed as a long-term teaching and learning plan, it is a concrete representation of what the future should be like; thus by conducting environmental scanning, unique threats and opportunities can be identified which will inform the curriculum design process. Rothwell and Kazanas (1994) in Van Dyk, Nel, Loedolff & Haasbroek (1997: 187) describe "environmental scanning for human resource development as the process of monitoring trends, issues, problems or events which may create future learning needs as a result of environmental changes. These changes often require new knowledge and skills among people affected by them". Environmental scanning is similar in nature to needs assessment or situation analysis relevant to strategic business planning, "but when the assessment is directed towards a curriculum as an instructional plan spanning learning experiences ... the focus is more general" (Van Dyk *et al.*, 1997: 184). A needs assessment study could be conducted at three levels: macro, meso and micro (individual). According to Wolmarans and Eksteen (1987) in Van Dyk *et al.* (1997: 253), these three levels can be defined as:

- **Macro-level** needs refer to needs of national and even international interest; for example, needs resulting from technological developments or the increasing need for skilled labour and managerial staff may result from national developments with respect to economic, political and social factors.
- **Meso-level** needs refer to specific requirements of the organisation [industry] and of a group of employees with the same job classification. Meso-level needs may include aspects such as the vision, mission, strategy, long and short-term goals, new products and services, organisational change, equipment and pool of available skills of the organisation [industry].
- **Micro-level** needs refer to a need that exists for just one person, or a very small group. Such a need is determined by comparing the individual's performance with the required norms of competence.

Adopting a macro- and meso-level environmental scanning approach, this chapter will seek to provide a general overview of the main trends, problems and challenges confronting the South Africa textile industry viewed from a macro perspective and will specifically include aspects of the industry's vision and long and short-term goals and objectives with the purpose to inform the curriculum development and curriculum-orientated evaluation process of a textile technologist programme at the Peninsula Technikon.

The chapter can be divided into **three** sections:

- The **first** section will outline the importance of the textile industry to the South African economy and its contribution to the manufacturing sector specifically, while also considering its contribution to socio-economic conditions in South Africa in general. This outline provides quantitative information of textile production output, the utilisation of production capacity, employment numbers, textile trade performance and international trade agreements as well as industry support programmes. The research project will also reflect on some aspects of the clothing industry (wearing apparel), since the textile industry and clothing (apparel) industry are intricately linked, and to a large degree interdependent. The national clothing industry provides a significant and ready market to the textile industry, while the clothing industry is to some extent dependent on national textile manufacturing capacity and output. Textile mills not only manufacture yarn, thread, and fabric for clothing, but also such products as carpeting, automotive upholstery, fire hoses, cord and twine. The major processes in these highly automated textile mills include yarn spinning, weaving, knitting, tufting and non-woven production, as well as dyeing, printing and finishing of textile products.

- The **second** section considers locational aspects of the industry, industry segmentation and processes involved in textile manufacture as well as new developments in textile manufacturing.

- **Finally**, focusing on the industry's vision, strategy and long- and short-term goals until 2010, conclusions will be drawn from the environmental scanning process to be incorporated into the curriculum development and curriculum-orientated evaluation process of a textile technologist programme.

2.2 BRIEF OVERVIEW OF THE SOUTH AFRICAN ECONOMY

2.2.1 KEY CHARACTERISTICS OF THE ECONOMY

South Africa is a middle-income, developing country with an abundant supply of natural resources. The country has the largest, most sophisticated economy in Africa with a gross domestic product (GDP) almost four times that of Egypt, the next largest economy in Africa. The country has well-developed financial, legal, communications, energy and transport sectors and a modern infrastructure that supports an efficient distribution of goods to major urban areas throughout the region.

The standard of living of a population, expressed in terms of the real household income per capita, is often used as indicator of economic performance, growth and development of a country. An historical review of the last four decades indicates that the real household income per capita increased by an average 2,2 per cent per annum during the 1960s, with a slower increase per annum of 1,3 per cent during the 1970s and a sharp decline to 0,1 per cent per annum during the 1980s. During the first half of the 1990s it declined by an annual average of 1,2 per cent. Thereafter, however, during the mid-1990s an improvement of economic growth resulted in a rise of 0,1 per cent, per annual average, from 1996 to 2001. The average rise, however, is extremely low, and substantially lower than average real gross domestic product (GDP) growth over this period (ABSA, 2002). A high unemployment rate estimated at 30,5 per cent, hampers economic growth and the low economic growth rate has been unable to ensure adequate job creation to lower the unemployment rate in a sustainable way, which emphasises the importance of job creation as an essential element of creating a sound economy (ABSA, 2003: 30).

The economy of South Africa is based on a democratic political dispensation and has increasingly, since the first democratic elections in 1994, been opening its doors to international trade and free movement of capital. The political instability in the past and the country's mineral wealth have strongly shaped the course the economy has taken over the past few decades, as illustrated by the statistics of the household income per capita in the previous paragraph. These influences had the effect of alienating the country from the rest of the world, and South Africa adopted policies of import-substitution, ensuring independence from international trade. International economic and political sanctions limited access to technology and resources from abroad, leading to the development of a very diverse manufacturing base in South Africa (WESGRO, 2002: 6).

After the first democratic elections in 1994, South Africa was recognised as a member of the international community and economic barriers were dismantled, revealing an economy that was very inefficient, unproductive and uncompetitive owing to limited access to technology and resources, instability in the domestic labour market and lack of business confidence.

South Africa could no longer rely on its mineral wealth for prosperity, owing to the declining value of gold and other raw materials; it had to move its focus to the development of value-adding products. At present, commerce, financial services and the manufacturing sector are collectively responsible for over half of South Africa's output by value and jointly employ approximately 36 per cent of the workforce.

2.2.2 IMPACT OF GLOBALISATION

South Africa is a society in transition, influenced by internal forces of transformation and external forces of globalisation. The last decade has seen increased integration of South Africa with the global economy as a result of the end of economical and political sanctions, trade liberalisation and increased flows of foreign investment.

The impact of economic, technological, social and political factors is transforming the working world radically and fundamentally. The movement of technology, goods, capital, the location of production, and to a lesser extent, labour across national borders, is leading the rapid globalisation of the world economy, resulting in economies that are becoming interdependent and integrated (Van Dyk *et al.*,1997: 4).

In a study commissioned in 2000 by the UK Department for International Development on the implications of globalisation on the developing world, Thoburn and Roberts (2002: 14-17) focused on globalisation and its impact on the South African textile industry. Thoburn and Roberts (2002: 14) define globalisation as the "closer integration of countries into international marks through the effects of trade liberalisation", and argue that trade liberalisation impacts on firms through employment, wages and the quality of employment". The textile sector is often a typical route through which a country chooses to industrialise, largely due to its huge import-competing potential (Thoburn & Roberts, 2002: 14-17). They argue that trade liberalisation reduces the bias against exports, leads to economies of scale and technological progress, resulting in domestic firms being more efficient. The study revealed that 76 per cent of the firms surveyed were engaged in international trade of some form, although mostly for sourcing imports and not for exports. Almost all the firms in the study had foreign sources of technology, mostly from Germany. A number of firms in the sample of the study had foreign ownership. The study also revealed that the textile industry engaged in exports in response to an increase of imports by major clothing retailers in South Africa.

Trade liberalisation, including a scheduled gradual decrease in import tariffs from 1994 onwards and the lifting of non-tariff barriers, had a deteriorating impact on employment. Employment in the textile industry dropped by almost 18 per cent between 1994 and 1997. This was demonstrated when 100 000 textile, clothing and leather workers throughout South Africa marched upon the government on 8 September 1999 in an effort to save jobs (Hamilton & Meerkotter, 1999). During 1998, 20 000 workers in these sectors lost their jobs. The impact of the job loss on the lives of ordinary citizens is more disturbing, when considering that the majority of these workers are females, mostly breadwinners, who earn less than R1000 per month.

This trend is growing and "it is expected that about 23 000 jobs will be lost in the textile and clothing industry" by the end of 2003, according to Searll, the chairman of SA largest clothing and textile group, Seardel (Von Lieres, 2003). At a Fashion Conference organised by the South African Clothing & Textile Workers Union (SACTWU) in December 2003, the SA Minister of Finance, Trevor Manuel, suggested that the clothing and textile industry should "adopt a long-term view" and that "retooling the industry for competitiveness and a focus on small and medium enterprises" should be included in the plan to reposition these industries nationally and globally (Von Lieres, 2003).

While the majority of persons who are retrenched remain unemployed, those workers who retain their jobs often become "flexible" workers. "Flexible" workers are often regarded as casual workers, part-time workers, contract workers or permanent workers, who perform multiple tasks. The status of these workers results in little or no job security, benefits, leave or promotion opportunities, and also implies health problems. A number of South Africa government legislative initiatives since 1994 are designed to address systemic disadvantages and to promote gender equity in the workplace. Yet, the experience of the textile and clothing workers is indicative of the threat of globalisation for the South African economy and its people.

2.3 ECONOMIC, POLITICAL AND SOCIAL INDICATORS OF THE TEXTILE INDUSTRY

2.3.1 GENERAL INDICATORS

According to the Textile Federation of SA (Claassens, 2001: 5) the textile industry is the 6th largest employer in the manufacturing sector and the 11th largest exporter of manufactured goods. It is also the second largest user of electricity from ESKOM and the second largest payer of rates and taxes in towns and cities in which it is located. The textile industry represented 1,2 per cent of the gross domestic product in 2002 (TEXFED, 2003) as presented in **Table 2.1**.

Table 2.1: General statistics of the SA textile industry

General statistics of the textile industry	1998	1999	2000	2001	2002
Employment (Average)*	58,133	56,486	55,475	53,372	54,538
Sales (R 'mill)	9,615	9,774	10,164	10,470	13,412
Imports (R 'mill)	4,276	4,023	4,656	5,192	6,929
Exports (R 'mill)	2,357	2,618	2,888	3,372	4,517
Contribution to GDP (%)	1,3	2,0	1,5	1,2	1,2
Textile consumption per capita	R288	R280	R298	R307	R400
Inflation (%)	**	5,4	5,7	6,6	9,3

* Textiles (excluding knitting)
** Statistics not available

Source: Textile Federation of SA, 2003

Statistics obtained from the Textile Federation of SA (TEXFED, 2003) revealed that in 2002 the textile industry employed 54,538 employees, excluding the knitting sector, with an additional 200,000 workers who are indirectly employed in dependent industries, such as transport and packaging. The knitting sector employed 10,913 employees in 2002, resulting in a total of 65,451 employees of all the sectors of the textile industry, which is an increase of 2,1 per cent compared with 2001.

Textile imports increased with 38 per cent, while textile exports increased 47,8 per cent during the same period, from 1998 to 2002. The textile consumption per capita also showed a steady increase of 28 per cent from R288 to R400 during the same five-year period. Claassens (2003c: 4) records that the value of textile imports during "the first half of 2003 amounted to R2,9 billion which is 6,2 per cent lower than the same period in 2002, while the value of clothing imports increased by 11,6 per cent and amounted to R1 billion." The value of textile exports during the first half of 2003, amounted to R1,9 billion, which is 12,7 per cent lower than 2002, while clothing exports increased by 3,3 per cent and amounted to R1,1 billion. Looking critically at the volume of imported goods, displays "a clear case of 'under-valuation', if not dumping, according to Claassens (2003c: 4), whereby made-up textile articles are being imported from China at average 'free-on board' prices of way less that the 'normal' fibre price. Claassens (2003c: 4) indicates that during the first half of 2003, cotton yarn and cotton fabrics were imported from China at an average 'free-on-board' price of R21,15/kg and R26/kg respectively. Even more alarming is the fact that knitted pile fabrics were imported at an average of only R4/kg and curtaining fabrics at an average 'free-on-board' price of less than R3/kg. "The local producers are losing market share as a result of this practice" (Claasens, 2003c).

The President of the Textile Federation of SA, Simeoni, states that the impact of the stronger South African Rand, the high interest rates and labour costs are impacting negatively on the future of the textile industry in South Africa. Simeoni (2003b: 2) suggests that "the textile as well as the clothing industry needs a safety net linked to the exchange rate in order to regain local market shares ... and that various proposals have been forwarded to the DTI (Department Trade & Industry)." Simeoni (2003b: 3) poses the question: "Does government want to have a textile and clothing pipeline ... or not?" He suggests that going forward "we ought to remain positive, convince retailers that buying local has many advantages, while engaging government departments in a positive manner. After all, we all want the same: increase employment, a stable economy as well as a rewarding investment climate" (2003b: 3).

Claassens (2003c: 4) also warns "if there are no drastic steps taken to look after our own, the local manufacturing industry will definitely be lost to the East with serious consequences for every South African."

2.3.2 TEXTILE PRODUCTION OUTPUT

It was estimated by the Textile Federation of SA in February 2003 that the volume of production index[1] for the total manufacturing sector in South Africa for 2002 would be 115,3, which would have been approximately 6,3 per cent higher than for 2001. For textiles, it was estimated that the volume of production index would have been 103,7, which is 11,3 per cent higher than for the previous year, while it was predicted that clothing would also increase to 83.7 in 2002 (Claassens, 2003a: 7).

According to the latest available statistics from the Textile Federation of SA (TEXFED, 2003) the index of the physical volume of production for textiles shows an increase from 94,8 in 2001 to 111,6 in 2002, which is an increase of 15,0 per cent, while clothing increases from 78,8 in 2001 to 101,7 during the same period, representing an increase of 22,5 per cent. Claassens (2003c: 4) indicates that the average manufacturing volume of production index (2000 = 100 as per seasonally adjustment) shows a decrease of 7,7 per cent from January to July 2003, with a decrease in the average volume of production in the textile industry for the first seven months of 2003 of 1,8 per cent, in comparison to the same period in 2002. Clothing has shown an increase of 21 per cent during the same period.

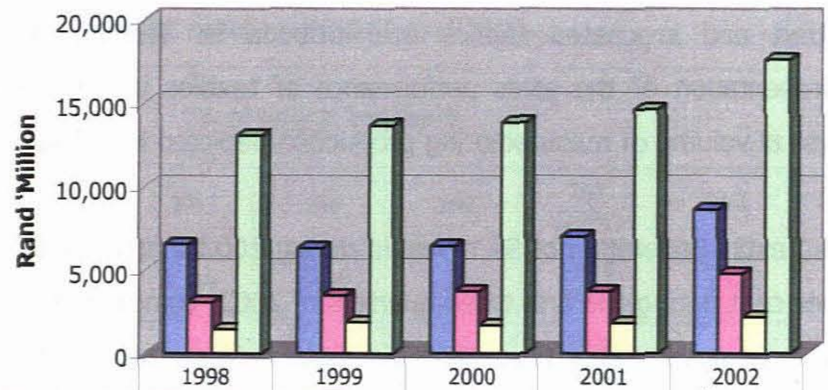
Table 2.2: Summary of the physical volume of production 1998-June 2003

Index of the physical volume of production 1995 = 100	**1998**	**1999**	**2000**	**2001**	**2002**	**June 2003**
Manufacturing	101,2	101,2	106	109,4	114,1	105,9
Textiles	91,4	91,2	93,5	94,8	111,6	103,8
Clothing	87,3	88,7	82,7	78,8	101,7	99,9
Source: Textile Federation of SA (2003)						

In the Annual Report of the Department of Trade and Industry: 1 April 2001- 31 March 2002 (DTI, 2002) indicated that the weaker performing sectors, including the wage goods (consumer) industries – particularly textiles, wearing apparel and footwear as well as food and beverages have had depressed domestic demand during this period, which lead to weak

[1] 1995 Production index = 100

performance of these sectors. Value of sales statistics of the Textile Federation of SA (TEXFED, 2003) reflects marginal increase in value of sales from 2001 to 2002 as illustrated below in **Figure 2.1**:



	1998	1999	2000	2001	2002
SIC311: Spinning, weaving and finishing of textiles	6,544	6,304	6,440	7,023	8,623
SIC312: Other textiles	3,070	3,470	3,724	3,740	4,780
SIC313: Knitted and crocheted fabrics and articles	1,459	1,882	1,690	1,848	2,187
Total textile sales (including knitted goods)	13,071	13,655	13,854	14,612	17,592

Source: Textile Federation of SA (2003)

Figure 2.1: Summary of value of sales (ex-factory) 1998-2002

Statistics SA (2002) reported that the manufacturing group (SIC 311) of "spinning, weaving and finishing of textiles" constituted 62,7 per cent of total industry sales in 2001. Statistics released by the Textile Federation of SA in January 2003, indicated an increase to approximately 65 per cent in 2002, while sales to the value of R6143 million have been produced until September 2003 (TEXFED, 2003). "Other textiles" (SIC 312), consisting of the manufacture and make-up of textile articles (except apparel), manufacture of blankets, furnishing articles, stuffed articles, tents, tarpaulins, sails and other canvas goods, automotive goods, carpets, rugs and mats, as well as cordage, rope, twine and netting, constituted the rest. **Table 2.3** on page 21 indicates that "other textile" category (SIC 312) represents a growth of 24 per cent of the industry over the past five years, while "washing, combing and carding of wool" has dropped significantly with a loss in sales of 23 per cent since 1997, but is showing some recovery.

It is important to note that knitted and crocheted fabrics and articles are **not** categorised by Statistics SA as textile products (SIC 311 and 312), but as "wearing apparel" (SIC 313) according to the Standard Industrial Classification (SIC),[2] although the manufacturing of knitted goods (warp, weft and hose knitting) would be regarded as a sector of the textile industry in general terms. **Appendix A** provides a complete list of SIC 311 and 312 items. With the aim of presenting a more inclusive picture of the textile industry, sales statistics of knitted and crocheted fabrics are included in **Table 2.3**, as well as in graphical representation of the sales performance of textiles in **Figure 2.1** and the index of the physical volume of manufacturing production depicted in **Table 2.2.**

The Textile Federation of SA revealed during 2003 that knitted fabric production declined by 1 per cent during the first three quarters of 2002, compared to the same period in 2001 and that local woven fabric production increased by 5 per cent during the same period compared to 2001 (Claassens, 2003a: 7). The latest statistics reveal an increase in the value of knitted goods (SIC 313) sales from R1,848 million in 2001 to R2,187 million in 2002 (TEXFED, 2003).

Table 2.3 depicts the sales performance, according to SIC code, for the period 1997-2001.

[2] SIC codes are an internationally accepted set of codes for the standard classification, primarily for statistical purposes, of all economic kinds of activity relevant to the supply of goods and services by an establishment as part of the social division of work. The International SIC Codes (ISIC) are prescribed by the United Nations Department of International Economic and Social Affairs.

Table 2.3: Contribution to textile sales by various industry segments

Category	1997	1998	1999	2000	2001	% Change
	R Million (Actual Values)					**1997-2001**
Textile sales per SIC categories (311 and 312)						
Major Group SIC 311: "Spinning, Weaving and Finishing"	(% of total in brackets)					
Washing, Combing and Carding of Wool	394	271	240	290	302 (2.7%)	- 23%
Spinning, Weaving, Finishing	6,621	6,233	6,064	6,150	6,662 (60%)	+ 0.6%
Total for group SIC 311:	***7,015***	***6,505***	***6,304***	***6,440***	***6,965 (63%)***	***- 0.7%***
Major Group SIC 312: "Other Textiles"	(% of total in brackets)					
Tents, Tarpaulins, Canvas Goods, Automotive Textiles	627	622	672	827	892 (8.1%)	+ 42%
Furnishing Articles, Bags, Sacks	950	939	988	944	1,053 (9.6%)	+ 10.8%
Carpets, Rugs, Mats	683	661	701	750	802 (7.3%)	+ 17%
Other textiles not elsewhere classified	1,056	1,037	1,105	1,202	1,310 (11.9%)	+ 24%
Total for group SIC 312:	***3,317***	***3,260***	***3,466***	***3,724***	***4,059 (37%)***	***+ 22%***
Total: Textile Industry	***10,333***	***9,765***	***9,770***	***10,164***	***11,024 (100%)***	***+ 7%***
Wearing apparel sales per SIC category (313)						
Major Group 313: "Knitted and crocheted fabrics and articles"	1,909	1,818	1,858	1,693	1,846	+ 3%
Source: Statistics, SA: 2002						

2.3.3 INVESTMENT IN NEW ASSETS

Compared with the clothing industry, the textile industry is a relatively capital-intensive sector. Replacement of outdated equipment and technology is essential if the industry is to remain internationally competitive. Capital expenditure on new assets reveals that investment levels have remained fairly stable in the period under review presented in

Table 2.4. A significant increase of almost R200 million is seen in 2000, which is the result of an increase in exports. This compares favourably to the clothing sector, which invested R86 million on new assets during the same period, taking into account that the clothing industry is less capital-intensive. Technology is more easily applied in textile manufacturing due to the large scale and uniformity of the production processes.

Since a significant proportion of machinery, equipment and technology are imported from abroad, the value of the local currency plays an important role in determining new investments. In order for the textile industry to compete internationally as well as to respond to a renewed growth in demand in clothing products, as a result of export growth, it is important for the sector to continue upgrading its production equipment.

Table 2.4: Capital expenditure on new assets in the textile industry

R (million)	**Year**			
	1998	**1999**	**2000**	**(Sep) 2001***
Buildings	18	44	14	11
Machinery & equipment	330	273	502	278
Vehicles	14	19	17	6
TOTAL	**362**	**336**	**533**	**295**

Source: Textile Federation of SA (2003)
*Official statistics of 2001 (Jan-Dec) not available
Official statistics of 2002 and 2003 – not available from Textile Federation of SA

The Annual Report of the Department of Trade and Industry 2000-2001 (DTI, 2002) reveals that from the perspective of the technological composition of output, South African manufacturing has seen the share of the low-technology sectors decline; the share of medium-technology sectors remain constant, while the high-technology sectors have seen a steady increase. Currently, the high-technology sectors contribute more than 41 per cent to total manufacturing value added. It is important to note that an increase in capital expenditure of machinery and equipment has a directly bearing on the skills needed in the industry to operate the new technology.

The technological composition of output of the various production processes of the textile industry can be derived from the capital intensity of these production processes as listed in **Table 2.5.**

Table 2.5: Characteristics of textile and clothing production stages

Production Process	Energy Usage	Water Usage	Labour Intensity	Capital Intensity	Lead Time for New Production
Natural Fibre Preparation	Low	Little or none	Low	Low	Moderate
Man-Made Fibre Production	Moderate to high	Moderate to high	Low	High	Long
Yarn Texturising	Moderate	Low	Low	Moderate	Moderate
Yarn Spinning	Moderate	Little or none	Low	Moderate	Moderate
Yarn Dyeing	Very high	Very high	Low	High	Moderate
Fabric Formation	High	Moderate	Low	High	Long
Fabric Finishing	Very high	Very high	Low	High	Long
Garment Production	Low	Low	High	Low	Short
Garment Washing	Moderate	High	Low	Moderate	Short

Source: WESGRO (2002)

2.3.4 UTILISATION OF PRODUCTION CAPACITY

The gross domestic product (GDP) is often used to measure the level of maximum sustainable economic growth of a country. According to ABSA (ABSA, 2002: 14) this can be defined as "the output that the economy can produce under conditions of full employment of the factors of production". The growth potential of the economy is therefore determined by both the rate at which production factors expand, as well as the efficient utilisation of these production factors. Productivity, capital and labour are the most important factors underlying the growth potential of the economy.

The rate of GDP growth has in recent years undergone fairly significant fluctuations, from a low growth rate of 0,8 per cent in 1998 to a increased growth rate of 3,4 per cent in 2000, dropping again to 2,2 per cent in 2001. Based on realistic economic prospects for the next fifteen years, ABSA predicts a base scenario GDP growth of 2,4 per cent for the next five years on condition that sound economic policies are in place, the inflation rate is around 5,5 per cent per annum on average and relatively stable labour market conditions exist (ABSA, 2002: 14).

The labour market is unbalanced in South Africa, as is evident from the average highly-skilled labour-to-total employment ratio of 17,5 per cent during 1997-2002. This indicates a shortage of skilled labour and a surplus of unskilled labour. ABSA predicts that the supply of highly skilled labour will increase according to the historical rate by an average of 19,3 per cent per annum during 2003 to 2007 as detailed in the **Table 2.6**.

Table 2.6: Economic growth and determining factors (annual averages)

Factors		1992-1996	1997-2002	2003-2007***
Potential real GDP growth	y/y%	2,1	1,8	2,8
Actual real GDP growth	y/y%	2,8	2,4	2,8
Highly skilled labour/ total employment ratio	%	14,5	17,5	19,3
Capital employed per worker	R'000	157,0	178,1	188,8
Capital/labour ratio*	y/y%	0,5	2,6	0,2
Output per worker	R'000	70,2	85,4	96,8
Output/labour ratio**	y/y%	2,5	4,1	1,0

* Real capital stock/labour force

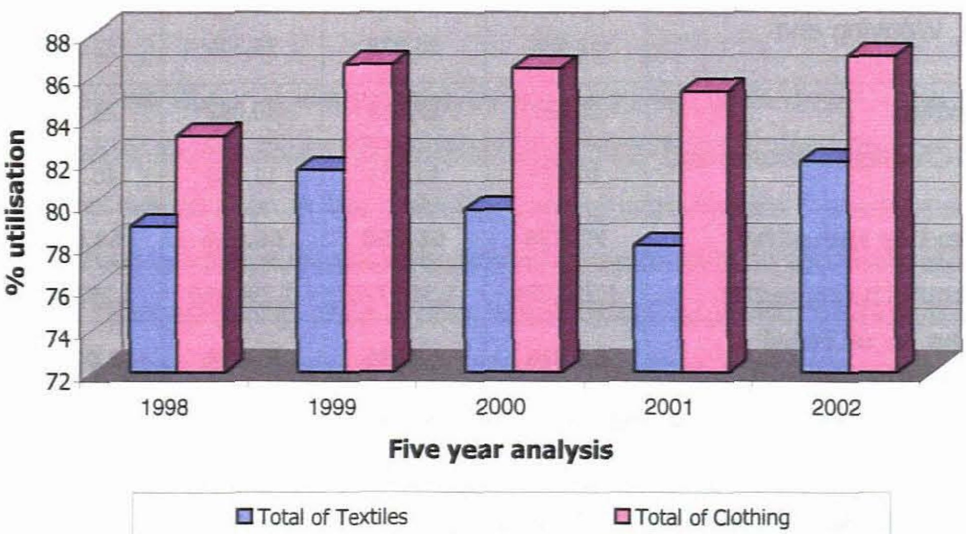
** Real GDP/labour force

*** ABSA Base scenario: realistic forecast

Source: ABSA (2003)

Another factor underlying the growth potential of the economy is productivity that has, apart from the past few years, performed less than satisfactorily in previous years. ABSA (2002: 14) argues that a number of reasons influenced this performance, including insufficient education and training, obsolete technology and systems as well as a lack of awareness and knowledge regarding productivity, resulting in a sharp increase of unit labour costs. This caused the economy to become more capital intensive, resulting in an increase in the capital-to-output ratio. A growth rate of 1,0 per cent per annum in total factor productivity (labour and capital productivity combined) is needed to achieve the economic growth potential as predicted in **Table 2.6** for the next five years (ABSA, 2003: 14).

Figure 2.2 indicates that the textile industry utilised 78,0 per cent of its production capacity during 2001 according to Statistics SA (2002), compared to an average of 79,8 per cent in 2001 for the manufacturing sector in South Africa. The clothing industry reported a production utilisation of 85,4 per cent in 2001, which is 7.4 per cent higher than the textile industry during the same period. It is argued by WESGRO (2002: 25) that the biggest factor contributing to the under-utilisation of production capacity in the textile sector can be accounted to insufficient demand. An increase in exports of 33 per cent during 2002, compared with 2001, is mainly due to opportunities created by the African Growth & Opportunity Act and this signals a more effective use of production capacity.



Source: Textile Federation of SA (2003)

Figure 2.2: Utilisation of production capacity 1998-2002 according to major manufacturing groups

2.3.5 TEXTILE INDUSTRY EMPLOYMENT NUMBERS

According to Statistics SA (2002), the number of persons employed in the textile industry in 2001 was 64,073, accounting for 4,9 per cent of total manufacturing sector employment during that year. A total of 1,262,570 people were employed by the total manufacturing sector in South Africa during 2001 (WESGRO, 2002: 26). **Table 2.7** presents the employment statistics of a four-year period (1998 to 2001), indicating that employment numbers decreased gradually with a drop of 8,763 employees, owing to difficult trading conditions experienced by the industry.

Year-on-year growth in labour productivity in the manufacturing sector rose from 3.1 per cent in the 3rd quarter of 2001 to 6,5 per cent in the 2nd quarter of 2002. With reference to textiles (including knitting mills), the average employment of the first half of 2002 was 65,305, which is 2,4 per cent more than the same period in 2001 (Claassens, 2003a: 7).

Table 2.7: Total employment in the textile industry and manufacturing sector

Industry Category	**Number of Employees**				
	1998	**1999**	**2000**	**2001**	**2002**
"Spinning, Weaving and Finishing"	29,585	26,278	25,379	25,203	26,634
"Other Textiles"	28,682	27,719	30,097	28,169	27,904
"Knitted / Crocheted Fabrics and Articles" [3]	14,569	11,661	11,150	10,701	10,913
Total: Textile Industry	**72,836**	**65,658**	**66,626**	**64,073**	**65,451**
Total: Manufacturing sector	1,350,784	1,315,723	1,296,166	1,262,570	1,270,000
Textiles as % of Total Manufacturing	**5.39%**	**4,99%**	**5,14%**	**5,07%**	**5,15%**
Source: Textile Federation of SA (2003)					

2.3.6 AVAILABILITY OF SKILLED LABOUR

South Africa is often regarded as a labour-abundant country, judging by the official 2002 unemployment rate of 30,5 per cent, this would appear to be the case (ABSA, 2003: 30). However, in a modern economy, it is not appropriate to examine only the number of people available to the economy; this supply should be assessed in terms of supply of appropriate skills. Middleton, *et al.* (1993: 1) state that two factors are generally considered to be prime determinants of the quality of a workforce: labour productivity and flexibility of the workforce. According to Middleton *et al.* (1993: 5), these two factors are becoming

[3] This category has significant overlap with clothing manufacturing activities and is thus often excluded. This needs to be considered when viewing "Total Textiles" employment totals.

increasing significant to countries with emerging economies seeking to expand their economies and improve the welfare of the citizens. These factors impact on a country's ability to adapt the technology needed to produce better quality goods and services at lower costs and to shift the structure of production to new markets and products as required in a global economy.

One of the key factors constraining long-term growth of South Africa is a relative scarcity of skilled labour. Modern production processes often require an increasing proportion of highly skilled labour as a percentage of the total labour employed. The implication is that investment will increasingly follow the flow of skills, because without the necessary appropriate skills to operate modern production technology effectively, capital equipment will be used less productively. The relative scarcity of highly skilled human resources implies a limited potential for labour force productivity gains through capital investment, and is thus a key constraint on both potential and actual output growth (ABSA, 2002: 2).

This scarcity of skilled labour is exacerbated by the so-called "brain drain". The report on *Long-term Prospects for the South African Economy 2002-2016* by ABSA (2002: 2) argues that if there is no deterioration in the domestic political and economic situation from 2002 onward, South Africa will find it increasingly difficult to retain skills in the years ahead. This is influenced by changes taking place in the industrialised countries, which will raise the demand for skilled labour in those countries. The slow-down in immigration rates is equally to blame for the loss of skilled labour in South Africa, as confirmed by interviewees in **Chapter 5** of this thesis, which is compounded by a too low intake of students at higher education institutions in areas where a shortage of skilled labour already exists, including clothing and textiles. The Technikon learner profile is discussed in more detail in **Chapter 4** of this thesis.

Other important factors impacting on the availability of skilled labour are the declining fertility rates in South Africa, which are accelerated by the HIV/Aids pandemic. ABSA (2002: 4) predicts that these factors will contribute to a decline in fertility rates and will raise the death rate, resulting in a negative growth of both the size of the total population and the labour force. ABSA (2002: 4) argues that, although the impact on the highly skilled labour component of the labour force will be less severe, a mortality rate of 2 per cent is expected, which will result in a significant impact over the longer term. Statistics also reveal that the bulk of Aids deaths will take place among the younger sections of the working age population, with the 30-34 year-old age group being the hardest hit by Aids deaths.

Domestic demographic trends influenced by a decline in the fertility rate and increase in HIV/Aids deaths, accompanied by emigration of skilled labour to developed countries in search of better job opportunities, are key constraints to the formation of a substantially larger skills pool in South Africa.

At the NATCON Conference held in Cape Town in May 1998, a number of speakers focused on the need for the textile and clothing industries in South Africa to be globally competitive and to target export markets in order to survive in a difficult economic climate. Gottschalk of Woolworths remarked at the Conference, "outdated management practice and the lack of sound technical managers in the 25-40 age bracket, is a hindrance to the industry locally" (Anon, 1998: 6). Gottschalk indicated that it is the responsibility of the industry to close the generation gap of suitable managers and technologists in the textile industry.

The shortage of skilled labour has become even more pertinent, as confirmed in an interview with Page of a specialist textile recruitment company in South Africa, published in the June/July 2003 edition of the clothing and textile industry magazine, *Pursuit* (Turvey, 2003: 22-25). Page reports that there is a critical shortage of skilled and trained technical labour in the textile industry with various technical positions in spinning, weaving, sizing, pre-treatment, continuous dyeing, finishing and printing, as well as other mechanical positions, that need to be filled. "Page accounts the drop in expertise as a result of people retiring, others having left the industry for better jobs in, for example, the paper industry or having emigrated" (Turvey, 2003: 22-25).

2.3.7 SKILLS DEVELOPMENT

The Human Development Index (HDI) is often used to measure the average achievements of a country in three basic dimensions of human development:

- Longevity or life expectancy.
- Knowledge or educational attainment (adult literacy and combined primary, secondary and tertiary enrolment).
- Standard of living or real gross domestic product (GDP) per capita.

The HDI is used for obtaining internationally comparable indications of the ability of individuals within a country or across various countries to live long, informed and comfortable lives. The scale of the HDI ranges from zero, which indicates a very low level of development to 1, which indicates a very high level of development. The United Nations Human development report of 1997 (Statistics SA, 2002) ranked countries such as Norway, Sweden, Australia, United States, Japan, United Kingdom, Germany, Israel, Greece and Chile as countries of "high human development", while South Africa was listed as a country with "medium human development" along with other countries such as Mexico, Saudi Arabia, Brazil, China, Egypt, Namibia, India, Swaziland, Botswana and Zimbabwe. South Africa obtained an HDI score of 0,724 in 1995, which dropped to 0,695 in 2000, while countries of high human development showed a steady increase during the same period. Human Development Index trends of selected countries are included as **Appendix B**.

When considering solutions to the skills shortage, more appropriate and efficient education, training and skills development are often listed as possible solutions. Reforming the education and training system in a country is the responsibility of the state. In fulfilling this core function, the state is faced with the dilemma of increasing the relevance, effectiveness, efficiency, equality and sustainability of the training system to meet new demands. Van Dyk *et al.* (1997: 82) argue that the South African government is faced with the enormous challenge of balancing the demand for a skilled and flexible labour force to make industries more competitive on the one hand; yet on the other hand, it also has to redress equal access for all citizens to training opportunities, while at the same time redressing disadvantages faced by particular groups. The state is therefore forced to develop new policies and enabling mechanisms that are supportive of the economic and social changes in the country. Policy goes hand in hand with legislation that should make provision for enabling mechanisms that will regulate the actions and inputs of those involved in training. The most important elements of labour legislation that have been enacted in recent years are the *Labour Relations Act* (LRA) (Act 66 of 1995), the *Skills Development Act* (SDA) (Act 97 of 1998), the *Skills Development Levies Act* (SDLA) (Act 9 of 1999), the *Employment Equity Act* (EEA) (Act 55 of 1998), the *Basic Conditions of Employment Act* (BCEA) (Act 75 of 1997) and the *South African Qualifications Authority Act* (SAQA) (Act 58 of 1995).

The Department of Labour in South Africa is primarily responsible for legislation and state expenditure for training. Part of the skills enhancement strategy is provided for in the *Skills*

Development Act (Act 97 of 1998) and the *Skills Development Levies Act* (Act 9 of 1999). The main focus of the *Skills Development Act* is the improvement of skills levels of the South African work force to ensure greater productivity of employees (workers) and competitiveness of employers. The *Skills Development Levies Act* (Act 9 of 1999) is the financing counterpart of the *Skills Development Act* (Act 97 of 1998), which is set to replace the *Manpower Training Act* (Act 56 of 1981).

The SDA and SDLA provide for a partnership between the public sector and private sector. A payroll levy is placed on all firms, yet only those that train will qualify for a grant. The training strategy has a sectoral focus and is aimed at providing generic skills. It will also attempt to address the constraints placed on first-time entrants to the labour market through a learnership system. Funds collected in terms of the levy system are used to finance the Sector Education and Training Authorities (SETAs) which were established during 2000. A Sector Education and Training Authority dedicated to clothing, textiles, footwear and leather (CTFL SETA) was established to replace the old Clothing Industry Training Board (CITB) and the Textile Industry Training Board (TITB) during 2000. The Clothing, Textiles, Footwear and Leather Sector Education and Training Authority (CTFL SETA) aims to develop and enlarge the skills base of all employed in the clothing, textiles, footwear and leather economic sector, through the promotion and implementation of effective learning programmes and skills planning, which is aimed at work place security and productivity.

The Textile Industry Training Board conducted a Skills Audit in August/September 1997 to identify skill shortages and to develop an acceptable strategic training plan to satisfy the needs of the textile industry in South Africa. An analysis of the results of the Skills Audit revealed the following as presented in **Table 2.8**:

Table 2.8: Statistics of textile technologists 1997

Region	Number of textile technologists employed in the textile industry	Percentage employment per region
Kwazulu-Natal	88	54,7%
Eastern Cape	27	16,7%
Western Cape	34	21,1%
Other regions	12	7,5%
Total	161	100,0%

Source: TITB (1997)

The Textile Industry Training Board drew the following conclusions from the data presented in the Skills Audit (1997), which resulted in the implementation of a high-level textile technologist programme at the Peninsula Technikon in January 2001:

- The Western Cape textile industry represents approximately 22 per cent of the textile production units of the South African textile industry (Naumann, 2002: 33) yet only 21,1 per cent of the total number of qualified textile technologists in South Africa were employed in the Western Cape.
- The industry has traditionally relied on a supply of highly skilled technologists from other countries. The political climate and declining value of the South African currency at the time have resulted in a drop in supply from other countries.
- The training and development costs of sending employees from the Western Cape to KwaZulu-Natal have increased significantly, resulting in fewer textile technologists being developed by the Western Cape textile industry.
- The importance of providing high-level textile technology education in the Western Cape became evident. Tertiary education in textile technology was limited to only the Durban Institute of Technology (formerly known as Technikon Natal), until Peninsula Technikon established a National Diploma programme in Textile Technology in January 2001. The conceptualisation of the programme at Peninsula Technikon was the culmination of cooperation between industry, labour, the Clothing, Textiles, Footwear and Leather SETA (CTFL SETA) and Peninsula Technikon.

The focus of this research project is to present an outcomes-based training model for textile technologists, consisting mainly of the development and curriculum-orientated evaluation of an outcomes-based textile technologist programme at the Peninsula Technikon.

2.3.8 TEXTILE TRADE PERFORMANCE AND TRENDS

For several years, the textile industry in South Africa has been a highly protected and supported sector. In addition, textile companies also earn credits for products exported under the *Duty Credit Certificate Scheme* (DCCS) of the SA Department of Trade and Industry, which is used by companies exporting products to offset between 10 per cent and 15 per cent of the cost of importing input materials. Textile manufacturing companies exporting products also earn a rebate on approximately 400 imported goods, if they use these materials in their production processes. "While this has seen sometimes quite dramatic increases in the levels of exports particularly of higher value added products and some yarn products it has caused an over-dependence on the incentive. There are grave concerns that without the DCCS exports will in many instances fall away" (TEXFED, 2002: 5).

The figures presented in **Table 2.9** indicate that effective levels of tariff protection for the industry have been reduced markedly and rapidly since 1995, as a result of Government's embarking on a series of negotiations on a number of fronts to enter trade agreements, such as the SA/EU trade agreement and the Southern African Development Community free trade protocol (TEXFED, 2002: 6).

Table 2.9: Liberalisation of the SA textile sector: 1995-2002 (%)[4]

Sub-sector	Tariff: 1995	Tariff: 1999	Tariff: 2002
Polyester fibre	23	15	7.5
Spun yarn	30	22	15
Woven fabric	42	30	22
Household textiles	52	40	30

Source: Textile Federation of SA (2002: 6)

According to economist, Twine (Anon, 2003b), South Africa is a net importer of textiles; in other words, the country consumes more than what it is able to produce. Net imports also indicate that the textile industry is unable to compete sufficiently to ensure that it exports more than what it imports. Although total trade in textiles has increased steadily over the

[4] In terms of the SA/EU Free Trade Agreement, the EU will reduce its tariffs to zero over six years, while South Africa will reduce its duties to 50% of its MFN (Most Favoured Nation) levels over an eight-year period.

past five years as illustrated in **Figure 2.3**, Twine states that "the sector looks very much like it did 10 years ago" (Anon: 2003b).

Both imports and exports of textile goods have been increasing during the period under review as presented in **Table 2.10**. These figures reveal the increasing integration of the textile industry in South Africa into global value chains. Both exporting and importing have increased substantially, with exports increasing from R1,8 billion in 1995 to R3,4 billion in 2001. Imports increased from R3,4 billion to R5,2 billion during the period of seven years. The net trade value of the industry remains negative with a R1,8 billion trade deficit for textiles in 2001.

Table 2.10: Export, import and net trade values of S.A. textile industry 1995-2001

Year	Exports[5] (R'million)	Imports (R' million)	Net trade value (R'million)
1995	1,800	3,366	-1,566
1996	2,154	3,539	-1,385
1997	2,438	4,021	-1,583
1998	2,356	4,276	-1,920
1999	2,618	4,023	-1,405
2000	2,888	4,656	-1,768
2001	3,372	5,192	-1,820

Source: Textile Federation of SA (2002: 6)

Figure 2.3 provides an overview aggregate of production and consumption of the textile industry, by presenting total sales of textiles, imports, exports and domestic consumption for the five-year period 1997-2001. It clearly illustrates that domestic consumption (consisting of total sales plus imports, less exports) consistently exceeds local industry production and sales. WESGRO (2002: 34) reports that an analysis of the import and export performance of the textile industry, relative to domestic production, reveals that both textile and clothing imports have gained an increasingly greater foothold in the domestic market. These figures will not reflect the illegal and unrecorded textile and clothing imports that threatens local production.

[5] These figures are inflated by the export orientation of the wool fibre sub-sector where 90% of sales are derived from exports.

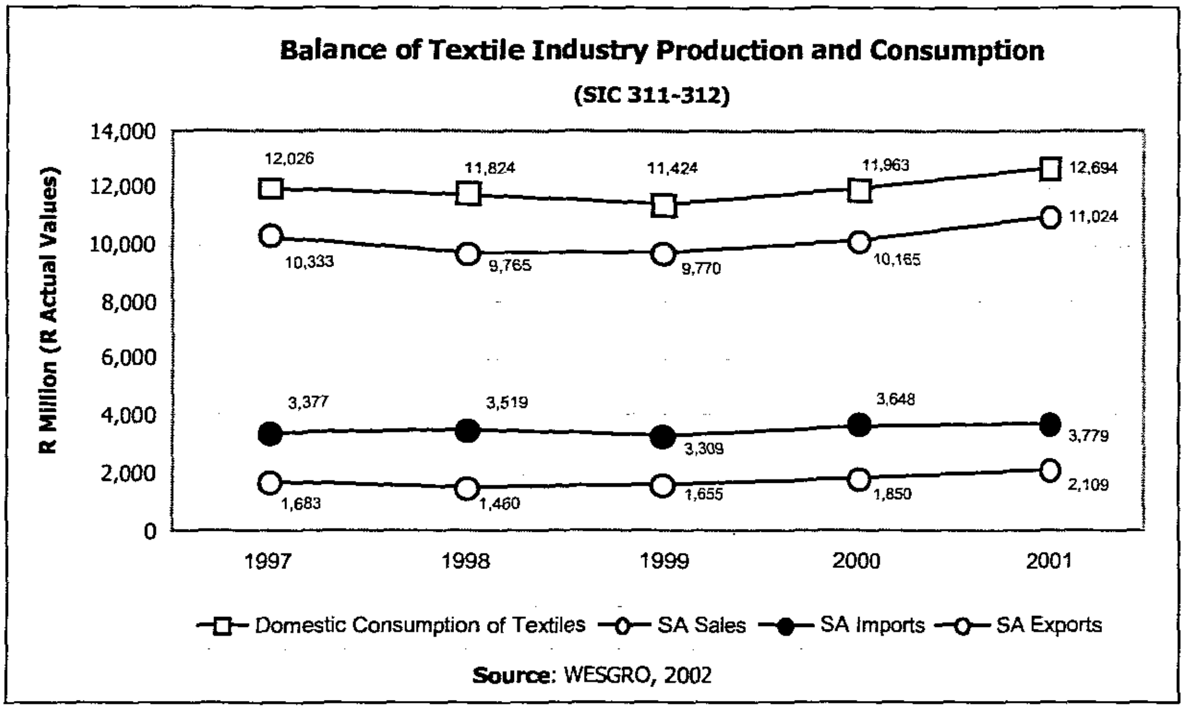


Figure 2.3: Consumption, sales, imports and exports of the textile industry

2.3.9 INTERNATIONAL TRADE AGREEMENTS

Trade and industrial policies of the South African government are aimed at facilitating transformation of South Africa into a sustainable, fast growing, internationally competitive, labour absorbing and export-oriented economy. Recent trade agreements between South Africa and its most important international partners – the European Union (EU) and the United States of America - have important implications for the South African clothing-textile pipeline.

An increase in textile exports over the past three years can largely be contributed to the recent decline in the value of the South African currency relative to the US dollar, which would have made South African textile products more competitive, while making imports more expensive and therefore less competitive. During the first quarter of 2003 the South African currency strengthened against other currencies, which impacts negatively on exports, resulting in a decline in apparel exports. With a stronger South African currency there is more competition from other countries and the clothing, textile and footwear sectors are sensitive to these fluctuations of the S.A. Rand, which could lead to job losses. Kipling (Anon, 2003b), chairman of the Export Council for the clothing industry, argues that the country is still in the process of becoming an export-driven economy and that South Africa may not yet have reached the level of sophistication needed to ensure that the currency remains fairly stable, which is regarded as a prerequisite for successfully retaining and building a market share in the global economy.

2.3.9.1 African Growth and Opportunity Act

On 18 May 2000 President Clinton, former president of the United States of America, signed the African Growth and Opportunity Act (AGOA), which announced a era of trade between the United States and sub-Saharan African countries. The African Growth and Opportunity Act forms part of the United States Trade and Development Act of 2000, which expands the benefits previously available under the Generalised System of Preferences (GSP) programme, with the intention to:

- Encourage increased trade and investment between the United States and sub-Saharan Africa.
- Reduce tariff and non-tariff barriers and other obstacles to sub-Saharan Africa and United States trade.
- Expand United States assistance to sub-Saharan Africa's regional integration efforts.
- Negotiate reciprocal and mutually beneficial trade agreements, including the possibility of establishing free trade areas that serve the interests of both the United States and the countries of sub-Saharan Africa.
- Focus on countries committed to the rule of law, economic reform, and the eradication of poverty.
- Strengthen and expand the private sector in sub-Saharan-Africa, especially enterprises owned by women and small businesses.
- Facilitate the development of civil societies and political freedom in sub-Saharan Africa.
- Establish a United States-sub-Saharan Africa Trade and Economic Cooperation Forum.
- Facilitate accession of the countries in sub-Saharan Africa to the Organization for Economic Cooperation and Development Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (USA Government, 2000).

The Africa Growth and Opportunity Act (AGOA) authorises the President of the United States of America to designate countries as eligible to receive the benefits of AGOA, if these countries are determined to have established, or are making continual progress toward

establishing the following: market-based economies; the rule of law and political pluralism; elimination of barriers to US trade and investment; protection of intellectual property; increasing availability of health care and educational opportunities; protection of human rights and worker rights; and elimination of certain child labour practices. Current legislation makes provision for countries to utilise these benefits until 2008, although President Bush indicated in his address to the second annual US-Sub-Saharan African Trade and Economic Cooperation Forum in January 2003 that he would approach US Congress to extend AGOA beyond 2008.
The significance of AGOA to the clothing and textile industries in South Africa was emphasised by President George W Bush, when he stated in his address to the first US-Sub-Saharan African Trade and Economic Cooperation Forum in October 2001, that: "No nation in our time has entered the fast track of development without first opening up its economy to world markets. The African Growth and Opportunity Act is a road map for how the United States and Africa can tap the power of markets to improve the lives of citizens" (USA Government, 2001).

AGOA provides duty-free and quota-free access to the US market within limits for apparel made in eligible sub-Saharan Africa countries from US fabric, yarn and thread. It also provides for substantial growth of duty-free and quota-free apparel imports made from fabric produced in beneficiary countries in sub-Saharan Africa. Amendments to the African Growth and Opportunity Act signed by President Bush in August 2002, further expands preferential access for imports from beneficiary sub-Saharan Africa countries.

On 6 March 2001 South Africa became eligible for participation in the benefits of AGOA, resulting in a dramatic increase of apparel and textile exports to the United States from $33 million in 2001 to $88 million in 2002. The Southern African Customs Union (SACU) consisting of Namibia, Botswana, Swaziland, Lesotho and South Africa aims to create a free trade agreement (FTA) with the United States of America in order to maintain and increase export potential, since free trade agreements between South Africa and the European Union might impact negatively on the success of AGOA.

The clothing-textile pipeline can vastly benefit from AGOA, with Cape Town conveniently located to reduce shipping time from South Africa to US markets. Textiles are currently disqualified from benefiting directly under the African Growth and Opportunity Act, and may not be exported to the US duty-free, but the textile industry will benefit from an increased demand for textiles produced in sub-Saharan African countries. Although the clothing/wearing apparel benefits have been in place for approximately two years, the number of Western Cape clothing manufacturers exporting to the United States is still relatively low. The textile industry is well positioned to supply textile products to both the domestic and SACU region, yet according to recent studies strict rules of origin, tariffs and technical trade barriers are hampering the development of an efficient regional textile-clothing pipeline to ensure greater benefits (WESGRO, 2002: 46). Naumann (2002: 9) claims that AGOA also brought about renewed interest in the region by foreign investors, who are seeking to establish supply chain linkages with South Africa.

2.3.9.2 European Union Trade Agreement

A *Trade, Development and Co-operation Agreement* between the European Union and South Africa was signed on 11 October 1999 in Pretoria. The agreement regulates the gradual downscaling of tariff-based barriers between South Africa and the European Union, which is known as the EU/SA Trade Protocol.

According to WESGRO (2002: 47), since the European Union is the largest overall trade partner of South Africa, accounting 37 per cent of the total value of exports in 2001 and 41 per cent of total imports in the same year, any trade-related agreements will impact significantly on the clothing and textile industries of SA. The EU/SA trade agreement has the following objectives as viewed from a South African viewpoint:

- The consolidation of strategic links with South Africa's main trading partners in Europe with a view to provide sustainable economic growth.
- South Africa will increase its international competitiveness and will expand in those sectors where it is competitive.
- The continuing development of local and regional industrial capacity.
- The facilitation of industrial restructuring.
- Increasing investment flows into South Africa and regional economies.

2.3.9.3 World Trade Organisation Agreement on textiles and clothing

The *General Agreement on Tariffs and Trade*, known as GATT, came into existence after World War II, with the intention to bring countries into interdependence by means of trade. North America and European countries were reluctant to allow free trade of clothing and textiles for fear of developing countries threatening their home industries through imports, resulting in textiles and clothing being formally exempted from rules applicable to GATT in 1961.

In 1974 the *Multi-Fibre Agreement* (MFA) came into existence, allowing countries a means of protecting their clothing and textile industries by selectively restricting imports on a country-by-country basis. When the *Multi-Fibre Agreement* ended on December 31, 1994 after 21 years, it regulated 35 per cent of world trade in clothing and 11 per cent of world trade in textiles. The World Trade Organisation came into existence in January 1995 and the MFA was replaced by the *Agreement on Textiles and Clothing* (ATC), which resulted in a gradual process for the ultimate removal of textile and clothing quotas over a ten-year period to 2005. The *Agreement on Textiles and Clothing* affords SA clothing and textile producers the opportunity of quota-free access to export markets, while South Africa should reciprocate by abolishing quotas on textiles and clothing that may still in be existence, thus increasing competition in the domestic market which will provide increased opportunities to exporters.

WESGRO (2002: 5) predicts that countries such as Korea, India and China will stand to benefit more from the *Agreement on Textiles and Clothing* than South Africa, since these countries will have quota-free access to markets of developed countries. South Africa will thus have to compete with a greater volume of clothing and textile exports flowing to Europe and the United States from Korea, India and China. A recent study by the American Textile Manufacturers Institute (AMTI, 2001: 9) reveals the significance of the threat; it concludes that China stands to take over two-thirds or more of the US textile and apparel market once quotas are removed by January 1, 2005. The study predicts that this could signal a collapse of the U.S. textile and apparel industry, one of the largest manufacturing employers in the United States, with the resultant loss of 630,000 U.S. textile, apparel and related jobs and the closure of over 1,300 U.S. textile plants. The report concludes that the United States government and the world community must act quickly through a new World Trade

Organisation initiative to restrain Chinese trade before millions of jobs are lost around the world.

2.3.10 INDUSTRY SUPPORT PROGRAMMES

A number of government support programmes are available to clothing and textile manufacturers from the Department of Trade and Industry (DTI) and the Industrial Development Corporation (IDC). During 1994, the Structural Adjustment Programme was replaced with the Duty Credit Certificate Scheme (DCCS). This scheme is an incentive scheme for exporters of clothing and textile products and will be in place until 2005. The main objective of the DCCS is to influence and encourage textile and clothing manufacturers to compete internationally, independent of government subsidies. Participation in the DCCS is linked to a performance-audit, measuring performance in terms of productivity and training. Participants are also expected to show export growth. Duty-free imports under the DCCS have increased by 59 per cent from R363 million in 1996 to R578 million in 2000. Exports of clothing have also increased considerably and it is expected that exports will continue to increase due to the DCCS benefits (Claassens, 2003b: 3). The International Trade Administration Commission administers the scheme, which was recently promoted through workshops held countrywide. A recent development, announced at these workshops, is the involvement of Sector Skills Facilitators of the CTFL SETA to compile training plans and progress reports for purposes of the Duty Credit Certificate Scheme (Smith, 2003: 30). It is important to consider what will happen after 2005 when the DCCS will expire and to what extent local textile and clothing exporters will be able to export without support from government.

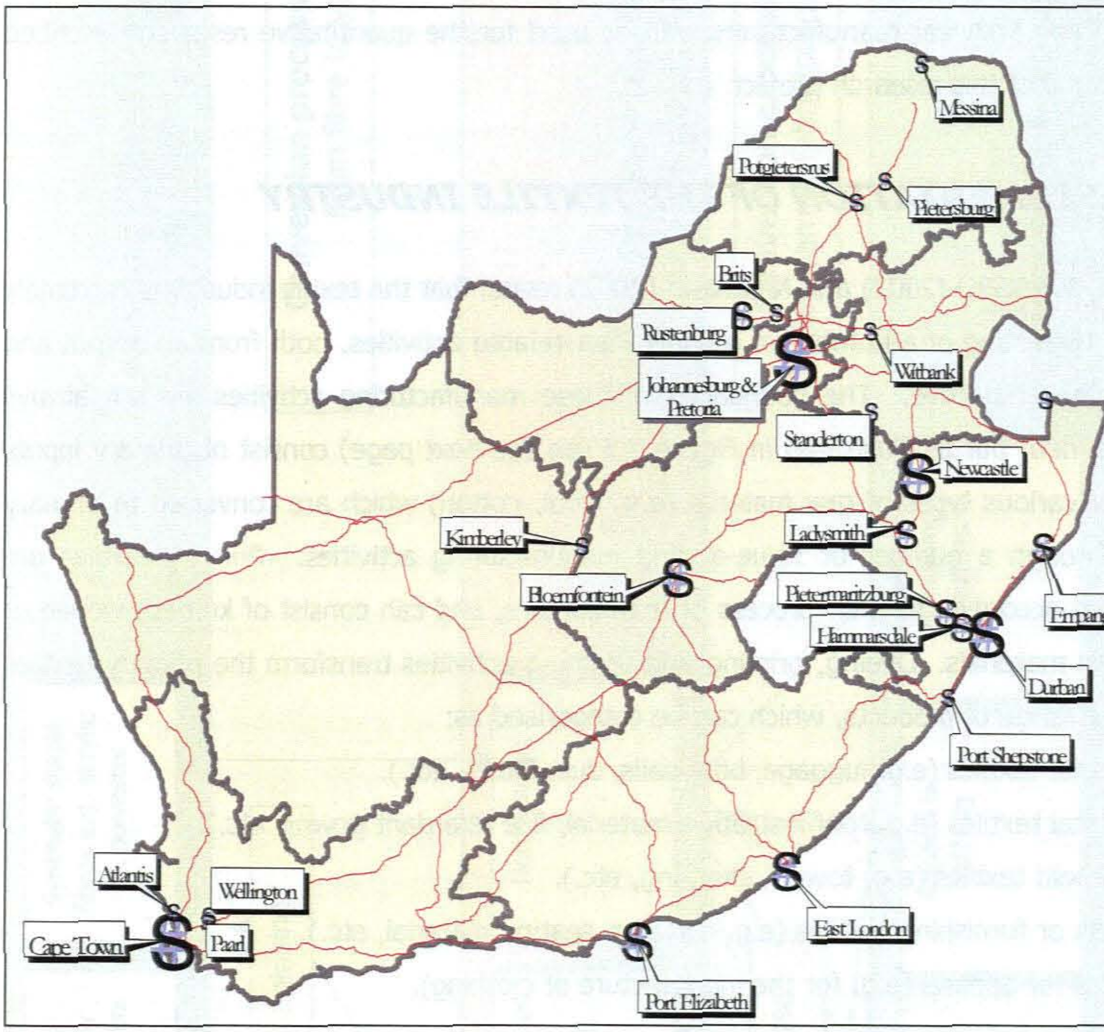
Participating textile manufacturers use funding available through the DCCS to train employees at tertiary institutions in South Africa and other accredited training providers. A number of students are currently financially supported through the DCCS to complete studies in clothing and textile technology at Peninsula Technikon and Durban Institute of Technology. The termination of the DCCS will impact negatively on student numbers in clothing and textile technology at these institutions.

2.4 LOCATION OF TEXTILE INDUSTRY IN SOUTH AFRICA

A sectorial study conducted by WESGRO (2002: 9) as well as a study by Naumann (2002: 17 & 32), reveals that the textile industry is widely dispersed in South Africa, with a concentration in KwaZulu-Natal, the Western Cape and Gauteng, but with textile manufacturing enterprises also located in outlying, decentralised areas. Naumann (2002: 3) states that textile production units are located on the one hand, close to the source of their raw material, and on the other hand, near their main output markets (where the clothing manufacturing and retail industry is located). While existing enterprises in the clothing and textile sectors have based their location decisions in the past on ready access to raw materials and favourable government policies, the development of a regional supply chain has become an important factor for consideration in today's competitive market.

Based on a comprehensive industry database developed over more than a decade, Naumann (2002: 33) reports that there are approximately 530 textile production units and 2,350 clothing production units in South Africa in a study to analyse the spatial distribution of the clothing and textile industry in the SADC region. KwaZulu-Natal is the dominant textile and clothing manufacturing region in South Africa, representing approximately 36 per cent of the textile industry and 33 per cent of the clothing industry in South Africa. The textile and clothing production units in KwaZulu-Natal are located between Durban Metro, Hammersdale, Port Shepstone, Isithebe, Newcastle and Empangeni. The Western Cape represents 22 per cent of textile manufacturing units and 27 per cent of clothing manufacturing units, located mainly in the Cape Metropolitan Area around Cape Town and to a lesser extent in Paarl, Wellington and Atlantis. Gauteng has 22 per cent of the textile industry's production units and 29 per cent of the clothing production units.

Naumann (2002: 2) used specialised Geographical Information Systems (GIS) software in his study on the spatial distribution of the clothing and textile industry in the SADC region to provide an excellent means of presenting the spatial distribution of the textile industry in South Africa, as illustrated in **Figure 2.4**



(Textile production units: **S**:41-105, **S**:26-40, **S**:11-25,**S**:1-10)
Source: WESGRO (2002)

Figure 2.4: **Locational concentrations of South African textile manufacturers**

Decentralised manufacturing activities are a result of the continuous threat from lower-priced imports, which has resulted in manufacturers seeking ways to improve competitiveness. One of these ways has been to move into areas that do not fall under bargaining council jurisdiction, yet in many cases offering attractive investment subsidies from local metropolitan councils (WESGRO, 2002: 9).

Lists were compiled using reliable sources obtained from the Clothing, Textiles, Footwear and Leather Sector Education and Training Authority (CTFL SETA) during 2002 and the Pursuit Index 2003. These lists, containing contact details of Western Cape textile manufacturers, Western Cape textile auxiliary producers, suppliers and commissioners and

Western Cape knitwear manufacturers, will be used for the quantitative research described in **Chapter 6** of this research project.

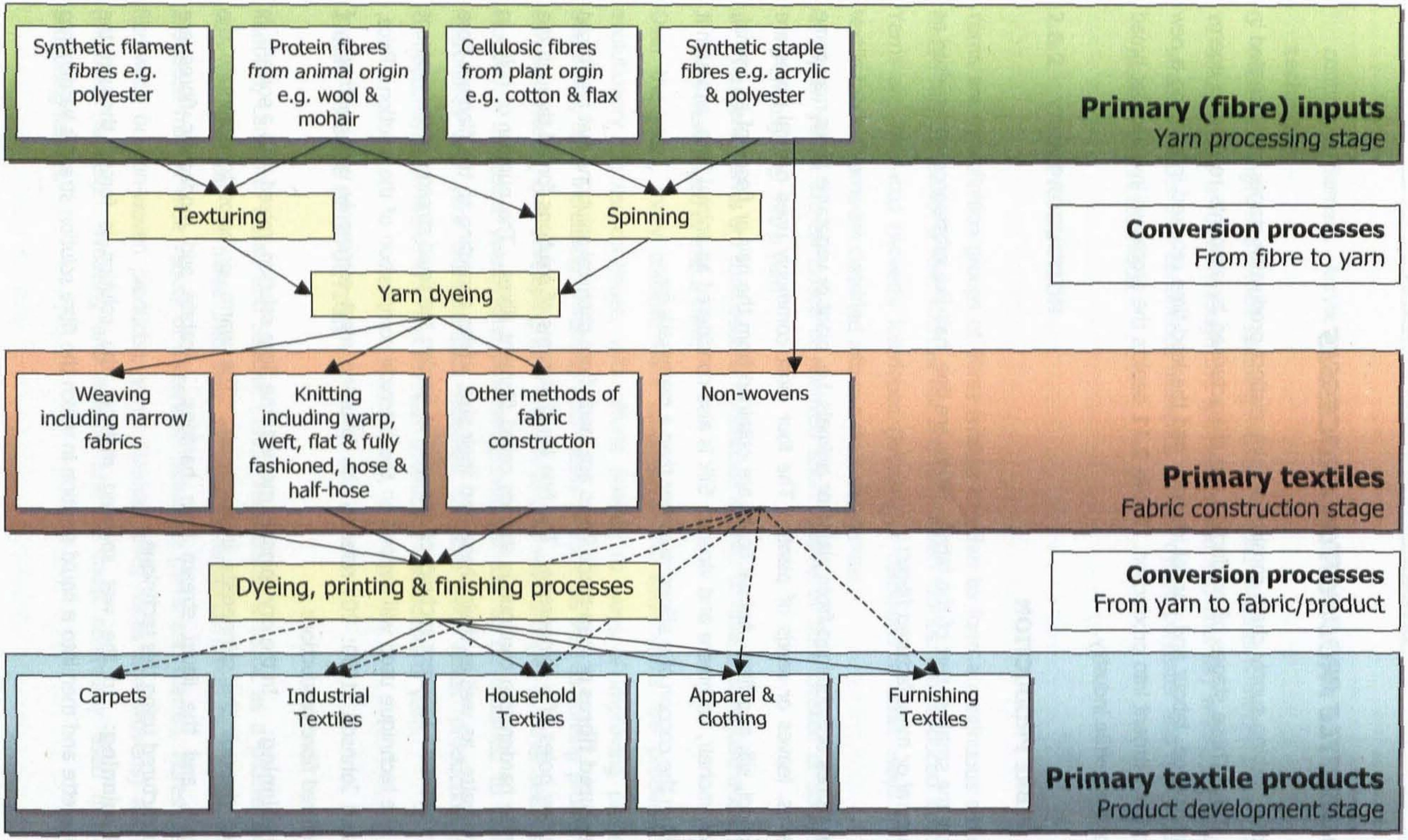
2.5 SEGMENTATION OF THE TEXTILE INDUSTRY

Studies by WESGRO (2002) and Naumann (2002) reveal that the textile industry is extremely complex, consisting of a number of broadly inter-related activities, both from an output and value-chain perspective. The boundaries of these manufacturing activities are not always clearly defined, but as illustrated in Figure 2.5 (on the next page) consist of primary inputs (fibres) of various types of raw material (e.g. wool, cotton) which are converted to primary textiles through a number of value-adding manufacturing activities. Primary textiles are categorised according to their process of manufacture, and can consist of knitted, woven or non-woven materials. Dyeing, printing and finishing activities transform the primary textiles into a vast range of products, which can be categorised as:

- Industrial textiles (e.g. luggage, boat sails, dust filters, etc.).
- Technical textiles (e.g. roof insulation material, fire retardant gowns, etc.).
- Household textiles (e.g. towels, sheeting, etc.).
- Carpets or furnishing textiles (e.g. curtains, seating material, etc.).
- Textiles for apparel (e.g. for the manufacture of clothing).

Major manufacturing processes include:

- Yarn processing: Spinning and texturing.
- Fabric construction:
    - Weaving (including specialised narrow weaving).
    - Knitting (warp, weft, flat and fully fashioned, as well as hose and half-hose knitting).
    - Non-wovens (interlining materials).
    - Other methods of fabric construction e.g. knotting, braiding, etc.
    - Dyeing, printing and finishing.
    - And a number of processes, which include make-up departments (this establishes a link into the clothing manufacturing sector).



Source: WESGRO (2002)

Figure 2.5: Segmentation of the textile industry

2.6 TEXTILE PRODUCTION PROCESSES

The textile clothing supply chain consists of fairly distinct production stages, as illustrated in **Figure 2.6**. These stages of production are characterised by elements relating to energy and water usage, labour and capital intensity and the lead-time required in bringing a new operation/investment into production. **Table 2.11** depicts the processes involved per broad sector of the textile industry.

2.6.1 FIBRE PRODUCTION

Fibres are the smallest part of the fabric. Fibres are fine, hair-like substances, categorised as either natural or manufactured fibres:

Natural fibres are obtained from plants or animals, i.e. plant or vegetable fibres may come from stems, leaves or seeds of plants. The four most commonly used natural fibres are cotton, wool, silk and flax. Animal fibres are obtained from the hair or fleece of an animal, e.g. wool, mohair, cashmere and vicuna. Silk is also considered an animal fibre, although it comes from the cocoon of a silkworm rather than a mammal's fur.

Manufactured fibres or man-made fibres are made from chemical solutions that are forced through tiny holes of a spinnerette. The fine liquid streams of solutions forced through the spinnerette harden into continuous strands called filament fibres. The number of holes in the spinnerette, as well as their shape and their size, varies according to the filament fibre and yarn desired. Different techniques are used to harden the liquid streams of the filament fibres. The technique used will depend on the chemical composition of the solution. Price, Cohen and Johnson (1999: 20) refer to the following most commonly used methods of manufactured fibre production:

- **Dry spinning**: In the dry spinning method, the fibre solution, mixed with a solvent, is forced through the spinnerette in warm air. The warm air helps to evaporate the solvent, and the liquid stream then hardens. Acetate and modacrylic fibres are manufactured using this technique.
- **Wet spinning**: In the wet spinning method, the solution is forced through the spinnerette and then into a liquid solution in which the fibre solution streams harden into

continuous filament. Acrylic fibres as well as viscose rayon fibres are made **with this technique.**

- **Melt** spinning: In the melt spinning method, a solid material is melted to form a liquid solution that is forced through the spinnerette and into cool air, where the liquid fibre streams harden into continuous filaments. Glass, nylon, polyester and olefin fibres are made with this technique.

2.6.2 YARN PRODUCTION

Yarns are by definition groups of fibres twisted together to form a continuous strand. All textile fabrics, except a few, such as felt and non-woven fabrics, are produced from yarns. Yarns are interlaced (woven), interloped (knitted) or combined in other ways to form a textile fabric. Yarns are classified into two main categories:

- **Spun yarns** are composed of relatively short lengths of fibre twisted or spun to hold them together into a yarn.
- **Filament yarns** are composed of continuous strands of fibre that require a low twist to hold them together into a yarn.

Over the years, many changes have occurred in the ways yarns are produced. This evolutionary process continues, with efforts relating to ways of improving productivity, decreasing cost, increasing uniformity and quality of yarn, as well as solving problems with current systems, and developing new systems to deal with changes in other sectors of the industry. In recent years, yarn processing systems had to be modified to work with microfibres and yarn characteristics modified to cope with faster production speeds. Computer systems are used to monitor yarn production and quality of yarn.

2.6.3 FABRIC PRODUCTION

Kadolph, Langford, Hollen and Saddler (1993: 180) define a fabric as a pliable, planelike structure that can be made into two- or three-dimensional products. Fabrics can be produced from a wide variety of materials: solutions (films and foams), fibres (felts and fibrewebs or non-woven products), yarns (braids, knits, laces and wovens) and fabrics (multiplex fabrics). Weaving and knitting are the most commonly used methods of producing fabrics.

2.6.4 DYEING PROCESSES

The application of colour to a textile product is recognised as the most important element in textile sales and marketing. It is often the colour of a textile product that will appeal to the consumer. Adding colour to textiles is a sophisticated and complex area where art and creativity meet with science and technology. The chemistry of dyestuff and the dyeing process is extremely complex, yet the development of electronic and computer science applied to the dyeing process have enhanced rapid global trading and quick response systems. Computer applications relate to improved quality of dyed goods, with the possibility of producing thousands of shades with minimal colours in overlap printing. Computer-aided design systems (CAD), computer-aided engraving systems (CAE) and computer-aided manufacturing systems (CAM) provide the designer with creativity, flexibility and improved coordination, while the monitoring of dyeing processes will decrease the environmental impact of these processes.

2.6.5 PRINTING PROCESSES

Price *et al.* (1999: 196) describe printing as dyeing in a localised-patterned design. Textile printing uses the same dyes or pigments applied to produce dyed fabrics. The designs for printed fabrics are an important element of printed fabrics, which are produced by textile designers using manual and computerised design methods. There are several methods for the printing of textiles. Screen printing and roller printing are the two methods of commercial importance. Heat-transfer printing and jet printing are recent developments in the printing of fabrics. Both these processes increase production rates and eliminate the time delay and costs for the engraving of rollers or screens used in other printing methods.

2.6.6 FINISHING PROCESSES

Fabrics usually have to undergo finishing processes, which follows after fabric construction, dyeing and printing. Finishing is the final process before the fabric is cut into apparel or made into articles such as towels, curtains or draperies. Fabric finishes have a profound effect on fabrics and can change the appearance, the handle or the performance of fabrics. Textile finishes are classified in several ways. The most common classification is aesthetic finishes, which modify the appearance and/or handle or drape of fabrics, and functional finishes, which improve the performance properties of fabrics. Another classification of finishing processes distinguishes between wet finishing, which uses chemicals in processing and dry finishing, which uses mechanical processes.

Development regarding environmentally friendly textile production has resulted in developments in finishing processes, resulting in higher production speeds and less water and energy usage. Another important development is the use of computer-controlled finishing processes, which allow for ease of planning and incorporate built-tin menus to facilitate changing of recipes. Computer systems also result in better control of environmental impact by allowing for the treatment of residue and recycling of recoverable chemicals from finishing.

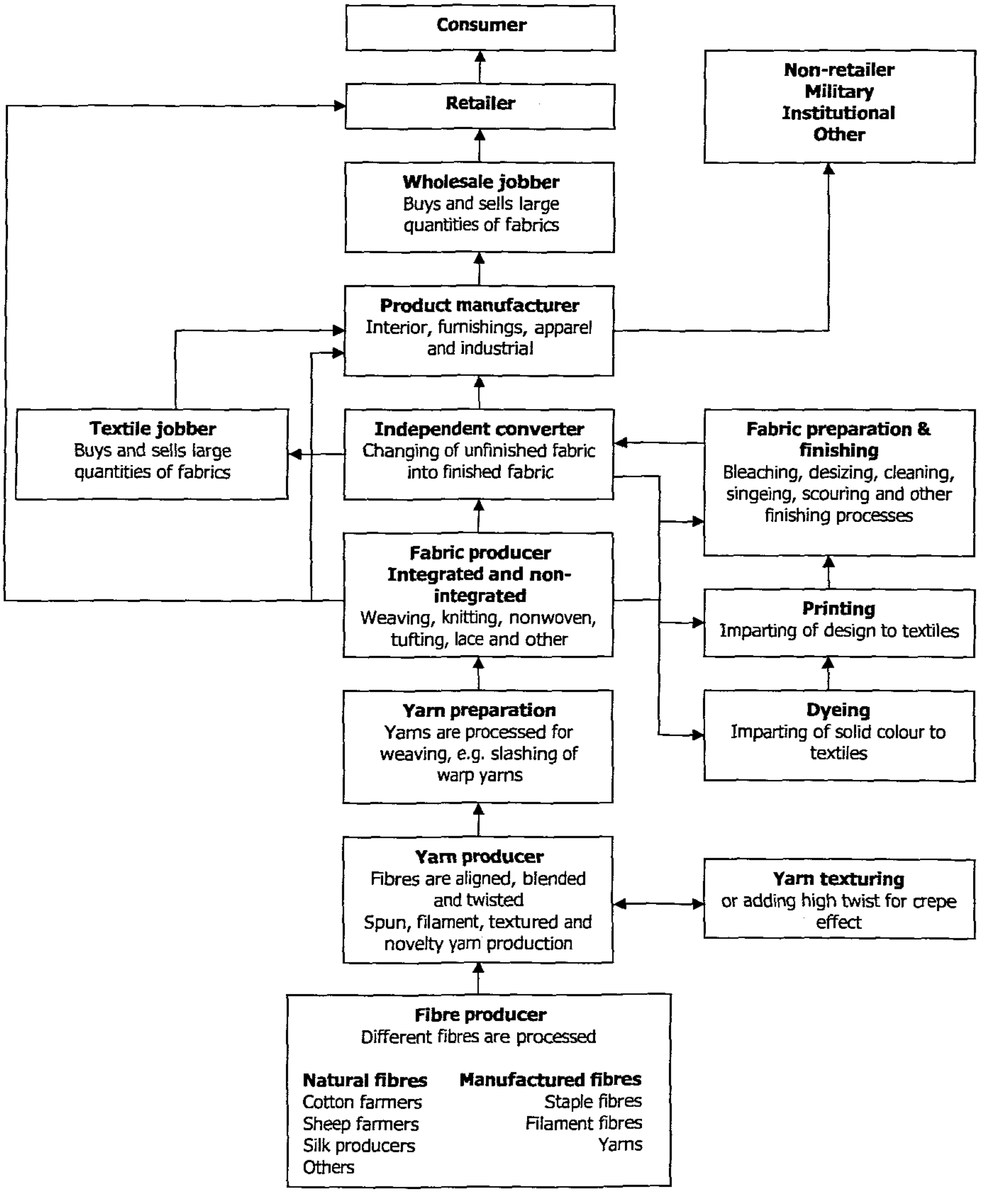


Figure 2.6: Textile production processes

Table 2.11: Production processes of the various sectors of the S.A. textile industry

Process	**Various sectors of the South African textile industry**							
	Man-made fibre manufacturing	**Natural fibre production**	**Cotton yarn and fabric production**	**Wool.yarn and fabric production**	**Knitting**	**Carpets**	**Home textiles**	**Industrial textiles**
Extrusion	√							
Fibre preparation	√	√	√					
Ginning		√						
Opening/blending			√			√	√	
Carding			√	√		√	√	
Drawing			√	√			√	
Combing			√	√			√	
Spinning			√	√			√	√
Winding			√	√			√	√
Doubling/twisting			√	√			√	√
Warping			√	√		√	√	√
Sizing			√	√			√	√
Drawing/knotting			√	√		√	√	√
Weaving			√	√		√	√	√
Non-woven processing			√			√		
Tufting						√		
Warp knitting					√			
Weft knitting					√			
Dyeing preparation			√	√	√	√	√	√
Dyeing			√	√	√	√	√	√
Printing			√		√	√		√
Finishing			√		√	√		√
Inspection		√	√	√	√	√	√	√
Quality assurance		√	√	√	√	√	√	√
Textile testing (dry)		√	√	√	√	√	√	√
Textile testing (wet)		√	√	√	√	√	√	√

Source: TITB (1997)

2.7 DEVELOPMENTS IN TEXTILE MANUFACTURING

Textile and apparel production has moved over the years from the craft era, characterised by a "cottage" form of organisation, to large-scale production of standardised products in vertically-integrated mills during the mass production era of 1950-1970. Since the late 1970s, the structure that developed during the 1950s and 1960s has increasingly broken down and mass production and standardisation have given way to an emphasis on variety, flexibility, speed, innovation and brand positioning, and promotion as a means to differentiate from competitors. The Information Era since the late 1970s has encouraged the development of more flexible manufacturing and supply chain technologies influenced by increased internationalisation of manufacturing and marketing operations, with an increasing number of businesses sourcing, manufacturing and marketing their products across the world.

Kilduff (2000a) states that the textile and apparel industries have witnessed the internationalisation of markets and competition, advances in product, process and business technologies and changing consumer requirements, which have brought about radical and continuous change in the textile and apparel industries over the past four decades. Textile and apparel businesses today look radically different in terms of their capital and technical intensity, their manufacturing and business process capabilities, and their business scope, structure and relationships. All of these changes impact significantly on the level of technical expertise required by human resources to drive these changes.

Kilduff (2001b) predicts "the trend towards more dynamic, diverse, complex and hostile business conditions will continue as global economic integration proceeds, as consumer affluence spreads, as communication improves accessibility to other cultural influences, as companies from an even-wider number of countries enter international markets; and as rapid technological change continues, with the emergence of new bio-materials and advances in information technology".

Fralix (2001) announces that a new era of mass customisation is emerging. Mass customisation has emerged into a practice that combines the best of the craft era, when customers had products made according to their specifications, with the best of the mass production era, when customers could purchase products because they were affordable.

The textile and apparel business environment of the future will be influenced by consumers who are able to select products with the use of information technology that exactly meets their needs. Kilduff (2001b) further predicts the growth of markets in newly industrialising and developing countries as industrial input and disposable incomes rise.

Technological change will improve the processing and performance capabilities of textile and apparel products, enhancing their technical performance and widening their applications, accelerating processing speeds and probably reducing the use of energy and minimising waste and pollution. Information technology (IT) applications will continue to evolve, becoming more powerful, yet less expensive. These IT applications will impact on the textile and apparel industries by creating new marketing channels through internet and e-commerce; in addition, the identification of market segments on a global basis will be enhanced by capturing information about the customers' needs and servicing their requirements. Both Kilduff (2001b) and Fralix (2001) argue that through improved knowledge about what customers want and the introduction of more flexible manufacturing technologies, the era of mass customisation will increase the number of products that are made specifically according to customer requirements. But more significantly, the new technologies are likely to result in the re-engineering of supply and distribution networks in order to respond faster and more effectively to the needs of the customer in the new era of mass customisation.

The success of a number of South African textile manufacturers entering the global market and establishing niche markets is encouraging. For example, Gelvenor Textiles produces world-class parachute fabrics and the world-first special fabrics for incontinence underwear. Fibremill develops high tenacity tarpaulin fabrics; world-class home furnishing products are produced by Castellano Beltrame, Svenmill, Nettex, Vrede and Fabric Decor. Worsted suiting cloth is produced by Hextex and S.A. Fine Worsted, as well as apparel by Falke, Continental Knitting, Maxmore, Baisch, Monviso and the Sherco Group are listed companies who are firmly established in niche markets. (Wood, 2001: 15). Other success stories include the development of the world's first "soft-feel" polypropylene yarns produced by SAPY and a range of UV-retardant industrial sewing threads produced by Techno-Threads. These developments are linked to high capital investment in new and advanced technology, which will require high-skilled technical staff to manage these processes.

The extraordinary export success of SANS Fibres can be seen in the fact that its products are contained in 40 per cent of the world's motor cars and more than 80 per cent in the world's branded running shoes. The company was recently awarded the Maersk Sealand Cape Chamber of Commerce and Industry Western Cape Exporter of the Year Trophy for its remarkable increase in exports over recent years. SANS Fibres plant has an annual production capacity of 60,000 tons of nylon and polyester yarns and the polyester polymer plant has a capacity of 100,000 tons. The company believes in continuous improvement and its vision is to be "number one in our chosen markets, creating prosperity for our people and partners" (Anon, 2003a: 12).

The future of the textile industry is difficult to predict and a number of elements act as driving forces. The forces shaping the future of the textile industry, according to Rigby (1992) would include:

- Satisfying the needs of individual customers.
- Responding to an increase of environmental expectations in respect of products, processing and packaging from customers.
- Developing new advanced technologies resulting in new products and services.
- Emphasising real innovation in products and services to supplement the current offering of basically the same product in different colours from season to season.
- Adapting the supply system to higher levels of specialisation.

2.8 CONCLUSIONS

South Africa has one of the most highly developed textile industries in Africa. Very few other countries in sub-Saharan Africa possess the ability of South Africa to manufacture a diverse range of textile products (Naumann, 2002: 32-33). Its manufacturing capacity is located predominantly in the provinces of KwaZulu-Natal, Western Province and Gauteng.

The African Growth and Opportunity Act, while excluding textile exports from directly benefiting from duty-free treatment into the United States of America, nonetheless offers South African textile manufacturers vast indirect opportunities. The clothing industry, being excluded from using non-African textiles for the manufacture of clothing exports to America under AGOA, will increasingly provide a ready market for the domestic textile industry.

Other countries, for example Mauritius, are also increasingly sourcing textiles from South Africa for clothing exports under AGOA to America.

At present, the South African textile industry is facing a number of challenges including the phasing out of tariffs, cheap imports from overseas producers, a demand from local customers for high quality at market related prices and stiff competition from SADC producers. For those manufacturers penetrating the global market, stiff international competition in terms of quality and price is a known fact, especially after 2005, when quotas are removed.

Part of the global and local challenge to produce quality products at market related prices revolves around the need to continually increase levels of technology, but allied to this is the need to also develop highly skilled technologists to drive the development process. The President of the Textile Federation of South Africa (Simeoni, 2003a: 1) recently emphasised the need for the textile industry "to continue investing in plant, equipment and education". The Textile Federation of South Africa in its strategic plan titled *"Laying the foundations for a globally competitive national textile industry"* (TEXFED, 2002: 3) accepts "the need for change" and "endorses the view that the industry's opportunity for success resides in its ability to adopt world class manufacturing principles, create more value, and expand its presence in high-value added, technically demanding international markets". It also recognises the important role "it continues to play in the socio-economic development of South Africa and as a result commits itself to a transformation process inclusive of Black Economic Empowerment (BEE), the creation of Equal Employment (EE) opportunities and finally, adherence to international environmental standards" (TEXFED, 2002: 3).

In responding to the challenges facing the textile industry, the Textile Federation of South Africa formulated a strategic vision, which indicates that by 2010 the South African textile industry intends to increase "its competitiveness and outputs, attract investments, promote exports and create and sustain quality job opportunities and living standards for its employees in an integrated textile pipeline" (TEXFED, 2002: 10). To realise its vision, the Textile Federation of SA (TEXFED, 2002: 10) indicates that strategies will be developed to:

- Aggressively develop and grow both direct and indirect exports.
- Support the clothing industry as a strong domestic resource, in all aspects, particularly increased capacity, in partnership with the textile industry.

- Strengthen and enhance the industry's present position in the domestic market.
- Strive for world-class manufacturing standards and competitiveness throughout the industry.
- Ensure coordinated action between social partners.
- Create shareholder value, thus obtaining a commitment to investment.
- Enhance the industry's human capital and ensure fair labour practices.
- Effectively promote black economic empowerment, employment equity, SME development and environmental compliance.

In this regard, the textile industry will focus its attention on eight key strategic focus areas, which should lead to the successful realisation of its vision by 2010. These strategic focus areas include:

- **Growth in sales and employment**: The industry is committed to achieve a minimum of 80 per cent inflation adjusted sales growth and 20 per cent employment growth.
- **Penetration of value added export markets**: By substantially increasing levels of export in particular markets, companies should gain economies of scale, which will enhance global competitiveness.
- **Consolidation and enhancement of the industry's domestic market presence**: Bolstering the domestic performance at each link of the textile chain from fibre to finished textile product, will strengthen the capacity of the industry to compete internationally.
- **Adoption of world-class manufacturing standards**: By adopting "lean manufacturing principles" the industry will establish itself as a competitive global player. These principles include the development of multi-skilled and multi-tasked workers who are able to work effectively in teams.
- **Development of a more skilled and technically capable workforce**: The industry recognises the shortage of technician and technologist level skills and suggests "an infusion of technical qualifications and skills, as well as experience from expatriates is required by the industry if firms are to attain global competitiveness" (TEXFED, 2002: 16).
- **Enhancement of capital investment**: The levels of investment will have to increase substantially to respond to rapid technology advances occurring in the textile industry internationally.

- **Commitment to a dynamic transformation process**: The industry commits itself to the purchasing from historically disadvantaged individual (HDI)-owned business and to "the development of technically qualified affirmative action employees into management positions" (TEXFED, 2002: 19).
- **Commitment to international environmental standards**: The industry commits itself to the concept of cleaner production and waste minimisation programmes and to compliance with international quality standards.

A critical element to the successful realisation of the 2010 vision and strategic objectives of the textile industry remains the quality of the work force. Middleton *et al.* (1993: 1) underscore the fact that "the higher a country's labour productivity and the more flexible its work force, the better able that country is to acquire and adapt the technology needed to produce better quality goods and services at lower cost and to shift the structure of production to new markets and products".

The critical need to develop high-level technical skills and knowledge, associated with a value orientation of world-class manufacturing performance and international quality standards has been recognised by the textile industry in South Africa. This can only be developed through effective education and training systems, which requires a long-term strategic teaching and learning plan or curriculum that is based on the development of employability skills, high-level technical subject knowledge and holistic outcomes.

The purpose of this research project is present a training model for textile technologists by focusing on the development of a curriculum that would meet industry requirements as outlined by the macro- and meso-level environmental scanning exercise presented in this chapter and the curriculum-orientated evaluation presented in **Chapter 6** of this thesis, as a means of determining the value or effectiveness of the curriculum and the outcomes [output] of the curriculum against industry needs.

Chapter 3

Legislative framework and structures of skills development, education and training:
Implications for curriculum development and evaluation of a learning programme in textile technology

3.1 INTRODUCTION

The previous chapter provides a broad overview of the textile industry in South Africa and features the challenges that the textile industry faces regarding globalisation. This chapter will outline the legislative framework and structures of skills development, education and training in terms of implications for curriculum development, implementation and evaluation of a learning programme for textile technologists in the Western Cape.

South Africa is faced with the enormous challenge of providing appropriate skills development, training and education to meet the requirements of the economy in the 21st century. In the light of this situation, it is appropriate to discuss the underlying concepts and principles of outcomes-based training and education in general and to outline the legislative framework and structures of skills development, education and training in particular. Before engaging in this investigation, it is important to reflect on the concepts of education, training and development:

> **Education**, is concerned with the development of sound reasoning processes to enhance one's ability to understand and interpret knowledge ... it is the deliberate, systematic and sustained effort to transmit, evoke or acquire knowledge, attitudes, values and skills and sensibilities, and any learning that results from the effort, intended or unintended (Van Dyk *et al.*, 1997: 227).
>
> **Training** is a learning experience in that it seeks a relatively permanent change in an individual that will improve his or her ability to perform on the job" (De Cenzo & Robbins, 1994: 255) "Consequently, training must be result-orientated, it must focus on enhancing those specific skills and abilities to perform the job, it must be measurable and it must make a real contribution to improving both goal achievement and the internal efficiency of the organisation (Van Dyk *et. al.*, 1997: 227).
>
> **Development** refers to development possibilities within a job/position for a specific employee, with reference to the employee's personal growth and personal goals (Gerber, Nel & Van Dyk, 1995: 49).

Education and training have always played a crucial role in providing the quality of human resources, which is a prime determining factor for continuing progress and prosperity of a country. The impact of economic, technological, social and political factors is constantly changing the work environment, requiring of a nation's workforce to be productive and flexible. Middleton *et al.* (1993: 1) underscore the fact that "the higher a country's labor productivity and the more flexible its work force, the better able that country is to acquire and adapt the technology needed to produce better quality goods and services at lower cost and to shift the structure of production to new markets and products". Technological change alters the pattern of required skills, the trend being towards broader and fewer occupational categories, a decrease in the need for manual skills, and a corresponding increase in the conceptual content of jobs (Middleton *et al.*, 1993: 15).

According to Meyer (1996: 125) it is imperative for South Africa to create capacity, both technological and human, in defining its role in Africa as well as in the global economy. Meyer further suggests that although there might be many opportunities to accelerate the pace by installing state-of-the-art technology, technology at all levels is rendered inoperable without the human capacity to put it into practice. The complexities of the country and the legacy of apartheid education require that capacity building take place at all levels on the skills continuum, from the provision of basic education to the growth of high-level managerial and vocational skills and competencies which equate to the best of the world.

It is therefore important for the higher education sector to realign its strategy and transform its system in order to ensure that its contributions will impact on productivity and the economic development of the country. The White Paper on the Transformation of Higher Education (SA: 1997a) argues for the restructuring of higher education to meet the "needs of an increasingly technological economy with the capacity to participate in a rapidly changing global context". For the higher education sector to meet these demands, the fundamental responsibility is to design, develop, deliver and evaluate learning systems that will maximise student performance in a cost effective manner. Learning programmes need to ensure that qualifying students will have extensive knowledge and skills they can apply in a world of constant change. As knowledge workers, students need to become the next generation of knowledge producers, who will be able to exploit knowledge and opportunities in an innovative and entrepreneurial manner, to ensure economic growth of the country and to enhance international competitiveness (CTP, 2001: 17).

Meyer (1996: 125) encourages for a change in mindset with respect to the importance of competitiveness by South Africans by stating that "to build capacity demands going beyond skills acquisition."

> It requires the growth of a body of knowledge and the intellectual capital, which provides the platform for change and constant innovation. In particular it requires a mind-set, which reflects a value orientation towards world-class performance. This applies in respect of the country as a whole, it applies to organisations, to occupations and professionals and it applies to each individual. It is the integration of these three elements – skills, knowledge and value orientation – which constitutes the competencies necessary to operate effectively in South Africa, in Africa and in the boundaryless global economy (Meyer, 1996: 125).

Higher education will have to respond to these challenges by incorporating the needs of industry through pro-active engagement, by designing and developing programmes in harmony with industry and by specialising in making knowledge useful and applicable.

The design, development, implementation and evaluation of an outcomes-based qualification in textile technology take place within a world of constant change, where work and education are becoming increasingly interwoven, stressing the importance for higher education to transform. This chapter will reflect on legislation, structures and practices of skills development and higher education in South Africa, applicable during 2000-2001 when the textile technology learning programme was developed and implemented at the Peninsula Technikon. It will outline the policy framework for skills development and higher education and will focus on the impact of the legislative framework on curriculum development in a Technikon context.

New developments in proposed policy, e.g. the draft *New Academic Policy for Programmes and Qualifications in Higher Education* of the Council on Higher Education (CHE, 2001) and the consultative document compiled by the Department of Education and the Department of Labour (SA, 2003) on *An interdependent National Qualifications Framework system and legislation*, will only be included, in this research project, if and where applicable. The curriculum design and evaluation process of a textile technologist programme at Peninsula Technikon will be discussed in more detail in the next chapter.

3.2 SKILLS DEVELOPMENT & TRAINING LEGISLATION & STRUCTURES

3.2.1 NATIONAL SKILLS DEVELOPMENT STRATEGY

The skills development, education and training environment should not be viewed in isolation, but against the background of current economic, technological, social and political factors that are in the process of transforming the working world. The responsibility to transform training and education systems rests with the state. It is a universal problem that training and education systems are trapped in tradition and bureaucracy and are unable to respond effectively to the changing needs of the labour market. Van Dyk *et al.* (1997: 82) state that the "government in South Africa is faced with the challenge of balancing the demand for a skilled and flexible labour force to make industries in the country more competitive on the one hand and on the other hand to ensuring equal access for all citizens to training opportunities as well as to redress disadvantages faced by particular groups".

In a world competitiveness survey in 1996, South Africa was ranked last out of 46 developing countries in human resources development and other labour market indicators. There are several key problems that have contributed to this poor record (SA, 1998b):

- There is a mismatch between education and training decisions and the real needs of the economy and society; i.e., there is too little training in skills that are needed, and too much training in skills that are inappropriate.
- The level of industry training is much lower than that of our major trading partners, leaving South Africa with a major competitive disadvantage. A survey conducted by a Cape Town-based Labour Research Service revealed that most large industrial companies spend only 2,5 per cent of their payroll on training in comparison with the international average of between 4 to 7 per cent spent by their overseas counterparts.
- The sectors in which most growth and employment opportunities are likely to occur spend less on skills development than the national average.
- Most industry training is informal.
- Only a very small proportion of formal training is provided to lower-level workers.
- There is a shortage of high quality management.
- Firms fail to recognise the importance of training within the new competitiveness environment and within their competitive strategies.

- Apprenticeship and artisan training has declined dramatically.

With an economically active population of 14 million people in South Africa of a total of more than 40 million people, it is clear that a national skills strategy has an important role to play by increasing the investment in skills development and by improving competitiveness of business via productivity upliftment. The challenges facing South Africa as a developing country are evident from a study conducted by Wood (1999: 7-19), which provides the following information regarding the adult population:

- Thirty-eight per cent of economically active adults are unemployed.
- Thirty per cent who are employed perform unskilled work.
- Twenty-four per cent of adults are semi-illiterate and under-educated.
- Twenty-two per cent of adults are trained as technicians, management and professionals.

In transforming training and education systems in South Africa the role of the state is to shape a policy environment that is conducive to skills development. The underdeveloped nature of human resources in South Africa requires a number of policy and strategic interventions, such as the recent *Skills Development Act* (Act 97 of 1998), the *Skills Development Levies Act* (Act 9 of 1999) and the *Human Resource Development Strategy for South Africa* (SA, 2001), which necessitates a broader approach to human resource development and education and training. The mission of the *Human Resource Development Strategy for South Africa* (SA, 2001c: 10) is "to maximise the potential of the people of South Africa, through the acquisition of knowledge and skills, to work productively and competitively in order to achieve a rising quality of life for all, and to set in place an operational plan, together with the necessary institutional arrangements, to achieve this".

The overarching goals of the Human Resource Development Strategy (SA, 2001c: 10) is to:

- Improve the Human Development Index. An improved basic social infrastructure is critical for a productive workforce and successful economy.
- Reduce disparities in wealth and poverty and develop a more inclusive society.
- Improve international confidence and investor perceptions of the economy.

The Human Resource Development Strategy (SA, 2001c: 15-19) aims to:

- Improve the foundations for human development.
- Improve the supply of high-quality skills which are more responsive to societal and economic needs.
- Increase employer participation in lifelong learning.
- Support employment growth through industrial policies, innovation, research and development.
- Ensure that the four strategic objectives of the Human Resource Development Strategy are linked.

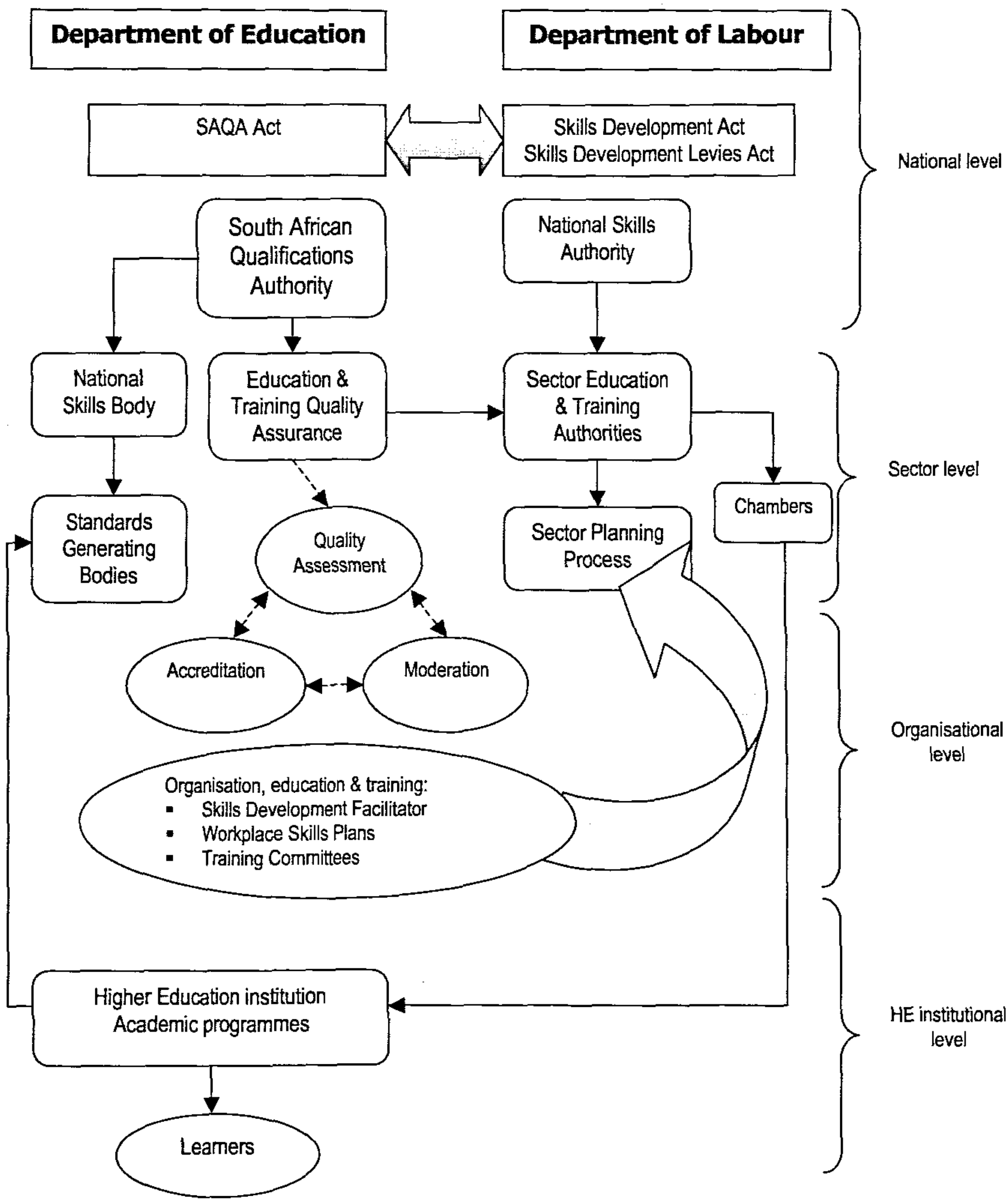
The national skills development strategy evolves from a clearly defined set of structures:

At a **national** level National Skills Authority (NSA) is responsible for creating the policy that drives the skills development strategy and for implementing that policy through structures that operate at a **sector** level, namely the Sector Education and Training Authorities (SETAs). The twenty-five SETAs operate within different business sectors of the economy to facilitate the development and implementation of customised skills development strategies.

The Clothing, Textiles, Footwear and Leather SETA was established in 2000 to coordinate the registration of companies, the development of sector skills plans, the promoting of learnerships and the collection and disbursement of skills levies of the clothing, textiles, footwear and leather industries.

At a **company** level, workplace skills plans are developed by companies to develop the skills of their employees according to market demands of their organisation and their particular industry. Companies are required to establish forums where both employers and employees can meet to consult on a skills development strategy for their organisation. A skills development facilitator will draft the workplace skills plan and assist with the implementation of training programmes.

The successful implementation of a Human Resources Strategy for South Africa requires the delivery of skills development and higher education across the full range of human capability. The national structures for skills development, training and education of the Department of Education and the Department of Labour are illustrated in **Figure 3.1**.



Adapted from:
Source: Van der Schyff (2001: 68)

Figure 3.1: National structures: Skills development, education & training

3.2.2 SKILLS DEVELOPMENT ACT (1998)

The *Skills Development Act* (Act 97 of 1998) was enacted in 1998 with the purpose to:

- Develop the skills of the South African workforce by improving the quality of life of workers, improving productivity, promoting self-employment and improving the delivery of social services.
- Encourage employers to use the workplace as an active learning environment by providing employees with opportunities to acquire new skills, as well as to provide opportunities for new entrants to the labour market to gain work experience.
- Encourage workers to participate in learnership and other training programmes.
- Improve the employment prospects of previously disadvantaged persons through training and education.
- Ensure the quality of education and training in and for the workplace.
- Assist work-seekers and retrenched workers with entry to the labour market and to assist employers to find qualified employees.
- Provide and regulate employment services.

In order to achieve the aims of the *Skills Development Act*, (SA DoL, 1998b) the following have been provided for in the legislation:

- **The National Skills Authority** (NSA)

  The National Skills Authority will, amongst others, perform the following functions by advising the Minister of Labour on national skills development policy and strategy, liaising with SETAs and reporting to the Minister of Labour on progress made in the implementation of the national skills development strategy.
- **The National Skills Fund** (NSF)

  The National Skills Fund must be credited with 20 per cent of the skills development levies as contemplated in the Skills Development Levies Act to be used for projects identified in the national skills development strategy as national priorities or for such projects related to the achievement of the purposes of the Skills Development Act.
- **Sector Education and Training Authorities** (SETAs)

  A SETA is a body consisting of representatives from labour, employers, key government departments, any professional body and any bargaining forum from the sector of business or industry involved. A SETA will use the national skills development strategy as a basis to develop a skills development plan for its industrial sector(s). The sector skills plan will be implemented by:

- Establishing learnerships.
- Approving workplace skills plans.
- Allocating skills grants to employers, training providers and workers.
- Monitoring the quality of education and training in the sector.

- **Skills development planning unit**

  The Skills development planning unit is responsible for research and analysis of the labour market in order to determine skills development needs of the country, economic sector(s) and organs of the state, as well as for the formulation of the national skills development strategy, sector skills development plans and information to the different authorities.

- **Levy grant scheme**

  The levy grant scheme makes provision for the payment of grants to employers based on certain conditions, such as the appointment of a skills development facilitator, submission, implementation and reporting of a workplace skills plan and for addressing specific upliftment strategies in the sector.

3.2.3 SKILLS DEVELOPMENT LEVIES ACT (1999)

The *Skills Development Levies Act* (SA, 1999) establishes a compulsory levy scheme for the purpose of funding education and training. The Act makes provision for a funding and grant distribution system, whereby employers are required to pay a skills levy of 1 per cent of payroll from April 2001. The South African Revenue Services (SARS) is responsible for administering the Skills Development Levies Act in so far as it relates to the collection and payment of levies. From the levy payable by employers, 2 per cent is deducted for administration of the levies by SARS, a further 18 per cent is paid to the National Skills Fund and the balance is used by the SETAs for the establishment of infrastructure at SETA level and to pay grants.

The Skills Development Bill (SA DoL, 1998b) will aim to:

- Develop the skills of the workforce.
- Increase the quality of working life of workers.
- Improve the productivity of the workplace.

- Promote self-employment and the delivery of social services.
- Encourage firms to be active learning environments and provide experience to new workers.
- Improve the employment prospects of the previously disadvantaged through education and training.

Aligning the Bill with the South African Qualification Authority Act (SAQA) will:

- Promote the quality of learning in and for the labour market.
- Give organised employers and workers greater responsibility for ensuring relevant training

(SA DoL, 1998b).

3.3 SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

3.3.1 SAQA ACT (1995)

The SAQA Act was promulgated on 4 October 1995, with the objectives to:

- Create an integral national framework for learning achievements.
- Facilitate access to and mobility and progression within education, training and career paths.
- Enhance the quality of education and training.
- Accelerate the redress of unfair discrimination in education, training and employment opportunities.
- Contribute to the full personal development of each learner and the social and economic development of the nation at large.

The Act (SA, 1995b) enables South Africa to develop its own integrated National Qualifications Framework (NQF) accompanied by a supporting quality assurance system. The quality assurance system focuses on recognition of both newly obtained learning, as well as prior learning achievements. The role of the quality assurance system is to ensure that credits, unit standards and qualifications:

- At all levels will comply with recognized national and international standards.
- Obtained by learners will comply with set standards.

3.3.2 ROLE AND FUNCTIONS OF THE SOUTH AFRICAN QUALIFICATIONS AUTHORITY

The South African Qualifications Authority (SAQA, 2000b) aims to "ensure the development and implementation of a National Qualifications Framework, which contributes to the full development of each learner and to the social and economic development of the nation at large". SAQA will play a transforming role by ensuring equity in education, access to educational provision, progression through the educational system as well as ensuring that the needs of a changing economy are being met. SAQA's main function is the establishment and maintenance of a single system of qualifications for all South Africans, called the National Qualifications Framework (NQF).

SAQA (SAQA, 2003) has two "arms" i.e. **Standards Setting** and **Quality Assurance**. The sub-structures in the standards setting arm are the National Standards Bodies (NSBs) and the Standards Generating Bodies (SGBs), while the sub-structures in the quality assurance arm are the Education and Training Quality Assurance bodies (ETQAs). SAQA may choose to appoint moderating bodies if it deems it necessary. The Higher Education Quality Committee reports to the Commission for Higher Education of the Department of Education which oversees the quality assurance of higher education institutions in South Africa.

The SAQA Act (SA, 1995b) prescribes that SAQA must establish and maintain a quality assurance management system, which will ensure:

- Stakeholder involvement.
- Mechanisms for registration, accreditation, moderation and auditing.
- Maintenance of the quality of unit standards.

3.3.3 NATIONAL QUALIFICATIONS FRAMEWORK

The National Qualifications Framework is a means of transforming education and training in South Africa by integrating education and training into a single national framework for learning achievements, making it easier for learners to enter the education and training system and to move and progress within the framework along learning pathways. It furthermore provides a framework for achieving and maintaining quality and standards of education and training in South Africa. It opens up learning and work opportunities for those who were treated unfairly in the past because of their race or gender, and enables learners to develop their full potential and thereby support the social and economic development of the country as a whole.

The National Qualifications Framework has the following objectives:

- To create an integrated national framework for learning achievements.
- To facilitate access to, and mobility and progression within education, training and career paths.
- To enhance the quality of education and training.
- To accelerate the redress of past unfair discrimination in education, training and employment opportunities and, thereby, to contribute to the full personal development of each learner and the social and economic development of the nation at large.

The concept of articulation and mobility has been built into the NQF whereby learners will be able to exercise their options to move vertically, horizontally or diagonally between learning or career pathways, accumulating credits for learning achieved. Pathways should be regarded as "a series of learning platforms", of which the essential ingredient for progress will be knowledge and skills and the associated qualifications that will allow learners to move to the next stage of the transition process (SA, 2003: 13).

The following principles underpin the National Qualifications Framework (Cosser, 1998: 5):

Table 3.1: Principles of the National Qualifications Framework

Principle	**Education and Training should:**
Integration	Form part of a system of human resources development, which provides for the establishment of a unifying approach to education and training
Relevance	Be and remain responsive and appropriate to national development needs
Credibility	Have national and international value and acceptance
Coherence	Work within a consistent framework of principles and certification
Flexibility	Allow for multiple pathways to the same learning ends
Standards	Be expressed in terms of a nationally agreed framework and internationally acceptable outcomes
Legitimacy	Provide for the participation of all national stakeholders in the planning and coordination of standards and qualifications
Access	Provide ease of entry to appropriate levels of education and training for all prospective learners in a manner which facilitates progression
Articulation	Provide for learners, on successful completion of accredited prerequisites, to move between components of the delivery system
Progression	Ensure that the framework of qualifications permits individuals to move through the levels of national qualifications via different appropriate combinations of the components of the delivery system
Portability	Enable learners to transfer their credits or qualifications from one learning institution and/or employer to another
Recognition of Prior Learning	Through assessment give credit to learning which has already been acquired in different ways, e.g. through life experience
Guidance to learners	Provide for counselling of learners by specially trained individuals who meet nationally recognised standards for educators and trainers

Source: National Training Board (1994)

The National Qualifications Framework consists of four parameters, namely: band, types of qualification, location or sites of learning for units and qualifications as well as levels. It is important to understand levels in the context of the other three parameters. NSB Regulations (SA, 1998b: 3.1) specify that the NQF shall consist of eight levels, each level described by a unique level descriptor. These levels are grouped into three bands. The NQF levels provide the framework for progression along learning pathways and function as a framework for pegging standards and qualifications for workplace learning. Level descriptors are designed to provide a recognised currency for learning achievements, providing for the pegging of standards and qualifications at levels that are appropriate and mutually consistent. The current draft level descriptors of SAQA are intended only as "a tool to guide the writing of context-specific learning outcomes" (SA, 2003: 13).

Table 3.2: Levels and bands of the National Qualifications Framework

Higher Education and Training (NQF level 5-8) Learners who have achieved outcomes required at this level will be awarded degrees, diplomas and certificates offered by colleges, technikons and universities.
Further Education and Training (NQF level 2-4) Learners who have achieved the outcomes required at this level will be awarded with further education and training certificates.
General Education and Training (NQF level 1), consisting of nine years of compulsory education: ❑ Senior phase (Grade 7-9) ❑ Intermediate phase (Grade 4-6) ❑ Foundation phase (Grades 1-3) Learners who have achieved the outcomes required at this level will be awarded with general education and training certificates.

The Ministries of Education and Labour have distinct responsibilities for the development and management of the government's policies toward education and training on the one hand and skills development on the other hand. These departments are also jointly responsibility for the National Qualifications Framework. Although tension exists between the two fields of discipline-based learning (mainly in institutions) and skills development (mainly in the workplace), both are accommodated in the National Qualifications Framework. Discipline-based learning recognises the importance of career-preparation, but emphasises that programmes should have a broader educational value, which is important for individuals to adapt in a changing economic and technological environment. On the other hand, workplace learning practitioners argue that work-readiness and work competence are best obtained through learning in a real work context, while recognising the value of fundamental education. NQF is a "vital mechanism for holding these tensions between them and bringing out the complementary and mutually reinforcing attributes of institutional and workplace learning" (SA, 2003: 7).

The draft *New Academic Policy for Programmes and Qualifications in Higher Education* of the Council on Higher Education (CHE, 2001) and the consultative document compiled by the Department of Education and the Department of Labour on *An interdependent National Qualifications Framework system and legislation* (SA, 2003) are proposing changes to the number of levels and the bands of the National Qualifications Framework as specified in the NSB regulations (SA: 1998b). In essence the proposed changes:

- Acknowledge the difficulties being experienced to define level descriptors whose common vocabulary fit both the work-place based qualifications and the discipline-based qualification (SA, 2003: 13).
- Acknowledge that the system of public provision of education and training must offer a broadly-based range of knowledge and vocational preparation, which cannot substitute for the specific trade, occupational and professional training that is unique to the workplace (SA, 2003: 13).
- Recommend the inclusion of three pathways of learning with articulation between these pathways as detailed in **Table 3.3** consisting of:
    - General pathway.
    - General vocational/Career-focused pathway.
    - Trade, occupational and professional pathway (SA, 2003: 17).
- Recommend a ten-level National Qualifications Framework to provide scope for higher education post-graduate qualifications at levels 8-10 and the pegging of certificates and diplomas at levels 5 and 6 (SA, 2003: 16).
- Propose a nested qualifications model based on the classification of qualifications by level, type and sub-type, which makes provision for a discipline-based logic as previously proposed in the New Academic Policy document, but also includes a newly proposed contextual or occupational logic (SA, 2003: 19).

- Emphasise the importance of qualifications to be achieved by credit accumulation, which reduces unnecessary differences between whole qualifications and qualifications based on unit standards (SA, 2003: 20).
- Acknowledge the role of sector education and training authorities in providing an organised voice in every economic sector that will open up possibilities for partnership with training providers (SA, 2003: 22).

Table 3.3: Proposed revised National Qualifications Framework

NQF band	General pathway	Articulation column	General vocational/ Career-focused pathway	Articulation column	Trade, occupational and professional pathway
	Leading to the Further Education and Training Certificate based on basic programmes offered by senior secondary schools, but also available in FET colleges		Relevant to 16-18 year olds who have not yet made a career choice, but who wish to progress to higher education in a career-focused pathway or who have not been able to secure access to a workplace for trade, occupational and professional skills training.		This pathway will be more specific with less flexible to both young people and adults, who have been able to secure access either to a workplace learning site or a simulated workplace-learning site.
Higher education and training	Discipline-based qualifications	Articulation credits	Career-focused qualifications	Articulation credits	Occupational recognition or context-based qualifications unique to the workplace
Further education and training	Discipline-based qualifications	Articulation credits	General vocational qualifications	Articulation credits	
General education and training			General education qualifications (ABET defined separately)		

Source: SA (2003: 17)

3.3.4 NATIONAL STANDARDS BODIES (NSB)

In 1998 SAQA published the National Standards Bodies (NSB) Regulations whereby provision was made for the registration of National Standards Bodies and Standards Generating Bodies. Twelve National Standards Bodies (NSBs) are currently operating representing particular fields of knowledge or organising fields of the economy. NSBs are required to perform the following main functions (Du Pré, 2000):

- Define and recommend to SAQA the boundaries of the discrete field for which they are constituted.
- Define and recommend to SAQA a framework of sub-fields to be used as a guide for the recognition and/or establishment of SGBs.
- Recognise and/or establish SGBs and ensure that SGBs meet the SAQA requirements for the registration of unit standards and qualifications.
- Recommend the registration of unit standards on the NQF to SAQA and recommend qualifications to SAQA.
- Update and review qualifications.

The study fields of clothing, textiles, footwear and leather are grouped within NSB06 – Manufacturing, Engineering and Technology. This aspect will be discussed in **Chapter 4** of this thesis.

3.3.5 STANDARD GENERATING BODIES (SGB)

Standard-Generating Bodies consist of stakeholder representation from the educational sector, industrial training sector, trade unions, community organisations and the relevant industries. It is the function of the Standards Generating Bodies to:

- Generate unit standards and qualifications in accordance with SAQA requirements in identified sub-fields and levels.
- Update and review standards.
- Recommend unit standards.
- Perform other functions as may from time to time be delegated by SAQA

(Du Pré, 2000: 20).

When developing unit standards and qualifications, SGBs have the following overarching functions:

- Assess the broad impact of their field of concern on all the levels of the framework.
- Limit duplication of unit standards and qualifications across all the areas of learning.
- Consult with stakeholders.
- Ensure that the needs of the beneficiaries of the education and training are met.

- Promote the transferability of skills.
- Accommodate changes in areas such as technology.
- Set and maintain standards, whilst focusing on quality, effective and efficient provision of education and training by providers

(Du Pré, 2000: 20).

3.3.6 EDUCATION AND TRAINING QUALITY ASSURANCE (ETQA)

The Education and Training Quality Assurance (ETQA) regulations were also published in 1998 and provide for the accreditation of Education and Training Quality Assurance bodies. These bodies are responsible for accrediting providers of education and training standards and qualifications registered on the NQF, monitoring provision, evaluating assessment and facilitating moderation across providers, and registering assessors. There are two types of ETQAs registered by SAQA:

- The first type reports to the Department of Education and is positioned in education, namely for Higher Education (Higher Education Quality Committee) and for Further Education (Further Education and Training Quality Assurance).
- The second type of ETQAs is linked to Sector Education and Training Authorities, which reside in an industrial sector and represent quality in terms of industrial interests.

3.4 SECTOR EDUCATION AND TRAINING AUTHORITY FOR CLOTHING, TEXTILES, FOOTWEAR & LEATHER

3.4.1 ORGANISATIONAL STRUCTURE

The Clothing, Textiles, Footwear and Leather Sector Education and Training Authority was established on 20 March 2000. Industrial Training Boards in clothing, textiles, footwear and leather were dismantled, and designated to the CTFL SETA. In order to meet the specific needs of the three sub-sectors of clothing, textiles, footwear and leather, the CTFL SETA has delegated some of its activities to Chambers, which will focus specifically on the needs of each of the sub-sectors. The Clothing Chamber is positioned in Cape Town, the Textile Chamber operates from Durban and the Footwear and Leather Chamber is located in Port Elizabeth.

3.4.2 MISSION STATEMENT

The mission of the SETA (CTFL SETA, 2001) is to develop and enlarge the skills base of all those employed within the clothing, textiles, footwear and leather economic sectors, through the promotion and implementation of effective learning programmes and skills planning, which will advance workplace security and productivity as part of the process. There will be a particular focus on skills acquisition leading to qualifications, career planning, the latent demands of the SMMEs and the unemployed in satisfying the national skills development needs.

3.4.3 SECTOR SKILLS PLAN 2000-2004

The *Skills Development Act* (Act 97 of 1998) states in Section 10(1) that each SETA must "develop a sector skills plan within the framework of the national skills development strategy". The Act (SA DoL, 1998b) further states that it must implement its skills plan by:

- "establishing learnerships;
- approving workplace skills plans;
- allocating grants in the prescribed manner to employers, education and training providers and workers; and
- monitoring education and training in the sector".

The Department of Labour (SA, 2000: 15) developed guidelines for the development of a sector skills plan, which could be grouped into three broad categories:

- **Firstly,** a background analysis of the sector, consisting of a sector profile, factors influencing the future changes in the sector and information pertaining to current education and training supply for the sector.
- **Secondly**, the desired future direction and skills needs of the sectors, consisting of sector development strategy, employment and skills needs as well as implications for skills policy and skills provision.
- **Thirdly**, how the sector plan is to be achieved and monitored, consisting of the vision, mission, objectives, priorities, outcomes and key performance indicators, including a budget as well as monitoring, reporting and evaluating procedures.

Based on these guidelines a sector skills plan for the clothing, textiles, footwear and leather SETA was developed in August 2000. A working group, constituted by the CTFL SETA, collected the data from various sources to outline the sector profile, which indicated the following (CTFL SETA, 2000a: 2-7):

- Approximately 2,500 companies exist in the sector.
- The distribution of companies per industrial sectors are as follows:
    - Clothing companies constitute 76 per cent of the total.
    - Textile and footwear companies constitute 10 per cent of the total.
    - Leather and other sub-sectors constitute 4 per cent of the total.
- The majority of companies are based in KwaZulu-Natal (38,2 per cent) followed by the Western Cape (33,4 per cent).
- The following statistics indicate the size (large, medium, small and micro) of the companies as listed in **Table 3.4**:

Table 3.4: Distribution by size of companies in CTFL sector

Industrial sector	Large 200 +	Medium 50 – 199	Small 6 – 49	Micro 5 -
Clothing	10%	15%	60%	15%
Textiles	40%	42%	18%	0
Footwear	15%	15%	40%	30%
Leather	10%	30%	20%	40%

Source: CTFL SETA (2000a: 5)

- Distribution of employees per broad occupational category indicate the following:
    - Machine operator and assemblers: 61,8 per cent.
    - Labourer category: 18,2 per cent.
    - Professionals and associate professionals: 6,5 per cent.
    - Senior officials and managers: 4,5 per cent.
- A total of approximately 160,000 people are employed in clothing, consisting of approximately 90,000 people employed in the formal sector of the industry and 70,000 people employed in the informal sector (SMME sector) of the industry. In the textile industry the CTFL SETA estimated that 42,000 people are employed by the industry with 37,000 of these people employed in the formal sector of the industry.
- The current qualifications profile across the sector reveals that 51,2 per cent of people are qualified below NQF level 2, 33,8 per cent have qualifications up to NQF level 4 and 15 per cent have qualifications at NQF level 5 and upwards.

- CTFL SETA proposed that the qualifications profile of employees should be altered in the next 3-5 years to reflect the following profile as listed in **Table 3.5**:

Table 3.5: Proposed preferred profile of CTFL sector in 3-5 years

NQF LEVELS	Clothing	Textiles	Footwear	Leather
8 7 6 5	10%	20%	10%	25%
4 3 2	60%	70%	60%	55%
1 Abet 3 Abet 2 Abet 1	30%	10%	30%	20%

Source: CTFL SETA (2000a: 6)

The CTFL SETA (2000a: 10-12) articulated a broad range of priorities in the sector skills plan for attention during the four-year period (2000-2004) of which the following priorities indirectly impact on the development of a textile technologist programme:

- Emphasis on multi-skilling of learners, who should be able to use a range of machinery, equipment and processes through acquiring new skills.
- Improving quality by encouraging companies to utilise international standards and to focus on quality awareness programmes.
- Focus learning on the development and use of new and appropriate technology.
- Use and implement information technology by optimising resources, developing strong communications and networks and remain abreast with information technology.
- Develop and maintain a culture of learning in the sector.
- Improve levels of numeracy and literacy.
- Implement continuous improvement processes as a means of reducing waste.
- Work in teams to build relationships among people to ensure the existence of harmony in the workplace.

- Develop an understanding of the pipeline to enhance understanding of the different processes involved in production.
- Improve product development skills through the acquisition of technical skills that will result in a capacity to continuously design and development new products in the CTFL sector.

3.4.4 STANDARDS GENERATING & QUALIFICATIONS

The CTFL SETA, through a number of standards generating processes, developed five new qualification pathways, namely:

- **Clothing Qualifications Framework** consisting of unit standards at NQF level 2, 4 and 5 and qualifications at these levels.
- **Textile Qualifications Framework** consisting of unit standards at NQF level 2, 4 and 6 and qualifications at these levels.
- **Footwear Qualifications Framework.**
- **Leather Qualifications Framework.**
- **Maintenance and Repair (Mechanician) Qualifications Framework.**

These frameworks consist of unit standards for fundamental, core and elective areas.

Paragraph 4.6.3.2 describes the learner profile that emerges from data compiled by the Textile Industry Training Board in 1997 (Skills Audit) and the CTFL SETA in 2000 (Sector Skills Plan).

3.5 HIGHER EDUCATION LEGISLATION & STRUCTURES

3.5.1 OUTCOMES-BASED EDUCATION

The complex and contested origins of outcomes-based education in South Africa are stated by Jansen (1999: 3) when he indicates that the precise date and sequence of events that led to the introduction of outcomes-based education in South Africa are not clear, but, what is clear is "that since the mid-1990s OBE triggered the single most important curriculum controversy in the history of South African education". The turning point in curriculum debates was 1990 when unprecedented political and economic pressures from the liberation movements and the international community resulted in the releasing of political prisoners and the unbanning of political organisations. The curriculum significance of the political moment defined by 1990 was that within South Africa social movements and political actors began to stake their curriculum positions, which was followed by a series of events of which the work done by the National Training Board rooted outcomes-based education in South Africa. The National Training Board was fundamentally restructured in 1996 to make it more representative of the state, employers, employees, providers and community-based organisations. The National Training Board produced an important policy document at the time, the National Training Strategy Initiative (NTSI), which provided the foundation for curriculum reform in South Africa. The primary focus was on labour and the training sector, yet an integrated approach to education and training which led to the development of the National Qualifications Framework stemmed from this initiative. It is clear from this very brief historical account that outcomes-based education did not emerge as a coherent and comprehensive curriculum reform in South Africa, but that its origins lie in a number of disparate influences, both internal and external as described by Jansen (1999: 14). Most of the external influences came from similar movements in England, Australia, New Zealand and the United States of America where attempts to introduce new forms of economic and social relations emerged.

Outcomes-based education was introduced in South Africa in December 1995 as a response in the curriculum field to overcome the problems of the national system of education and training. According to Mahomed (1999: 158), the introduction of outcomes-based education in South Africa is intended to:

- Develop an authentic national system of education and training.
- Afford equal opportunity of access and outcome in education and training to all citizens in terms of race, class, gender and ethnicity.
- Provide a qualitative system in terms of relevance, learner-centredness, critical thinking, economic growth and development, social responsibility, integration and *ubuntu*.

Van der Horst and McDonald (2001: 5) describe the mission of outcomes-based education in South Africa as comprising the following:

- Focus on the learner and his/her needs.
- Acknowledgement of human diversity (learners' differences must be accommodated).
- A move to participatory, democratic decision making in education.
- Emphasis on accountability (responsibility).
- Allowing all learners to achieve their full potential (different levels according to individual ability).

The SAQA Act of 1995 imposed a new way of devising learning programmes based on outcomes-based learning. This requires a paradigm shift from traditional content-based and competency-based learning towards outcomes-based learning in South Africa as outlined in **Table 3.6**. Spady (1994:1) defines outcomes-based education as "focusing and organising everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences". This means that curriculum, instruction and assessment should be organised around what students should be able to do at the end of the learning process. This radical demand on institutions of Higher Education requires institutions to take the interest of the learner into account when engaging in curriculum development, implementation and review. According to Van der Horst and McDonald (2001: 5), Higher Education institutions are required to focus on:

- **The desired end results of each learning process**: These desired end results are called the outcomes of learning and learners need to demonstrate that they have attained these outcomes.
- **The instructive and learning processes that will guide the learners to these end results**: Educators are required to use the learning outcomes as a focus when making instructional decisions and planning learning experiences.

According to Spady (1994:10), at the heart of an outcomes-based educational system are **four principles**, which work together to strengthen the conditions enabling learners and educators to be successful. These principles are:

- **A clarity of focus on the learning outcomes** that ultimately students need to demonstrate, which are reflected in the critical cross-field outcomes formulated by SAQA.
- **Expanded opportunity and support for learning success**, which requires institutions to move beyond the rigid blocks of time and traditional organisation of learning institutions.
- **High expectations for all to succeed**, which indicates that it is necessary for those who work in the system to behave and structure what they do in working with learners, in such a way that learners are enabled to achieve these outcomes.
- **Design down/build-back approach to building the curriculum**, which starts with the abilities, skills, knowledge and attitudes that learners should ultimately be able to achieve and to focus assessment on what the learner has achieved in relation to these outcomes, rather than to focus merely on what was presented in the course of delivery.

Van der Horst and McDonald (2001: 5-6) describe outcomes-based education as a learner-centred, results-oriented approach to learning, which is based on the following underlying beliefs:

- All individual learners must be allowed to learn to their full potential, regardless of background, previous achievements, age, sex, learning style or other factors.
- Success breeds further success, which focuses on the importance of positive and constructive ongoing assessment to enable learners to reach their full potential.
- The learning environment is responsible for creating and controlling the conditions under which learners can succeed, emphasising the importance of promoting a culture of learning.
- All the different stakeholders in education share in the responsibility of learning, requiring participation in curriculum development, implementation and review.

Outcomes-based education is not just about changing the curriculum, it is about changing the nature of how the education system works in South Africa. In recognising the need for systemic change, it is likely that old practices of curriculum development and delivery will be affected. In order for South Africa to respond to the need for transformation at the systemic level, the National Qualifications Framework was established to address problems in the system regarding relevance, integration, coherence, access, articulation, progression, portability, credibility and legitimacy.

The National Qualifications Framework determines that a system organised around the notion of learning outcomes will drive education and training in South Africa, indicating that decisions of learning programme design, development, delivery and assessment need to consider constantly the learning outcomes that learners need to demonstrate as achievement of competence.

A paradigm shift is required by educators and training practitioners to adapt to the differences as identified by Meyer and Mokoele (2001: 19) between content-based and outcomes-based education as tabled in **Table 3.6**:

Table 3.6: Differences between content-based and outcomes-based education

Education Dimension	**Content-based education**	**Outcomes-based education**
Needs analysis	❑ Few parties are consulted before the educator/trainer develops the course him or herself. ❑ Educators/trainers decide themselves how needs are determined and expressed.	❑ All six stakeholders are consulted prior to curriculum development: employers, employees, government, special interest groups, providers and learners. ❑ The end-product of needs analysis is reflected as unit standards.
Course design	❑ Instructional designers develop courses around the content. ❑ The outcomes of a course are written as objectives.	❑ Learning programmes are designed according to the needs of the above six stakeholders. ❑ Outcomes clearly indicate what the learner must be able to do.
Learning material	❑ The learning material is called study manuals or textbooks, which are content-driven. ❑ The instructor determines the content.	❑ Learning material is called learning guides and is outcomes-driven. ❑ The content is determined by the inputs of various roleplayers.
Presentation	❑ The instructor presents a pre-determined lesson. ❑ The instructor is in control of the learning event.	❑ A facilitator presents a lesson based on the unit standard in a flexible manner. ❑ The facilitator guides learners to achieve outcomes.
Assessment	❑ Learners do assignments and write tests and examinations in order to indicate their level of competence. ❑ Assessment criteria are non-existent or vague.	❑ A variety of assessment techniques are used, for example, simulations, portfolios, self-assessment, workplace assessment. ❑ Assessment criteria are clearly defined and indicated as part of the unit standard.

Source: Meyer & Mokoele (2001: 19)

It is important, at this point, to reflect on terminology associated with standard setting, learning programme development and delivery, as well as quality assurance of the delivery process in an outcomes-based educational context in South Africa. This is, however, more difficult than initially anticipated, since one of the difficulties being experienced when dealing with the new terminology and concepts is that "the writers either attempt no particular definition of the terms or clarifications of the concepts, ... or give definitions that are so narrow that they exclude the possibility of exploring the notions; or are so vague that they are unhelpful; or so technicist that they lead to reductive adaptations" (Bellis, 1999: 220).

3.5.1.1 Outcomes

The word "outcomes" generally relates to the end result obtained at the end of an activity, process or situation. In the context of outcomes-based education in South Africa, "outcomes" are defined as "the results of learning processes and refer to knowledge, skills, attitudes and values within particular contexts" (Bellis, 1999: 220). An analysis of the relevant literature reveals that both the terms "outcome" and "competence" are interchangeably used by training and human resource development practitioners, whereas the term "outcome" is favoured in the formal education system in South Africa. Both these terms are strongly reminiscent of the term "key competencies" used by Australian Mayer Report (Kearns, 2001). The concept of key competencies and employability skills is discussed in more detail in **Chapter 4** of this thesis.

3.5.1.2 Qualification

Cosser (1998: 6) argues that it is important not to merely focus on the nature of the qualification, but that is necessary to reflect on the terms "qualify" and "quality", which are both functions of SAQA, namely standard setting (quality) and NQF (qualify or qualification). The terms *qualify* and *quality*, significantly share the common Latin root: *qualis*, which means "of what kind". Both quality and qualification have the same inherent property of the entity of the terms, therefore one denotation of quality as "degree of excellence". He further concludes that the linking of the terms "quality" and "qualification" is not merely a semantic diversion, but that it defines qualification as recognition that the learner has successfully completed a particular journey and that the "destination" (qualification) has been reached. It also refers to the "quality" of the journey (learning process) to the destination, which relates to the importance of clearly defined learning outcomes, appropriate assessment methods and criteria, as well as learning and teaching strategies employed during the process. The learning process should not only prepare learners for a qualification, but should enable learners to continue learning and adapting to the constantly changing world of work, which Gibbons (1998) interprets as the "dynamics of relevance" for higher education by drawing attention to the fact that relevance is not static, but rather a functional concept, "one that is intended to be adapted to a particular, but evolving, techno-economic environment". Linked to this, is the fact that in a knowledge driven society, education and training has the task of preparing people to perform difficult jobs competently, with a realisation that in a constantly changing work environment, they must be equipped to deal with change. Gibbons (1998) states: "The only skill that does not become obsolete is the skill of learning new skills."

Du Pré (2000: 16) defines a qualification as the formal recognition of the achievement of a range of credits embodied in a coherent number of unit standards supported by evidence of achievement of outcomes and required number and range of credits and other requirements, as may be determined, at a specific level of the NQF, determined by the relevant bodies registered for such purposes by SAQA. A qualification constitutes a planned combination of learning outcomes, which have a defined purpose (destination) and are intended to provide qualifying learners with applied competence and a basis for further learning.

The requirements of a qualification, as outlined in the *SAQA Act of 1995*, are that a qualification shall:

- Represent a planned combination of learning outcomes, which has a defined purpose or purposes, and which is intended to provide qualifying learners with applied competence and a basis for further learning.
- Comply with the objectives of the NQF including the enhancement of learner access, mobility and progression, and the provision of quality education and training.
- Have both specific and critical cross-field outcomes, which promote life-long learning.
- Incorporate integrated assessment appropriately to ensure that the purpose of the qualification is achieved, using a range of formative and summative assessment methods.
- Develop the learner by providing for:
    - Employability.

- Professional status.
- Marketability.
- Recognition by professional bodies in South Africa and internationally.

- Provide benefits to society and the economy through enhancing citizenship, increasing social and economic productivity.

The NSB regulations provide guidelines regarding the mapping of qualifications on the National Qualifications Framework, which determines that any qualification registered at any level of the framework should carry a credit weighting of a minimum of 120 credits, with 72 or more credits obtained at or above the level at which the qualification is registered.

3.5.1.3 Credit

The NSB regulations, defines a credit as ten notional hours of learning. Notional hours of learning imply the time spent by an average learner to meet the outcomes defined, which will include contact time in class, time spent on structured learning in the workplace and individual learning by completing learning activities such as assignments, projects, etc.

3.5.1.4 Unit standard

Unit standards are the cornerstone of the standard-setting function of SAQA, consisting of:

- Statements of purpose.
- Units and elements of competence.
- Performance criteria or assessment criteria.
- Range statements, which indicate context and parameters of application of the element;
- Statements of the knowledge and understanding that underpin or are embedded in each unit or element.

These standards form the building blocks of the National Qualifications Framework and are packaged into qualifications at specific levels of the NQF. Unit standards must be submitted to SGBs in a format provided by SAQA for approval by NSBs and ultimately for registration with SAQA.

Although higher education institutions may register unit standards or whole qualifications with SAQA, most institutions only registered whole qualifications with SAQA, which resulted in a divide between the education community and the economic sector community as observed by the Study Team appointed by the Ministers of Education and Labour, who were required to investigate how the NQF implementation could be streamlined and accelerated. The Study Team (SA, 2003: 20) reports that:

> A broad demarcation is emerging between academically and vocationally oriented qualifications, with the former mainly comprising whole qualifications and the latter being based on unit standards.

The Study Team argues that the purpose of the National Qualifications Framework was to make access to programmes leading to a qualification available to learners as widely as possible, which would include both discipline-based and workplace context-based learning. It further argues that all qualifications, including whole qualifications, are made up of component parts, which could use a form of unit standards to achieve qualifications through credit accumulation. Reflecting on legislation, the NSB regulations (SA, 1998b) state that a qualification "must represent a planned combination of learning outcomes which has a defined purpose or purposes", while the New Academic Policy emphasises the importance that qualifications based on unit standards should be integrative and cumulative in nature, "the whole being more than the sum of its parts" (SA, 2003: 20). Acknowledging the reality that unit standards and qualifications are not automatically transferable across career paths and that skills and knowledge must often be adapted or newly acquired, it is important for curriculum designers and developers to develop "modular programmes, flexible learning sequences and appropriately varied learning contexts, [that] would enable learners to enter at multiple points and progress in ways that suit their learning needs, prior knowledge and experience" (SA, 2003: 21). This will only be possible if a functional credit accumulation and transfer (CAT) scheme is established to facilitate the principles of access, mobility and progress of the National Qualifications Framework.

3.5.1.5 Learning programme

SAQA refers to a learning programme as sequential learning activities, associated with curriculum implementation, which leads to the achievement of a particular qualification, while Luckett quoted in Fourie & Hay (2000: 197) adds an outcomes-based dimension by defining a programme as "a coherent combination of units of learning (modules) expressed in an outcomes-based format, which lead to one or more qualifications, which serve an academic and/or vocational purpose". Although no specifications for academic programmes have been set out in detail by the Department of Education for implementation by higher education institutions, these institutions are required to design, develop and implement a programme-based approach as referred to in the White Paper (SA, 1997a). A programme-based higher education system will:

- Promote diversification of access, curriculum and qualification structure with programmes developed and articulated within the NQF.
- Encourage an open and flexible learning system based on credit accumulation and multiple entry and exit points for learners.
- Improve the responsiveness of the higher education system to social and economic needs.
- Address present and future social and economic needs, including labour market trends and opportunities and the new relationship between work and education.
- Respond to new curriculum and methodological changes that flow from the information revolution, the implications for knowledge production and the types of skills and capabilities required to apply or develop new technologies.
- Require the implementation of institution-based planning processes.
- Enhance a responsive regulatory and funding system; and
- Ensure that the expansion of the system is managed in a responsible way responding to the demands for access, redress, diversification, human resource requirements of both society and economy, affordability and sustainability.

The National Commission on Higher Education Report quoted in SA: Department of Education (2003: 6) indicates:

> The demands of the future and the situation of South Africa as a developing country require that programmes, while necessarily diverse, should be educationally transformative. Thus they should be planned, coherent and integrated; they should be value-adding, building contextually on learners' existing frames of reference; they should be learner-based, experiential and outcomes-oriented; they should develop attitudes of critical enquiry and powers of analysis; and they should prepare [learners] for continued learning in the world of technological and cultural change.

3.5.2 HIGHER EDUCATION LEGISLATIVE FRAMEWORK & TRANSFORMATION

Higher education plays a central role in the social, cultural and economic development of modern societies. The past decade will be remembered in the history of higher education in South Africa as the period during which South African higher education has undergone more dramatic reconstruction and development than ever before in the history. Policy documents such as the *National Commission on Higher Education Report* (NCHE), the *White Paper on Higher Education*, the *Higher Education Act*, the *South African Qualifications Authority Act* and skills development legislation, paved the way for the restructuring and transformation of education and training in general, but higher education in particular.

In South Africa today, the challenge is to redress past inequalities and to transform the higher education system to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities. These legislative frameworks and structures must lay the foundations for the development of a learning society, which can stimulate, direct and mobilise the creative and intellectual energies of all the people towards meeting the challenge of reconstruction and development. Related to the main purpose of Higher Education to contribute to and support the process of societal transformation in South Africa, Higher Education is also required to equip individuals to make the best use of their talents and of the opportunities of self-fulfilment as well as to provide the labour market in a knowledge-driven and knowledge-dependent society, with the ever-changing high-level competencies and expertise necessary for the growth and prosperity of a modern economy (SA DoE, 1997b: 7). The current shortage of high-level skills in science, engineering and technology is evidence of the mismatch between output in Higher Education and the needs of a modernising economy, which requires Higher Education to develop the skills, knowledge and value orientation necessary for successful participation in the global economy.

The *Higher Education Act* (SA DoE, 1997b) requires Higher Education institutions to:

- Restructure and transform programmes and institutions to respond better to the human resource, economic and development needs of the Republic.
- Provide optimal opportunities for learning and the creation of knowledge.
- Pursue excellence, promote the full realisation of the potential of every student and employee; and promote tolerance of ideas and appreciation of diversity.
- Respond to the needs of the Republic and of the communities served by the institutions.
- Contribute to the advancement of all forms of knowledge and scholarship, in keeping with international standards of academic quality.

Education White Paper 3. A programme for Higher Education Transformation outlines the vision of the Department of Education for the Higher Education sector in South Africa, which is based on "a transformed, democratic, non-racial and non-sexist system" (SA, 1997a: 10).

The vision is based on the following:

- To promote equity of access and fair chances of success to all who are seeking to realise their potential through higher education.
- To meet, through well-planned and coordinated teaching, learning and research programmes, national development needs, including the high-skilled employment needs presented by a growing economy operating in a global environment.
- To support a democratic ethos and a culture of human rights by educational programmes and practices.
- To contribute to the advancement of all forms of knowledge and scholarship (SA DoE, 1997b: 11).

Tromp (2001: 6) states, "in the future higher education will be planned, governed and funded as a single co-ordinated system, based on a programme-based definition of higher education". According to the *Education White Paper 3* (SA DoE, 1997a: 13-18), is a programme-based approach fully compatible with the functions and integral components of higher education, which include learning and teaching, scholarship and research, community development and extension services. The Higher Education sector faces the challenge to promote the development of flexible learning systems, a range of distant and face-to-face delivery mechanisms and support services, using appropriate, cost-effective combinations of resource-based learning and teaching technologies.

3.6 CONCLUSIONS

In 2001 the Ministers of Education and Labour published the *Human Resource Development Strategy for South Africa,* which defines the close relationship between these departments to achieve the underlying principle of the strategy, that of human dignity. These government departments have distinct responsibilities for the development and management of the government's policies toward education and training on the one hand and skills development on the other hand. "Moreover, the two departments are equally challenged by the exponential increase in knowledge and knowledge flows, communication capacity and advanced technology, the frequent changes in business and work organisation, the premium now placed on productivity, adaptability and international competitiveness in a global economy, and the progressive shift from primary production to value-added production, knowledge-based industries and services" (SA, 2003: 6).

"South Africa's learners and workers have to be increasingly well equipped to engage effectively with such changes in their learning and working lives as well as in their personal, social and civic lives. This means enabling them to continually upgrade their knowledge and skills, develop cognitive capacity to understand their world and the values to guide their conduct, and adapt constructively to rapid change" (SA, 2003: 6). This implies that programmes should be educationally transformative, bridging the two worlds of discipline-based learning (mainly at institutions) and skills development (mainly in the workplace) through learner-based, experiential and outcomes-oriented learning programmes, focusing on continued learning in world of technological and cultural change. There is an underlying tension between these two perspectives. Although educators recognise the importance of career preparation, they are of the opinion that programmes should have "much broader educational value for individual and social development" (SA, 2003: 6). Workplace learning practitioners emphasise the importance of work for sustaining and enhancing life and society, recognise the value of fundamental education, but argue that work-readiness and work competence are best acquired through learning that is embedded in real work experience. (SA, 2003: 7).

It is with these imperatives in mind, that the curriculum design team at Peninsula Technikon embarked on the design of a curriculum for textile technologist education and training. The curriculum design team had the difficult task of coping with the tensions of the two perspectives described in the previous paragraph, while focusing on the development of a programme that will be "value-adding, building contextually on learners' existing frames of reference" (SA, 2003: 6), as well as ensuring that the programme is learner-based and outcomes-oriented toward the needs of the textile industry in South Africa.

The next chapter will describe the curriculum design and curriculum-orientated evaluation process of an outcomes-based textile technologist programme in more detail.

Chapter 4

Development and evaluation of a curriculum for textile technologist education and training

4.1 INTRODUCTION

In the previous chapter the legislative framework of skills development, education and training in South Africa and associated concepts and terminology are outlined. The purpose of this chapter is three-fold:

- **Firstly**, to provide a historical background on textile technology education during the transitional phase (1997 – 2000), before the implementation of an outcomes-based textile technologist programme in 2001.
- **Secondly**, to conduct a literature review on curriculum development models, to introduce curriculum development in a National Qualifications Framework context at technikons and to explore the different phases of a curriculum development model, by elaborating on the nature and processes associated with each phase of development, which underpinned the curriculum development process of an outcomes-based textile technologist programme at the Peninsula Technikon. In this respect, it is also important to develop an understanding of the terms and concepts that underpin the National Qualifications Framework and outcomes-based education.
- **Thirdly**, to describe the curriculum development process, focusing mainly on the curriculum design and curriculum evaluation phases of the process. The **curriculum development phase**, which led to the implementation of the outcomes-based National Diploma in Textile Technology at the Peninsula Technikon in January 2001 is described in this chapter, while the **curriculum-orientated evaluation phase**, which is supported by an evaluation of the enabling outcomes or subject-specific knowledge and skills of the programme, is outlined in **Chapter 6** of this thesis.

4.1.1 OFFERING TEXTILE TECHNOLOGY QUALIFICATIONS 1997-2000

The National Diploma in Textile Technology (3208031) was established with support from the local industry at the Durban Institute of Technology (formerly Technikon Natal) in the early 1980s. This was the only programme of its kind in South Africa at the time. The original programme developed during the 1980s was revised and replaced with the National Diploma Textile Technology: Dry processing (3208065) and the National Diploma Textile Technology: Wet processing (3208069) in January 1997.

The 1997 revised **National Diploma Textile Technology: Dry processing** (3208065) (**Appendix C**) consisted of the following subjects:

- **Year 1**: Communication T1, Basic Factory Engineering T1 or Electrical Engineering T1, Dyeing and Printing Technology T1, Fibres, Introduction to Textiles T1 and Textile Science T1.
- **Year 2**: Textile Electronics T2 or Textile Chemistry T2, Conversion of Fibres to Yarns T2, Dyeing Technology T2, Fabric Manufacturing, Fibres and Yarn Technology.
- **Year 3**: Finishing Technology T3, Weaving Technology T3 or Knitted and Nonwoven Technology T3 or Physical and Polymer Chemistry T3, Special Project T3, Textile Colouration and Bleaching T3 and Textile Quality Testing T3.

The programme consisted of 18 months of formal education at the Technikon and 18 months of experiential learning at a textile manufacturing company.

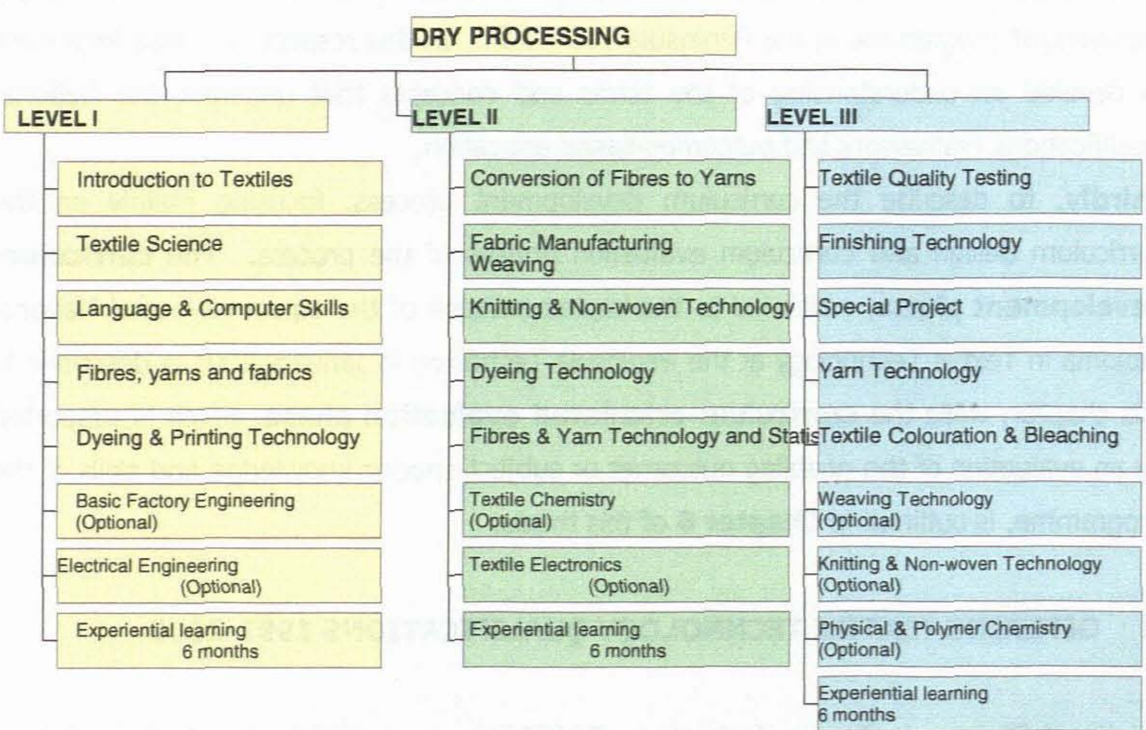


Figure 4.1: ND Textile Technology: Dry processing (1997)

The *1997* revised **National Diploma Textile Technology: Wet processing** (3208069) (**Appendix D**) consisted of the following subjects:

- **Year 1:** Communication T1, Basic Factory Engineering T1 or Electrical Engineering T1, Dyeing and Printing Technology T1, Fibres, Introduction to Textiles T1 and Textile Science T1.
- **Year 2**: Conversion of Fibres to Yarns T2, Dyeing Technology T2, Fabric Manufacturing, Fibre and Yarn Technology and Statistics T2, Knitted and Non-woven Technology T2 and Textile Chemistry T2.
- **Year 3**: Dyeing and Printing Technology T3, Finishing Technology T3, Physical and Polymer Chemistry T3, Special Project T3, Textile Quality Testing T3 and Textile Chemistry T3.

The programme consisted of 18 months of formal education at the Technikon and 18 months of experiential learning at a textile manufacturing company.

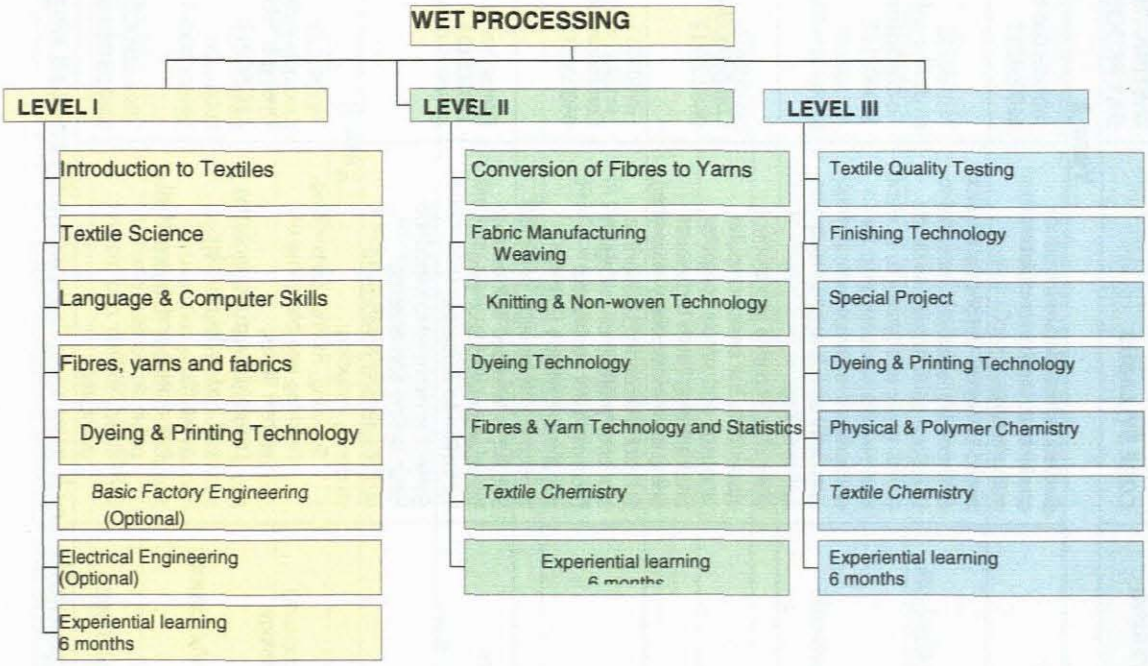


Figure 4.2 ND Textile Technology: Wet processing (1997)

A synopsis of ND Textile Technology: Dry Processing and ND Textile Technology: Wet Processing courses implemented in January 1997 is outlined in **Table 4.1** on the next pages. It is important to note that these courses were content-based and did not meet the requirements of outcomes-based qualifications as stipulated by SAQA.

Table 4.1: ND Textile Technology (dry and wet processing) course outline of 1997

LEVEL	INSTRUCTIONAL OFFERING WET PROCESSING	CORE SYLLABUS	INSTRUCTIONAL OFFERING DRY PROCESSING	CORE SYLLABUS	SAPSE CREDIT
Year 1					
T1	Introduction to Textiles 110202312	Subject is intended to introduce students to the basics of fabric manufacture.	Introduction to Textiles 110202312	Subject is intended to introduce students to the basics of fabric manufacture.	0.083
T1	Textile Science 150407112	Based on Senior Certificate Physics & Chemistry, subject is intended to introduce basic science in textile fibres, yarns and fabrics to students. Wet process students must be encouraged to widen their view of chemistry as it is applied to dyeing and finishing.	Textile Science 150407112	Based on Senior Certificate Physics & Chemistry, subject is intended to introduce basic science in textile fibres, yarns and fabrics to students. Wet process students must be encouraged to widen their view of chemistry as it is applied to dyeing and finishing.	0.083
T1	Computer Skills 060200312	Subject is intended to introduce students to the basic computer language and simple computer programming (both techniques being used increasingly in textiles)	Computer Skills 060200312	Subject is intended to introduce students to the basic computer language and simple computer programming (both techniques being used increasingly in textiles)	0.083
T1	Communication Skills 060200312	Subject is intended to improve students' proficiency in English (necessary for report and assignment writing both for academic and industry projects)	Communication Skills 060200312	Subject is intended to improve students' proficiency in English (necessary for report and assignment writing both for academic and industry projects)	0.083
T1	Fibres, Yarns and Fabrics 110205012	Subject is intended to introduce fibres and methods of yarn formation to students.	Fibres, Yarns and Fabrics 110205012	Subject is intended to introduce fibres and methods of yarn formation to students.	0.083
T1	Dyeing & Printing Technology 110201212	Subject is intended to introduce basic dyeing and finishing techniques and practices to students, including: ▪ Scouring, milling, carbonising, finishing and bleaching of protein fibres; ▪ Different dyestuffs, including acid and metal complex dyestuffs; ▪ Preparation and dyeing of all cellulosic fibres, including direct, sulphur and reactive dyestuffs.	Dyeing & Printing Technology 110201212	Subject is intended to introduce basic dyeing and finishing techniques and practices to students, including: ▪ Scouring, milling, carbonising, finishing and bleaching of protein fibres; ▪ Different dyestuffs, including acid and metal complex dyestuffs; ▪ Preparation and dyeing of all cellulosic fibres, including direct, sulphur and reactive dyestuffs.	0.083

Table 4.1: ND Textile Technology (dry and wet processing) course outline of 1997

LEVEL	INSTRUCTIONAL OFFERING WET PROCESSING	CORE SYLLABUS	INSTRUCTIONAL OFFERING DRY PROCESSING	CORE SYLLABUS	SAPSE CREDIT
T1	Basic Factory Engineering (optional) 081602212	Subject is intended to improve basic understanding of engineering equipment and services – those which are typical in normal industrial concerns.	Basic Factory Engineering (optional) 081602212	Subject is intended to improve basic understanding of engineering equipment and services – those which are typical in normal industrial concerns.	0.083
T1	Electrical Engineering (optional) 080803012		Electrical Engineering (optional) 080803012		0.083
Year 2					
T2	Conversion of Fibres to Yarns 110202122	Subject is intended to introduce general principles of traditional spinning systems and theoretical concepts of staple yarn production, to compare ring and rotor spinning principles and to improve understanding of yarn properties.	Conversion of Fibres to Yarns 110202122	Subject is intended to introduce general principles of traditional spinning systems and theoretical concepts of staple yarn production, to compare ring and rotor spinning principles and to improve understanding of yarn properties.	0.083
T2	Textile Chemistry 150407022	Subject is intended to develop understanding of the interaction of various dyestuffs with fibres and to illustrate the various rates of reaction and their application to dyeing and finishing.	Textile Chemistry (optional) 150407022	Subject is intended to develop understanding of the interaction of various dyestuffs with fibres and to illustrate the various rates of reaction and their application to dyeing and finishing.	0.083
T2			Textile Electronics (optional) 080808022		
T2	Fabric Manufacturing (Weaving) 110205222	Subject is intended to develop understanding of preparation of yarn (warping, sizing, entering and knotting) for weaving processes, the various motions of the loom and a variety of fabric analysis.	Fabric Manufacturing (Weaving) 110205222	Subject is intended to develop understanding of preparation of yarn (warping, sizing, entering and knotting) for weaving processes, the various motions of the loom and a variety of fabric analysis.	0.083
T2	Knitting & Non-Woven Technology 110205122	Subject is intended to introduce basic methods of fabric production by warp-knitting, weft-knitting and non-woven technology and to distinguish between the three types through fabric analysis.	Knitting & Non-Woven Technology 110205122	Subject is intended to introduce basic methods of fabric production by warp-knitting, weft-knitting and non-woven technology and to distinguish between the three types through fabric analysis.	0.083

Table 4.1: ND Textile Technology (dry and wet processing) course outline of 1997

LEVEL	INSTRUCTIONAL OFFERING WET PROCESSING	CORE SYLLABUS	INSTRUCTIONAL OFFERING DRY PROCESSING	CORE SYLLABUS	SAPSE CREDIT
T2	Dyeing Technology 110201422	Subject is intended to extend knowledge and understanding of dyeing, including wool dyeing with chrome and reactive dyes, dyeing of polyamide fibres, continuation of cellulosic dyeing using vat, azoic and phthalogen dyes, poly-acrylic and polyester dyeing.	Dyeing Technology 110201422	Subject is intended to extend knowledge and understanding of dyeing, including wool dyeing with chrome and reactive dyes, dyeing of polyamide fibres, continuation of cellulosic dyeing using vat, azoic and phthalogen dyes, poly-acrylic and polyester dyeing.	0.083
T2	Fibre & Yarn Technology and Statistics 110205322	Subject is intended to provide detailed knowledge of fibre classification, production of synthetic fibres and yarns and the harvesting of natural fibres. It also covers various texturing methods and provides an introduction to statistics.	Fibre & Yarn Technology and Statistics 110205322	Subject is intended to provide detailed knowledge of fibre classification, production of synthetic fibres and yarns and the harvesting of natural fibres. It also covers various texturing methods and provides an introduction to statistics.	0.083
			Year 3		
T3	Textile Quality Testing 110204303	Subject is intended to emphasize reasons and costs of testing and quality control, to apply statistical methods and to perform tests on fabrics, yarns, floor covering, including fastness testing.	Textile Quality Testing 110204303	Subject is intended to emphasize reasons and costs of testing and quality control, to apply statistical methods and to perform tests on fabrics, yarns, floor covering, including fastness testing.	0.083
T3	Finishing Technology 110200003	Subject is intended to provide advanced knowledge of fabric finishing processes and equipment, including optical brightening agents, shrink proofing of wool, softeners, flame proofing, water proofing, anti-static electricity, anti-soiling, laminating, coating, foam finishing and foam coating.	Finishing Technology 110200003	Subject is intended to provide advanced knowledge of fabric finishing processes and equipment, including optical brightening agents, shrink proofing of wool, softeners, flame proofing, water proofing, anti-static electricity, anti-soiling, laminating, coating, foam finishing and foam coating.	0.083
T3	Physical & Polymer Chemistry 110200303	Subject is intended to provide basic understanding of dye/fibre reaction and effects of pH on dyestuff solubility and affinity. Various polymer forming substances, addition and condensation polymers, structures and properties of polymers.	Physical & Polymer Chemistry (optional) 110200303	Subject is intended to provide basic understanding of dye/fibre reaction and effects of pH on dyestuff solubility and affinity. Various polymer forming substances, addition and condensation polymers, structures and properties of polymers.	

Table 4.1: ND Textile Technology (dry and wet processing) course outline of 1997					
LEVEL	**INSTRUCTIONAL OFFERING WET PROCESSING**	**CORE SYLLABUS**	**INSTRUCTIONAL OFFERING DRY PROCESSING**	**CORE SYLLABUS**	**SAPSE CREDIT**
T3	Dyeing & Printing Technology 110201303	Subject is intended to provide advanced knowledge and understanding of colorants, their classification, application and chemical composition. Advanced aspects of printing technology also included.	Weaving Technology (optional) 110205403	Subject is intended to provide basic knowledge weaving technology, theory of weaving, including carpets and shuttleless methods of high speed weaving. Fabric design and structure and fabric analysis and calculations used in weaving production.	0.083
T3	Textile Chemistry 150406903	Subject covers organic acids and bases, substitution in organic molecules, types of dyestuffs. Colour physics covering colour mixing, colour vision, laws of light absorption and Tristimulus Colorimetry form part of this subject.	Yarn Technology 110200403	Subject is intended to provide students with understanding of various methods of spinning staple fibres into yarns (ring, rotor and various yarns like dref, murata and corespun). The impact of atmospheric conditions for yarn production, the importance of moisture and oil content in buying/selling of yarn and application of various yarn finishes are studied.	0.083
T3			Knitting and Non-woven Technology (optional) 110200203	Subject is intended to provide students with knowledge of weft knitting, fully fashioned and warp knitting machinery. Types of needs, various knitting elements and their functions, production calculations and fabric faults and analysis are studied. The methods used in the manufacturing of non-woven textile products and their analysis are also included.	0.083
T3			Textile Colouration & Bleaching 110204403		
T3	Special Project 110202403	Students are required to complete a research project on a chosen topic in accordance with the academic requirements of the Department and in collaboration with industry.	Special Project 110202403	Students are required to complete a research project on a chosen topic in accordance with the academic requirements of the Department and in collaboration with industry.	

4.1.2 POLICY FRAMEWORK FOR INTERIM REGISTRATION OF QUALIFICATIONS

The procedures, criteria for evaluation and guidelines to universities, technikons and colleges for the registration, accreditation and funding approval of qualifications were outlined in:

- Report 116 (96/02), A Qualification Structure for Universities in South Africa.
- Report 150 (97/01), General Policy for Technikon Instructional Programmes.
- Committee on Teacher Education Programmes (COTEP) (1996), Norms and Standards for Teacher Education.

In terms of these regulations, the Association of Universities and Technikons (AUT) and the Committee on Teacher Education Programmes (COTEP) were responsible for advising the Minister of Education on the registration, accreditation and approval for qualifications.

Since 1998, the registration, accreditation and funding approval process previously used by technikons were changed by the *SAQA Regulations* (Regulation 452 of 28 March 1998), the *New Higher Education Policy Framework outlined in the White Paper 3* (1997), and *A Programme for the Transformation of Higher Education* (2000). This new legislation dissolved the Association of Universities and Technikons (AUT) and Committee of Teacher Education Programmes (COTEP) and reallocated the responsibilities of these bodies for the registration of qualifications, and the accreditation and funding approval of programmes, to the following authorities as stipulated in the table below:

Table 4.2: New legislative framework and authorities

Activity	**Responsible body**
Registration of qualifications	South African Qualifications Authority (SAQA)
Accreditation of programmes	Higher Education Quality Committee (HEQC) of the Council for Higher Education (CHE)
Approval for new learning programmes for funding purposes	Department of Education (DoE)

Source: Du Pré (2000: 46)

Transitional arrangements for the registration of qualifications and the accreditation and funding approval of learning programmes were in place at the time when the Skills Audit of the textile industry was conducted by the CTFL SETA in its former capacity as Textile Industry Training Board as described in **Paragraph 4.5.2** of this thesis. An Interim Joint

Committee (IJC) on Qualifications and Programmes was established in June 2000, consisting of SAQA, the Council on Higher Education (CHE) and the Department of Education (DoE) for the purpose of registering qualifications as well as accrediting and approving programmes for funding purposes during the interim period until the relevant bodies are ready to assume full responsibility of duties delegated to them as outlined in **Table 4.2**.

After the transition period, the Interim Joint Committee (IJC) will be disbanded and the registration of qualifications will be submitted to SAQA via the relevant National Standards Bodies and the Standard Generating Bodies established by SAQA. The accreditation of learning programmes will occur via the quality assurance processes of the HEQC of the Council for Higher Education. Approval of programmes for funding purposes will be consistent with the procedures of the new funding formula developed by the Department of Education.

Durban Institute of Technology (formerly Technikon Natal) acted as convenor technikon at the time of developing outcomes-based textile technologist programmes and was responsible for the submission of a revised outcomes-based (1999) ND Textile Technology qualification to SAQA, CHE and the DoE via the Interim Joint Committee (IJC) for interim registration, accreditation and approval of the programme for funding purposes. The interim registration documentation per qualification (two-year diploma, three-year first degree qualification and four-year professional BTech degree qualification) was prepared by the convenor Technikon (Technikon Natal) during 2000, according to a prescribed format provided by the Committee for Technikon Principals, in line with the National Standards Body Regulations published in March 1998. These guidelines required technikons to formulate qualifications according the requirements of outcomes-based education, and consisted of the following:

- Name of institution.
- Title of qualification.
- A statement of the purpose of the qualification.
- Assumptions of learning already in place before the programme leading to the qualification is commenced.
- Exit level outcomes as contemplated in regulation 5(1)(b) and (c) and the associated assessment criteria.
- Total credits required.

- Minimum credits required at specific levels or maximum credits where these exceed the minimum specified in regulation 8 or 9.
- Integrated assessment appropriately incorporated to ensure that the purpose of the qualification is achieved.
- Articulation possibilities with related qualifications.
- Criteria for the registration of assessors.
- Moderation options including the recommendation of a moderating body or bodies.
- Authorised person, including the signature of such a person.
- Date of submission.
- Contact details of authorised person, including physical address, postal address, telephone, cell phone, e-mail and facsimile.

The formulation of the interim registration documentation for registration with SAQA coincided with the development and implementation of a NQF level 6 textile technologist programme in the Western Cape by the Peninsula Technikon. These processes are therefore inextricably linked, with the one feeding off the other. The convenor technikon (Technikon Natal) acted as the institution officially responsible for the registration of the revised outcomes-based qualifications with SAQA and the submission of the relevant documentation to DoE for funding of the new programmes, while Peninsula Technikon had to obtain approval from the Interim Joint Committee (IJC) and the Department of Education (DoE) to offer the revised NQF level 6 (first degree) outcomes-based textile technology programme by January 2001.

The development of unit standards at NQF level 6 for textile technology by the CTFL SETA impacted significantly on this process, whereby outcomes of the new programmes were benchmarked against the unit standards. The principles of flexibility, accessibility, progression and recognition of prior learning underpinning the NQF as outlined in **Table 3.1** influenced the curriculum development process, resulting in multiple exit points, consisting of a set of qualifications, namely a two-year programme (diploma), three-year programme (first degree) and four-year degree programme (BTech degree). The interim registration documentation of the new set of outcomes-based qualifications benchmarked against the unit standards of the Textile Qualifications Framework (**Appendix J**) was prepared by the convenor technikon (Technikon Natal) and consisted of the following:

Appendix E: Diploma in Textile Technology (240 credits)

Appendix F: First degree in Textile Technology (360 credits)

Appendix G: BTech degree in Textile Technology (480 credits)

4.2 DEFINITION AND THEORIES OF CURRICULUM

Jacobs (1999: 97) indicates that the word "curriculum" is derived from the Latin verb *currere*, which means "the running of a race". The root meaning can therefore be described as 'a course to be run', which in turn emphasises the notable feature of the description, that the role of the individual is pivotal in this process. Grundy (1987: 5) supports this view by defining curriculum as "a cultural construction, " ... a way of organizing a set of human educational practices". Jacobs (1999: 97) states: "To run the race successfully, it is believed that one needs a certain type of knowledge described as 'desirable knowledge' ... [that] gives rise to the question: Desirable for what?" The most prevalent viewpoints in respect of this question is summarised by Jacobs (1999: 98) as follows:

- **Subject matter**: A curriculum is often associated with the subjects being taught at a learning institution in order to complete a qualification.
- **Content**: This perception of curriculum focuses on course content and supporters of this definition stress the importance of obtaining desirable knowledge by studying suitable content.
- **Planned activities**: All activities aimed at enabling learners to complete a course of study are located within this definition. "Supporters of this view believe that desirable knowledge is much more than content; desirable knowledge can only be obtained if suitable content is learned using appropriate teaching methods, lesson plans, evaluation procedures and other planned activities" (Jacobs, 1999: 98).
- **School [institutional]-directed experiences**: Supporters of this definition of curriculum regard classroom-based learning experiences and unplanned experiences outside the classroom as the hidden curriculum. This perception relates to a wide variety of planned as well as unplanned experiences which learners and education have at educational institutions but which are not stipulated in specific syllabi (Jacobs, 1999: 107).
- **Individual experiences**: The focus on this definition is on the actual experiences of a particular learner as a result of learning, which includes both desirable and undesirable experiences of learning.

- **Transfer of culture**: Supporters of this definition regard the transfer of existing knowledge, skills and values of a particular culture to the next generation as the curriculum and to them desirable knowledge is current knowledge identified by representatives of society that is suitable for transmission to the next generation.
- **Social reform**: This perception of the curriculum assumes that the curriculum should consist of content and experiences that will equip the next generation to improve society.

Adding to this definition of curriculum provided by Jacobs (1999: 97); Stenhouse (1976: 1-5) describes curriculum as the way in which educational aims are realised in practice, while Tanner and Tanner (1975: 48-49) refer to curriculum as "the planned and guided learning experiences, formulated through the systematic reconstruction of knowledge and experience, under the auspices of the school [institution] for the learner's continuous and wilful growth in personal-social competence". Schubert in Carl (1995: 32) emphasises the broader context of curriculum by using the term "characterisation" instead of a definition, which provides a wider conceptualisation of curriculum and prevents the loss of the totality of the curriculum. Oliva (1988: 8-9) provides a classification of definitions of the term "curriculum" and groups the different perspectives in to **three** categories:

- Curriculum as **objectives** or what is intended or what it should do with the emphasis on purpose.
- Curriculum as **context**, namely the particular context or perspective within which it develops.
- Curriculum as **strategies** utilised during the process, for example,, the particular instructional-learning strategy adopted throughout the process.

Definitions of curriculum range from narrow interpretations to broad all-encompassing interpretations. In a broader context, curriculum includes aspects of standard setting, learning programme development and delivery, as well as quality assurance of the delivery process as currently promoted by SAQA.

4.2.1 CURRICULUM DEVELOPMENT MODELS

As a changing and developing country, South Africa faces many problems regarding education and many of these problems are directly related to the curriculum. Carl (1995: 25) argues that South Africa has a need for dynamic curriculum development so that relevant education may prepare learners for a world of work. This view is confirmed by Claassen (1999: 35), who states that "an effective education system will constantly be in touch with the demands of the world of employment". Curriculum should reflect the global context, it should not be confined to "localised facts"; it should "become more focused on preparing one for a prescribed life in the global economy" (Claassen, 1999: 34). Jacobs (1999: 97) indicates "curriculum planners, teachers, politicians and others involved in curriculum issues [should] constantly deliberate about the nature of the desirable knowledge they believe students should learn".

Curriculum development is an ongoing educational process that involves the following aspects as defined by Bellis (SAQA, 2000b:6):

- Determining the values and purposes of learning.
- Analysing the needs and the nature of the learners.
- Deciding on the outcomes of learning.
- Deciding on the tasks which will support achieving the outcomes.
- Deciding on the content which will support achieving the outcomes.
- Planning assessment.
- Planning evaluation for continuous change or improvement.

Jacobs (1999: 102) claims that these aspects of curriculum development are also present in the behaviourist curriculum theory of Ralph Tyler (1949) who built his theory around four fundamental questions, each one of which leads to the development of a perennial curriculum component as illustrated in **Figure 4.3**.

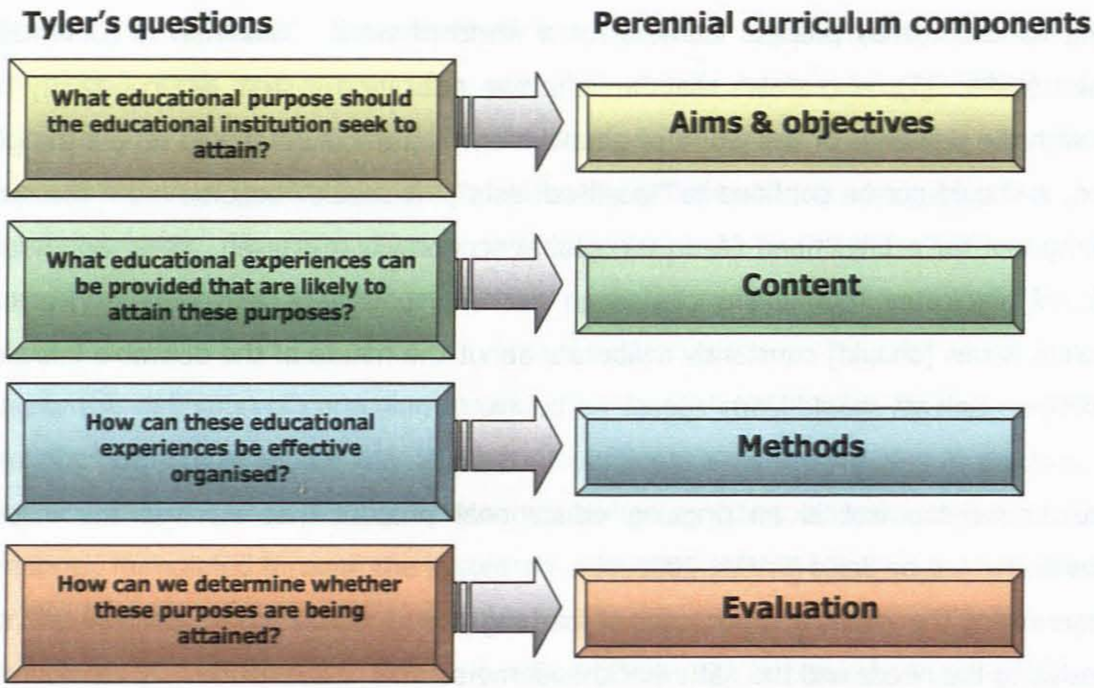


Figure 4.3: Links between Tyler's rationale and perennial curriculum components

Different approaches to curriculum development exist; these are grouped into **three groups** by Walters (1985) in Carl (1995: 49-56) namely:

- **Academic approach** is characterised by a systemic process directed by academic rationality and theoretical logic. According to Carl (1995: 48) the curriculum specialist or specialist team is in a position to make curriculum decisions unilaterally without the educator and others involved in the process. The Tyler approach to curriculum development as illustrated in **Figure 4.3** provides the theoretical and ideological points of departure. The process begins with the identification of objectives and goals, which is followed by the selection of content and the classification of the content, and the design of methods and eventually the evaluation to determine if the objectives and goals have been reached.
- **Experiential approach**, developed by Dewey, emphasises the role of the educator and learners in the curriculum decision-making process. "Personal feelings, inclinations, values and experiences are regarded as necessary curriculum content and the active involvement of the pupil is regarded as necessary in order to obtain maximal learning outcomes" (Carl, 1995: 51).

- **Technological approach** influenced by large-scale technological development during recent years is analytical and regards instructional planning in terms of "systems", "management" and "production" (Carl, 1995: 53). This approach resembles aspects of the academic approach based on the Tyler rationale and specifies learning outcomes or "desired terminal behaviour" [exit level outcomes] as the key element. This approach, according to Carl (1995: 53), differs from the academic approach in terms of the relationship between "means and end, the methods for identification of instructional goals, the structure and formulation of the goals and the evaluation criteria employed to measure the desired learning outcomes". The technological approach relates directly to the approach adopted by the curriculum development team at the Peninsula Technikon for the development of a textile technologist curriculum model, since it resembles the features defined by Londoner (1972) in Carl (1995: 54) as a "total analytical procedure ... for progressing from the assessment of an educational need and the specification of the terminal outcome to the actual achievement of that outcome through the logical sequencing of the components compromising the total system".

The following elements are present in this "system" as illustrated in **Figure 4.8** on page 118 of this thesis:

- Empirical analysis of needs [**Chapter 2**, **Chapter 4** and **Chapter 5** of this thesis].
- Determination of needs priorities [**Paragraph 4.5**].
- Specification of the objectives in the form of behaviour or performance objectives [**Paragraph 4.6**].
- Selection of content to fit the specified outcomes [**Paragraph 4.7**].
- Definition, description and classification of instructional procedures and learning activities [**Paragraph 4.8**].
- Identification of quantifiable evaluation methods [**Paragraph 4.9** and **Chapter 6** of this thesis].

The technological curriculum approach sees learning as a "system" that can be reduced into component parts or steps, and it takes place in a predictable, systematic and controllable manner. Furthermore, the effectiveness of the curriculum can be increased by the application of good control according to management principles (Carl, 1995: 54).

4.2.2 CURRICULUM DEVELOPMENT IN A NATIONAL QUALIFICATIONS FRAMEWORK CONTEXT AT TECHNIKONS

The impressive array of education and training legislation implemented since South Africa's first democratic elections took place in 1994, all promote and reflect the principles and objectives of the National Qualifications Framework. The NQF is pivotal to the process of deep transformation of the South African education and training system to ensure that it is able to meet national and individual imperatives and aspirations for development, redress, access and quality (Du Pré, 2000: 33).

For curriculum development it is essential to understand:

- **What** is envisaged by the National Qualifications Framework – which deals with the nature and extent of the NQF levels, the character, calibration and building of qualifications and the establishment of unit standards and their clustering into credits.
- **How** the NQF is constructed – which deals with the process of involving stakeholders for the successful development and implementation of standards and qualifications.

Du Pré (2000: 32) describes the notion of outcomes-based education contained in the SAQA Act and the new way of devising learning programmes based on outcomes as "a new ball game", which impacts on curriculum development, the provision of education and training and the learning process. He uses the following analogy to illustrate the paradigm shift from traditional content-based towards outcomes-based learning:

> One could say that the SAQA Act determines the form of the ball, which will be used during the game. If a cricket ball is created, the name of the game will be cricket and consequently only tennis can be played if a tennis ball was created. This implies that the appearance and structure of the ball determines the type of game that can be played with the ball. In this case the ball that was created will only allow the game to be played known as the outcomes-based learning game. The playing field must accordingly be set for and rules be devised to play this new game.

Table 3.6 describes the differences between content-based education and outcomes-based education, which indicates the impact of outcomes-based education on curriculum development. Tromp (2001: 6) summarises the curriculum development in a technikon context as a process based on the needs of students, employers, communities, the public sector and the policies and requirements of the Department of Education and the relevant quality assurance bodies. The challenge for technikon education is to develop and deliver programmes that are educationally transformational. Programmes should be value adding, learner-centred, experiential and outcomes-orientated to prepare learners for continued learning in a world of technological change. The Committee of Technikon Principals (CTP, 2003b) stresses the importance of work-focused degrees and argues that Technikons "provide a broad variety of learning opportunities focused on the needs of a developing economy, ... [these institutions] have an ethos of being more employer-centred and are continuously striving to make their students more competent, more employable, more directly supportive of entrepreneurial activities and economic growth".

According to the Committee of Technikon Principals (CTP, 2003a) are technikons playing three very important national roles, namely in education and training (particularly in technological fields); in research and development (focused on clearly identified national priorities that emphasise the usefulness of technology); and in community development (particularly in business development and technology-based new venture creation). Genis (2001: 6) that "the development and review of technikon qualifications according to a rigorous process of consultation with industry and also among technikons, has been the cornerstone of the 'national' character of technikon qualifications". Genis (2001: 6) indicates that curriculum development in technikons have always been conducted at two levels, namely:

- The **consultative phase**, where consultation with the relevant industry [textile industry] for whom the qualification is intended establishes the nature and scope of the needs that need to be addressed in the curriculum.
- The **academic phase**, where consultation among academic peers [convenor technikon process] determine the educational response to the economic needs.

Du Pré (2000: 39) states that it is therefore essential that programmes are "purposefully designed to ensure that each graduate emerges well prepared for the working environment of the 21st century, or for postgraduate study". Du Pré distinguishes between programmes that are designed for vocational training and programmes that are designed for preparing students for a career. Career-orientated programmes, such as a textile technologist programme are carefully planned to combine a strong foundation in one or more academic disciplines with the professional skills required in the world of work. Students are better equipped for their chosen careers, i.e., textile technologist, but will acquire important transferable skills to meet new challenges in a rapidly changing work environment. In designing curricula, technikons should adopt "an interdisciplinary approach, this will enable graduates to become experts in particular fields, while acquiring the versatility they need to work across professional boundaries" (Du Pré, 2000: 40).

Finally, Du Pré (2000: 40) summarises the purpose of programmes offered by technikons as follows:

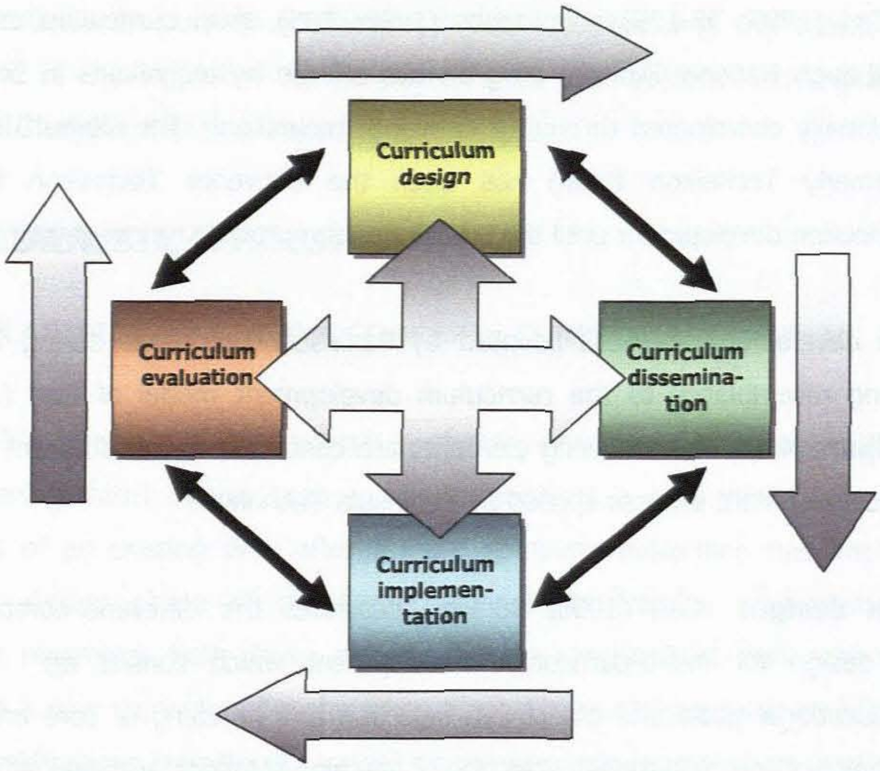
- A programme is a purposeful and structured set of learning experiences designed to enable learners to achieve pre-specified exit level outcomes.
- A programme is a coherent combination of units of learning (modules or unit standards) expressed in an outcomes-based format, leading to one or more qualifications which serve an academic and/or vocational purpose.
- A programme should have recognised entry and exit points (qualifications) comprised of core modules and electives.

4.2.3 CURRICULUM DEVELOPMENT PROCESS

The four-phase curriculum development model developed by Carl (1995: 48-49) as illustrated in **Figure 4.4** was used as model for the process of curriculum development for textile technologist programme at the Peninsula Technikon.

This model consists of four main elements:

- **Curriculum design** is that phase during which a new curriculum is planned, or during which the re-planning and review of an existing curriculum is done after a full re-evaluation has been carried out.
- **Curriculum dissemination** is the phase during which the curriculum consumers are prepared for the intended implementation, and information is disseminated.
- **Curriculum implementation** is the phase during which the relevant design is applied in practice.
- **Curriculum evaluation** is the phase during which not only the success and effectiveness of the curriculum are evaluated, but also the effect thereof on the learners. A distinction must be drawn between curriculum-orientated and learner-orientated evaluation of the curriculum. The focus of this research project is on curriculum-orientated evaluation as described in **paragraph 4.9** of this thesis.



Source: Carl (1995: 48)

Figure 4.4: Curriculum development model

Carl (1995: 82) distinguishes between three levels of curriculum design, namely:

- Macro level.
- Meso level.
- Micro level.

Jacobs (1999: 105) based on research by Krüger & Müller (1988), provides the following description of the three levels of curriculum design: "On a macro-level curriculum design deals with planning which occurs on a national scale; on a meso-level it deals with planning within a particular school [learning institution] and its immediate environment, but outside individual lessons; and on a micro-level it refers to the planning of individual lessons or units."

The extent of curriculum design will differ according to the level, but there is an interdependency and interaction between the various levels which determines the success of the curriculum development. The curriculum development process, which led to the implementation of the National Diploma Textile Technology at the Peninsula Technikon, is more related to the characteristics associated with curriculum design at a meso-level as described by Carl (1995: 96-125) and Jacobs (1999: 105), than curriculum design at a macro-level, although National Diploma programmes offered by technikons in South Africa have to be nationally coordinated through a convenor technikon. The Durban Institute of Technikon (formerly Technikon Natal) has been the convenor Technikon for textile technology curriculum development until the transformation process has been completed.

The curriculum development process adopted by Peninsula Technikon during 2000-2003 exhibits a strong resemblance to the curriculum development model of Carl (1995: 48) illustrated in **Figure 4.4**. The following elements are contained in the different phases of the curriculum development process applied by Peninsula Technikon:

- **Curriculum design:** Carl (1995: 96-125) describes the different components of curriculum design for micro-curriculum development which consist of: situational analysis, educational goals and objectives, selection and handling of core and learning contents, choice of teaching media, selection of teaching methods and evaluation.
- **Curriculum dissemination:** This phase comprises the preparation of curriculum utilisers (academic staff) through the distribution of information, thoughts and concepts to ensure successful implementation of the curriculum.
- **Curriculum implementation:** Development of work programmes, determination of offering type, drafting of timetable, allocation of staff to subjects, development of learning material, installation of equipment for teaching and learning activities, etc.
- **Curriculum evaluation:** Evaluation of learning outcomes developed during curriculum design phase with emphasis on curriculum-orientated evaluation and not learner-orientated evaluation. The results of the curriculum-orientated evaluation process will inform the review of the curriculum.

The purpose of this research project as outlined in **Chapter 1** and illustrated in **Figure 1.1** is to develop of an outcomes-based training model for textile technologist by focusing on the **curriculum design phase**, which consists of the planning of a new curriculum for textile technologist training in the Western Cape and the **curriculum-orientated-evaluation phase**, which consists of the evaluation of the enabling outcomes or subject-specific knowledge and skills (see **Chapter 6**) formulated by the curriculum design task team. The curriculum-orientated evaluation phase will be conducted taking into account the changes affecting the textile industry in South Africa in general, but the Western Cape in particular as outlined in **Chapter 2** and **Chapter 5** of this thesis, as well as the implications of the legislative framework of skills development and higher education as outlined in **Chapter 3** of this thesis.

4.3 CURRICULUM DESIGN PHASE

4.3.1 CLARIFICATION OF THE CONCEPT: CURRICULUM DESIGN

Carl (1995: 81) defines the curriculum design phase as "a phase **within** curriculum development [which] relates both to the creation of a new curriculum as well as the replanning of an existing one, after a more complete evaluation has been made". The curriculum design phase of the textile technologist training programme at Peninsula Technikon resembles both these aspects, which consisted of two actions, namely the creation of a new curriculum benchmarked against the unit standards at NQF level 6 of the Textile Qualifications Framework, as well as the re-configuration of an existing one, namely the ND Textile Technology programmes in dry processing (3208065) and wet processing (3208069) offered by Durban Institute of Technology (formerly Technikon Natal) until January 2001, after a complete evaluation of this programme was performed by the curriculum development team. Both these actions of the curriculum design process culminated in the formulation of learning outcomes which constituted the foundation of the new National Diploma Textile Technology curriculum implemented by Peninsula Technikon in January 2001.

4.3.2 CURRICULUM DESIGN MODELS

A literature survey reveals a number of curriculum models which emerge from the methods of approach used by curriculum developers. These methods of approach to curriculum design are not the only source of curriculum models, as the nature of a particular educational system has often influenced the design of a particular model. This is the case with the design of a curriculum for textile technology training at Peninsula Technikon, which is underpinned by an outcomes-based educational philosophy adopted by South Africa after 1994.

Curriculum design is essentially a decision-making process, which is not based on a "fixed recipe consisting of components and fixed rules, but a process characterized by flexibility and pliability within which the specific variables exercise a strong influence" (Carl, 1995: 82). A review of relevant literature on curriculum matters revealed that a variety of curriculum models is encountered which mostly came about, *inter alia,* from the approach to curriculum design adopted by the curriculum developers. Some models are more complex than others, or are a refinement of an already existing model or are distinctive, original designs according to particular requirements.

Bramley (1991: 6) illustrates the main elements of a training [curriculum] design process as outlined in **Figure 4.5.**

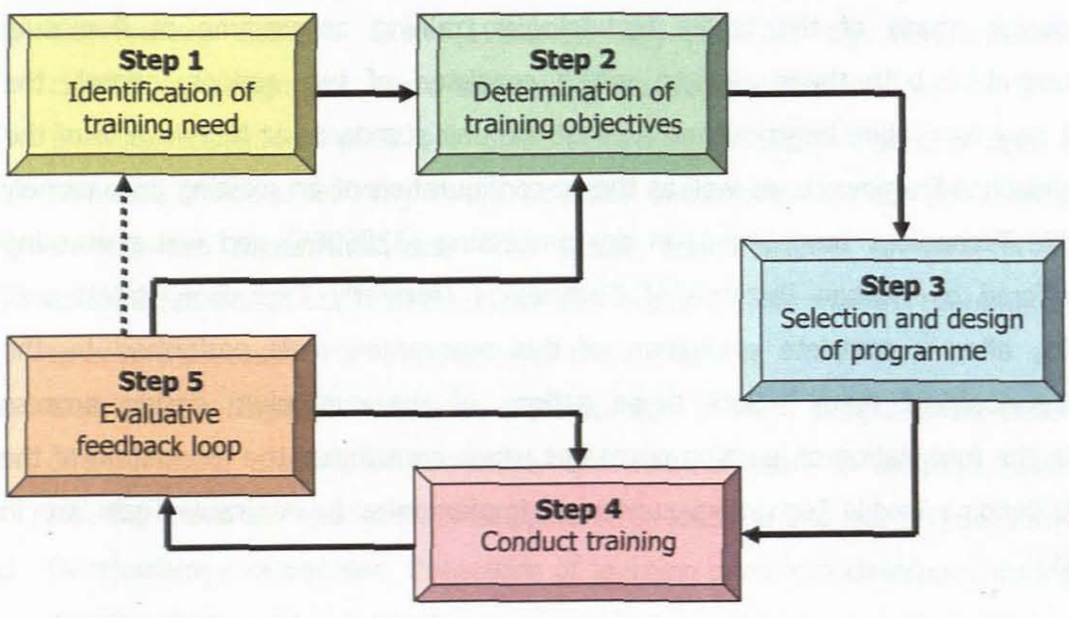


Figure 4.5: Bramley's training design model of five elements

Taba's (1962) model has, according to Oliva (1988: 16), an inductive approach and consists of five basic steps:

- **Step 1**: Design of experimental instructional learning units for a particular programme, consisting of the following eight-step sequence:
    - Determination of needs.
    - Formulation of objectives and goals.
    - Selection of contents.
    - Classification/organisation of contents.
    - Selection of learning experiences.
    - Classification of learning experiences.
    - Evaluation.
    - Control for balance and sequence.
- **Step 2**: Testing of experimental instructional learning units.
- **Step 3**: Review and consolidation.
- **Step 4**: Development of a frame of reference.
- **Step 5**: Establishment and dissemination of units.

Van Dyk *et al.* (1997: 239) describe a systems approach to curriculum design consisting of five general stages:

- Problem definition.
- Analysis.
- Selection and synthesis of an optimal solution.
- Controlled implementation.
- Evaluation and possible revision.

The systems approach is "essentially a way of thought, a tendency to think about problems in systems terms" (Romiszowski, 1981:11). The systems approach can be applied to the curriculum design process which involves carrying out a number of steps, "beginning with the analysis of needs and goals, and ending with an evaluated system of instruction [learning] aimed at meeting organisational goals [outcomes]" (Van Dyk *et al.*, 1997: 239).

Tyler's (1950) model has a deductive approach as it leads from the generalised (analysed needs) to the particular (objectives, goals). Local curriculum design models by Walters

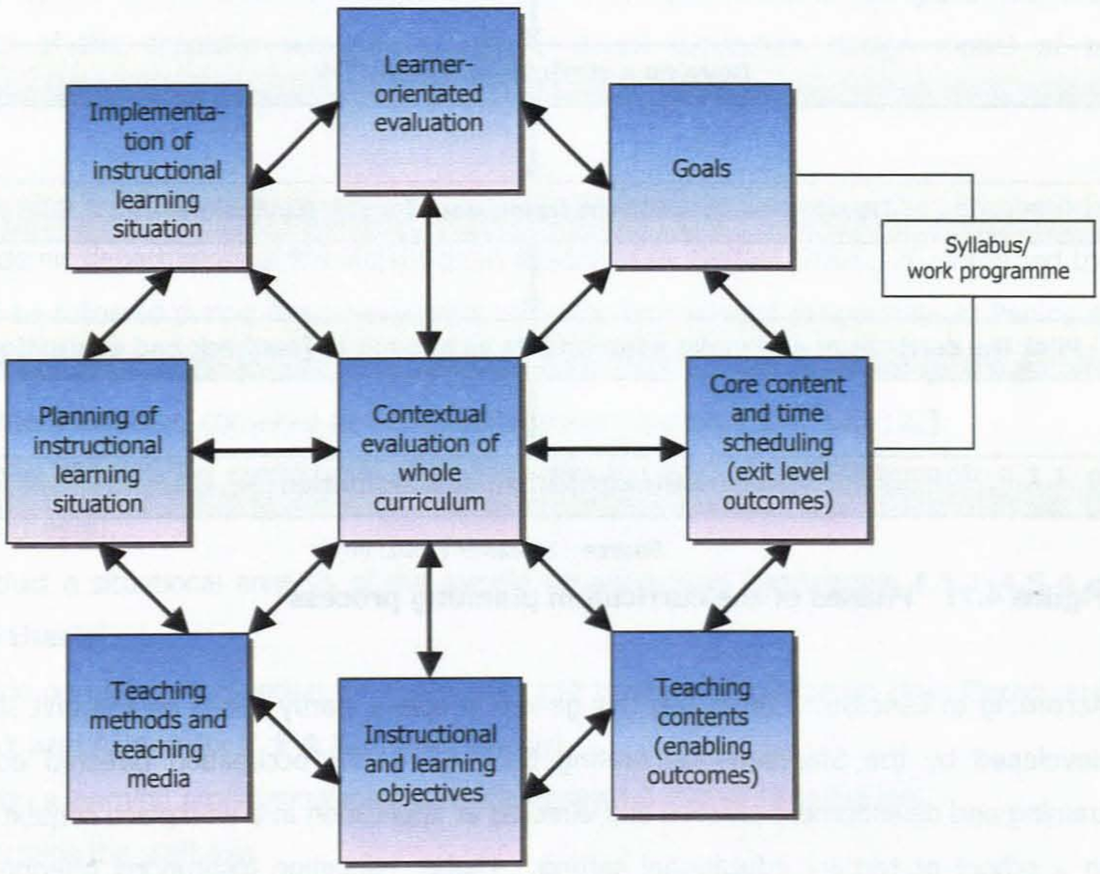
(1978), Krüger (1980) and Cawood-Carl-Blanckenberg (1986) depict a strong influence by international curriculum design models (Carl, 1995: 85-96).

There are a few components or elements that are common among these models, namely:

- **Situational analysis/contextual evaluation/initial evaluation**: The process of situation analysis or contextual evaluation is a method of evaluation that comprises the collection and interpretation of all information which may influence curriculum development. This process often serves as the starting point for curriculum development and will act as a strong guideline for the curriculum design process, which is to follow with all its different facets.
- **Aims and objectives**: The most important value of the formulation of aims and objectives is that it provides direction to the design and evaluation of the curriculum, by considering the nature of the learning outcomes, the nature of the needs of the society or industry and the nature of the learners who will engage in the learning process.
- **Selection and classification of contents**: The selection and classification of contents is a core aspect which normally determines the nature and extent of the relevant curriculum. At this level, the broader curriculum content will be considered as set out in national policy of the relevant authorities (SAQA, CHE and Department of Education); the educational institution will deal with the subject content, once the broader curriculum content has been finalised. This provides the institution with an opportunity to incorporate aspects that would provide a competitive edge to the learning programme.
- **Instructional learning strategies and teaching methods**: A close connection exists between the learning strategies and teaching methods. Carl (1995: 114) describes the connection as follows: "... by means of instruction and learning actions, in other words actions on the part of the teacher [educator/facilitator] and learner, a learning opportunity is created for the pupil [learner] also to be personally and activity involved with a view to deriving the most meaningful experience from this involvement". Assessment plays an important role in the development of learners, in measuring performance and in determining progress in achievement and development, which has changed considerably with new legislation.
- **Evaluation**: Evaluation will determine to what extent the learning has taken place and how successful the curriculum design has been. Evaluation is often learner-orientated or curriculum-orientated.

The following curriculum design model developed by Cawood, Carl and Blanckenberg (Carl, 1995: 95) has utilisation possibilities at any curriculum level (macro, meso and micro); however it does not assume that all components will be applicable at all levels and therefore provides an element of flexibility to the curriculum developer. The various components resemble a dynamic, interactive and integrated relationship which does not require a fixed pattern of progress. **Figure 4.6** is a diagrammatical representation of the model developed by Cawood, Carl and Blanckenberg.

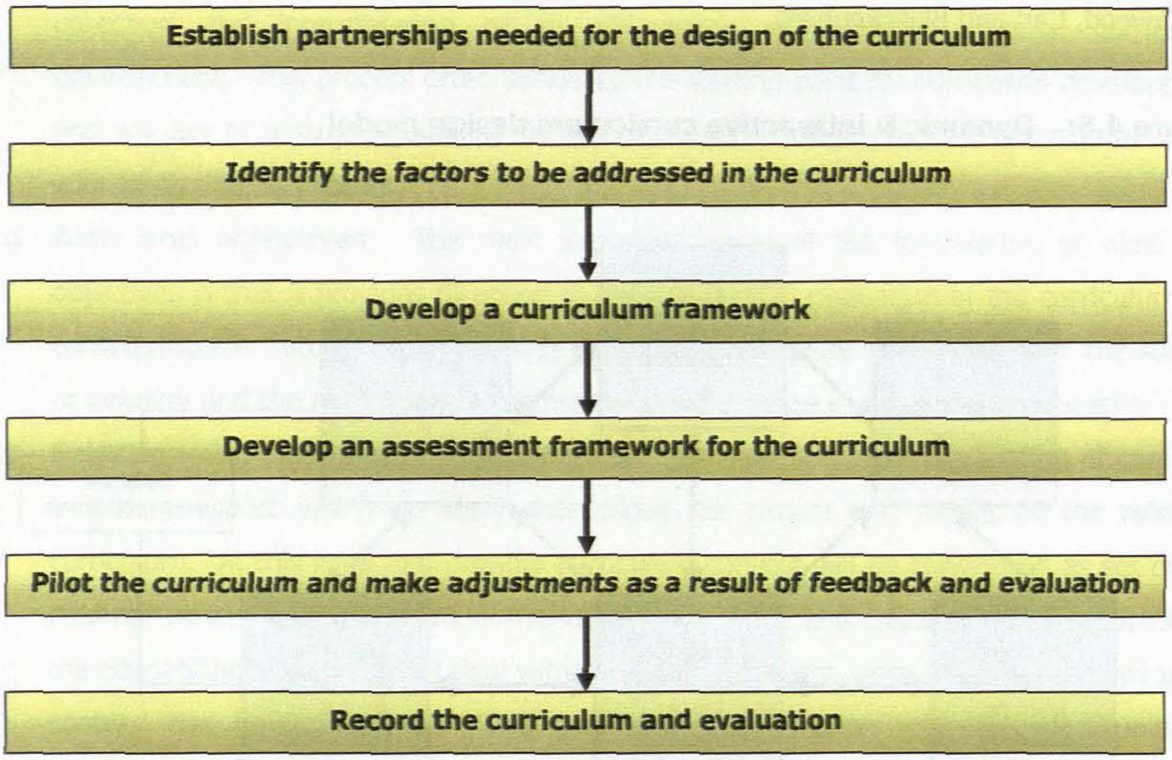
Figure 4.6: Dynamic & interactive curriculum design model



Source: **Carl (1995: 95)**

Although this curriculum design model is particularly suitable for application in a general education environment, it contains relevant elements for the development of a textile technologist curriculum at Peninsula Technikon. In the absence of an outcomes-based curriculum model, the dynamic nature of the model depicts the changing education and training situation in South Africa of policy development and implementation. The model was adapted by the curriculum design team to suit an outcomes-based educational context as illustrated in **Figure 4.8.**

Lancaster (2001: 90) proposes a workplace-related curriculum design model that consists of a number of sequential steps or phases, as illustrated below:



Source: Lancaster (2001: 90)

Figure 4.7: Phases of the curriculum planning process

According to Lancaster (2001: 89) this generic model is partly based on the unit standards developed by the Standards Generating Body (SGB) for occupation directed education, training and development practice and directed at application in a workplace context and not in a school or tertiary educational setting. Higher education institutions offering career-orientated education and training, should however consider adopting elements of this generic model for application.

The following two phases of Lancaster's model should be considered, namely:

- The establishment of partnerships for the design of the curriculum, which will reflect a more participative approach.

- Identify factors to be addressed in the curriculum, which will display a *real sense of* commitment in providing for the needs of the economy.

4.4 CURRICULUM DESIGN MODEL FOR TEXTILE TECHNOLOGIST EDUCATION & TRAINING

The curriculum design process adopted by Peninsula Technikon during the development of a textile technologist learning programme in 2000, focussed in general on the common components of the curriculum design models of Walters (1978), Krüger (1980) and Cawood-Carl-Blanckenberg (1986), but resembled a dynamic interactive and integrated approach as depicted by the Cawood, Carl & Blanckenberg model (1985) illustrated in **Figure 4.4,** with elements of the simplistic sequential workplace-based curriculum design model of by Lancaster (2001: 90), illustrated in **Figure 4.7**.

The "learning programme development exercises" conducted at Technikon Port Elizabeth by fvie academic departments of the institution as described by Gerber (2001:120) informed the steps to be followed during the development of textile technologist programme at Peninsula Technikon as indicated in brackets next to each step. These learning programme development exercises consisted of the following steps (Gerber, 2001: 120-122):

- Analyse the existing qualification offered by the institution [**see Paragraph 4.1.1 of this thesis**].
- Conduct a situational analysis of the current situation [**see Paragraph 4.5.1-4.5.4 of this thesis**].
- Decide on registration option for students or exit points in qualification [**see Paragraph 4.7.1 and Appendix E, F & G of this thesis**].
- Design a learning programme map [**see Paragraph 4.7.2 of this thesis**].
- Determine the staff role.
- Develop learning experiences for each unit of learning to realise the purpose and specific outcomes for the unit of learning [**see Paragraph 4.7.7 & Figure 4.17 of this thesis**].
- Develop integrated assessment experiences for summative assessment purposes at different stadia in the learning process towards mastering the knowledge, skills, attitutes and values needed to successfully demonstrate the set of specified outcomes for realising the purpose according to the assessment portfolio [**see Paragraph 4.8 of this thesis**].

- Develop a delivery date and timetable schedule for a set time period – to be confirmed with academic administration for registration purposes and finalisation of assessment dates [**see Appendix N of this thesis regarding implementation dates**].
- Confirm summative assessment dates and times with academic administration and add to the assessment portfolio [**see Paragraph 4.8 of this thesis**].

The curriculum design model adopted by Peninsula Technikon for the development of a textile technologist programme consisted mainly of the following elements as illustrated in **Figure 4.8.**

- **Situational analysis/contextual evaluation/initial evaluation** [**Chapter 2 & Paragraph 4.5**]:

The **first element** consists of a synopsis of global employment trends in textiles, a global Higher Education perspective on textile technology education and an analysis of South African Textile Industry Skills Audit 1997, as well as the role of stakeholders in the design process. It therefore incorporates both the establishment of partnerships and the factors to be addressed in the curriculum as proposed by Lancaster (2001: 90) and Genis (2001:6).

- **Curriculum goals, objectives and outcomes** [**Paragraph 4.6**]:

The **second element** of the curriculum design model reflects on the employability skills of learners, national outcomes-based curriculum goals and objectives (SAQA requirements).

- **Enabling outcomes-based curriculum structure** [**Paragraph 4.7**]:

The **third element** consists of the development of the enabling outcomes-based structure by using a design-down curriculum design approach which includes the following steps:

  - Develop enabling and sub-enabling outcomes using specified outcomes, assessment criteria, embedded knowledge and range statements of textile unit standards at NQF level 6.
  - Consider fundamental, core and elective outcomes to be included in the enabling outcomes framework.
  - Screen enabling and sub-enabling outcomes per subject to reflect critical cross-field outcomes, applied competence and level descriptors.
  - Group outcomes into modules and modules into subjects to make up the qualification.

- Develop tasks per enabling and sub-enabling outcomes per subject.

Instructional learning strategies and teaching methods [Paragraph 4.8]:

The **fourth element** focuses on the development of learning and teaching strategies for implementation of the learning programme and contains the following:

- Train staff to develop outcomes based learning material.
- Develop outcomes-based learning material based on enabling outcomes and assessment criteria per subject.
- Develop assessment criteria and methods of assessment per subject.

Curriculum-orientated-evaluation [Paragraph 4.9]:

The **fifth element** is central to the development process and focuses on the evaluation of the enabling (learning) outcomes:

- Implement and monitor outcomes based curriculum.
- Review enabling outcomes, assessment criteria and methods, as well as learning material regularly during implementation.
- Record the curriculum-orientated evaluation process and results obtained.

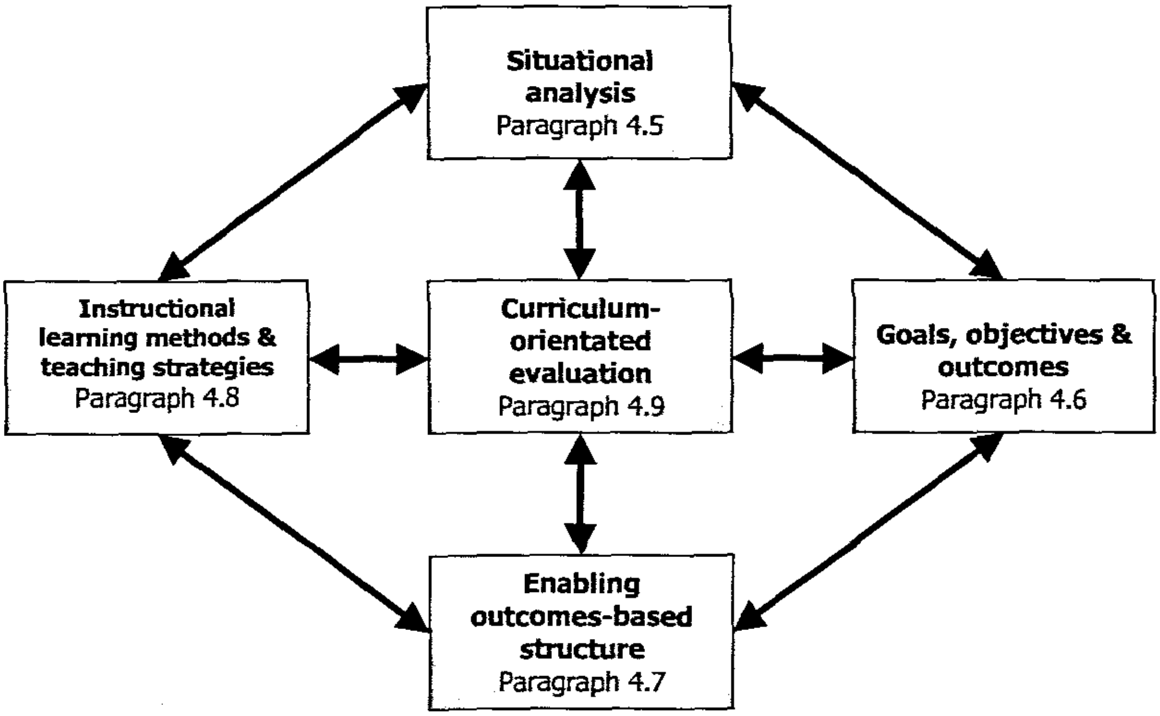


Figure 4.8: Curriculum design model adopted by Peninsula Technikon

4.5 SITUATIONAL ANALYSIS

The process of situation analysis or contextual evaluation is a method of evaluation that comprises the collection and interpretation of all information which may influence curriculum development. This process often serves as the starting point for curriculum development and will act as a strong guideline for the curriculum design process which is to follow with all its different facets.

4.5.1 SITUATIONAL ANALYSIS: GLOBAL EMPLOYMENT TRENDS IN TEXTILES

The development, implementation and evaluation of a textile technologist learning programme in the Western Cape cannot be done in isolation, without taking into account the impact of external forces affecting these industries today. Although every industry in the South African economy has been affected in some way by globalisation and new developments in technology, few, however, have felt the effects of these trends more acutely than the textile and apparel industries. Over the last few decades, internationalisation of markets and competition, advances in product, process and business technologies, and changing consumer requirements have brought about radical and continuous change in the textile and apparel industries. Indeed, these external factors have been the primary reasons for the employment decline over the past few years. During the four-year period of 1998 to 2001, South African textile employment numbers decreased gradually with a drop of 8,763 employees, as detailed in **Table 2.7**, owing to difficult trading conditions experienced by the industry. Although the patterns of change have varied significantly between companies, industry sectors and nations, the underlying forces shaping the industry have been pervasive.

The same picture of continuous decline in employment is also evident in other countries, for example in 1973 there were more than 2,4 million textile and apparel workers employed in the United States; by 1996 that figure had dropped to 1,5 million. Mittelhauser (1997: 24) reports that the decline of 39 per cent contrasts with the 8 per cent decline among all manufacturing workers, and the 56 per cent rise in employment among all workers over the same period. Mittelhauser (1997: 24) indicates that job losses appear to be intensifying in the textile and clothing industries in the USA and he predicts that these will continue.

Although many of the job losses can be accounted to textile mills and clothing factories closing down in the face of fierce domestic and international competition, a significant part of the decrease over the past few years was caused by survival strategies of companies struggling to reinvent themselves. "By investing in new technologies, merging to reduce costs, employing offshore plants to perform certain operations, and developing new products and services, they have been attempting to find a niche in the international market" (Mittelhauser, 1997: 24). This view is supported by Byrne (1995), who states "technology has been key to this competitive struggle and is still largely controlled by the 'older' established industries of Japan, Europe and the USA". The application of new technologies, especially "new modes of competition based on organisational know-how and systems", is having a profound impact on the total number and location of those employed in the clothing and textile industries, which *inter alia,* impacts on skills, training and management needs of organisations (Byrne, 1995). Mittelhauser (1997: 30) emphasises the importance for textile and clothing manufacturers to specialise in textile and apparel products in which they have a competitive advantage, in order to remain competitive in a world market. The development of niche market products requires highly skilled technologists who are able to develop new fibres, fabrics and manufacturing processes.

The structure of the supply chain for clothing and textiles has always had an important impact upon the technology focus of these industries. In the 1970s the emphasis was on industrialising all levels of the supply chain in order to achieve economies of scale; this focus changed in the 1980s to meeting the growing threat of low-cost imports from developing countries and the wave of consumer demand for greater product variety and quality. Important influences of the 1990s and beyond include changing structures in retailing and a reshaping of supply chain relationships, with global sourcing accelerating. Byrne (1995) predicts that "strategic alliances" will be created in order to develop quick response supply chains based on fewer but larger suppliers. According to Kilduff (2000a: 5), information technology has intensified international competition by enhancing communications with distant customers and suppliers, which has given rise to an expansion of customised products and services. Byrne (1995) predicts that the importance of quick response systems and the development of new fabrics and fabric finishes will become key factors in satisfying customer interest, which has become increasingly sophisticated, demanding more frequent innovation, greater exclusivity, more choice and better service.

A comprehensive study on employment trends in the USA apparel industry conducted by Mittelhauser (1997: 32) revealed that only one occupational group is growing in terms of both absolute employment and it's share of the industry employment, namely the category of professional speciality occupations. This reflects "*the increasing importance of engineers and computer systems analysts as textile and apparel firms continue to implement new automation*", which confirms why he predicts that in coming years, occupations requiring more education will enjoy the most stable employment in the apparel and textile industries (Mittelhauser, 1997: 32-33).

It is important to note that although employment decline in the textile and apparel industries in developed countries is expected to continue, some companies are showing tenacity and have established niche markets. "*Their competitive strength will lie in their ability to capitalize on high quality, maintain strong brand names, develop market niches, and respond to changes in demand rapidly*" (Mittelhauser, 1997: 33).

The development of niche market products is a key factor in the survival and growth of the textile industry in South Africa, which will require highly skilled technologists who can initiate the development of new products and function adequately in a highly automated and capital-intensive environment. There is a tendency in developed countries to separate the "*brain*" (*or creative and controlling*) *functions from physical manufacturing*, assembly and distribution. Kilduff (2000b: 5) predicts that "brain activity" companies will focus on innovation and market development without the risks of heavy investment in specialised production technologies, which stresses the importance of increasing skill requirements in order to respond effectively to the new trends of the information age.

4.5.2 <u>SITUATIONAL ANALYSIS</u>: SOUTH AFRICAN TEXTILE INDUSTRY SKILLS AUDIT 1997

The Textile Industry Training Board recognised the need, identified through training workshops and agreed on by *all* stakeholders, to *provide a comprehensive training and education service to the textile industry*. In order to respond to the needs of industry, the Textile Industry Training Board conducted a Skills Audit in August-September 1997 with the view to:

"identify where skills exist in key functional areas and where there are major skills gaps in our industry, so that resources can be focussed on those areas which will result in the greatest return on investment" (TITB, 1997: 1).

The Skills Audit was conducted with the following terms of reference:

- To ascertain approximate numbers of employees in key functional areas (where possible, a racial and gender classification was also to be identified).
- To identify academic qualifications and key skills currently existing within the industry.
- To identify skill shortages, especially with reference to skills proposed in the Learnership Model.
- To evaluate different options available to satisfy the demand for appropriate personnel.
- To develop an acceptable strategic training plan to satisfy the needs of the textile industry (TITB, 1997: 1).

A total of 111 companies participated in the survey during July to September 1997 as illustrated in **Table 4.3**. This represented a total labour compliment of 39 309 employees, with KwaZulu-Natal representing 41,2 per cent and the Western Cape 31,7 per cent of the total labour complement of the textile industry in South Africa in 1997. A decline was reported in the average size company of 354 in 1997 in comparison with 1,030 employees during 1991, when the Textile Industry Training Board conducted a previous survey.

Table 4.3: Summary of participating companies and employees per region 1997

Region	Participating companies		Employees	
	Total number of companies	% per region	Total number of employees	% per region
KwaZulu-Natal	41	36,9	16 203	41,2
Eastern Cape	8	7,2	7 078	18,0
Western Cape	40	36,0	12 469	31,7
Gauteng & other	22	19,8	3 559	9,1
South Africa	**111**	**100,0**	**39 309**	**100,0**

Source: TITB (1997)

The survey also revealed the following racial and gender classification as detailed in the table below.

Table 4.4: Racial and gender classification of textile industry employees 1997

Racial classification		Gender classification	
African	**55%**	**Male**	**61%**
Coloured	**28%**		
White	**9%**	**Female**	**39%**
Asian	**8%**		

Source: TITB (1997)

The survey revealed the following statistics as detailed in **Table 4.5**, regarding the qualifications profile of the various job categories of the textile industry in South Africa, which emphasises the lack of qualified employees across the different job categories. Only 20,4 per cent of employees obtained degree qualifications, with another 43,6 per cent of employees who obtained post matric qualifications. In view of the technologically advanced nature of the industry, this relatively low number of supervisors and managers with higher qualifications was a serious concern to the Textile Industry Training Board (TITB). The Skills Audit did not provide details of the nature of degree and post matric qualifications obtained by employees, but taking into account the low number of qualified textile technologists in the industry, it could be assumed that these qualifications would span a wide range including, for example, general management, human resources, marketing, design and technology qualifications.

Table 4.5: Qualifications profile of employees of textile industry 1997

Qualification levels	Artisans & technician	Supervisors	Managers
Degree	1%	0.4%	19%
Post matric	13%	4.6%	26%
Grade 10-12	42%	9%	11%
Below Grade 10	44%	86%	44%

Source: TITB (1997)

The rationale for the development and implementation of a textile technology qualification at the Peninsula Technikon in January 2001, was based on statistics obtained from the Skills Audit 1997 as outlined in **Table 2.8**, which revealed that a total of 88 textile technologists, representing 54,7 per cent of textile technologists in South Africa in 1997 were employed in KwaZulu-Natal, with merely 34 textile technologists representing 21,1 per cent of textile technologists in South Africa employed in the Western Cape. The Eastern Cape employed 16,7 per cent and other regions employed only 7,5 per cent of textile technologists at the time of the study in 1997.

The following conclusions can be drawn from the data:

- The Western Cape employed a total of 12,469 employees, but only employed 34 textile technologists, in contrast to KwaZulu-Natal that employed a total of 16,203 employees but had 33,6 per cent **more** textile technologists in employment at the time of the study in 1997, namely a total of 88 textile technologists.
- The Textile Industry Training Board (Bowen, 1999) argued that the offering of a textile technology qualification at the Durban Institute of Technology (formerly Technikon Natal) had a considerable influence on the higher number of textile technologists employed in KwaZulu-Natal.
- The Textile Industry Training Board reported that 30,6 per cent of the companies which participated in the Skills Audit sponsored the enrolment of students in the textile technology qualification offered by Technikon Natal in 1997.
- The Skills Audit also revealed that a total of 165 textile technologists would, in the next five years, be sponsored by participating companies, of which 97 textile technologists would be trained by KwaZulu-Natal companies and only 31 by Western Cape companies as detailed in **Table 4.6**.
- A further investigation by the TITB (Bowen, 1999) into the relatively low response of only 18,8 per cent in respect of the anticipated number of textile technologists to be trained in the next five years from companies in the Western Cape, revealed that the cost of sending employees from the Western Cape to the Durban Institute of Technology (formerly Technikon Natal) was an inhibiting factor. It was estimated, yet never confirmed through a training needs analysis, that the establishment of the textile technology programme in the Western Cape would increase the anticipated number of textile technologists to be trained, hence the rationale for the development and implementation of a textile technology programme at Peninsula Technikon in January 2001.
- In the past the industry had traditionally relied on a supply of highly skilled technologists from other countries. A number of political, economic and social factors have resulted in

a drop in the supply of textile technologists from abroad as reported in **Paragraph 2.3.6**.

Table 4.6: Anticipated number of textile tecnologists to be training in next 5 years

Region	Anticipated number of textile technologists to be trained in next 5 years	Percentage per region
Kwazulu-Natal	97	58,8
Eastern Cape	17	10,3
Western Cape	31	18,8
Other regions	20	12,1
Total	165	**100,0**

Source: TITB (1997)

Another important aspect that was revealed by the Skills Audit focused on the number of companies that confirmed a need for the establishment of a graduate programme (BTech degree) in textile technology as detailed in **Table 4.7**.

Table 4.7: Training needs analysis: BTech Textile Technology qualification

Region	Number of companies that indicated a need for a B. Tech Textile Technology programme						
	Yes	% per region	No	% per region	Undecided	% per region	Total
Kwazulu Natal	21	51,22	8	19,51	12	29,27	41
Eastern Cape	4	50,00	2	25,00	2	25,00	8
Western Cape	12	30,00	5	12,50	23	57,50	40
Other regions	6	27,27	1	4,55	15	68,18	22
Total	**43**	**38,74**	**16**	**14,41**	**52**	**46,85**	**111**

Source: TITB (1997)

Only 30,0 per cent of Western Cape companies confirmed their need for the establishment of a degree programme in textile technology in the Western Cape in comparison to 51,22 per cent from KwaZulu-Natal. Taking the high training costs into account, Western Cape companies were uncertain about their support for a textile technology degree programme, which would have meant funding the class and accommodation costs of employees for a period of four years in addition to the costs of replacing staff members while they were on training in KwaZulu-Natal, hence their request to the Textile Industry Training Board to initiate the development and implementation of a textile technology programme in the Western Cape.

4.5.3 SITUATIONAL ANALYSIS: ROLE OF STAKEHOLDERS

The new education and training dispensation in South Africa has redefined the role players in a more participative society. This participative nature is fundamental to the philosophy of the new national and training strategy as embodied in the formation and structure of SAQA and has been the "cornerstone of the national character of technikon qualifications" (Genis, 2001: 6). Six "social partners", namely government, business, trade unions, education and training providers, critical interest groups (disabled, women and youth) and community groups are to be included as role players.

The Clothing, Textile, Footwear and Leather SETA, in its former capacity as Textile Industry Training Board, initiated the curriculum planning and development process of a high-level textile technology qualification in October 1998 when various stakeholders and key role players were invited to attend a contextual workshop on textile technologist training in the Western Cape. Representatives from five higher education institutions were also invited to report on current provision in textile education. The programme of the workshop, containing the various stakeholders, key role players and representatives from higher education institutions in South Africa who participated in the workshop, is included as **Appendix H**.

Mr David Bowen, Director of the Textile Industry Training Board provided an overview of the challenges facing the textile industry in South Africa, with specific reference to global competition. Bowen outlined the role of the TITB in providing the industry with a Textile Qualifications Framework consisting of unit standards at NQF levels 2, 4 and 6 for the benchmarking of qualifications. The establishment of a Textile Qualifications Framework is outlined in **Paragraph 3.4.4**.
Various stakeholders presented their views on the challenges facing the textile industry in South Africa and the needs of the industry regarding high-level training of textile technologists at the workshop:

- **Retailer perspective**

  Mr Peter Thickett of Foschini briefly outlined issues regarding the scarcity of skilled labour, the impact of emigration on the industry and cost of replacing a skilled employee. He emphasized the need for the establishment of "a training facility within easy/close proximity to each major manufacturing centre ... the days of sending large numbers of trainees to other regions for training are over" (Thickett, 1998). He argued for the establishment of part-time or distance learning education and speculated on the possibility of web-based learning. Emphasis was also placed on the importance of programmes of higher learning to achieve international recognition by integrating theoretical knowledge with practical work experience – based on the model of textile technologist training in the United Kingdom.

- **Labour perspective**

  The SA Clothing & Textile Workers Union represented by Mr Ralph Alexander focused on the need to build capacity in the industry through the development of human resources, especially textile technologists, the promotion of strategic partnerships, the development of effective and flexible learning systems, the provision of access to higher level training for textile industry employees and the development of a culture of learning in the industry (Alexander, 1998).

- **Manufacturer perspective**

  Mr Frans Barnard of Aranda Textiles listed the following critical challenges that the textile industry in South Africa faces:

  - Global competition from low cost producers.
  - Illegal/grey imports.
  - Falling Rand – impacts on the ability to purchase technology and the importing of high-level skills.
  - The need to Increase productivity and improve quality.
  - The need to work smarter and more efficiently.
  - The need to manage manufacturing processes more effectively.
  - Tariff reduction.
  - The need to export textiles.
  - The impact of legislation on manufacturing – quality and environmental.
  - The need for increased levels of innovation and differentiation (Barnard, 1998: 1).

  Barnard (1998: 2) also interpreted the challenges to providers of technologist level learning as follows:

  - The ability to deliver technologist, who fit a particular skills profile as detailed in **Table 4.8**.
  - The ability to integrate the theoretical knowledge/understanding with practical experience.
  - The need to become closely integrated into the industry and its needs.

- The need to deliver high level, internationally recognised learning that will equip the industry with the skills required.
- The need to become much more flexible in responding to industry needs. This has implications for curriculum and delivery.
- The need to develop academic and technical staff who are able to meet the above challenges.
- The need to develop organisational flexibility to respond quickly to industry needs.
- The need to deliver cost-effective learning to all textile regions.
- The need to deliver some type of high-level needs-driven consulting service to manufacturers.
- The need to network locally and internationally.
- In the light of the above, to critically evaluate current provision and make the necessary alterations to both programme content and delivery.

A task team, consisting of 15 members (**Appendix I**), was established after the contextual workshop to work jointly with higher education institutions in the Western Cape in developing an outcomes-based textile technologist programme. During the consultation process that followed, it became clear that Peninsula Technikon should offer the textile technologist programme and that the existing ND Textile Technology programme (dry and wet processing) as outlined previously in this chapter, should be amended according to SAQA requirements as an outcomes-based programme in textile technology at NQF levels 5-6. A core team, representing the relevant stakeholders, was established to drive the curriculum design process at Peninsula Technikon with the view to implementing an outcomes-based textile technology programme by January 2001.

Barnard (1998: 2) described the employability skills of future textile technologists to be as follows:

Table 4.8: Employability skills of textile technologist

Technical skills	An in depth understanding of production processes across the textile spectrum with a specialisation in one or two main processes in terms of internationally recognised standards.
Design/innovation skills	An ability to analyse current production processes and associated machinery and to identify areas of improvement which impact on the bottom line.
Production management skills	The ability to manage complex production processes. These skills will include costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management and continuous improvement.
Market research skills	The ability to identify market trends and opportunities (local and international) and how these will impact on production processes, product design and machinery capabilities.
Testing skills	An understanding of a range of product and process tests and testing techniques.
Thinking skills	The ability to think critically, laterally, analytically and focus on results, outcomes and solutions rather than on problem identification.
Analytical skills	The ability to undertake statistical analysis, draw conclusions and make recommendations for production and the business.
Computer skills	General computer literacy, use of software programs for example, word processing, spreadsheet and production related scheduling.
Performance improvement skills	The ability to achieve optimum performance by training, developing and guiding production staff on three levels: organisational, process and job performance.

Source: Barnard (1998: 2)

4.5.4 SITUATIONAL ANALYSIS: GLOBAL PERSPECTIVE OF TEXTILE TECHNOLOGY EDUCATION

The importance of international benchmarking of the proposed textile technologist programme for the Western Cape was recognised by the stakeholders at the contextual workshop in October 1998. A representative of Hogeschool Enschede in the Netherlands was invited to outline the course content of the textile technologist programme offered by this institution. Industry representatives emphasised the importance of international recognition (and accreditation) in order to gain acceptance by the South African textile industry. The Textile Institute, an international professional organisation, plays a fundamental role in accreditation of higher education institutions offering textile technology programmes worldwide. Accreditation is awarded to institutions that meet a set of criteria prescribed by the Textile Institute.

The curriculum design team (**Appendix I**) conducted an analysis of a number of higher education institutions during 1999 to determine fundamental, core and elective areas of the programmes offered by these institutions. Among those institutions analysed during the investigation were institutions that offer programmes accredited by the Textile Institute, and these were used as a benchmark for the development of a textile technologist programme in the Western Cape. Programmes offered by the following international institutions were included in the investigation:

- North Carolina State University (United States of America)
- School of Textiles (Sweden)
- Bolton Institute (United Kingdom)
- De Montfort University (United Kingdom)
- University of Leeds (United Kingdom)
- Hogeschool Enschede (Netherlands)
- Scottish College of Textiles (Scotland)
- Hong Kong Polytechnic University (Hong Kong)
- Genth University (Belgium)

4.6 CURRICULUM GOALS, OBJECTIVES & OUTCOMES

The most important value of the formulation of aims and objectives is that it provides direction to the design and evaluation of the curriculum, by considering the nature of the learning outcomes, the nature of the needs of the society or industry and the nature of the learners who will engage in the learning process.

4.6.1 CURRICULUM GOALS, OBJECTIVES & OUTCOMES: NATURE OF LEARNING OUTCOMES (EMPLOYABILITY SKILLS)

With reference to the important role of employers as a key stakeholder group in identifying the skills employees need to obtain, hold and develop in employment, and to create new employment opportunities for others, it is in their interest to be as explicit as possible about the skills required in the workplace and to work closely with education and training providers in helping to develop these employability skills. An analysis of these employability skills of textile technologists listed in **Table 4.8** indicates that they are based on descriptions of "work roles" which are external to individual attributes. They are mostly broad based, considering the interaction between the "technical" role and the organisational environment. They are dynamic, incorporating changes in work organisation, technology and society and are concerned with concepts of adaptability, versatility, change, creativity and innovation as well as with routine activities (Mansfield, 1998: 28).

Generic [employability] skills are defined by Kearns (2001: 4) as "those **transferable** skills, essential for **employability**, which are relevant to different levels for most"; he further states that the research conducted in America by Carnevale and Desrochers (1999) indicates that the demand for specific vocational skills is giving way to a growing need for generic cognitive skills – mathematical and verbal reasoning ability, as well as a new set of general behavioural skills. Gnanam (2000: 147) states that the demand in the job market for graduates with higher **levels** of academic knowledge and core skills that higher education provides, the **maturity** that develops with the additional years of education and the exposure to a **range** of generic competencies, is growing steadily in the developed world. The growing importance of higher education as a minimal qualification for many career opportunities is not because of the subject knowledge and the subject-related skills, but because of the level, range and maturity of generic competencies that higher education can provide. According to Gnanam (2000, 147), the purpose of higher education is to provide subject-specific knowledge and skills, as well as subject-neutral skills or generic competencies.

Generic competencies are embedded in the concept of employability skills, which provides a bridge between education and work. In a dynamic knowledge-based economy, the job-specific skills that employees need cannot be readily predicted and are subject to constant change as the world of work adapts to political, social, economic and technological influences. Curtis and McKenzie (2001: 4) state that the debate regarding employability skills is often stimulated and led by employers, yet these skills are largely consistent with the broad objectives of the education and training system. In the past, educational institutions almost always included some form of generic employability skills among programme objectives. The lack of understanding between education and the world of work is often reflected in the language used when discussing the concept of employability skills. Nouns (descriptors) such as skills; competencies, capabilities and attributes are often used with adjectives (qualifiers) such as core, key, generic, essential, transferable, necessary and lifelong learning. The descriptors are modified by a range of qualifiers to indicate the breadth or purpose of their application, which impacts on the learning environment. It is not always clear whether these terms reflect slight variants of the same basic concept or whether these different terms signal new developments, which complicates the building of a coalition of employers and educators. Barnett (1994: 71) asserts that the new vocabulary in higher education is a sign that modern society is reaching for other definitions of knowledge and reasoning and that traditional definitions of knowledge are inadequate for meeting the "system-wide problems faced by contemporary society". Notions of skills, vocationalism, transferability, competence, outcomes, experiential learning, capability and enterprise are replacing traditional definitions of knowledge and he "urges higher education to allow the term "knowledge" to embrace knowledge-through-action, particular outcomes of a learning transaction, and transdisciplinary forms of skill" (Barnett, 1994: 71).

4.6.1.1 Competence

In recognising the importance of employability skills in preparing learners for employment in the world of work [clothing and textile industry], it is necessary to explore the new terminology, before embarking on a curriculum development and review process for high-level textile technology education. Central to the debate of shifting the paradigm from education and training to learning is the concept of competence, which raises the question to what extent is the education and training system in general, and technikon education in particular, able to respond to the challenges of societal, institutional and individual transformation in South Africa.

Competence and competency are essentially abstract concepts, which can be defined as "the ability to do something well or effectively" (Collins COBUILD English dictionary for advanced Learners, 2001: 301) and measured only through behaviour and performance. According to Meyer (1996: 34), **competency** could be defined as "the integration of knowledge, skill and value orientation, demonstrated to a defined standard in a specific context". An analysis of the components of the definition suggested by Meyer reveals the following aspects:

- The **integrative nature** of the components of a particular competency links to levels of complexity and systemic thinking. Meyer (1996: 34) states that the higher the levels of complexity, the less possible it becomes to isolate variables, which is confirmed by Curtis and McKenzie (2001: 7) who hold the view "that advanced levels of performance on cognitively complex tasks are not amenable to disaggregation into discrete competencies".

- According to Curtis and McKenzie (2001: 7), complex performance is the result of having a body of **knowledge**, being able to recognise when it is appropriate to enact that knowledge, being able to activate that knowledge, to use it to guide actions, and to monitor the results of the actions. Knowledge could be defined as what we know as well as how we think and understand. It refers to information, theory, arguments and concepts that have been conceptualised within our own particular mental and affective structures (HSRC, 1995).
- The word "**skill**" has always been used in a very general sense to subsume the following descriptors: competencies, competences, attributes, characteristics and qualities; more commonly it is understood to refer to "an ability to perform a specific task" (Curtis & McKenzie, 2001: 7). According to Bellis (1999: 222), the notion of "skill" is central to the definition of competence, but he suggests that skill be defined as "a generalised, performed capability in any domain of human learning and endeavour", which avoids the mechanistic carrying out of a task.
- If South Africa wants to build capacity, both technological and human, the mind-set of individuals, organisations, regions and the country should reflect a **value orientation** towards world-class performance. Meyer (1996: 6) defines world-class as "the ability to meet international standards in terms of:
  - Quality.
  - Customer service.
  - Cost".

  Individuals in a modern economy need to understand how they can add value through continuous improvement in the quality of their work, in the service they deliver and in the cost effectiveness and efficiency of the work they perform. An analysis of the outcomes of the unit standards at NQF level 6 of the Textile Qualifications Framework reflects the importance of a world-class value orientation for learners of the textile industry in South Africa and therefore supports the inclusion of value-orientation as an element of competence in textile technology education.

Meyer (1996: 31) expresses the view "that the concept of a 'competency' or a 'cluster of competencies' is increasingly being viewed as an abstract commodity which has a tradable value and provides the basis for the competitiveness of nations ... global economy and world of work". Competence becomes the currency of competitiveness of individuals, organisations and nations in a rapidly changing world, which is described by Meyer (1996: 31) as "the outcomes and the product of learning".

4.6.1.2 Applied competence

The Green Paper on Skills Development by the Department of Labour (1997) introduced the concept of applied competence, which was later defined in the National Standards Body regulations (SA, 1998a) as "the ability to put into practice, in the relevant context, the learning outcomes acquired in obtaining a qualification". This concept suggests that applied competence is the overarching term for three kinds of sub-competences:

- **Foundational competence**: The demonstrated understanding by the learner of understanding the knowledge and thinking which underpins the action taken.
- **Practical competence**: The demonstrated ability to perform a set of tasks. In mastery of this competence, a learner will demonstrate, in an authentic context, the ability to consider a range of possibilities for action, make considered decisions about which possibility to follow, and perform the chosen action (Harley & Parker, 1999: 185).
- **Reflexive competence**: The ability to integrate or connect performance with the understanding of that performance so as to learn from the actions and adapt to change and unforeseen circumstances and explain the reasons behind these adaptations (Harley & Parker, 1999: 185).

The notion of applied competence focuses on the delivery of qualifications that would address "both the 'theory' needs as well as the practical needs of learners"; it furthermore requires of educational institutions to ensure that qualifying learners "must be able to understand [foundational competence], as well as do something useful with the knowledge [practical competence], in a real-world context", while also enabling learners to "adapt and re-contextualise their learning to function successfully in complex and unpredictable circumstance" (SAQA, 2000b: 16-17). It could be argued that a element of value orientation, as discussed previously, is neglected in the concept of applied competence, yet reflexive competence will require of learners to reflect critically on their learning experience, in terms of values espoused by the democratic society. The values embedded in critical cross-field outcomes of the National Qualifications Framework will also require learners to consider critically "the ethical implications of particular practices and the attendant social responsibilities" (SAQA, 2000b: 18).

In textile technologist education and training, foundational competence will be reflected in the academic requirements of a learning programme and will link to subject-specific knowledge and skills, which is explicitly and implicitly embedded in the curriculum. Practical competence will be linked to the occupational skills, and can be expressed as extrinsic objectives of the curriculum, which are often provided in the form of requirements negotiated by employers and labour organisations, as detailed in **Table 4.8**. Critical and ethical dimensions are linked to the values and dispositions underpinned by lifelong learning and citizenship – these are essential components of reflexive competence (Harley & Parker, 1999: 185).

Bellis (1999: 221) questions the components of the term "applied competence" by stating, that "useful as those characterisations may appear to be, they also make the notion of competence as integrated, unlikely to achieve" and claims that he is not persuaded that it does justice to the "complexity of human competence". Bellis (1999: 221) proposes the following definition of competence:

> A skill or integrated cluster of skills executed within an indicated range or context to specific standards of:
> - Performance,
> - Integrated understanding of the performance and its knowledge base;
> - Understanding of the system in which the performance is carried out;
> - The ability to transfer to other related contexts;
> - The ability to innovate when appropriate.

Bellis emphasises that the definition does not only address task performance, but should be viewed as supporting concepts of understanding, reflectiveness and development. This definition of competence is clearly an attempt to move the notion of skills and competence away from the narrowly defined application within the psychomotor domain. It places it firmly in "the broader spectrum of cognitive and affective domain" (Bellis, 1999: 226), which is further illustrated by him through the symbol of an onion where the "layers" or "rings" are distinct but also integral to the whole and are living interactively with each other as illustrated in **Figure 4.9**.

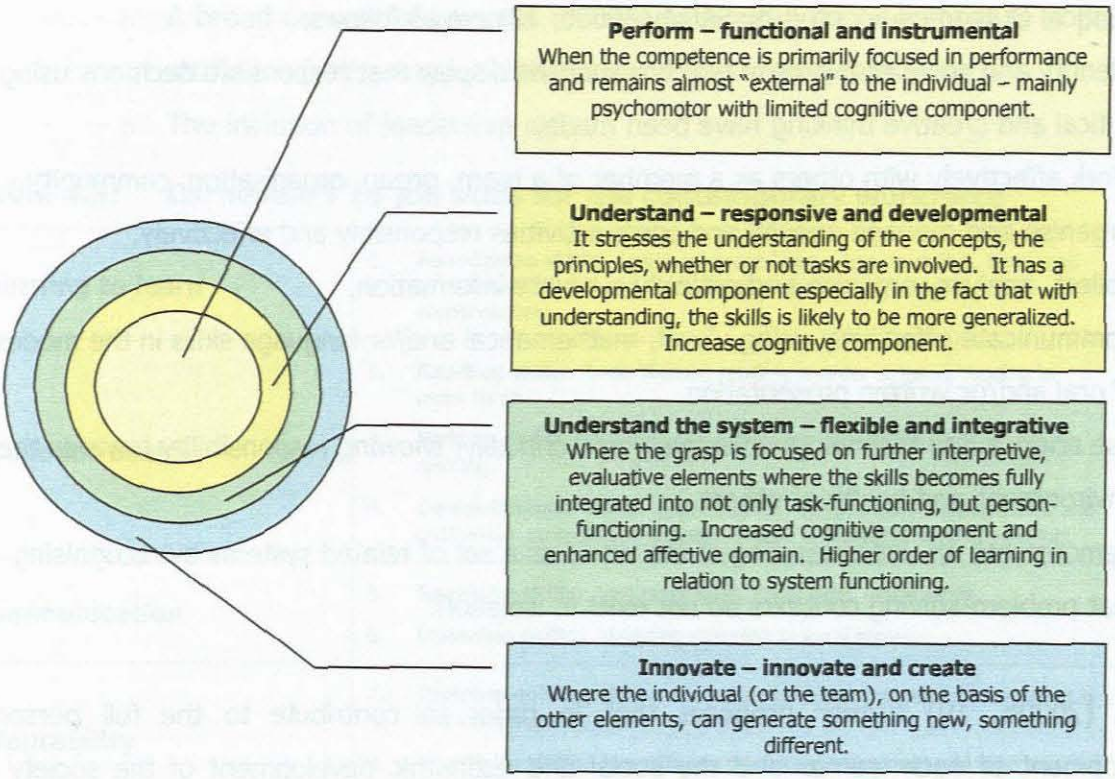


Figure 4.9: Bellis - Layered concept of competence

These concepts of competence impact on defining level descriptors for outcomes-based qualifications in South Africa, which will be discussed later in this chapter.

4.6.1.3 Critical cross-field outcomes

The development of generic competencies was recognised by SAQA through the formulation of critical cross-field outcomes that must form an integral part of outcomes-based qualifications in South Africa. SAQA (2000b, 18) declares that it is "mandatory for standard setters to incorporate at least some of the critical outcomes in the standards that they recommend and proposers of qualifications must ensure that all critical outcomes have been addressed appropriately at the level concerned within the qualifications being proposed". Critical cross-field education and training outcomes provide a mechanism for achieving coherence in the National Qualifications Framework, since these outcomes are not linked to a specific area or content of learning, but are important for the development of the capacity for life-long learning.

The Critical Outcomes adopted by SAQA (2000b, 18) are as follows:

- Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made.
- Work effectively with others as a member of a team, group, organisation, community.
- Organise and manage oneself and one's activities responsibly and effectively.
- Collect, analyse, organise and critically evaluate information.
- Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation.
- Use science and technology effectively and critically, showing responsibility towards the environment and health of others.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

SAQA (2000b, 19) further proposes that in order to contribute to the full personal development of each learner and the social and economic development of the society at large, it must be the intention underlying any programme of learning, to make an individual aware of the importance of:

- Reflecting on and exploring a variety of strategies to learn more effectively.
- Participating as responsible citizens in the life of local, national and global communities.
- Being culturally and aesthetically sensitive across a range of social contexts.
- Exploring education and career opportunities.
- Developing entrepreneurial opportunities.

These critical cross-field outcomes were based on research on generic employability skills conducted in other countries, such as:

- **United States of America**: American Society for Training and Development and the Department of Labor conducted a major empirical study in 1988 which provided a substantial source of information on generic skills. The following 16 key skills emerged from the three-year ASTD/DoL study on workplace basic skills as listed in **Table 4.9**. The following key points emerges from the ASTD/DoL approach to generic employability skills (Kearns, 2001: 11):
    - The focus on learning how to learn as a foundations concept.
    - Linking creativity skills to the concept of adaptability.

- A broad concept of personal development which includes a range of personal attributes (self-esteem, motivation and goal setting skills).
- The inclusion of leadership skills.

Table 4.9: Carnevale's 16 job skills for the contemporary workforce

Learning to learn	1. **Foundation skills**: learning how to learn – how to collect, know and comprehend, how to give and receive feedback, and how to learn collaboratively.
Academic basics	2. **Reading skills**: basic literacy, reading in order to learn, reading in order to do. 3. **Writing skills**: preparing and organising information, writing, editing, revising. 4. **Computational skills**: quantification, computation, measurement and estimation, quantitative comprehension, quantitative problem solving.
Communication	5. **Speaking skills**: nonverbal skills, vocal skills, verbal skills. 6. **Listening skills**: assigning meaning to aural stimuli.
Adaptability	7. **Problem-solving skills**: the ability to bridge the gap between what is and what ought to be. 8. **Creativity skills**: the ability to produce a novel idea, and then turn it into a practical one.
Personal development	9. **Self-esteem skills**: the ability to maintain a realistic and positive self-image. 10. **Motivation and goal-setting skills**: the ability to translate work into an instrument for the development of self. 11. **Personal and career development skills**: the ability to adapt to changing work requirements to ensure employment security and to fulfil personal potential.
Group effectiveness	12. **Interpersonal skills**: the ability to judge appropriate behaviour, to absorb stress, to share responsibility, to deal with ambiguity. 13. **Negotiating skills**: the ability to overcome disagreements by compromising and accommodating. 14. **Teamwork skills**: the ability of groups to pool human resources to pursue common goals.
Influencing skills	15. **Organisational effectiveness skills**: the ability to work productively in the context of explicit and implicit organisational cultures and subcultures. 16. **Leadership skills**: the ability to influence others to serve the strategic purposes of an organisation or the developmental needs of an individual.

Source: Kearns (2001: 11)

- The **USA** Secretary's Commission on Achieving Necessary Skills (SCANS) adopted the foundations concept embedded in the ASTD/DoL report and adopted a broad approach, which included personal attributes as well as "workplace competencies" as listed in **Table 4.10**. Kearns (2001: 13) reports that the SCANS workplace know-how is made up of five competencies and a three-part foundation of skills and personal qualities that are needed for solid job performance.

Table 4.10: The SCANS workplace know-how

Workplace competencies	
Effective workers can productively use:	
Resources	They know how to allocate time, money, materials, space and staff.
Interpersonal skills	They can work in teams, teach others, serve customers, lead, negotiate, and work well with people from culturally diverse backgrounds.
Information	They can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.
Systems	They can understand social, organizational, and technological systems. They can monitor and correct performance; and they can design and improve systems.
Technology	They can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.
Foundation skills	
Competent workers in the high-performance workplace need:	
Basic skills	Reading, writing, arithmetic and mathematics, speaking and listening.
Thinking skills	The ability to learn, to reason, to think creatively, to make decisions and to solve problems.
Personal qualities	Individual responsibility, self-esteem and self-management, sociability and integrity.

Source: Kearns (2001: 13)

- In **Australia,** the Education Council (AEC) and Ministers of Vocational Education, Employment and Training (MOVEET) established the Mayer Committee in 1991. The Mayer Committee regarded its approach to its task to be guided by work on national competency standards developed by the National Training Board.

- The Committee adopted the following definition of key competencies:

  Key competencies are competencies essential for effective participation in the emerging patterns of work and work organisation. They focus on the capacity to apply knowledge and skills in an integrated way in work situations. Key competencies are generic in that they apply to work generally rather than being specific to work in particular occupations or industries. This characteristic means that they key competencies are not only essential for effective participation in work but are also essential for effective participation in further education and in adult life more generally (Kearns, 2001: 15).

  The Mayer Committee adopted a broad approach to competence and according to Kearns (2001, 15), "its neglect of the human factor and the cognitive processes and motivation that influence the acquisition of these competencies has led to a spectrum of issues in the implementation of the key competencies and their integration into the work of schools and Vocational Education & Training institutions" in Australia. The key competencies of the Mayer Committee are as follows:

Table 4.11: Key competencies for effective participation in the emerging patterns of work and work organisation – Mayer Committee

Collecting, analysing and organising information The capacity to locate information, sift and sort information in order to select what is required and present it in a useful way, and evaluate both the information itself and the sources and methods used to obtain it.
Communication ideas and information The capacity to communicate effectively with others using the range of spoken, written, graphic and other non-verbal means of expression.
Planning and organising activities The capacity to plan and organise one's work activities, including making good use of time and resources, sorting out priorities and monitoring one's own performance.
Working with others and in teams The capacity to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of a client and working effectively as a member of a team to achieve a shared goal.
Using mathematical ideas and techniques The capacity to use mathematical ideas, such as number and space, and techniques, such as estimation and approximation, for practical purposes.
Solving problems The capacity to apply problem-solving strategies in purposeful ways, both in situations where the problem and the desired solution are clearly evident and in situations where the problem and the desired solutions are less evident and in situation requiring critical thinking and a creative approach to achieve an outcome.
Using technology The capacity to apply technology, combining the physical and sensory skills needed to operate equipment with the understanding of scientific and technological principles needed to explore and adapt systems.

Source: Kearns (2001: 14)

- In the United Kingdom, as in Australia, personal attributes and values have been largely excluded from the British key skills (core skills), resulting in a more narrowly focused and instrumental set of key skills/competencies.

4.6.2 CURRICULUM GOALS, OBJECTIVES & OUTCOMES: NATURE OF THE NEEDS OF INDUSTRY

In recent times, higher education in South Africa, and the clothing and textile education sector in particular, have been under sustained pressure to adapt to the demands of industry by ensuring that graduates have the generic skills desired by employers as outlined in **Table 4.8**. Following onto the contextual workshop on textile technologist education and training in the Western Cape held in October 1998 as outlined in **Paragraph 4.5.3**, a curriculum design task team consisting of stakeholders, industry subject experts and academic staff members of Western Cape Higher Education institutions was established to drive the curriculum design process. The curriculum design task team met on November 16, 1998 to map the design process and Mr David Bowen of the Textile Industry Training Board tabled a number of matters for discussion that included strategic issues (international linkages, funding and marketing strategies) and curriculum design and implementation issues (course content and structure, medium of delivery, identification of industry role players, as well as recruitment and selection of learners). The curriculum design task team was also requested to compile a list of international institutions offering textile technologist education and to analyse curricula of these institutions for consideration. A brief summary of this aspect is provided in **Paragraph 4.5.4**.

The curriculum design task team at the Peninsula Technikon articulated "up front" the type of graduate (textile technologist) desired by industry, based on the employability skills of future textile technologists defined by Barnard (1998: 2). These employability skills provided the basis for the development of clear educational objectives to be included in the curriculum for textile technologist training at Peninsula Technikon. The curriculum design task team formulated the following educational objectives for the development of a textile technologist learning programme, which would require of learners:

- To think critically, laterally and analytically with a view to draw conclusions from statistical analysis and to find solutions to complex problems, obtain results and recommend improvements.
- To develop understanding of a range of product/process tests and testing techniques.
- To develop understanding of production processes and technology across the textile spectrum, consisting of eight different sectors, with specialisation in either wet or dry processing of textiles.

- To manage complex production processes with a view to analyse costs, solve problems, manage quality and continuously improve processes, systems and human resources.
- To develop a good business sense.
- To understand global market trends and opportunities and to consider their impact on production processes, product development and machine capabilities.
- To develop computer skills relevant to a competitive textile manufacturing and business environment.

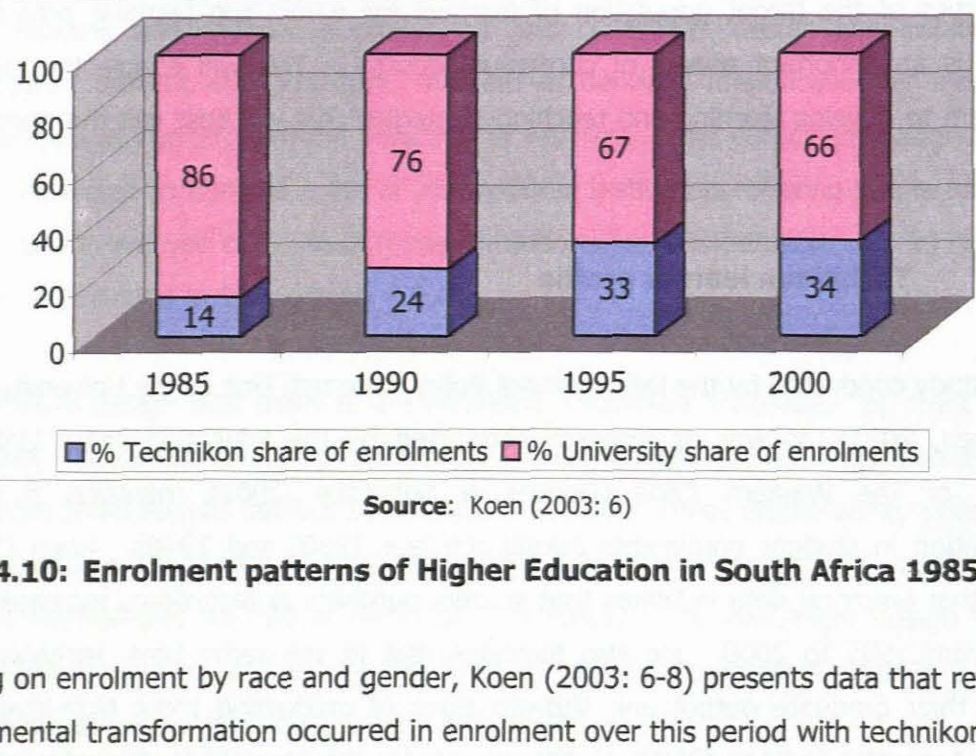
4.6.3 CURRICULUM GOALS & OBJECTIVES: NATURE OF THE LEARNERS WHO WILL ENGAGE IN THE LEARNING PROCESS

According to Lancaster (2001: 98) the creation of a learner profile which describes the characteristics of the target population of learners for whom the learning programme is designed, is an important aspect of curriculum design,. This will enable the curriculum design team to develop learning and teaching strategies that will best suit the needs of the learners.

4.6.3.1 Technikon learner profile

A recent study conducted by the Development Policy Research Unit of the University of Cape Town (Koen, 2003), as well as research conducted by the Education Policy Unit of the University of the Western Cape (Cooper & Subotsky, 2001), revealed a dramatic transformation in student enrolments during the late 1980s and 1990s. Koen (2003: 1) suggests that empirical data indicates that student numbers at technikons increased almost fourfold from 1985 to 2000. He also indicates that at the same time, technikons have increased their graduate output and showed signs of graduating more high-level degree students. According to Koen (2003: 1), the reasons for this increase in student numbers are self-evident, taking into account that "political change and improved access to global economic markets in the post-1990s have contributed to an increased need to produce high-level labour to modernise and make South Africa's economy more internationally competitive". The labour shortages in high skill professional and managerial occupations in science, engineering and technology fields resulted in calls from key higher education policy documents such as the *Education White Paper 3: A programme for the Transformation of Higher Education* (SA DoE, 1997a) and the *National Plan for Higher Education* (SA, 2001a) to expand student enrolments, increase graduation output and focus on more career-orientated tertiary level education.

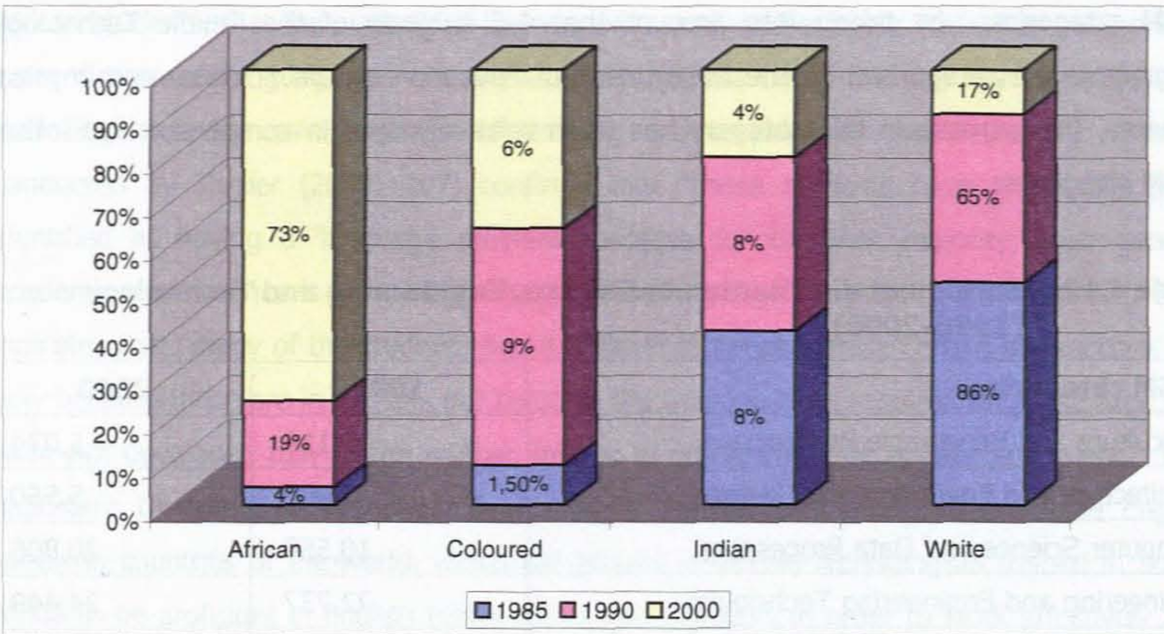
The dramatic increase in enrolments is evident as pointed out by Koen (2003: 5), who states that in 1985 Technikons registered nearly 36 000 students. This number increased significantly to 93,000 by 1990 and more than doubled over the following five years to 190,000 students. A slower growth in number is recorded until 2000, which can be contributed to the decrease in the number of school-leavers from 1994 to 2000. By 2000, technikons increased their share of higher education enrolments to 34 per cent, in comparison with universities with a drop in enrolments from 86 per cent in 1985 to only 66 per cent in 2000, as illustrated in **Figure 4.10**.



Source: Koen (2003: 6)

Figure 4.10: Enrolment patterns of Higher Education in South Africa 1985-2000

Focusing on enrolment by race and gender, Koen (2003: 6-8) presents data that reveals that a fundamental transformation occurred in enrolment over this period with technikons making considerable progress in bringing about greater equity. The enrolment of African students increased from 4 per cent of technikon enrolees in 1985 to 73 per cent in 2000 as illustrated in **Figure 4.11**. Koen (2003: 6) indicates that the current technikon enrolments of racial classification show a close alignment with national population totals for Africans, Coloureds, Indians and Whites. "In terms of the share, Africans constitute 76 percent of the national population (vs. 73 percent at technikons), whites comprise 11 percent (vs. 17 percent), Coloureds 10 percent (vs. 6 percent) and Indians 3 percent (vs. 4 percent at technikons)" (Koen: 2003, 6).



Source: Koen (2003: 7)

Figure 4.11: Enrolment changes by racial groups of 1985-2000

Gender data shows a higher annual growth in female enrolments compared with male enrolments, with 54 per cent of enrolees being male and 46 being female by 2000. According to Koen (2003: 7), "since females currently comprise a majority among matriculants with non-exemption passes, it seems clear that many of these matriculants are entering technikons". With reference to enrolments by field of study, Koen (2003: 10) shows that data indicates a decrease in enrolments for science, engineering and technology (SET) from 48 per cent in 1985 to 34 per cent in 2000. An analysis of SAPSE Classification of Education Matter (CESM) categories for 15 technikons from 1996 to 2000 reveals that "the underlying pattern relates to employer demand since enrolment for Computer Science and Data Processing shows the most significant growth over this period" (Koen, 2003: 10). Another important factor according to Koen (2003: 11) is that "the number of matriculants passing mathematics and physical science decreased by 6 000 from 1997-2000". In a recent article on education in South Africa, Bisseker, (2003: 23) emphasises that the number of passes in mathematics (Higher Grade) and physical science (Higher Grade) is still too small, taking into account that "the best available figures show that last year [2002] at least 3 300 black pupils passed maths on higher grade (HG); about 6 000 passed science on HG ... the actual numbers represent a pass rate of only 23% for maths and 22,4% for science". **Table 4. 12** shows the enrolment distribution in Science, Engineering and Technology according to CESM categories; by taking into account that 4-6 subjects of the Textile Technology programme are categorised by the Department of Education as Life Sciences and Physical Sciences, the increase in this category has been relatively slow in comparison with other CESM categories.

Table 4.12: Enrolment distribution in Science, Engineering and Technology (1996-2000)

CESM categories	1996	2000
Agriculture and Renewable Resources	5,118	5,074
Architecture and Environmental Design	2,092	5,560
Computer Science and Data Processing	10,550	20,806
Engineering and Engineering Technology	22,737	24,449
Industrial Arts, Trades and Technology	647	1,381
Life Sciences and Physical Sciences	3,840	5,540
Mathematical Sciences	1,273	2,951

Source: Koen (2003: 11)

The picture that emerges from this information, indicates that although enrolments at technikons have increased and a fundamental transformation in student bodies is evident from the statistics, the enrolment patterns at technikons in SET fields of study are still being hampered by low matriculation pass rates in Mathematics (HG) and Physical Science (HG). Admission criteria to a National Diploma in Textile Technology require prospective learners to have a Senior Certificate with an E-symbol in both Mathematics and Physical Science on Higher Grade or a D-symbol in both Mathematics and Physical Science on Standard Grade. Taking into account the relatively low number of matriculants available each year that would meet these requirements and the competitive higher education market that wishes to attract these learners, it is clear that it will be very difficult to attract a sufficient number of learners to enrol for a qualification in textile technology each year, unless incentives in the form of bursaries are provided to prospective students.

Another crucial factor that has to be considered in the curriculum design of a textile technologist programme is the role that language plays in teaching and learning. Taking into account that 73 per cent of learners enrolled at technikons in South Africa during 2000 were African students, that the majority of learners who study at Peninsula Technikon have one or more indigenous languages as a home language (Xhosa being the majority language) and that English is the sole language of learning and teaching at the institution, research conducted by Ziegler (2002: 207) confirms that "these students have historically been identified as having a 'language problem' because for the vast majority, their general academic performance is poorer than English first language speakers". Ziegler (2002: 207) indicates that "many of the students find it difficult to conceptualise certain abstractions not only because these are in English, but because the thinking skills required for these exercises were not developed fully in the mother tongue in primary and secondary schooling". It is important to note that the practice of modern textiles has strong roots in the English speaking countries of the world, which will require of textile technologists trained in South Africa to be proficient in English textile terms and concepts in order to work effectively in a global market place.

4.6.3.2 Industry learner profile

The Clothing, Textiles, Footwear and Leather SETA (CTFL SETA, 2000) concludes in the Sector Skills Plan compiled in August 2000, that "a lack of qualitative research information across the same information categories" has enabled the SETA only to identify broad trends, which are as follows:

- It is estimated that there are 2,500 companies in the Sector, although statistics obtained from the SA Revenue Services (SARS) indicated that over 4,000 establishments have registered with the SETA.
- The majority of companies are clothing companies (76 per cent) with textiles and footwear (10 per cent) and leather (4 per cent).
- The majority of establishments of 38,2 per cent are based in KwaZulu-Natal, followed by Western Cape with 33,4 per cent.
- Regarding size of the companies, it is estimated by the CTFL SETA that:
    - 18 per cent of textile companies employ fewer than 50 employees.
    - 40 per cent of textile companies employ more than 200 employees.
    - 60 per cent of clothing companies employ fewer than 50 employees.

- 10 per cent of clothing companies employ over 200 employees.

- The distribution of employees per broad occupational category of the textile industry indicates that 61,8 per cent of employees in the sector are employed in the category of machine operators and assemblers, as detailed in **Table 4.13**.

Table 4.13: CTFL Sector employees per broad occupational category

OCCUPATIONAL GROUPS	CLOTHING	TEXTILES	FOOTWEAR & LEATHER	TOTAL
Senior Officials and Managers	3,200	4,200	1,040	8,440
Professionals and Associate Professionals	4,800	8,400	1,820	15,020
Administrative and Clerical	16,000	4,200	1,820	22,020
Machine Operators & Assemblers	104,000	21,000	25,120	150,120
Labourers	32,000	4,200	5,200	41,400
TOTAL	160,000	42,000	35,000	237,000

Source: CTFL SETA (2000a)

- An estimated NQF level qualifications profile of the CTFL sector indicated that only 20 per cent of employees in textiles have NQF level 5-8 qualifications as provided in the table below.

Table 4.14: Estimated NQF level qualifications profile of CTFL sector

NQF LEVELS	Clothing	Textiles	Footwear	Leather
8 7 6 5	10%	20%	10%	20%
4 3 2	30%	25%	30%	50%
1 Abet 3 Abet 2 Abet 1	60%	55%	60%	30%

Source: CTFL SETA (2000a)

In addressing the shortage of highly-skilled employees in the sector, the CTFL SETA (2000: 20) identified the need to train technologists as a focus area whereby "tertiary institutions will be encouraged to re-position their curricula in terms of the level 5/6 standards in the qualifications frameworks developed by each sub-sector". Critical success indicators were formulated by the CTFL SETA to bring about the necessary changes, which include emphasising the development of a learning culture, attainment of NQF registered qualifications, accessing of qualifications through the recognition of prior learning (RPL), retention of skills and sustained employment through learnerships and multi-skilling of employees, enhancing competitiveness of the sector and supporting the small, micro, medium enterprises (SMMEs) in the sector.

The information available from the CTFL SETA does not presenting an accurate picture of learners who would enter higher education with the view to complete a textile technology qualification. Only general trends emerge from this information, which indicate the following:

- Based on the statistics available in the sector skills plan, only 25 per cent of textile industry employees have completed NQF level 4 qualifications. Taking into account that the Skills Audit of 1997 conducted by the Textile Industry Training Board revealed that 55 per cent of employees were African, 28 per cent were Coloured, 8 per cent were Asian and 9 per cent were White, it can be assumed the majority of these employees, owing to the legacy of an apartheid educational system, would not meet the minimum admission requirements for a National Diploma in Textile Technology. It would therefore indicate that these learners might lack basic numeracy and literacy skills as well as knowledge and skills in Mathematics and Physical Science at matriculation level.
- Based on the textile industry gender distribution of 61 per cent male and 39 per cent female (TITB, 1997: 17) in 1997, it can be assumed that more male than female learners would emerge from the industry to enrol for a National Diploma in Textile Technology.
- The total number of employees of the textile industry decreased over the past five years as detailed in **Table 2.7**, which would indicate that the average age of employees in the industry would have increased during the same period. It can be assumed that the average age of learners from industry entering higher education would be higher than the average age of learners completing secondary education.

4.7 ENABLING OUTCOMES-BASED CURRICULUM STRUCTURE

A curriculum structure is a broad statement of principles to guide the curriculum design team during the process, by outlining the philosophy of outcomes-based education and to incorporate the principles underpinning the objectives of the National Qualifications Framework.

4.7.1 BENCHMARKING OUTCOMES AGAINST LEVEL DESCRIPTORS

Before the enabling outcomes-based curriculum framework/structure or learning programme map can be developed, the outcomes must be benchmarked against level descriptors. Level descriptors, as the nomenclature suggests, provide a description of levels, which in this case refers to the eight levels of the National Qualifications Framework as detailed in **Table 4.15**. Level descriptors, from the perspective of curriculum design, facilitate the assigning of a unit standard or a qualification to a particular level on the NQF. According to Mehl (1998), for the NQF level to establish its own inherent value and standard, level descriptors must consist of the following three elements: a knowledge level, a skills level and critical outcomes. Level descriptors are broad, cross-field standards of achievement, irrespective of field of knowledge, whereas unit standards are field-specific.

As referred to previously, the National Qualifications Framework consists of four parameters, namely level, band, type of qualifications, and location of learning for units and qualifications. The structure of the NQF as outlined by SAQA in a policy document: *Towards the development of level descriptors for the National Qualifications Framework* (2000) is provided in **Table 4.15**.

At the time of developing the curriculum for textile technology, uncertainty existed about the qualification names and levels within the Higher Education and Training Band; for example a three-year qualification of 360 credits is defined by SAQA as a first degree (**Appendix F**), but a three-year qualification of 360 credits awarded by technikons in South Africa would be named a National Diploma. The curriculum design team focused its attention only on the total number of credits awarded to a three-year qualification (regardless of the name of the qualification), which should be 360 credits, distributed equally over three years of study;

and that a learner will exit the higher education institution (technikon) at NQF level 6 benchmarked against the textile unit standards at NQF level 6.

Table 4.15: Structure of the National Qualifications Framework

NQF level	Band	Qualification type		Learning Provider
8	Higher Education and Training	Further Research Degree Doctorate Masters Degree Professional Qualification		Registered institutions (including universities, technikons and colleges) accredited as Public or Private Higher Education and Training Providers in terms of the Higher Education Act, 1997 and the Education and Training Quality Assurance Bodies Regulations, 1998
7		National First Degree Higher Diploma	360+ credits – 72+ at or above level 6	
6		National Diploma	240+ credits – 72+ at or above level 5	
		National Certificate	120+ credits – 72+ at or above level at which certificate is registered	
5		Fundamental, Core and Elective learning	Number of credits to be specified	
		Further Education and Training Certificate		
4	Further Education and Training	National Certificate	120+ credits 72+ at or above level at which certificate is registered	Registered institutions (including schools) accredited as Public and Private Further Education and Training Providers in terms of the Further Education and Training Act, 1998 and the Education and Training Quality Assurance Bodies Regulations, 1998
3		Fundamental learning	20+ credits from fields of Communication Studies & Languages 16+ credits from sub-field of Mathematics	
2		Core and Elective learning	52+ credits	
		General Education and Training Certificate		
		Grade 9	ABET Level 4	
1	General Education & Training	National Certificate	120+ credits 72+ at or above level at which certificate is registered	Registered institutions (including schools) accredited as Public or Private General Education and Training Providers in terms of the South African Schools Act, 1996 and the Education and Training Quality Assurance Bodies Regulations, 1998
		Fundamental learning	20+ credits from fields of Communication Studies & Languages 16+ credits from sub-field of Mathematics – including numeracy	
		Core and Elective learning	36+ credits	

Source: SAQA (2000a)

The Textile Qualifications Framework (**Appendix J**) developed by the CTFL SETA only makes provision for standards and qualifications at the following three levels of the NQF:

- **NQF level 2: National Certificate in General Textiles**

The purpose of the qualification is to provide a qualification which focuses on the general aspects of textile processes across a range of elective areas. The qualification will give learners a wide and general knowledge of the industry and allows learners to choose an area of specialisation relevant to textile manufacturing. Learners will be able to start up and shut down any process (wet and dry) and monitor and run a process (man-made), using given work specifications.

- **NQF level 4: National Certificate in Textile Processes**

The purpose of this qualification is to provide learners with a further qualification in textile processes across a range of elective areas. This qualification builds on the level 2 qualification where learners will build onto the core areas and focus more on the elective areas. Learners will be able to monitor, run and change over any process (wet and dry) or start up and shut down a process (man-made).

- **NQF level 6: National First Degree in Textile Technology**

The purpose of this qualification is to provide a higher qualification in textile technology in either wet, dry or man-made processes, where learners can combine elective areas with broader processes. Learners will be able to combine learning in particular processes with either wet, dry or man-made,
and will be able to enhance and improve on the process.

CTFL SETA has not developed and registered unit standards and qualifications for NQF levels 1, 3, 5, 7-8. The curriculum design team used the level descriptors (SAQA, 2000d: 1) as listed in **Table 4.16**, in screening the unit standards at NQF level 6 of the Textile Qualifications Framework. Outcomes derived from specified outcomes, assessment criteria and range statements of the NQF level 6 unit standards of textiles (**Appendix K**) were grouped into a broad framework or skills hierarchy, by benchmarking these against level descriptors of NQF level 5 and NQF level 6 provided in **Table 4.16**. The skills hierarchy is based on the principles of a design-down curriculum process, which begins with large, complex, workplace-orientated outcomes, which are derived from employability skills of textile technologists (specified outcomes of unit standards), and ends with specific, simpler outcomes (enabling outcomes of learning programme) and tasks (learning experience).

Table 4.16: NQF level descriptors

NQF level	Level descriptor
6	▪ Systematic and coherent introduction to, and incipient specialisation in, one or several fundamental or applied disciplines, with detailed knowledge of the discipline(s) and an awareness of the variety of contexts within which it/they may apply; ▪ Introduction to the principles and concepts underpinning the field(s) of study, to techniques of self-directed work and learning, and to basic research, and identification of key elements of problems and selection of appropriate methods for resolution; ▪ Development of skills and attitudes needed to comprehend and evaluate new information, concepts, and evidence from a range of sources; ▪ Analysis of a range of information under minimal guidance, application of major theories of the discipline(s), and comparison of alternative methods of obtaining data; ▪ Reformatting of a range of information towards the achievements of a given purpose; ▪ Progressive study of the literature of the field(s) of study to a level which provides a basis for work at the next level; ▪ Development of practical skills and techniques required in the effective application of knowledge in a professional context; ▪ Effective communication in a format appropriate to the discipline(s) and clear and concise reporting of practical procedures in a variety of formats; ▪ Effective interaction within a learning group, and development of professional working relationships within the discipline(s).
5	▪ Introduction to and training in the fundamental disciplines of one field of study or activity; ▪ Possession of a given knowledge base, with emphasis on appropriate terminology; ▪ Analysis with guidance using given classifications or principles; ▪ Collection and categorisation of ideas and information in a predictable, standard format; ▪ Evaluation of the reliability of data using defined techniques under tutor guidance; ▪ Awareness of the necessary tools and materials used in the field of study, and accurate and careful application of tools and methods to well-defined problems; ▪ Effective communication in a format appropriate to the discipline, and clear and concise reporting of practical procedures; ▪ Meeting of obligations to others (tutors and peers); ▪ Offering and supporting of initiatives, and recognition and assessment of alternative options.

Source: SAQA (2000d)

It was required of curriculum designers for technikon qualifications before the implementation of outcomes-based education to ensure that subjects met the certain knowledge-type subject content guidelines, commonly known as the A, B, C knowledge types.

These knowledge types are as follows:

- **A-type** subject content is that which is aimed mainly at the practice and mastery of manual skills or crafts, ways of doing things and techniques which amount to their application and practice.
- **B-type** subject content is that which is aimed mainly at the mastery of the application of existing knowledge, technology, results and formulas relating to a specific occupation/industry segment.

C-type subject content is that which is aimed mainly at the mastery of basic theoretical sub-structures, scientific principles and methods.

It was also a requirement that subject content at different levels of the qualification should reflect a certain combination of A, B & C knowledge types. At entry level of a career-orientated three-year qualification the subject content should be predominantly aimed at A-type knowledge content with less of B-type knowledge content and very little of C-type knowledge content. With progression to the exit level of the qualification, the C-type knowledge content should dominate with very little A-type knowledge content. Although these A, B & C-type knowledge types are no longer used in practice when designing career-orientated programmes for technikons, since it was originally designed for content-based programme; it was still considered by the curriculum design team at Peninsula Technikon during the development of the textile technologist programme.

This practice of defining levels of technikon qualifications had a strong resemblance to a taxonomy developed by Bloom for the cognitive domain. Bloom's taxonomy consists of six levels, from the simplest to most complex.

Table 4:17: Levels of Bloom's cognitive domain taxonomy

Level 1	Knowledge	This level involves recall of specific facts or other information. The focus on knowledge outcomes is thus the act of remembering, or the recall of verbal information.
Level 2	Comprehension	This level is the first level of understanding. At this level a statement must not only be recalled, but its meaning must be understood.
Level 3	Application	This refers to the ability to use information in new situations. Information used in the application phase would include general ideas, rules, methods, principles, or theories that must be remembered and applied.
Level 4	Analysis	This refers to the ability to break down a whole into its component parts. In this way the elements embedded in a whole are identified and the relationship among the elements are recognised.
Level 5	Synthesis	This level refers to the ability to put elements together to form a new whole, for instance, writing an essay.
Level 6	Evaluation	At this level judgements are made, based on certain criteria.

Source: Van der Horst & McDonald (2001: 37)

In writing enabling outcomes, which will be described in the next paragraph, the six levels of Bloom's taxonomy were used by defining outcomes according to action words (verbs) that are often associated with the six levels of Bloom's taxonomy. **Table 4.18** provides a list of these action words.

Table 4.18: Action words indicating different levels of complexity

Level 1	***Knowledge*** Recall Remembering previously learned information	Define, list, match, memorise, name, observe, outline, recall, recognise, state, give, provide
Level 2	***Comprehension*** Understand Grasping the meaning	Describe, support, explain, give examples, identify, paraphrase, report, summarise, tell
Level 3	***Application*** Generalise Using learning in a new situation	Apply, illustrate, organise, solve, imitate, manipulate, sequence, show, use
Level 4	***Analysis*** Break down/discover Break down an idea into component parts so that it may be more easily understood	Analyse, characterise, classify, categorise, compare, contrast, distinguish, differentiate, examine
Level 5	***Synthesis*** Compose Putting together to form a whole	Combine, construct, develop, invent, produce, revise, compose, design, formulate, plan, propose
Level 6	***Evaluation*** Judge Judging the value for a given purpose	Appraise, argue, assess, compare, consider, criticise, decide, evaluate, justify, judge, prioritise, rank, recommend, summarise, support, value

Source: Van der Horst & Mc Donald (2001: 38)

These action words would also be applicable to the writing of assessment criteria by differentiating the level of complexity of the performance required by the learner.

At a workshop in May 2000 at Peninsula Technikon on level descriptors, facilitated by Luckett of the University of Natal, the philosophy, concepts and problems associated with level descriptors were explored. Academic staff members (including the researcher) explored various national and international models of level descriptors (New Zealand, Welsh model, Australian model) during the workshop and then engaged in the formulation of level descriptors for application at Peninsula Technikon as tabled below. These level descriptors were used to guide the curriculum design team during the development of the textile technologist programme.

Table 4.19: Level descriptors for technikon qualifications – Peninsula Technikon

Categories	Academic year 1	Academic year 2-3	Academic year 4
Practical acts	Routine, simple use of tools. Know-how of tools and materials.	Complex tasks under supervision.	Complex tasks done independently.
Mental acts	Mostly imitative application of principles under tutor guidance.	Appropriately select and apply principles.	Adapt/construct and apply principles.
Planning	Tutor directed.	Independence in straightforward tasks.	Manage self and others in complex tasks.
Problem solving	Apply given methods to solve routine problems.	Identify key elements, choose methods to solve routine and more open-ended problems.	Construct/adapt methods to solve open-ended problems.
Communication	Largely given information is produced clearly and concisely in given modes.	Selected information produced in selected modes.	Professional and project reporting.
Groups	Offer information and support others' information in a group.	Modify own and others' information.	Conflict management, leadership in professional contexts.
Reflection	Against given criteria.	Against criteria which are selected from a list.	Construct/adapt criteria.

Source: Garraway (2001: 60)

A working group of technikons and universities engaged in the formulation of level descriptors for higher education qualifications in February 2001 and tabled the following level descriptors applicable to NQF level 5 & 6, which refer to applied competence and level of learning autonomy required by the learner. These level descriptors defined by the SA Universities Vice-Chancellors' Association, Committee of Technikon Principals and Council on Higher Education (SAUVCA-CTP-CHE) are listed in **Table 4.20**.

Table 4.20: Level descriptors of NQF level 5-6 (SAUVCA-CTP-CHE)

NQF level	Applied competence	Autonomy of learning
5	A broad knowledge of the main areas of at least one discipline/field and an awareness of current issues in that discipline/field. Some awareness of how the discipline/field relates to cognate fields. An understanding of the key terms, rules, concepts, principles and theories of one or more disciplines/fields. Familiarity with and effective application of the essential methods and techniques of the discipline/field. A knowledge of at least one other mode of enquiry. The ability to use the above to identify and solve clearly defined problems using correct procedures and appropriate evidence. Skills in information gathering and processing, critical analysis and synthesis within given frameworks; presenting information using basic information technology skills. An ability to communicate information reliably and accurately, using basic academic/professional discourse conventions and formats appropriately in the required medium of instruction.	A capacity to: Operate within well-defined contexts requiring some personal responsibility and initiative. Learn within a structured environment. Identify own learning needs within defined contexts.
6	A comprehensive knowledge of one or more disciplines/fields and a detailed knowledge of some specialist areas, informed by current issues in the field. A critical understanding of the key terms, rules, concepts, principles and theories of one or more disciplines/fields. An understanding of the central methods of enquiry and research in a discipline/field. An awareness of the provisional nature of knowledge and of the boundaries and limitations of a discipline/field. An understanding of at least one other mode of enquiry. An ability to use the above to identify and solve concrete and abstract problems and issues using evidence solutions and arguments. Well-developed information-processing and presentation skills using IT skills appropriately. Critical analysis, synthesis and evaluation of both quantitative and qualitative data. An ability to communicate his/her work accurately and reliably to a range of audiences using academic/professional discourse appropriately in the required medium of instruction.	A capacity to: Operate in contexts where the task is not always well-defined, requiring personal responsibility, initiative and decision-making. Accurately evaluate own learning. Identify and address own learning needs by independently accessing learning resources.

Source: Garraway (2001: 60-62)

4.7.2 CREATING THE ENABLING OUTCOMES-BASED CURRICULUM STRUCTURE

In outcomes-based learning programmes, the curriculum design process starts with the intended learning achievements, namely, the outcomes. The characteristics of outcomes-based education outlined by Van der Horst and McDonald (1997: 13) stress the importance of a learner-centred, results-orientated approach to learning, by defining the characteristics of outcomes-based education as follows:

- What a learner needs to learn is stated clearly and unambiguously.
- The learner's progress is based on his or her demonstrated achievement of the outcomes.
- Each learner's needs are catered for by means of a variety of instructional strategies and assessment tools.
- Each learner is provided the necessary time and assistance to fulfil his or her potential.

Learning outcomes must be future-orientated, learner-centred, focused on knowledge, skills and values, characterised by high expectations of all learners and a base for further instructional decision making (Van der Horst & McDonald, 1997: 13-14).

An enabling outcomes-based curriculum framework/structure or a learning progamme map consists of the "overall view the learning programme and should supply the most important information needed to understand what the learning programme is all about" (Gerber, 2001: 126).

Gerber (2001: 126) proposes that the following elements should be contained in the enabling outcomes-based curriculum framework/structure or learning programme map:

- The modules with the module purposes and exit level and/or specified outcomes of each module.
- The units of learning with the unit purposes and specific outcomes and associated assessment criteria for each unit of the different modules.
- Core, fundamental and elective modules and/or units.
- The number of credits allotted to each module and the units of each module.
- Assessment praxis and integrated assessment procedures preferably in the form of an assessment portfolio for summative assessment purposes.
- The modules and/or units for each year of study.

Foxcroft, Elkonin and Kota (1998), focusing on the pivotal role of developing an enabling outcomes framework, provide the following guiding principles for the development of an outcomes-based curriculum:

- The intended results (outcomes) rather than the inputs (subjects/content) should be the first step in the curriculum development process.
- Learning outcomes should be developmentally appropriate in terms of level/band of NQF.
- Learning outcomes should provide an integrated approach to education and training.
- Learning outcomes should contribute to the learner's lifelong learning (career path).
- Learning outcomes should contribute to the learner's personal development.
- Learning outcomes should promote the development of values and attitudes.
- Learning outcomes should promote the development of broadly applicable and functional (work-related) skills.
- Units of learning (modules) should as far as possible be "self-contained".
- Learning and assessment need to be integrated through a focus on clearly defined performance tasks.

In the curriculum design process adopted by the design team at Peninsula Technikon in 2000, enabling outcomes formed the basic framework/structure of the curriculum. The process used by the curriculum design team to develop the new outcomes-based curriculum framework/structure, was mainly a **design-down curriculum development process**. A design-down curriculum process begins with large, complex, workplace-orientated outcomes which are derived from employability skills of textile technologists (specified outcomes), and ends with specific, simpler outcomes (enabling outcomes) and tasks. The design-down curriculum development process requires the consideration of outcomes into three broad categories as defined by Spady (1994: 18):

- **Exit level** (culminating) **outcomes**: These outcomes define what the learners should be able to do on completion of the learning programme.
- **Enabling** (learning) **outcomes** are the key building blocks on which the exit level outcomes depend. These outcomes enable the achievement of exit level outcomes.
- **Discrete outcomes** are those outcomes that are not essential to the achievement of exit level outcomes by the learners and should be considered as those things that are "nice to know".

Spady (1994: 19) recommends that the curriculum designer should consider a few rules when applying the design-down curriculum process. The curriculum designer should:

- Work from the exit level outcomes towards the establishment of enabling outcomes.
- Replace or delete discrete outcomes that are not significant enabling components to the achievement of exit level outcomes.
- Be consistent, systematic and creative during this process, and simultaneously use the principles of outcomes-based education.

Although the curriculum design team considered various external factors, namely the nature, challenges and needs of the textile industry in South Africa, international perspectives of tertiary education in textile technology, employability skills of textile technologists and various other important factors, the curriculum design team concentrated on specified outcomes, assessment criteria, embedded knowledge and range statements of the unit standards of the Textile Qualification Framework at NQF level 6 (**Appendix J**) and the exit level outcomes of the SAQA interim registration of the revised outcomes-based qualification (ND Textile Technology) to inform the design-down curriculum process. (The process of developing of unit standards by the Clothing, Textiles, Footwear and Leather SETA for NQF level 6 of textile technology is described in more detail in **Chapter 3**).

The following three categories of outcomes, defined by Du Pré (2000: iv) are included in the NQF level 6 unit standards for textile technology (CTFL SETA, 2000b), as illustrated in **Figure 4.12**:

- **Fundamental outcomes**: Fundamental outcomes refers to that learning which forms the grounding or basis needed to undertake the education, training or further learning required in the obtaining of a qualification.

  The **fundamental outcomes** of the NQF level 6 unit standards for textile technology consist of:
    - Use sophisticated communication media.
    - Set up and monitor computer aided systems to enhance textile processes.
- **Core outcomes**: Core outcomes refers to that compulsory learning required in situations contextually relevant to the particular qualification.

  The **core outcomes** of the NQF level 6 unit standards for textile technology consist of:
    - Plan and implement a waste management system.

  - Design a quality management system for a particular area of specialisation in the textile industry.
  - Draw up and maintain a production plan for a particular area of specialisation in the textile industry.
  - Promote employer / employee relationships in textile plant.
  - Classify raw materials in grades.

- **Elective (specialised) outcomes:** Elective outcomes reflect areas of specialisation and would often require the learner to choose a particular area of specialisation, often consisting of both theoretical knowledge and practical application in the area of specialisation.

  The **elective outcomes** of the NQF level 6 unit standards for textile technology consist of:

  - **Wet processes**:
    - Set and adjust complex parameters to a wet process.
    - Modify and develop processes to enhance the wet process.
    - Create new textile products in a wet process.
  - **Dry processes**:
    - Set and adjust complex parameters to a dry process.
    - Modify and develop processes to enhance the dry process.
    - Create new textile products in a dry process.
  - **Man-made processes**:
    - Set and adjust complex parameters to a man-made fibre process.
    - Modify and develop processes to enhance the man-made fibre process.
    - Create new textile products in a man-made fibre process.

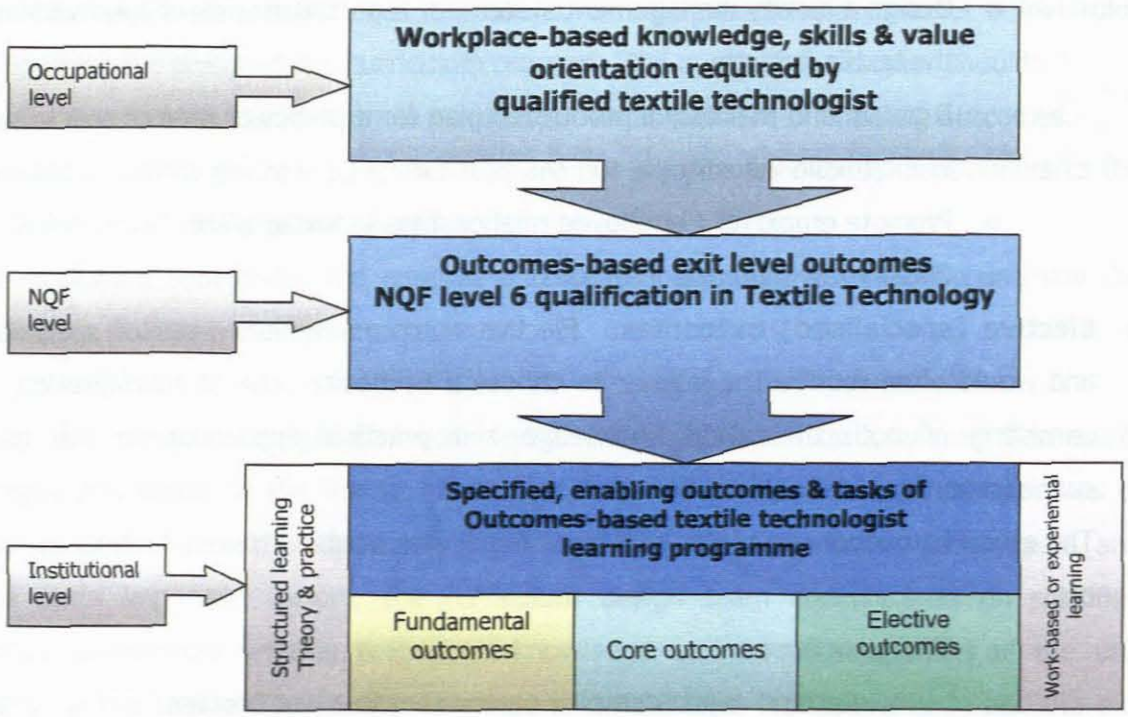


Figure 4.12: Learning pathway for textile technologist programme consisting of three categories of outcomes in a design-down process

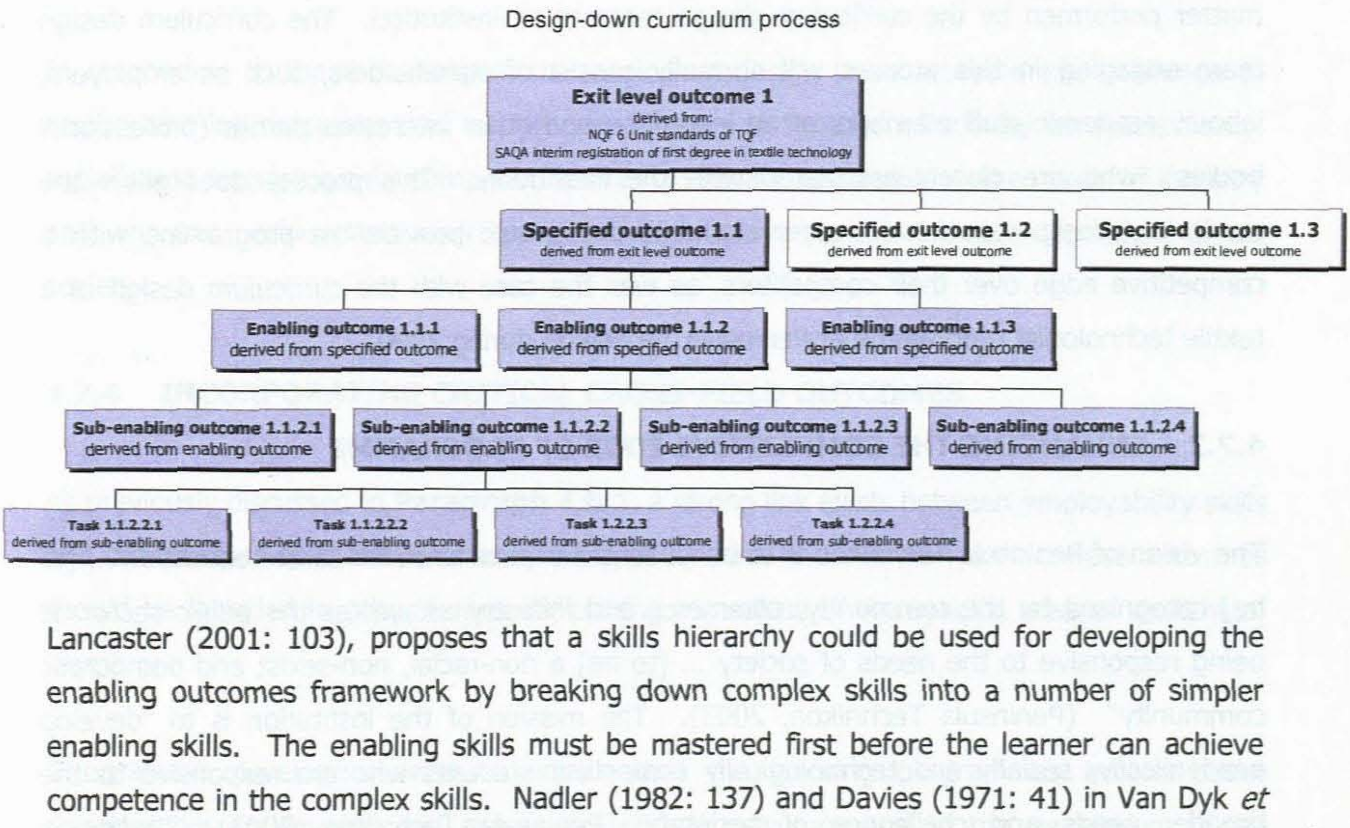
Creating the enabling outcomes curriculum framework/structure by applying the design-down curriculum development process, the curriculum design team engaged in a process consisting mainly of four stages:

- **Stage one**: The first stage consisted of the unbundling or disaggregating of outcomes working down from large, complex, work-orientated outcomes (exit level outcomes) to be achieved by the learner on completion of the learning programme to more specific outcomes, which would accumulatively support the exit level outcomes. The exit level outcomes would consist of fundamental, core and elective outcomes.
- **Stage two**: In developing enabling outcomes, the following question would be considered: What skills, knowledge and value orientation did a learner need to accomplish this specified outcome? These competencies translated into enabling outcomes, which meant that they enable the attainment of other, high-level outcomes, namely specified outcomes.
- **Stage three**: By unbundling or disaggregating the first-level enabling outcomes into more specific enabling outcomes a second-level of outcomes or sub-enabling outcomes was developed.

- **Stage four**: These sub-enabling outcomes did not yet provide details about what the learners would be doing in order to show that they could achieve these outcomes, which require the development of tasks. Tasks should relate to the workplace, reflect critical cross-field outcomes and applied competence and relate to assessment criteria.

The design-down curriculum processes adopted by the curriculum design team at the Peninsula Technikon for the development of a textile technology-enabling outcomes framework is illustrated below in **Figure 4.13**.

Figure 4.13: Enabling outcomes-based curriculum



Lancaster (2001: 103), proposes that a skills hierarchy could be used for developing the enabling outcomes framework by breaking down complex skills into a number of simpler enabling skills. The enabling skills must be mastered first before the learner can achieve competence in the complex skills. Nadler (1982: 137) and Davies (1971: 41) in Van Dyk *et al.* (1997: 316), list a number of approaches to sequencing of learning experiences namely:

- **From general to specific**: The learner is first given a broad overview of the topic [enabling outcomes], before the specific parts to be learned [sub-enabling outcomes and tasks] are introduced.
- **From specific to general**: This approach leads the learner through a series of specific learning experiences to the end results – the general.

- **Concrete to the abstract**: The learner starts with learning experiences, which are "simple, solid, observable and beyond dispute" and is then gradually exposed to more complex, abstract and nebulous concepts.
- **Spaced learning:** With this approach, the content is broken down into separate components (or modules).
- **Known to unknown:** With this approach the sequence begins with knowledge and skills familiar to the learner and then proceeds to new knowledge and skills.

It is important to note that the development of the enabling outcomes curriculum framework/structure, which forms the backbone of the curriculum is mostly an internal matter performed by the curriculum design team at an institution. The curriculum design team engaging in this process will normally consist of stakeholders, such as employers, labour, academic staff members of an institution and other interested parties (professional bodies), who are closely associated with the institution. This process does allow the curriculum design team to consider elements that would provide the programme with a competitive edge over their competitors, as was the case with the curriculum design of a textile technologist programme at Peninsula Technikon during 2000.

4.7.3 ENHANCING THE COMPETITIVE EDGE OF PROGRAMME

The vision of Peninsula Technikon is to be "a centre of excellence for career education ... [to be] recognised by the community, commerce and industry as well as the public sector as being responsive to the needs of society ... [to be] a non-racial, non-sexist and democratic community" (Peninsula Technikon, 2003). The mission of the institution is to "develop academically, socially and technologically competent students who are responsive to the broader needs and challenges of society" (Peninsula Technikon, 2003). Peninsula Technikon is furthermore committed to offer education to historically disadvantaged students, to foster life-long learning and to apply the principles of cooperative education. By enhancing the competitive edge of programmes developed by Peninsula Technikon, the Technikon has critically assessed the challenges posed by globalisation, the knowledge-based economy and technological changes, by combining "competitive and cutting edge technologies, modern business management competencies, knowledge and skills, with strong moral values, discipline and work ethic, in our efforts to have high quality teaching, learning, research, and outreach programmes" (Staak, 2003).

The institution has recognised that preparing learning to operate effectively in an increasingly competitive environment will have implications for curriculum development and has adopted an approach of looking beyond the narrow confines of a particular discipline, by encouraging learners to learn how to access knowledge from a variety of different sites and to apply this knowledge in a specific problem-solving context, which exposes the learners to problems beyond the narrow confines of their discipline. Curriculum development should contain elements that will encourage learners to work in transdisciplinary, problem-solving teams. Learners should be able to develop an understanding of complex systems and of techniques to model and simulate these systems. Greater emphasis should be placed on problem identification and creative problem solving (Staak, 2001: 13).

In responding to these challenges, the curriculum design team accepted the challenge to design learning outcomes that will prepare learners to function effectively as academically, socially and technologically competent learners, who are responsive to the needs of industry and who can perform and work in the knowledge-driven and knowledge-dependent global society.

4.7.4 INCORPORATING CRITICAL CROSS-FIELD OUTCOMES

As previously discussed in **Paragraph 4.6.1**, a strong link exists between employability skills and critical cross-field outcomes adopted by SAQA, and the intention is that these outcomes should be included in programmes of learning regardless of the specific area or content of learning.

"Programme developers need to ensure that the learning programmes accommodate opportunities to develop and assess the critical outcomes and in the evaluation of the delivery of the learning programme, there will be a need to focus on the extent to which attention has been given to this aspect" (SAQA, 2000b: 19).

An analysis of the unit standards of the Textile Qualifications Framework at NQF level 6 reveals that the exit level's fundamental, core and elective outcomes (**Appendix J**) implies the development of critical outcomes, which will ultimately impact on the employability skills of potential textile technologists by the industry. The curriculum design team had to focus on the integration of these outcomes into the learning programme, along with the development of technical, subject-specific knowledge and skills. The process adopted by the design team was to formulate enabling and sub-enabling outcomes derived from the exit level outcomes as described in **Paragraph 4.7.2** and illustrated in **Figure 4.12,** and to conduct focus group discussions with different teams of industry experts focusing specifically on the integration of critical cross-field outcomes into the curriculum.

The following three focus group session were held in October and November 2000:

Focus group	**Date**	**Time**
Wet processing	October 31, 2000	9h00-12h00
Dry processing	October 31, 2000	14h00-17h00
Man-made fibre	November 15, 2000	14h00-17h00

The enabling outcomes prepared by the design team were scrutinised by the industry experts during the focus group discussions under the supervision of the curriculum development officer of the Educational Development Centre at Peninsula Technikon by screening enabling outcomes to ensure that critical outcomes had been integrated sufficiently and appropriately with technical subject-specific knowledge and skills of the programme. **Appendix L** provides the names of the industry experts who participated in the focus group discussions.

Examples of the enabling outcomes produced by the focus group discussions for the textile technologist programme are provided on the next pages.

Example from the wet processing enabling outcomes curriculum framework/structure

Specific Outcome: 1. Draw up and maintain production plans.

TQF Unit standard C 24

Enabling outcomes	**Sub-enabling outcomes**
1.1 Demonstrate an understanding of textile calculations and statistics.	1.1.1 Classify and define, quantitatively, common yarn counting systems. 1.1.2 Define, quantitatively, common yarn twist definition systems and twist constants. 1.1.3 Working in a group, develop and use conversion factors for common yarn counting and twist definition systems. 1.1.4 Express fabric parameters wrt mass and area. 1.1.5 Define, quantitatively, moisture content and regain. Select and apply principles and given criteria to solve problems wrt standard regains and invoice mass. 1.1.6 Use science and technology and select from given criteria to develop formula to determine production-related parameters such as volumes, ratios, recipes, usages, pick-up, etc.

Example from the dry processing enabling outcomes curriculum structure/framework

Specific Outcome: 2. Classify raw materials into grades

TQF Unit standard C 24

Enabling outcomes	Sub-enabling outcomes
2.1 Differentiate between natural, synthetic and regenerated fibres, describing the fibre characteristics and properties.	2.1.1 Classify textile fibres into their main classification groups by origin. 2.1.2 Classify fibres by length characteristics. 2.1.3 Evaluate and compare fibre characteristics and properties. 2.1.4 Demonstrate independence to organise, analyse and evaluate information ensuring that classification of fibres, by physical characteristics is correct.
2.2 Relate fibre properties and grades to product end use.	2.2 1 Use science (e.g Hookes Law and and Young's modulus) to explain elasticity of fibres. 2.2.2. Organise the main types, categories, grades, varieties of man-made and natural textile fibres, into logical groups. 2.2.3 Working as a team member, evaluate the effect of raw material grade on the main end uses of the main textile fibres.
2.3 Classify fibres, yarns and fabrics, by selecting and applying appropriate principles.	2.3.1 Demonstrate an understanding of the main classification groups of fibres, yarns, fabrics 2.3.2 Collect, analyse and organize information to group fibres into Origin, Class, Grade, Staple, Properties and communicate the data using appropriate techniques. 2.3.3 Group yarns by Composition, Spinning system, Structure, Properties, Type, End use 2.3.4 Group fabrics by Composition, Type, Method of manufacture, Dimensions, Properties, End-use. 2.3.5 Identify the key elements and evaluate and compare product performance properties, including aesthetics, flammability, water resistance etc. 2.3.6 Use technology to suggest safety and ecological problems.

Example from the man-made fibres enabling outcomes curriculum structure/framework

Specific Outcome: 2. Modify and develop processes to enhance MMF process.

REF
E 47

Enabling outcomes	Sub-enabling outcomes
2.1 Demonstrate understanding of the formation, structure, thermal behaviour, of MMF.	2.1.1 Use basic concepts and select from given information to describe the essential features of fibre forming polymers.
	2.1.2 Use flow charts and chemical notations to explain the main polymerization systems.
	2.1.3 Draw diagrams to effectively communicate an understanding of crystalline, amorphous regions and of orientation, as it influences fibre properties and colouration.
	2.1.4 List the importance, and explain the significance of side chains, functional groups etc.
	2.1.5 Use technology responsibly, select and apply the appropriate principles to suggest polymer types and their uses as chemicals etc in textile processing.
	2.1.6 Use science to solve problems relating to de-polymerisation; degradation of polymers; effects of UV; temperature/time and drying on polymers; heat/strength relationships.
2.2 Demonstrate understanding of the chemical and morphological structure and properties of man-made fibres.	2.2.1 Construct a model to effectively communicate and to describe the importance of polymer chain structures and orientation, wrt wet processing.
	2.2.2 Describe, using chemical notation, the formula of the main MMF's. Select from given criteria the significant components of the formulae responsible for specific fibre types or properties. (eg Basic dyeable polyester).
	2.2.3 Describe the various structures, such as bi-component fibres.
	2.2.4 Collect, analyse and organize information relating to the morphology of MMF polymers to explain their influence on MMF processing and properties.
	2.2.5 Use science to demonstrate an understanding of flow mechanics wrt spinneret shape and size, flow pressures, draw-down ratios etc.

Enabling outcomes	**Sub-enabling outcomes**
2.3 Demonstrate an understanding of man-made fibre yarn production theory, structures, terminology, notation, linear densities, appropriate production calculations, etc..	2.3.1 Give a logical description and demonstration, using technology, of man-made fibre production. 2.3.2 Select and apply principles, from given criteria, and use combinations of process specifications, profiles, computer based flow diagrams, chemical notations etc. to illustrate the main machine components, general fibre production and process routes of the main man-made textile fibres: Polymer production, including solid state polymerization. Wet spun Dry spun Melt spun Post production processes Stapling/conversion 2.3.3 Work as a team member and use the learning experience from 2.3.2 and consultation with industry to select from given criteria the main parameters wrt monitoring and maintaining the main production processes. Effectively communicate these parameters wrt each main component of the process. 2.3.4 Use accepted statistical techniques, selecting appropriate information, to report on the results of changes in parameter values. 2.3.5 Use experiential learning to demonstrate an ability to set and make changes to these processing parameters as identified in 2.3.2, carrying out these tasks under supervision. 2.3.6 Perform workplace based calculations, selecting from given criteria. 2.3.7 Use experiential learning to demonstrate an ability to set and make changes to these processing parameters as identified in 2.3.3, carrying out these tasks under supervision. 2.3.8 Select and apply appropriate principles to compare the production advantages, yarn properties and costs of production of these processes. 2.3.9 Using given criteria, develop and use entrepreneurial abilities to evaluate and compare costs and market requirements for products of these processes. Carry out the complex task under supervision.

Enabling outcomes	**Sub-enabling outcomes**
2.4 Demonstrate an understanding of the limitations and capabilities of machines in MMF processes.	2.4.1 Describe the common systems of polymer and fibre production, processing and colouration, within the MMF manufacturing context. 2.4.2 Select and apply appropriate principles to give a reasoned justification of the processing sequence of the products in 3.1.1. Carry put this task independently. 2.4.3 Work in a group to select parameters from given criteria to relate product production, end use and chemical and physical characteristics to processing systems. Develop entrepreneurial abilities by suggesting cost and market influences on the process and product. 2.4.4 Select, with reasoned justification, using science and technology, the most appropriate production route to achieve a desired product. 2.4.5 Select from given criteria the key elements that affect the efficacy of the production sequence of each of the main product groups listed in 5.1.1. Communicate these effectively using appropriate communication techniques. 2.4.6 Use the experience gained so far to choose key elements that would suggest solving problems wrt to improving the efficacy of the processes used in 3.1.5. Carry out this complex task under supervision.
2.5 Produce basic product and polymer and extrusion process specifications, carrying out the complex task under supervision.	2.5.1 Given an end product, collect, analyse and organize information to identify the key elements and select a method to produce a product and process specification for the product for: Man-made fibre polymer MMF extrusion Post extrusion processes. 2.5.2 Use earlier learning experiences to select and apply appropriate principles for the design of the product and process. 2.5.3 Use science and technology, industry standard nomenclature and notations, to describe the product and process, scheduling machine types and producing flow charts. 2.5.4 Select from given criteria the main parameters required to produce basic specifications for the control of the product and process. 2.5.5 Calculate and define Raw Material requirements, product dimensions and outputs. 2.5.6 Identify costs and potential market segment, selecting information from given criteria.

4.7.5 FOCUSING ON APPLIED COMPETENCE

In **Paragraph 4.6.1.2** the concept of applied competence as "the ability to put into practice, in the relevant context, the learning outcomes acquired in obtaining a qualification" as defined in the National Standards Body regulations (RSA, 1998) is described in detail. Applied competence, consisting of three kinds of sub-competences, is central to curriculum design.

> In a **practical** competence, a learner will demonstrate, in an authentic context, the ability to consider a range of possibilities for action, to make a considered decision about which possibility to follow, and to perform the chosen action. A **foundational** competence is the ability of a learner to demonstrate an understanding of the knowledge and thinking which underpins the action taken. And a **reflexive** competence is the learner's ability to integrate or connect performances and decision-making with understanding and with an ability to adapt to change and unforeseen circumstances and explain the reasons behind these adaptations (Harley & Parker, 1999: 185).

During the curriculum design process of the textile technologist programme at Peninsula Technikon, the enabling outcomes curriculum structure/framework, consisting of sub-enabling outcomes, tasks and assessment criteria were screened to reflect, along with critical cross-field outcomes and level descriptors, also applied competence. The curriculum design team adopted a simple procedure with the assistance of the curriculum development officer of the Education Development Centre at Peninsula Technikon. Members of each focus group was required to screen the enabling outcomes curriculum structure/framework to ensure that critical cross-field outcomes, applied competence were included at an appropriate level of the programme as benchmarked against the level descriptors described previously in **Paragraph 4.7.**

4.7.6 GROUPING INTO SUBJECTS FOR FUNDING PURPOSES

The next stage of the curriculum design process at Peninsula Technikon was to group the modules or units of learning, consisting of enabling outcomes, sub-enabling outcomes and tasks, into a subject framework in order to meet requirements of the Department of Education for funding purposes. Currently technikons obtain subsidy from the state based on a formula system, which is outlined in Report 151 of the Department of Education (referred to SAPSE 151[1]).

[1] SAPSE is short for South African Post Secondary Education.

Four problems areas emerged as potential areas of conflict which confronted the curriculum design team at Peninsula Technikon during the development of the textile technologist programme, as described by Bleazard, Bester & Garraway (2001) namely:

- **First problem**: The outcomes required by SAQA, and defined in conjunction with industry during the design-down curriculum process, did not translate directly into the required number of subjects for the purposes of SAPSE 151 and had to be reworked into an acceptable format. The design-down modular subject approach culminating into a host subjects (SAPSE credit bearing subjects) is illustrated in **Figure 4.14**.
- **Second problem:** Whereas SAQA allocates credits according to notional hours (with a typical full-year credit being made up of 1200 hours, or 120 credits), SAPSE allocates credits to subjects as fractions of one FTE (full-time equivalent).
- **Third problem**: The broad fields of study adopted by SAQA did not correspond with the SAPSE CESM (Classification of Educational Subject Matter) categories.
- **Fourth problem**: Bureaucratic procedures for approval of qualifications by SAQA, Council for Higher Education and Department of Education.

The **first problem** emerged when subjects had to be defined for SAPSE credit purposes, based on the design-down curriculum process culminating in modules or units of learning. These units of learning had to be grouped into logical clusters or units of learning, consisting of enabling outcomes, based on an underlying common "theme" or based on the old paradigm of "traditional subjects". The following subject framework, as illustrated below in **Figure 4.14**, was developed by the curriculum design team at Peninsula Technikon and was tabled at a meeting held in Durban during May 2000 for finalisation and allocation of credits.

Western Cape curriculum development process June - November 2000

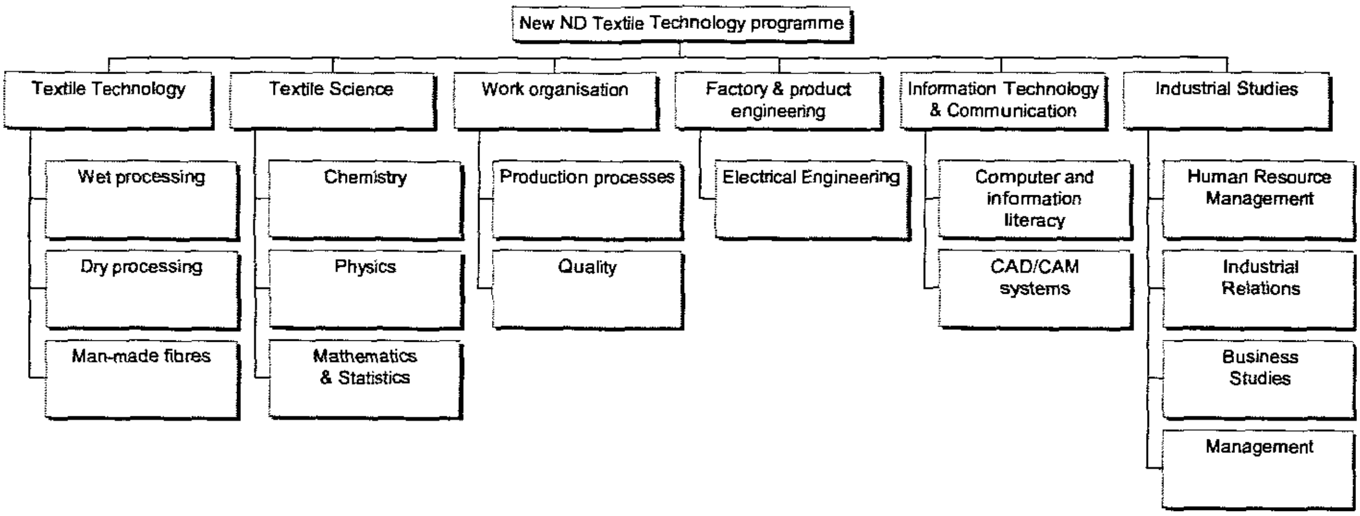


Figure 4.14: Proposed subject framework for textile technology qualification

Table 4.21 depicts the exit level outcomes and SAQA credits of the unit standards at NQF level 6 of the Textile Qualifications Framework.

Table 4.21: NQF level 6 exit level outcomes and SAQA credits

Fundamental outcomes	SAQA credits	Core outcomes	SAQA credits	Elective outcomes		SAQA credits
Communication studies and language	36	Plan and implement a waste management system	40	**Man-made fibres & polymers**	Set and adjust complex parameters to a man-made fibre process	30
Physical, mathematical, computer and life sciences	36	Design a quality management system for a particular area of specialisation in the textile industry	48		Modify and develop processes to enhance the man-made fibre process	30
	72	Draw up and maintain a production plan for a particular area of specialisation in the textile industry	40		Create new textile products in a man-made fibre process	40
		Promote employer/employee relationships in a textile plant	40	**Wet processing** Dyeing, printing and finishing processing	Set and adjust complex parameters to a wet process	30
		Classify raw material in grades	40		Modify and develop processes to enhance the wet process	30
			208		Create new textile products in a wet process	40
				Dry processing Spinning, weaving, knitting and non-woven processing	Set and adjust complex parameters to a dry process	30
					Modify and develop processes to enhance the dry process	30
					Create new textile products in a dry process	40
						300

At the meeting in May 2000, a team of industry experts, CTFL SETA staff and academic staff members of Peninsula Technikon and Durban Institute of Technology (formerly Technikon Natal), through a process of negotiation, assigned credits to each logical cluster or unit of learning using the credits of the exit level outcomes of the unit standards as point of departure. The following table summarises the credits per level and the logical clusters of units of learning or proposed "host" subject based on SAQA credits of 1 credit for every 10 notional hours of learning.

Table 4.22: Proposed SAQA credit structure of textile technology qualification

Proposed "host" subject name	Level I SAQA credits	Level II SAQA credits	Level III SAQA credits	Level IV SAQA credits	Total per subject
Textile Technology	60	60	50	40	**210**
Textile Science	15	15	10	0	**40**
Work Organisation	20	20	15	15	**70**
Factory & product engineering	5	5	20	40	**70**
Information Technology	10	10	10	10	**40**
Industrial Studies	10	10	15	15	**50**
Total per level	**120**	**120**	**120**	**120**	**480**

The **second problem** of a mismatch between the SAQA credits of 120 credits per level of study and the SAPSE credits of 1 full-time equivalent (FTE), resulted in a "translation" between these two systems. By working down from exit level outcomes of the unit standards towards enabling outcomes and tasks, the credits assigned to the exit level outcomes of the unit standards were used as decisive factor by the curriculum design team. SAPSE credits were calculated as a fraction of the SAQA credit as detailed in **Table 4.22**. This "translation" from one system to another was based on the ratio of 120 SAQA credits to 1 FTE (full-time equivalent) of the SAPSE system.

The SAPSE credits of the new outcomes-based qualification for textile technology were included in the curriculum approval procedure (Form A, B & C) which was submitted to the Department of Education via the convenor technikon (Technikon Natal) as contained in **Appendix M.**

The current SAPSE funding formula for technikons is based on the number of full-time (or equivalent) students, the credit per subject and the number of passes obtained per subject; in other words, the funding is currently subject-based, and not outcomes-based. In practice, this results in an unnecessary translation process between these two systems, whereby notional hours are allocated to outcomes to satisfy the SAQA requirements, and then, for subsidy purposes, converted into SAPSE credits, which have no direct bearing on notional hours and outcomes.

Table 4.23: SAQA & SAPSE credits of the textile technology qualification

SAPSE host subjects	SAPSE subject credits	SAQA credits based on unit standards
Textile Technology*	2,292	210
Production Organisation	0,437	70
Textile Science	0,229	40
Industrial Studies	0,312	50
Product Engineering	0,479	70
Information Technology	0,250	40
	3,999	480
* Including experiential learning component in second and third year of study		

Sources: CTFL SETA (2000a) & SA DoE (2001b)

The **third problem** impacted to a lesser extent on the curriculum design process at Peninsula Technikon, but is worth noting. The NQF organising fields adopted by SAQA and the SAPSE Classification of Education Matter (CESM) categories currently do not correspond. Both the CESM categories of the SAPSE system and the SAQA organising fields represent attempts to divide up the entire field of possible educational activity into a limited number of groupings. SAQA identified 12 fields of study and the CESM categories consist of 22 "first-order" groups as listed below in **Table 4.24.**

Table 4.24: SAQA Fields of Study & SAPSE CESM Categories

	NQF Organising fields
01	Agriculture and Nature Conservation
02	Culture and Arts
03	Business, Commerce and Management Studies
04	Communication Studies & Language
05	Education, Training & Development
06	Manufacturing, Engineering & Technology
07	Human and Social Studies
08	Law, Military Sciences and Security
09	Health Sciences and Social Services
10	Physical, Mathematical, Computer & Life Sciences
11	Services
12	Physical Planning and Construction

	SAPSE Classification of Educational Subject Matter categories
01	Agriculture and Renewable Natural Resources
02	Architecture and Environmental Design
03	Arts: Visual and Performing
04	Business, Commerce and Management Services
05	Communication
06	Computer Science and Data Processing
07	Education
08	Engineering and Engineering Technology
09	Health Care and Health Sciences
10	Home Economics
11	Industrial Arts, Trade and Technology
12	Languages, Linguistic and Literature
13	Law
14	Libraries and Museums
15	Life Sciences and Physical Sciences
16	Mathematical Sciences
17	Military Sciences
18	Philosophy, Religion and Theology
19	Physical Education, Health Education and Leisure
20	Psychology
21	Public Administration and Social Services
22	Social Services and Social Studies

Each of the first-order CESM categories is further sub-divided into second-order and third-order categories. The CESM category to which a subject is allocated is indicated in SAPSE 151 by a combination of numerals in the unique SAPSE number allocated to each subject. Similarly, each SAQA NQF organising field (SA, 1998) is further broken down into a number of sub-fields. For example, Field 06: Manufacturing, Engineering & Technology consists of the following three sub-fields:

- **Engineering and related design**, which includes the following scope of coverage: agricultural; chemical; civil; electrical; mechanical and mining.
- **Manufacturing and assembly**, which includes the following scope of coverage: animal feeds; auto assembly; automotive components; biotechnological systems; baking, beverages; chocolate confectionary; dairying; electrical and electronic components and products; fish and marine processing; furniture; generation of electricity; glass; crockery

and pottery products; graphic arts and printing; grain milling; groceries; spices and condiments; industrial chemicals; information systems and hardware; marine crafts; meat products and butchery; metal products; packaging materials and paper/pulp products; oils and fats (edible); poultry and eggs; rubber and latex products; sugar confectionary; **textile products**; vegetable and fruit processing; tobacco and cigarettes; snack foods; wood products and telecommunication systems.

- **Fabrication and extraction**, which includes the following scope of coverage: construction materials; glass and fibre glass; lumber; wood and saw-milling; ore extraction, metals and mining by-products; primary plastics; pulp and paper; primary rubber and latex; **textiles, natural and artificial**; sugar milling and molasses products.

Each qualification is linked to one or other of these sub-fields and is standardised according to the Standards Generating Body (SGB) for that sub-field and the National Standards Body (NSB) of that field. Textile technology is currently grouped within NSB field 06 of manufacturing, engineering and technology.

The problem presented by this mismatch of SAQA NQF organising fields and SAPSE CESM categories is that the outcomes required by the outcomes-based curriculum design process is firstly developed within one framework (NQF framework) and then later translated into the other framework (CESM categories). While outcomes may be within one SAQA NQF organising field (for example, Field 06: Manufacturing, Engineering & Technology), subjects within a SAPSE CESM category-based framework may belong to different CESM categories, other than the CESM categories of the qualification. **Appendix K** lists the SAPSE CESM categories and credits of the new outcomes-based qualification approved by the Department of Education in 2001. This translation from one system to another is an unnecessary complication, which poses the question why two different systems have to be used for standard-setting (SAQA NQF organising fields) and funding (SAPSE CESM categories). This could be seen as a deterrent for academic staff at higher education institutions to engage fully with outcomes-based education in South Africa.

The **fourth problem** relates to the bureaucratic procedures for registration of new qualifications required by different authorities, applicable at the time of the textile technologist curriculum design process at Peninsula Technikon. Although about six policy frameworks governing qualifications, programme registration and accreditation existed during this period, the curriculum design team had to respond in particular to the following:

- SAQA outcomes-based qualification registration.
- Council on Higher Education and Department of Education.

The steps involved in these two bureaucratic procedures are outlined in the table below.

Table 4.25: Procedures for registration of qualifications: SAQA & CHE

SAQA procedure
Involvement of stakeholders and role-players in the curriculum design process.
Defining exit level outcomes.
Defining specified outcomes.
Developing enabling, sub-enabling outcomes and tasks.
Consider assessment criteria per outcome.
Determine credit value based on notional hours.
Compile SAQA qualification registration documentation for submission to relevant authorities.
Obtain approval from stakeholders and role-players.
Obtain approval from Standards Generating Body.
Obtain approval from National Standards Body.
Registration of qualification with SAQA.

CHE & DoE procedure
Obtain approval from faculty management on proposed new qualification.
Obtain approval from Academic Board of institution on offering of qualification.
Consult with other higher education institutions in region regarding offering of new qualification and obtain approval from regional consortia.
Compile CHE Form A, B & C in conjunction with convenor Technikon for approval to offer qualification.
Submit SAPSE credit structure to Department of Education for approval .
Obtain approval from Minister of Education to offer programme.

Source: Bleazard, Bester & Garraway (2001)

It is important to note that the procedures applicable to the development of the outcomes-based qualification for textile technology differed from the procedures that were used for the registration of qualifications with SAQA by most other established qualifications, in this respect that the textile technology qualification implied the establishment of a new qualification with a new subject structure.

These bureaucratic procedures of SAQA and CHE (DoE) did not include the planning, preparation and implementation procedures of the Peninsula Technikon before implementation of the programme could commence in January 2001, for example, preparation of facilities, purchasing of equipment, appointment of staff, etc.

4.7.7 MODULARISATION

The changes in the political landscape in South Africa during the mid-90s impacted significantly on education and training policies, which is reflected in the following statement of the African National Congress (ANC,1994: 15):

> South Africa will have a national system of education and training, which enables citizens to become progressively qualified in a lifelong process. By integrating education and training in one system with a credit-based qualification framework, all citizens' chances to develop their capacities will be radically increased, whether they are in full-time or part-time study, employed or unemployed, in general education or in occupational preparation. The system will be learner-centred and achievement-led.

The NCHE report (1996: 48) explains that:

> Stimulated by global changes in the production and dissemination of knowledge, the traditional model is being augmented in many mass systems by an approach based on modular progression/accumulation of credits. This offers multiple entry and exit points ... it also provides greater flexibility for learners and allows for a more seamless interface between work and study. One way to achieve this is to restructure curricula according to programmes.

The imperatives reflected in these extracts are the need to broaden access to higher education and to promote lifelong learning. There is a clear link to modularisation in order to create mechanisms for the accumulation and transfer of credits, promote mobility and progression of learners, develop flexible and responsive curricula, and to promote innovation in teaching and delivery (Cooke, 2001).

The Department Clothing & Textile Technology at Peninsula Technikon first introduced the concept of modularisation during the mid-90s, when implementing the revised curricula of the National Diploma Fashion (formerly Fashion Design & Technology) and the National Diploma Clothing Management (formerly Clothing Production). This decision was largely influenced by the move to competency-based education at Peninsula Technikon, as well as by external pressures from the clothing industry to adopt a more flexible approach to the offering of programmes and to widen access to programmes offered by the Department.

Allan & Layer (1995: 45) indicate that managerial reasons often lead to modularisation; these educational reasons include: increased flexibility for students, interdisciplinary opportunities for staff and students, higher staff-student ratios, staff rationalisation, increased centralised managerial control and increased curriculum control. The main reasons for the implementation of a modular structure for the programmes offered by the

Department Clothing & Textile Technology were to enhance quality of learning and teaching, to apply restricted human resources in a more effective and efficient manner and to provide learners with a cost effective means of repeating "parts" of a subject, without having to repeat the full subject "load", especially in technology-related subjects. By increasing the managerial control through a modular structure, the Department was able to improve quality of education by monitoring the effectiveness of teaching and learning strategies. To this end, the Department introduced regular marks and programme review sessions to provide feedback on progress.

Based on experience gained with the implementation of a modular curriculum structure for clothing design and technology programmes, the curriculum design team considered the implementation of a modular system for the textile technologist programme and engaged in an investigation to understand what is meant by modularisation in an outcomes-based educational context.

According to Nasta (1994: 81), a module is "a measurable unit of learning and assessment leading to the award of a credit" and "a group of selected modules will normally lead to a designated qualification". Du Pré (2000: 42) defines a module as "a coherent self-contained unit of learning, designed to achieve a set of specific learning outcomes assessed within that unit of learning". The expression of each module as a set of learning outcomes enables the curriculum designer and the learner to be clear about the anticipated product of learning. A curriculum expressed in the form of learning outcomes provides "detailed statements of what the learner will be expected to know, understand and do upon successful completion of the module" (Nasta, 1994: 83).

In designing a curriculum the curriculum designer would often start with the 'whole', which has mostly been the practice in the past, but another approach would be to start from the modules and to make them the critical building blocks of the curriculum; in other words, to start the process of curriculum design with the parts (modules) rather than the whole. Nasta (1994: 82) suggests that this approach will result in greater flexibility to the learner, through a wider choice of modules leading to a qualification. But even with a modular system, the choice of the learner will be constrained by regulatory frameworks which indicate the combinations and levels of particular modules that have to be taken into consideration during the curriculum design process.

Another critical issue that requires examination has to do with the nature of a particular modular curriculum and whether the modules only make sense as components of a given course or whether the modules can stand alone and be accumulated towards a range of different qualification outcomes. Spours in Cooke (2001) distinguishes between "modular developments" and "modularistion", by defining the first approach as "varied and often fragmented attempts to develop a modular curriculum within qualifications or institutions", while "modularisation" refers to "the development of modular systems spanning qualifications and used as a means to alter their progression relationship to one another". This view is supported by Nasta (1994: 92), who indicates that the first approach of "modular developments" is still restricting the choice of the learner between one elective area or another within the same learning programme, as is currently the case with the choice amongst elective areas of the textile technology programme, namely wet processing or dry processing or man-made fibre processing. Learners may only choose one area of specialisation in the third year of study, which is restrictive in nature. The second, more flexible approach will be to allow the learner to choose modules across a wider range of clothing and textile technology modular offerings by accumulating credits towards a qualification. Examples of these types of modular systems in clothing and textile technology are available in other countries, but unfortunately this approach is still being considered in South Africa.

A simpler approach was adopted by the curriculum design team for the textile technologist programme, consisting of the division of the programme into separate elements (modules) by using the design-down curriculum approach as illustrated in **Figure 4.13**. The design-down curriculum structure consists of working down from the exit level outcomes of the unit standards towards enabling, sub-enabling outcomes and tasks and then by grouping these into units of learning or modules. In this context, modules are defined as building blocks or units of learning from which learning programmes are constructed. Modules were designed to be self-contained units of learning and to be individually assessed. The curriculum design process of the textile technology programme resulted in a re-conceptualisation of the traditional subject structure and presented the curriculum design team with new challenges regarding flexibility, building in a competitive edge as well as providing the learner with choices.

Figure 4.15 on the next page, is a simplified graphic representation of the design-down modular curriculum approach that was adopted by the curriculum design team for the development of the textile technologist programme. This approach is based on a model presented by Cooke (2000) at a workshop on modularisation at Peninsula Technikon and depicts elements of a "qualification-learning programme map" presented by Gerber (2001: 129) at a curriculum development seminar of the Committee for Tutorial Matters (CTM) of technikon education in South Africa.

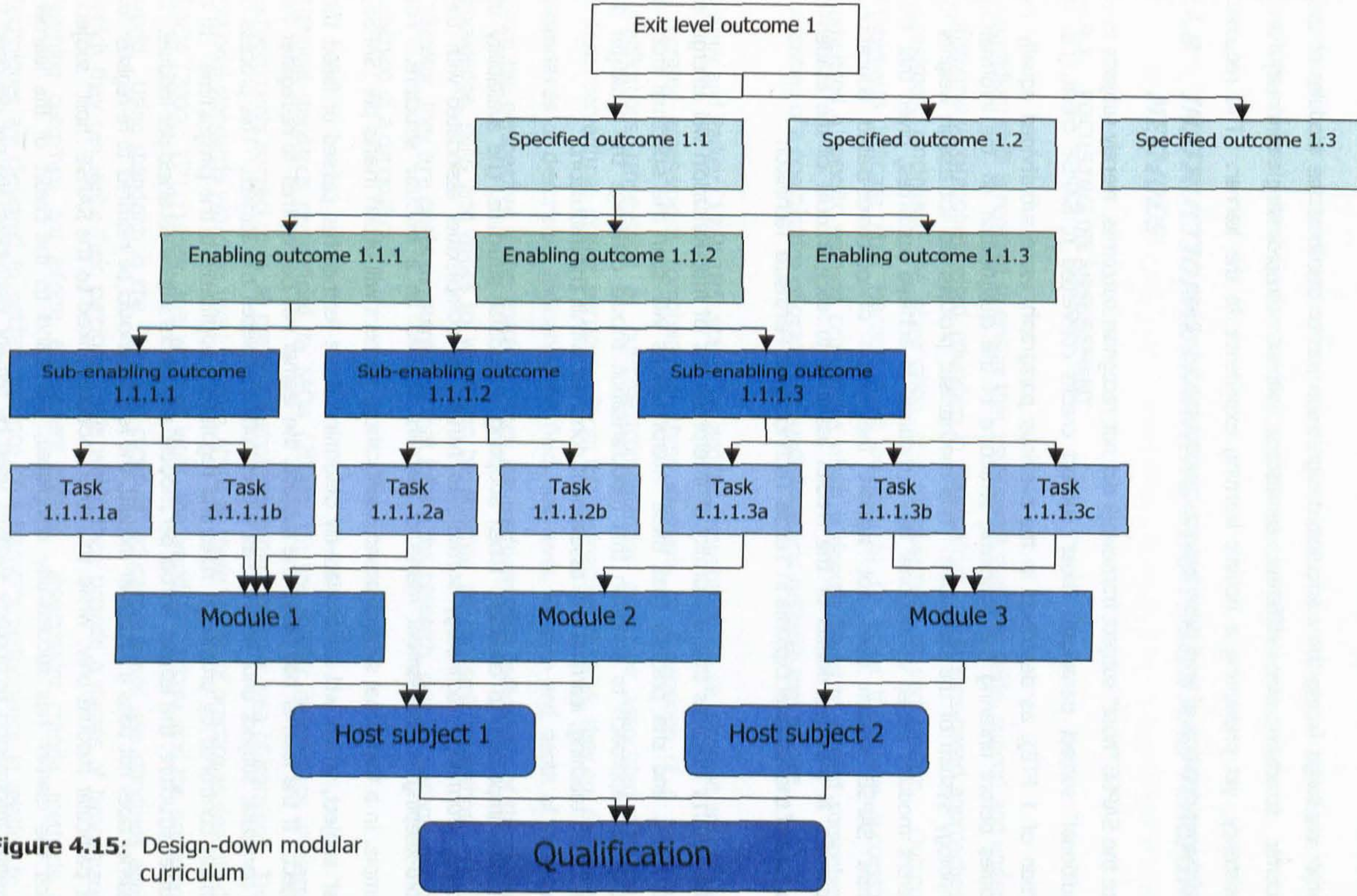


Figure 4.15: Design-down modular curriculum

Another challenge facing the curriculum design team was to distribute the modules of the academic structure over different semesters without compromising continuity and consistency, yet presenting a holistic learning experience to the learner. This required careful consideration of level descriptors as previously described.

Since the SAPSE "host" subject framework did not recognise outcomes, merely subjects in a "traditional" subject paradigm, "host" subject credits converted to SAPSE credit (i.e. a fraction of 1 FTE), as described in the previous paragraph, were sub-divided equally to modules before entering the academic structure of the qualification on the information technology system of the institution. This mechanistic process did not assign weights to different modules based on notional hours required to achieve outcomes, given that the current SAPSE system does not support the notion of outcomes-based education. **Appendix N** provides details of the credits assigned to each module of the academic structure of the National Diploma in Textile Technology at Peninsula Technikon

Cooke (2001) indicates that a plurality of interpretations of modularisation will emerge in institutions, and she predicts that these interpretations will span the spectrum from a mechanistic approach to a notion that modularisation should challenge the paradigm of curriculum, teaching, learning and assessment dominant within the institution.

It is also important to consider, when adopting a modular structure, the availability of suitable information technology software to handle the complexities associated with the record-keeping of assessment marks of learners enrolled on a modular structure. For example, in a traditional subject-based qualification, learners will obtain marks per (SAPSE) 'host' subject, which will accumulatively determine if the learner has passed or failed the subject. If the learner has failed the subject, the learner will be required to re-register for the particular subject until he/she has successfully completed the subject. This process is normally controlled by promotion rules and regulations applicable to the programme. In a modular structure, the learner enrols per module and marks will be obtained per module. If a learner does not pass a particular module, the learner should be required to re-register for that particular module only, while the other modules linked to the SAPSE "host" subject, which the learner has successfully completed, will stand to the credit of the learner. Currently information technology systems used by tertiary institutions are not designed to handle modular systems and often require that additional software be developed by the institution to deal with these complexities as is the case at Peninsula Technikon.

4.8 INSTRUCTIONAL LEARNING STRATEGIES AND TEACHING METHODS

4.8.1 FOCUSING ON ASSESSMENT

A paradigm shift is required to ensure that assessment practices guide, support and underpin transformative outcomes-based education in South Africa. Outcomes-based approaches to assessment emphasise the observation and measurement of performance. Outcomes statements indicate what learners must be able to do when they have successfully completed a specific learning programme which is directly linked to applied competence, consisting of a combination of practical, foundational and reflexive competence.

Harley and Parker (1999: 185) state: "An applied competence can be assessed only through integrated assessments combining all three elements or dimensions of a curriculum. Qualifications, understood as outcomes/competencies and their associated assessment criteria, serve three distinct purposes. From the perspective of SAQA, they are the national **standards** or descriptors indicating the field, and level, breadth and depth of the study. From the perspective of the employer, they are **performance indicators** of the learner's knowledge, skills and values to which can be attached an economic evaluation. For the educator, they are **goals or purposes** that inform the research, design, management and teaching of a curriculum."

National standards are defined by SAQA (2000c: 16) "as specific descriptions of learning achievements agreed on by all major stakeholders in the particular area of learning". These national standards would be used in South Africa by three worlds of practice as described by SAQA (2000c: 17), namely, the world of work, the world of curricula and the professional world. Using standards in the "world of curricula" educators would use standards against which they can write their curricula; this would then provide a means of benchmarking learning outcomes and inform assessment criteria. Assessment criteria, methods and techniques are designed to gather evidence of a learner's performance in relation to the outcome(s) being assessed.

Focusing on the implementation of outcomes-based assessment practices for the design, development (2000) and implementation (2001) of a textile technologist programme, required a change from the old paradigm of content-based learning and teaching strategies and assessment practices. The Department of Education compared content-based curricula with outcomes-based curricula, and although educators might have placed a high priority on learner participation in the past and were able to guide learners to a deep understanding and appreciation of their subjects, the learning and teaching strategies were often text-book bound, encouraging rote-learning and passive learners, with rigid syllabi and content placed in rigid timeframes. These "old" teaching and learning practices resulted in content-based assessment strategies as described by Van der Horst & McDonald (2001: 27) that would include:

- Assessment of (sometimes isolated) facts and skills.
- Assessment activities which were regarded as being separate from the instructional process.
- Assessment of knowledge as provided in the textbook (direct reproduction was often required).
- Academic exercises (for example, direct application of a rule).
- Single occasion assessment, for example, standardised tests and examinations (as opposed to ongoing assessment).
- Single attribute assessments, for instance, assessment of isolated knowledge or discrete skills.

In outcomes-based education assessment "involves the process of collecting and interpreting information or evidence of learner achievement so that comparisons or evaluations can be made" (Van der Horst & Mc Donald: 2001: 77). Assessment criteria are defined by SAQA (2001: 21) as "statements that describe the standard to which learners must perform the actions, roles, knowledge, understanding, skills, values and attitudes stated in the outcomes". As assessment is central to the recognition of achievement, the quality of assessment is therefore important to provide credibility in assessment. Assessment criteria should include a focus on relevant critical cross-field outcomes, particularly those dealing with verbal and computer communication, critical and analytical thinking and the development of self-appraisal and monitoring techniques. Assessment criteria should also test for evidence of applied competence. There should be an increase in the proportion of competence in the application of theoretical knowledge at higher levels of study.

4.8.1.1 SAQA Guidelines on assessment

The South African Qualifications Authority (2001: 16-19), has compiled guidelines for assessment practices for qualifications and unit standards on the National Qualifications Framework which were considered by the curriculum design team at Peninsula Technikon. The relevant guidelines are as follows:

Assessment should be integrated:

- Firstly, this means that when the programme outcomes are assessed, critical cross-field outcomes are also assessed.
- Secondly, theory and practice should be integrated. The integration of theory and practice is captured by the term "applied competence", which means that learners must be able to perform certain actions, understand what they are doing and why they are doing it and pass judgement on performance so that they can adapt their behaviour for different circumstances.
- Thirdly, integration means that there should be **a variety of assessment instruments** – what type of task is set for learners such as assignments, tests, practicals – **a variety of assessment methods**, which could include assigning a mark to the product, observing a learner working on the product, or questioning learners' understanding as they engage with an assessment instrument.
- Lastly, integrated assessment means that there will always be a mix of formative and summative assessments. Formative assessments are those which guide learners towards the achievement of larger, more final summative assessments.

Assessment should be transparent in terms of standards to be achieved:

- Through the use of criteria, it should be clear what it is that the learners have to achieve and how they are to show/demonstrate that achievement.
- The level of complexity of the required evidence should be clear to learners.
- When and what sort of assessment should be made clear to learners.

Assessment should offer guidance:

- Assessment should show learners what they know and can do, what they still need to learn and achieve and how to get to the final outcome.

Assessment should be fair, valid and reliable:

- An assessment should not disadvantage a learner through differential access to resources or through any form of discrimination.

- An assessment is valid when it is assessing what it says it is assessing.
- An assessment is reliable when assessment results are not perceived to be influenced by variables. Reliability in assessment is about consistency.

Institutional programme outcomes (learning and enabling outcomes) and assessment tasks and their associated criteria will ultimately be matched against the standards (unit standards or qualification) registered with relevant national bodies, for example, SAQA, HEQC and ETQA (Clothing, Textiles, Footwear & Leather SETA). Assessment must fulfill the requirements of the relevant nationally, accredited quality assurance bodies. All assessment must match the appropriate level according to the level descriptors for higher education. Within a level of study (for example first year of a three-year qualification), the level of complexity of the assessment should differ in the following ways:

- Problem situations to be solved move from being simple, routine and imitative to being complex, and open ended.
- Approaches to applying knowledge move from given methods to choosing and constructing appropriate methods.
- The assessment of theoretical and research knowledge and application increases.

4.8.1.2 Criterion-Referenced Assessment

Outcomes-based education is mostly associated with criterion-referenced assessment, although norm-referenced assessment could still be used as part of a range of assessments, which would also include self–referenced assessment. Criterion-referenced assessment features the following characteristics as explained by SAQA (2001: 25):

- Makes judgements about learners by measuring learners' work against set criteria.
- An individual is assessed.
- The criteria are pre-determined and are part of the standard.
- The criteria are objective and attempt to be as clear as possible in terms of the nature of the assessment.
- Where grading is used, learners are graded against the criteria for assessment.

In preparing a textile technologist curriculum it was important for the curriculum design team to understand the differences associated with assessment types and assessment methods or techniques. Within criterion-referenced assessment, two types of assessment emerge, namely, **formative assessment** that takes place during the process of learning and teaching and **summative** assessment, which is used by assessors to make judgements about a learner's achievement at the end of a learning programme. SAQA (2001: 26) provides the following information about these types of assessment to be considered during the curriculum design process:

Table 4.26: Comparison between formative and summative assessment types

Formative assessment	**Summative assessment**
▪ Designed to support the teaching and learning process. ▪ Assists in the planning future learning. ▪ Diagnoses the learner's strength and weaknesses. ▪ Provides feedback to the learner on his/her progress. ▪ Helps to make decisions on the readiness of learners to do a summative assessment. ▪ Is developmental in nature. ▪ Credits/certificates are not awarded.	▪ At the end of a learning programme (qualification, unit standard or part of a qualification – subject or module). ▪ To determine whether the learner is competent or not yet competent. ▪ In knowledge and inputs-based systems, this usually occurs after a specified period of study. ▪ In OBET, learner-readiness determines when assessments will take place. ▪ Is carried out when the assessor and the learner agree that the learner is ready for assessment.

Formative assessment often also involves peer (where learners assess each other against criteria) and self-assessment (where learners assess their own work against criteria). The purpose of peer and self-assessment is to develop a more reflective and independent learner.

In a workshop on assessment held in Peninsula Technikon in October 1999 other types of criterion-referenced assessment were explored which were considered by the curriculum design team of the textile technologist programme. According to Garraway (1999) these types include:

- **Diagnostic assessment:** Diagnostic assessment aims to identify the learner's aptitude. The main purpose of diagnostic assessment is to inform decisions about what the next educational steps should be for both learners and lecturers. A typical example of diagnostic assessment would be a pre-test at the start of a programme to determine what skills/knowledge the learners already possess.
- **Integrated assessment** should ensure that the purpose of the qualification is achieved by permitting the learner to demonstrate applied competence and by using a range of summative and formative assessments.

It means that the assessor should:

- Assess more than a narrow range of performances, but determine if the learner is able to demonstrate deeper levels of understanding and reflection about actions and products that comprise the idea of an applied competency.
- Assess the learner's ability to integrate other knowledge and skills (critical outcomes) with the knowledge of the particular subject/topic.
- Assess the learner's attitude towards the work and values embedded in it.

- **Continuous assessment:** Continuous assessment is an ongoing process that measures a learner's achievements in the process of learning, and provides information to support the development of the learner by suggesting improvements to both the learning and teaching process. Continuous assessment uses a variety of assessment methods, including a balance of formative, diagnostic and summative assessments. It requires that feedback from one assessment informs the design of the next assessment. It is a cyclic process that uses a variety of assessment methods, rather than a linear process where learners are assessed regularly using the same or limited methods. The cyclical process of continuous assessment is illustrated in **Figure 4.16.** Continuous assessment must not be confused with continual assessment. According to Sutherland (1999) continuous assessment "the former is a way of assessing student learning in a formative and developmental manner, where the lecturer is not always the sole judge of quality", while the latter on the other hand, "still functions in a traditional manner, with the lecturer as the sole judge of quality". Sutherland (1999) indicates that lecturers who undertake continual assessment often uses "the same technique of examining students repeatedly at short intervals, whereas continuous assessment, uses a variety of approaches".

In SAQA terms a qualification is the planned combination of learning outcomes with a defined purpose/purposes that is intended to provide qualifying learners with applied competence and a basis for further learning. The curriculum design team at Peninsula Technikon decided to organise the learning programme around enabling outcomes (grouped into modules) as described previously and therefore to assess enabling outcomes on a continuous basis during the learning experience by using predominantly formative and summative assessment types in a cyclical process as illustrated in **Figure 4.16.** When using formative and summative assessments, a range of assessment methods (observation, written and oral questioning, product evaluations) would be used as prescribed by SAQA

(2001: 27-28). A range of assessment instruments (practical work, role plays, written assignments, tests, examinations, demonstrations, projects, case studies, oral presentations, simulations, etc.) would also be used. It is important that the method and instrument should match what is being assessed and should be appropriate; sufficient evidence should be collected and it should be clear to the learner whether he/she is undergoing formative or summative assessment. The amount of formative assessment would be determined by the needs of the learner, in particular taking into account that learners at entry-level might require more guidance from the educator in the learning process.

Continuous assessment suggests a cyclic process as illustrated below in **Figure 4.16**, rather than a repeat (and often terminal) process (Sutherland, 1999).

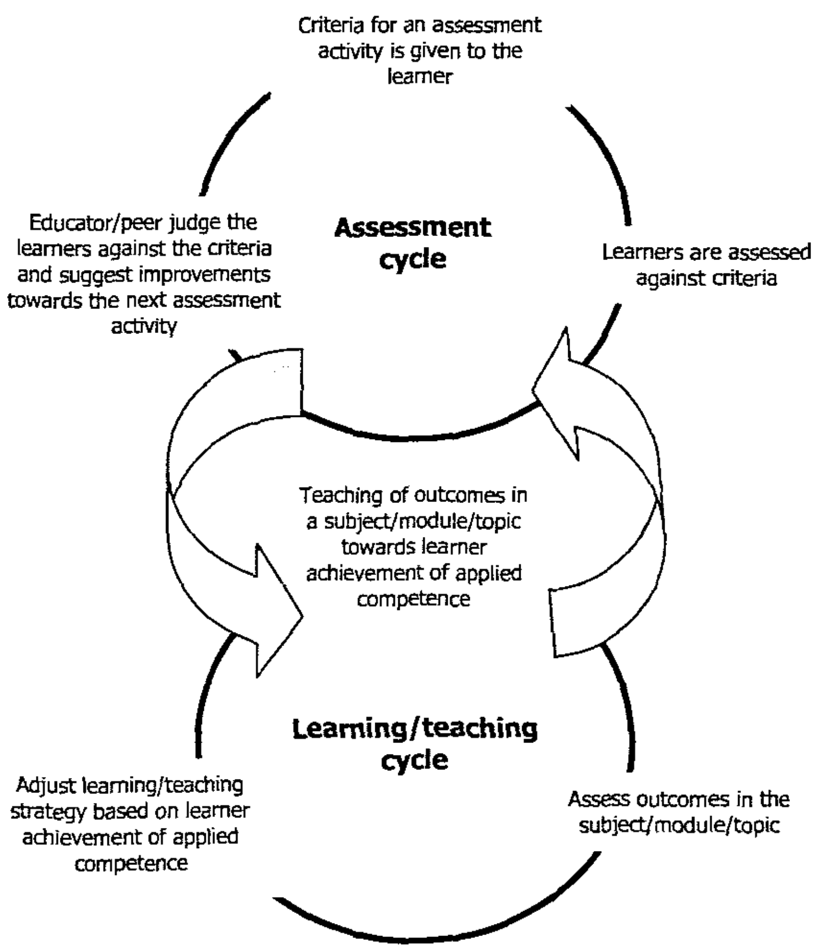


Figure 4.16: Continuous assessment cycle

4.8.2 SEMESTERISATION

The curriculum design team at Peninsula Technikon recommended that the textile technologist programme should be offered on a semester basis to allow for flexibility and accessibility. The modules, consisting of groups of enabling outcomes, were distributed across six semesters over a period of three years' full-time study. A learner would exit the qualification only after three years, although provision was made for learners to exit after two years of study in the qualification structure registered with SAQA by the convenor Technikon. It was decided to implement a three-year programme only, until qualification names, NQF levels and credit values had been finalised by SAQA and the Council on Higher Education.

Appendix N outlines the academic structure based on SAPSE "host" subjects compiled by the curriculum design team for implementation of the textile technologist programme in January 2001.

4.8.3 EXPERIENTIAL LEARNING

Experiential learning is a very important component of career-orientated Technikon education, whereby the boundaries between theoretical and applied/experiential knowledge and between academic and vocational knowledge are being collapsed. The learning programme, consisting of enabling outcomes, will reflect outcomes to be achieved by a learner during his/her study at the Technikon, as well as in the workplace. The academic structure of the textile technologist programme at Peninsula Technikon makes provision for a learner to gain practical experience, of a general nature, in a manufacturing environment for a period of six months in the second year of study and more specialised work experience in a specific sector (dry or wet processing) of the industry during the third year of study. The curriculum development process accommodated these requirements in the scheduling of the outcomes, resulting in a project-based approach toward experiential learning. A learning guide containing enabling outcomes to be achieved by the learner during the period of experiential learning at a textile manufacturing company was compiled for each period of workplace-based training; this will be monitored by academic staff members of the institution on a regular basis to ensure that learners perform accordingly.

4.9 CURRICULUM-ORIENTATED EVALUATION

Carl (1995: 49) defines curriculum evaluation as the phase during which not only the success and effectiveness of the curriculum are evaluated, but also the effect thereof on the learners. A distinction is being made between learner-orientated evaluation which implies "to determine the progress of learners on the way to goal realization in respect of the lesson, series of lessons, or the annual programme [achievement of outcomes]" and curriculum evaluation which "determines to what extent the objectives of the curriculum have been achieved" (Carl, 1995: 177). Curriculum-orientated evaluation, defined by Carl (1995: 177), could be regarded as "a broad and continuous effort to inquire into the effects of utilizing educational content and process according to clearly defined goals". In an outcomes-based educational context, curriculum-orientated evaluation would be concerned with the **value** or effectiveness of the curriculum and the **outcomes** [output] of the curriculum. The curriculum evaluation phase cannot be separated from the other phases of curriculum development. As illustrated in **Figure 4.4,** "curriculum evaluation therefore comprises the evaluation/value determination of the effectiveness/functionality of all curriculum actions and the curricula [learning programmes] that eminate from them" (Carl, 1995: 178). Human in Carl (1995: 180) argues that the effectiveness/value of a curriculum is not exclusively captured by the immediate outcome [output] thereof, but especially in the consequences/implications which the curriculum has for individuals and community [industry] in the long-term. Curriculum anticipations of long-term effect usually arise from the rationale of the curriculum as being the basic purpose of the programme. Carl (1995: 178) illustrates the role of a rationale in this process as follows:

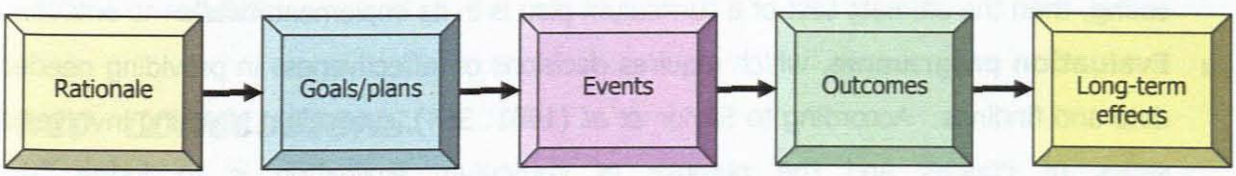


Figure 4.17: Role of the curriculum rationale in curriculum-orientated evaluation

According to Carl (1995: 182), events comprise instructional actions, contents and learning experiences, while outcomes consist of knowledge, skills and values and value judgements.

4.9.1 MODELS FOR CURRICULUM EVALUATION

Saylor, Alexander and Lewis (1981: 334) indicate that curriculum evaluation may take place at different levels and defines the following levels for evaluation:

- **Goals, sub-goals and objectives**, which require decisions on validity, appropriateness and inclusiveness. The aim of evaluating objectives according to Lewy in Saylor *et al.* (1981: 336) is to "get some sort of agreement from others outside the curriculum team that the instructional objectives are:
    - Related the objectives (and goals) of the program and likely to contribute cumulatively to the attainment of the program objectives.
    - Clearly stated.
    - Appropriate for, and attainable by, the pupils [learners] at the particular level of education and stage of mental development.
    - Important enough to encourage further learning by the pupils [learners]".
- **Programme of education as a totality**, which requires decisions on comprehensiveness, continuity and priorities. Saylor *et al.* (1981: 337) indicate "to evaluate a total educational program is to place a value judgement on all of the opportunities for educational engagements provided by a society for its citizens".
- **Specific segments of the educational program**, which require decision on the contribution to attainment of the goals and coordination. Saylor *et al.* (1981: 344) state that the evaluation of "a unitary segment of the curriculum, or program, is based on the set of sub-goals formulated within the general goals that apply to the program".
- **Instruction**, which requires decisions on contributions to the attainment of goals and objectives. Saylor *et al.* (1981: 350) contend that "if the 'proof of the pudding is in the eating, then the ultimate test of a curriculum plan is in its implementation".
- **Evaluation programme**, which requires decisions on effectiveness in providing needed data and findings. According to Saylor *et al.* (1981: 364), curriculum planning involves a series of choices and the purpose of curriculum evaluation is to judge "the appropriateness of these choices". It is further pointed out that "since the selection and use of an evaluation plan is itself a choice, the plan needs to be evaluated" (Saylor *et al.*, 1981: 364).

Carl (1995: 187) suggests that curriculum evaluation should not be seen as only the fourth phase of the curriculum development process as illustrated in **Figure 4.4**, but that is relevant after each phase, which means that it should take place before, **during and after each phase**, contributing to a more dynamic curriculum development process.

4.9.2 METHODS OF CURRICULUM EVALUATION

Based on work conducted by Human (1986), Carl (1995: 189) distinguishes between three basic forms of curriculum evaluation, namely:

- **Comparative evaluation** *by comparing the objects which must be judged with other* actual or **ideal objects.**
- **Linking** evaluation by linking different curriculum elements with one another.
- **Fundamental evaluation** by constructing criteria or demands.

Comparative evaluation could consist of three different types as described by Carl (1995: 189), namely:

- Comparing a curriculum or aspects of a curriculum with other curricula.
- Comparing curriculum events, outcomes and results with curriculum anticipations.
- Comparing the anticipations of different persons (groups of persons) of the same curriculum.

Carl (1995: 190) indicates that comparative evaluation has the following functions:

- The determination of standards (achievability).
- The identification of possible shortcomings.
- The maintenance of comparable norms and standards.

He also indicates that it is often difficult to estimate with any accuracy a particular curricular outcome or result.

4.10 CONCLUSIONS

The move away from traditional "content-based" education and training to "outcomes-based" education and training has far-reaching educational, administrative and structural implications for technikons, which requires a high level of commitment from stakeholders to ensure successful curriculum development, implementation and evaluation. Various curriculum design models were consulted as described in **Paragraph 4.3**. Although most of these models were originally design for content-based general education purposes, a number of common elements could be identified to inform the development of a curriculum design model adopted by Peninsula Technikon is illustrated in **Figure 4.8**. It is evident that curriculum development in a National Qualifications Framework at technikons is a complex and often confusing process, consisting of various aspects, processes and procedures as outlined in **Paragraph 4.5-4.9** of this chapter.

The next two chapters of this thesis will focus on the curriculum-orientated evaluation process. The qualitative research outlined in **Chapter 5** will focus on the changing external environment with the view to detect aspects to be incorporated into the curriculum. The quantitative research outlined in **Chapter 6** will focus on the critical evaluation of the enabling outcomes or subject-specific skills and knowledge of the textile technologist programme, by assessing the effectiveness and appropriateness of these enabling outcomes or subject-specific knowledge and skills by means of a questionnaire.

Chapter 5

Challenges facing the textile industry:
A qualitative study

5.1 INTRODUCTION

This chapter will focus mainly on the qualitative research method selected as most appropriate to achieve the objectives of this research project. The suitability of the method is substantiated and the methods of data collection and sampling are discussed. An outline of the data obtained from the interviews is also provided.

5.2 BACKGROUND

Change may be regarded as one of the few constants of recorded history. It will not disappear or dissipate.

> The pace of change has increased dramatically; mankind wandered the planet on foot for centuries before the invention of the wheel and its subsequent 'technological convergence' with the ox and horse. In one 'short' century a man has walked on the moon; satellites orbit the Earth; the combustion engine has dominated transport and some would say society; robots are a reality and state of the art manufacturing facilities resemble scenes from science fiction; your neighbour or competitor, technologically speaking, could be on the other side of the planet; and bio-technology is science of the future. The world may not be spinning faster but mankind certainly is! Paton & Mc Calman (2000: 5).

Paton and Mc Calman (2000: 1) argue that management and change are synonymous, that it is impossible to undertake a journey, which in many respects is what change is, without first addressing the purpose of the trip, the route you wish to travel and with whom. Managing change is therefore about handling the complexities of travel. "It is about evaluating, planning and implementing operational, tactical and strategic 'journeys' – about always ensuring that the journey is worthwhile and the destination is relevant" (Paton & Mc Calman, 2000: 1).

Acknowledging that change is constant and that managing change effectively could result in a deeper understanding of the complexities of a situation, the researcher attempts, through the use of an appropriate qualitative research method:

- To determine the factors impacting on the changing environment of the textile industry and to what extent these factors would impact on curriculum-orientated evaluation of an outcomes-based textile technologist learning programme at Peninsula Technikon.
- To confirm the need for the establishment of an outcomes-based textile technologist learning programme at Peninsula Technikon in January 2001.

5.3 QUALITATIVE RESEARCH METHOD & PREPARATION

There are numerous ways of collecting data and these depend on the purpose and aims of the research project. Interviews, focus group interviews and observation are the most commonly used methods of qualitative data collection. Mason (2002: 62) refers to *qualitative interviewing* as "in-depth, semi-structured, or loosely structured forms of interviewing". In considering the appropriateness of qualitative interviews as a qualitative research method to determine to what extent the changing environment of the textile industry would impact on curriculum-orientated evaluation of a textile technologist learning programme at Peninsula Technikon, the researcher considered a number of possible reasons why this method would be more appropriate than others. Mason (2002: 63) suggests that qualitative interviewing might be suitable "because your ontological position suggests that people's knowledge, views, understandings, interpretations, experiences, and interactions are meaningful properties of the social reality" that has to be explored. Another reason for using qualitative interviewing as a research method would be "if your view [as researcher] is that knowledge and evidence are contextual, situational and interactional" (Mason, 2002: 64). If the latter is the case then it is important for the interviewer to ensure that the interview in itself provides maximum opportunity for the construction of contextual knowledge by focusing on the relevant specifics in each interview.

5.3.1 QUALITATIVE INTERVIEWING: LOGIC AND RATIONALE

The researcher decided to use a "one-on-one" semi-standardised qualitative interview as research method instead of focus groups as interviewing method mainly for two reasons:

- **Firstly**, to provide each interviewee with an opportunity to **express his/her personal opinions** regarding the changes facing the textile industry within the framework of predetermined questions. Interviewees often reflected on their own personal experiences during the interviews.

- **Secondly,** to ensure that **key role players from different sectors** (fibre and fabric production, wet and dry processing) of the industry are consulted on the matter. Since external factors might impact differently on the different sectors as described in **Chapter 2** of this thesis, a 'one-on-one' interview would give an interviewee the opportunity to focus only on the particular sector of his/her expertise and not to be influenced by the opinion of colleagues from other sectors of the textile industry, which might have been the case in a focus group interview.

Struwig and Stead (2001: 98) define the semi-standardised interview as "a combination of the structured and unstructured interviews", whereby "predetermined questions are posed to each participant in a systematic and consistent manner but the participants are also given the opportunity to discuss issues beyond the questions' confines". Greeff (2002: 302) argues that this method gives the researcher and participant more flexibility, whereby the researcher is able to "follow up particularly interesting avenues that emerge in the interview, and the participant is able to give a fuller picture".

The semi-standardised interview makes provision for the participant to be perceived as "the expert on the subject and should therefore be allowed maximum opportunity to tell his [or her] story" (Greeff, 2002: 302). The complexity of the textile industry requires the use of a research method to gauge effectively the knowledge, views, understanding, interpretations and experience of a range of key role players and subject experts regarding the changing needs of the textile industry in South Africa.

5.3.2 PLANNING & PILOTING OF QUALITATIVE INTERVIEW QUESTIONS

Mason (2002: 67) indicates that qualitative interviewing requires a great deal of planning, which will result in a 'conversation with a purpose'. Greeff (2002: 303) suggests, "when constructing the questions, a focused literature study could be done to guide the researcher in understanding the construct at hand, and to know what questions to ask to cover the construct". For this reason, in planning the qualitative interviews, the researcher considered a range of questions about the substance and style, scope and sequence of the interview questions, which were based on interviews conducted by Wendy Borland during 1999 for an article titled 'Textiles beyond 2000' published in the clothing and textile industry trade publication *Pursuit*. Borland (1999) interviewed a number of key role players and technical experts representing a range of textile products and processes. The survival strategies for the textile industry emerging from these interviews could be summarised as follows:

- Develop stronger marketing strategies.
- Develop and produce quality end products for niche markets.
- Increase exports of value-added products.
- Change the customer's mindset that imported products are better than locally produced products, resulting in the establishment of the Proudly South African campaign.
- Become financially "fit" – reduce overheads.
- Drop prices on bulk products to maintain plant, while focusing on one or two profit-generating products.
- Investigate possibilities of amalgamations, joint ventures and inter-firm linkages to increase competitiveness.
- Promote sub-contracting to create room for each role player in the industry to concentrate on their chosen core business – ginning, spinning, weaving, dyeing, finishing or printing.
- Adopt a synergistic approach where members along the production line interact closely with and assist the other.
- Become more export-orientated – become internationally competitive.
- Need a paradigm shift in mindset – replace old-fashioned inward-looking approach with the foresight to see the 'bigger picture' and the willingness and ability to take calculated risks.
- Develop innovative and proactive marketing strategies to increase exports.
- Become less sales-orientated – sales techniques are perceived abroad as being too arrogant and demanding.
- Develop attractiveness to overseas manufacturers as an alternative source of innovative fabrics.
- Develop brand-name products and fabrics.
- Respond to trade agreements such as AGOA and EU trade agreements.
- Invest in research and development.
- Respond effectively to advanced technology.
- Develop effective training strategies.

In formulating the interview questions, the researcher reflected on these strategies and captured elements in the interview questions, in an attempt to gauge the changing environment of the textile industry. For example, investment in research and development was highlighted as a survival strategy by the key role players when interviewed by Wendy Borland, and it would be interesting to determine to what extent the industry has invested in research and development four years later, acknowledging that research and development are key elements to the development of niche markets in a global textile market.

Fifteen open-ended interview questions were arranged to guide the interviewee from general, broadly-based concepts (strengths, weaknesses, opportunities and threats) to more specific elements of the changing environment of the textile industry (technology, manufacturing practices, research and development) and finally concluding with aspects relating to textile technology education and training and confirmation of the need to educate textile technologists in South Africa.

After the interview questions for one-on-one interviewing were carefully worded by the researcher, a human resource practitioner at a textile manufacturing company in the Western Cape, who is also a board member of the textile chamber of the Clothing, Textiles, Footwear & Leather SETA, was consulted to ensure that the questions would capture the essence of the changing environment of the textile industry. Based on feedback from the human resource practitioner, changes were made to the interview schedule, before commencing with the interviews. **Appendix O** provides the letter to interviewees requesting their participation in the research project, a reply slip, as well as the interview schedule for personal interviews.

5.3.3 SAMPLING TECHNIQUE

Based on non-probability sampling, the researcher, using judgement sampling, compiled a sample of key role players and subject experts on the basis of their expert judgement. Struwig and Stead (2001: 111) state that "respondent selection [of judgment sampling] thus depends on the researcher's judgement", selecting experts who would provide an expert view on the topic. These individuals were carefully selected based mainly on years of experience, expertise, knowledge and skills in a particular sector of the textile industry. A list of the key role players and subject experts who were interviewed for this research project, is included as **Appendix P.**

5.3.4 SIZE OF THE SAMPLE

The size of the sample was influenced by the available time of the researcher to conduct the interviews, the availability of key role players and subject experts and the number of questions included in the interview schedule, which determined the duration of the interviews.

5.3.5 RECORDING OF INTERVIEWS

The average duration of the interviews was 75 minutes. All interviews were tape recorded with the permission of the interviewees, unless the interviewee was located outside the Western Cape. In these cases the interview questions were sent to the interviewee via electronic mail and the interviewee was requested to complete the attached set of questions and to return the answers to the questions to the researcher via electronic mail. **(See Appendix Q.)** The researcher telephonically followed up on issues that required clarity. The researcher obtained permission for interviewees to use information obtained from the interviews for the purpose of this research project.

5.4 ANALYSIS OF THE DATA

De Vos (2002b: 339) states that data analysis of qualitative data is "the process of bringing order, structure and meaning to the mass of collected data". Although qualitative data analysis could be regarded as a "messy, ambiguous, time-consuming, creative and fascinating process", it consists mainly of "a search for general statements about relationships among categories of data" (De Vos, 2002b: 340). Cresswell (1998) in De Vos (2002b: 340) believes that "the process of data analysis and interpretation can best be represented in a spiral image ... the researcher moves in analytical circles rather than using a fixed linear approach". The analytical spiral of data analysis as defined by De Vos (2002b: 340) consists of five different steps:

- Collecting and recording the data.
- Managing the data.

- Reading and memoing the data.
- Describing, classifying and interpreting the data.
- Representing and visualising the data.

The classification of the data should reflect categories that have "internal convergence and external divergence" (De Vos, 2002b: 344), which resulted in the following classification of the interview questions for data analysis:

- **Questions 1-6**: General, broadly-based concepts consisting of a SWOT analysis of the textile industry, critical aspects and strategies to ensure growth and survival of the industry, as well as a prediction of the future of the textile industry in South Africa.
- **Questions 7-11**: Key strategic factors impacting on the textile industry.
- **Questions 12-15**: Skills development, education and training of the textile industry in general and textile technologist education and training in particular.

According to De Vos (2002b: 344), the analytic process demands "heightened awareness of the data, a focused attention ... and an openness to the subtle, tactic undercurrents of social life", while the researcher attempts to "identify salient themes, recurring ideas or language, and patterns of belief that link people and settings together".

5.4.1 SWOT ANALYSIS, CRITICAL ASPECTS & STRATEGIES Questions 1-6

5.4.1.1 Strengths of the SA textile industry

Mason (2003) emphasises the importance of a good infrastructure, power supply and natural resources as positive aspects, while Bowen (2003) extends these to include training infrastructure and funding available for training. The number of large scale, vertically integrated, well equipped global players, complemented by highly flexible, low volume, niche producers and the amount of capital expenditure among the global players resulting in continuous improvement of technology are highlighted by both Bowen (2003) and Meeuwis (2003). Loots (2003) and Barkhuysen (2003) regard proximity to raw material supply and the general manufacturing capacity of the industry as strengths.

Gottshalk (2003) identifies the entrepreneurial spirit of management, the ability to handle short orders, the ability to utilize advanced technology in a relatively small-scale industry and the technical skills, especially of the knitted fabric industry, of a limited pool of experts as some of the strengths of the textile industry in South Africa. Barkhuysen (2003) indicates that the industry has "reasonable flexibility to adjust to market needs". According to Mason (2003) and Swiegers (2003) the strengths of the industry would include the ability of industry technical experts to communicate effectively in English with countries in Europe, America and the United Kingdom.

Bowen (2003) states that the prevalence of world class manufacturing standards among the larger factories should be listed as a strength; this view is supported by Meeuwis (2003) and Mason (2003), which makes South Africa, according to Mason (2003), "a good country to buy from".

Another important factor defined by Bowen (2003), Meeuwis (2003) and Swiegers (2003) is the prevalence of a fairly sound customer base both with the country and outside the country, especially in North America and Europe and ready access to sufficient raw materials (natural and man-made fibres) to feed production processes. Rasool (2003) contends that the stability of the workforce could also be regarded as a strong point. Swiegers (2003) indicates that from the perspective of a yarn spinner the high-value added garments manufactured in South Africa are on par with the rest of the world and emphasises that generally good working relationships exist between clothing and textile manufacturers, especially those manufacturing tailored garments.

5.4.1.2 Weaknesses of the SA textile industry

Meeuwis (2003) and Bowen (2003) emphasise that high cost of labour relative to our competitors should be regarded as a weakness in those sub-sectors where firms are competing in price sensitive commodity market segments dominated by Eastern producers. In upper market, high value-added segments, labour cost is less of a weakness. In these segments the major weaknesses pertain to the domestic cost of capital, which restricts the purchase of the latest technologies. Loots (2003) regards technological advances as inadequate to respond effectively to international competition. Gottschalk (2003) is of the opinion that South African textile mills are relatively small in comparison to textile mills producing world-class volumes of production; this impacts negatively on the ability of the industry to compete internationally. The financial cost structure of the textile industry is another concern expressed by Gottschalk (2003); in his opinion "it is missing a world-competitive element" in the way mills cost their products, which could be related to input costs. According to Mason (2003), work ethics are lacking in the industry, especially among workers, with a culture of "what is in it for me?" and "we'll only do as much as we have to do", which is impacting negatively on the ability of the industry to compete with countries like Taiwan, Korea and Hong Kong, where, according to Mason (2003) "the culture there is totally different ... the fact that they've got a job, ... it's an honour to have a job". Loots (2003) supports this view by regarding low productivity is as weakness of the industry.

Rasool (2003) states that outdated machinery and equipment could be regarded as a particular weakness. Meeuwis (2003) contends that a lack of profit derived from research and development initiatives and/or independent design capabilities is hampering progress, while Rasool (2003) states that the development of a culture of research and development requires attention. Bowen (2003) draws attention to the fact that South Africa has no textile machinery and equipment production capabilities, which necessitates importing new technology at a relatively high cost (depending on the strength of the South African currency).

The dependence of the industry on foreign currency fluctuations and the strength of the South African currency at present are seen as weaknesses by most experts. Other weaknesses defined by Bowen (2003) would include the high cost of capital (dependent on the interest rates and value of the South African Rand) and the distance between South Africa and overseas customers. Swiegers (2003) indicates that it takes "four weeks by ship to the United States and three weeks to the United Kingdom", which requires the industry to be dependent on the transport infrastructure to respond rapidly to customer demands.

Rasool (2003) and Barkhuysen (2003) focus on the lack of highly skilled technical and management staff, the high illiteracy rates and the low-skills base of the industry in general, to respond effectively to globalisation. Barkhuysen (2003) is also concerned about the low levels of innovation prevailing in the industry. Swiegers (2003) contends that there seems to be a lack of skills at supervisory level that impacts negatively on production. According to Swiegers (2003), the majority of top management in the textile industry is at retirement age, *yet there seems to be a large gap of approximately 20-30 years between top management* and middle management, which could be regarded as a "serious problem" and unless this problem is addressed, "the industry will not survive". Unless the industry is being made more attractive to people, the industry will continue to lose highly skilled labour. Gottshalk (2003) emphasises a lack of world-class technologists in the dyeing, printing and finishing sectors of the industry.

Rasool (2003), Swiegers (2003) and Gottschalk (2003) mention that manufacturers do not fully harness effective supply chain management. Swiegers (2003), by citing practical examples, emphasises that unhealthy rivalry among manufacturers is also seen as a weakness of the industry in general. Gottschalk (2003) argues, "instead of being competitive, they should be in collaborative competition, which broadly means they should be looking at competing on the world market rather than competing with each other, both locally and internationally". Gottschalk (2003) substantiates his statement thus by saying, "I *think there are a lot of egos involved in the industry on that basis."*

Swiegers (2003) argues that marketing of the textile industry is poor, and that "we do not market our abilities", resulting in a loss of orders to other countries like Mauritius. Other weaknesses, according to Swiegers (2003) are the level of service to customers, "which is far too low" and is hampering growth of exports, and "the lack of export orientated people in the industry". According to Swiegers (2003), exporting companies should focus more on "why orders are late" and then act accordingly. Gottschalk (2003) is concerned about the adherence to deliveries and states that quality inconsistency is not acceptable, with quality variations between batches.

Swiegers (2003) also mentions that South Africa is lacking "good cotton dyeing facilities", resulting in a dyed cotton yarn being imported from overseas. Gottshalk (2003) states that the industry is lacking in the development of new yarn types and the yarn spinning industry in general "is not as strong", with fluctuations in the quality of cotton yarn.

5.4.1.3 Opportunities for the SA textile industry

> The industry's opportunities rest in relation to its transformation into a world-class converter of fibre, yarn, fabric and finished textiles for discerning, high value added markets. If the industry succeeds in being able to compete with first world textile producers such as Korea, Italy and Taiwan, three of the five most important textile exporters globally, its growth potential is huge. In such a scenario the industry will contribute substantially to the revitalisation of the South African manufacturing sector, thus helping to prosperously develop South Africa's socio-economic environment. In this regard it is important to recognise that opportunities will also be dependent upon the stance and progressiveness of the local downstream converting sector, amongst others, to overcome time consuming distances from target markets and through shift-work, which would shorten the delivery cycle considerably (Bowen, 2003).

This opinion is echoed by all the experts interviewed, with emphasis on the opportunities created by the Growth & Opportunities Act (AGOA) and European Union trade agreements. Rasool (2003) and Swiegers (2003) contend that the South African textile industry should also explore trade opportunities with other African countries, while Barkhuysen (2003) suggests that European Union trade partners should relocate their manufacturing businesses to South Africa instead of the Far East. Swiegers (2003) is optimistic about the potential of the textile industry to establish markets in Africa, and cites examples of other South African industries exploring African markets successfully.

Swiegers (2003) indicates "there is an emerging black market in South Africa", while Rasool (2003) emphasises that the industry should commit itself to "broad-based black economic empowerment".

Rasool (2003) encourages textile-manufacturing companies to fully explore opportunities created by skills development legislation and to develop a world-class workforce, aspiring to world-class manufacturing standards and improved productivity, which will result in increased exports and domestic market sales. Swiegers (2003) suggests that the institutions of higher learning should use the industry experts to impart skills to enhance the competitiveness of the industry.

Gottschalk (2003) encourages the development of "highly innovative short-run production" and "quick response strategies". The development of niche markets and collaborative market strategies are also potential opportunities for the industry according to Gottschalk (2003), who singles the yarn spinning industry out as an opportunity for the development of new products, potentially leading to new niche markets. Loots (2003) also focuses on "specialisation to serve more lucrative niche markets".

5.4.1.4 Threats to the SA textile industry

Bowen (2003) and Meeuwis (2003) support the view of the Textile Federation of SA, which outlines the strategic plan of the industry for the next few years. The strategic plan describes the major threat facing the South African textile industry as its inability to compete in standard commodity-based market segments where labour costs are a key competitiveness determinant. According to Bowen (2003) and Meeuwis (2003), firms which continue to compete in these markets are likely to find their position increasingly difficult and yet this presently represents the "bread and butter" of the South African textile industry, particularly in terms of domestic and AGOA market supply. Notwithstanding this and accepting that the South African textile sector has very limited opportunities to compete against Eastern manufacturers in low, value-added markets, the major threat confronting the textile industry relates to its potential failure to move up the value chain and into new higher value-added market segments. It is, however, recognised that "value adding" reflects not only price points, but includes short cycle manufacture and quality consistency.

Rasool (2003) identifies the "volatile global and domestic economic environment" and an unstable exchange rate as further threats to the industry, which could result a "high number of job losses, closures and downsizing of companies". Both Mason (2003) and Rasool (2003) indicate that a flood of cheap imports, both legal and illegal, into the domestic markets, as well as ineffective customs control are potential problem areas. Swiegers (2003) warns against the threat that the Chinese clothing and textile industries present, citing an example of a Chinese textile mill that "owns the town", workers living in the "factory's houses", with labourers working in the yarn packaging division of the textile mill "for nothing just to get an opportunity to work in the factory".

Gottschalk (2003) states the approach to the total pipeline of clothing and textiles by the Department of Trade & Industry is a threat to the industry, although he acknowledges that the industry itself is not "good at integrating their own strategies" to the benefit of the "total pipeline". Although Gottschalk (2003) indicates that the Department of Trade & Industry has a "conceptual grasp of the issues" of the "total pipeline", the Department is unsure how to act on these issues, owing to a lack of "specific information" which is influenced by the ability of the industry to collaborate on the "beginning and the end of the pipeline".

The "aging expertise base" of the industry is highlighted as a potential threat by Swiegers (2003), who also states that not enough young people are entering the industry, with "textiles not being as attractive as the IT sector ... we've got to make it more attractive" with "*salaries for textile technologists not being as good as [they] could be compared to other* sectors". Barkhuysen (2003) is also concerned about the "poor image [of the industry] that can negate [*sic*] potential students" to higher education institutions.

Rasool (2003) expresses his concern regarding "the rapid tariff phase-down by government ahead of timelines", which if supported by Mason (2003) who states that "the GATT treaty was a big mistake by government, and I feel that government are not helping the industry, but actually *trying* to destroy the industry in a *round-about-way*".

5.4.1.5 Future of the SA textile industry

All the interviewees agree that the SA textile industry has a future, but that the future is dependent on "the choices the industry and the government make today" (Swiegers, 2003) and the ability of textile mills to move away from "low price, long run products" (Gottschalk, 2003) into high value-added products focusing on the establishment of niche markets and quick response strategies.

Mason (2003) states "the only way we have to come out is in the niche market, with the real technical, innovative design, and also there would be a future if the companies can fast react to the change or the retail demands, because they'll not be able to get that from imports". By comparing the South African textile industry with textile mills in the United Kingdom, Gottschalk (2003) supports the view of Mason (2003), who indicates that manufacturers focusing on "topping-up on 'a winner' ... if it is a very good seller in the stores", could do well in the future. "In terms of world production the only future would be collaboration and to become really smarter and quicker at getting:

i) New products to the market and;
ii) repeating winners into the market" (Gottschalk, 2003).

According to Rasool (2003), the textile industry is likely to survive in the medium- to long-term in a different form, "with globalisation and advancements in technology, companies are likely to be further reduced in size, utilizing new technology and fewer more highly skilled technical workers". Gottschalk (2003) supports this view and indicates that "growing in terms in output – productivity, efficiency and technology" would strengthen the industry in future.

Gottschalk (2003) is also of the opinion that if textile manufacturers develop new products and technology the Department of Trade & Industry has to provide "protection for the local market on the new products". Trade barriers by EU and the USA to protect their markets against Chinese imports will provide an opportunity to supply those markets, but South African textile manufacturers will have to be "a lot smarter, cleverer and quicker", according to Gottschalk (2003), to benefit from these opportunities in future.

5.4.1.6 Critical aspects and future strategies determining the future of the SA textile industry

Loots (2003) encourages the industry to "move away from the false protected environment that was created in the isolation years [of South Africa] and [which is] prolonged by the strong influence of labour unions". Bowen (2003) and Meeuwis (2003) refer to the strategy plan developed by the Textile Federation of SA when defining the critical aspects and future strategies of the textile industry. Bowen (2003) states "a key element in any future strategy will be the ability of the industry to work with the government in a fully integrated way for the betterment of the industry". The key strategies of the Textile Federation of SA are as follows:

- **Growth in sales and employment**: The industry is committed to achieve a minimum of 80 per cent inflation adjusted sales growth and 20 per cent employment growth.
- **Penetration of value-added export markets**: By substantially increasing levels of exporting in particular markets, companies should gain economies of scale, which will enhance global competitiveness.
- **Consolidation and enhancement of the industry's domestic market presence**: Bolstering the domestic performance at each link of the textile chain from fibre to

finished textile product, will strengthen the capacity of the industry to compete internationally.

- **Adoption of world class manufacturing standards**: By adopting 'lean manufacturing principles', the industry will establish itself as a competitive global player. These principles include the development of multi-skilled and multi-tasked workers who are able to work effectively in teams.
- **Development of a more skilled and technically capable workforce**: The industry recognises the shortage of technician and technologist level skills and suggests "an infusion of technical qualifications and skills, as well as experience from expatriates is required by the industry if firms are to attain global competitiveness" (TEXFED, 2002: 16).
- **Enhancement of capital investment**: The levels of investment will have to increase substantially to respond to rapid technology advances occurring in the textile industry internationally.
- **Commitment to a dynamic transformation process**: The industry commits itself to the purchasing from historically disadvantaged individual (HDI)-owned business and to "the development of technically qualified affirmative action employees into management positions" (TEXFED, 2002: 19).
- **Commitment to international environmental standards**: The industry commits itself to the concept of cleaner production and waste minimisation programmes and to compliance with international quality standards.

Loots (2003) regards the development of a "superior training regime [and] the introduction of state of the art technology to improve productivity and specialisation" as the two critical aspects that will enable the industry to meet future challenges. Barkhuysen (2003) lists the following four aspects that will determine the future of the textile industry:

- Technological innovation.
- Niche product development.
- Optimisation of Best Available Techniques (BAT).
- Technical and technological skills base improvement.

Mason (2003) singles out the development of technical skills as a critical aspect, which is supported by Swiegers (2003) and Bowen (2003), who state that the training of technologists and the development of middle management respectively should be regarded as essential elements to the future success of the industry and that the Clothing, Textiles, Footwear & Leather SETA has a pivotal role to play in this regard. Rasool (2003) and Mason (2003) confirm that increased investment in research and development, as well as capitalisation of the industry, is critical. Swiegers (2003) suggests that government should implement effective incentive schemes for industry to acquire new technology.

Mason (2003) and Gottschalk (2003) emphasise the important role of government in developing strategies to support and grow the industry, while Bowen (2003) focuses on investment in technology, the growth of domestic and foreign markets, as well as adherence to best practice and world class manufacturing practices. Meeuwis (2003) indicates "the ability to find and exploit niche markets with competitively priced products" should be regarded as a critical aspect for future development. Gottschalk (2003) also refers to the role of local retailers to purchase locally and the "willingness of the local retailers to commit some form of their purchases to the local industry". The African Growth & Opportunities Act did not benefit the textile industry "the way it should have", which could have been influenced by "the lack of market intelligence ... there have been lost opportunities" and local clothing manufacturers did not work in partnership with textile manufacturers to give the industry "some of the due benefits" (Gottschalk, 2003). The textile industry should also explore opportunities of working with European textile mills to develop products for both the local and international markets – "if they could come to some sort of collaborative agreement with European mills ... there is a possibility of an outsourcing operation, because our production costs are lower than those of Europe ... so that would help ensure the survival and growth of the local textile industry" (Gottschalk, 2003). In developing a strategy for the textile industry of South Africa, Gottschalk (2003) suggests that textile manufacturers should critically assess the requirements of the overseas market, "because that is what will be required by the local market two, three years down the road"; this assessment should include aspects such as price, production cost structure, protection required by the local market, the development of collaborative markets for those products in sector groups and how to deliver the products to those market according to their quality specifications. This strategy might require "stock investment response, building partnerships ... better partnership with the DTI ... [and] cooperation with both fibre and garment sectors of the pipeline ... [as well as] the ability to employ expert expatriate labour without unnecessary bureaucracy" (Gottschalk, 2003).

5.4.1.7 Sectors of the textile industry

Swiegers (2003) warns that if the industry does not invest in modern equipment and develop specialist skills "it will follow the UK textile model and die".

Bowen (2003) identifies woven and knitted fabrics, knitted products, yarn spinning, blankets, home textiles, worsted fabrics and technical textiles as sectors that will survive and grow in the future, while "carpets are probably at greatest risk as a result of the increasing use of tiled flooring in the country".

Meeuwis (2003) recommends industrial textiles and specialist products as potential areas of growth, while Rasool (2003) holds the view that "all sectors in the industry have a future to grow subject to meeting the needs of the marketplace and reorienting their operations to achieve greater global competitiveness".

Mason (2003) indicates that fashion changes influence customer demand and suggests that sectors focusing on the production of apparel, warp-knitted fabrics and specialised nylon-lycra fabrics have a good future. He also contends that "more sophisticated" products should have a good future, although he points out that it is difficult to relate these products to a particular sector of the industry. With reference to technical textiles, Mason (2003) argues that textile mills manufacturing coated-fabrics should do well in future, but warns that quality standards should be adhered to if these mills are to be successful.

Gottschalk (2003) is confident that the knitted fabric industry and yarn spinning industry, as well as industrial textiles, especially niche products, should grow. The worsted fabric industry has the benefit of the raw material [wool] being produced in South Africa, but this is dependent on constant upgrading of technology – "it all becomes what in world terms are niche products" (Gottschalk, 2003).

Barkhuysen (2003) is confident that the technical textile sector has a strong future in South Africa.

5.4.2 KEY STRATEGIC FACTORS IMPACTING ON THE TEXTILE INDUSTRY Questions 7-11

5.4.2.1 Human qualities, skills and knowledge

Mason (2003) defines "integrity and work ethics" as the main human qualities required to established world-class manufacturing practices, while technical skills are essential, "you've got to get the skills in the industry that can deal with the type of problem ... that you don't find in a book ... they [employees] don't have the critical thinking skills". "What we [textile manufacturing companies] are looking for ... the training must be developed to make people think laterally ... asking why and then working in logical sequence" to solve a problem (Mason, 2003). Mason (2003) continues by emphasising that "fault finding ... [is] very, very important ... and being able to think a process through, a problem through to a logical conclusion". Training should consist of both a theoretical component and practical component to develop these skills. Mason (2003) is critical of textile manufacturing companies in terms of the selection criteria used to identify potential learners for training programmes, which often result in learners "who are never, ever going to make it".

Gottschalk defines "the willingness to impart knowledge to subordinates and mentorship abilities" and "marketing skills" as well as "willingness of labour to understand that survival depends on productivity in the broad sense and that everyone is competing on a world-wide basis" as the key aspects of skills development. Gottschalk (2003) emphasises the constant upgrading of technical skills in modern technology and suggests that management should also critically look at benchmarking of productivity. Investment in research and development should also be "targeted to specific industry needs" and "industry should work with research institutions" (Gottschalk, 2003). Barkhuysen (2003) indicates that the availability of "high calibre technologists capable of a higher level of relevant innovation" is a crucial element of human resources required by the industry.

Swiegers (2003) recommends "working in the textile industry requires a strong personality ... someone who is prepared to get his hands dirty ... someone who is prepared to get stuck in"; he also recommends that technikon graduates should be willing to learn and to "start from scratch".

Bowen (2003) identifies a range of skills and knowledge, which include the following:

- Technical skills, including an in-depth understanding of production processes across the textile spectrum with a specialisation in one or two main processes in terms of internationally recognised standards.
- Design \ innovation skills, including an ability to analyse current production processes and associated machinery and to identify areas of improvement which impact on the bottom line.
- Production management skills including the ability to manage complex production processes involving such skills as costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management \ continuous improvement.
- Testing skills, including an understanding of a range of product \ process tests and testing techniques.
- Thinking skills, including the ability to think critically, laterally, analytically and focus on results \ outcomes \ solutions rather than on problem identification.

5.4.2.2 Need for cooperation

All the interviewees agree that there is a need for cooperation between textile companies in areas such as research and development, education and training and the development of 'best practice methods' for the industry, yet Bowen (2003) states "whether it is a pipe dream or whether we can get the various companies to buy into the process is another matter altogether". This sentiment is echoed by Swiegers (2003) and Mason (2003), who asks "how do you manage it, without giving away the competitive edge ... that's the difficulty", although Mason (2003) agrees that higher education institutions have a coordinating role to play. Mason (2003) and Barkhuysen (2003) confirm that there is a need for cooperation in the area of education and training, which is supported by Gottschalk (2003) who states that "unless you have a specific targeted need", full cooperation should be possible, especially with learnerships and learning material development.

Gottschalk (2003) cautions against "how one defines cooperation" and suggests that possibly cooperation could exist in areas such as "issues of 'dead' cotton" and "issues of water effluent treatment". According to Gottschalk (2003) if companies, through areas of cooperation, could find "cost advantages, without compromising what they believe are their competitive advantages", cooperation will be possible.

5.4.2.3 Manufacturing practices of the textile industry

The low level of innovation in terms of manufacturing practices currently employed by the industry is a "serious limitation" (Rasool, 2003). Although Bowen (2003), supported by Meeuwis (2003), regards larger, vertically integrated mills as being more innovative, "whether they are innovative enough is open to conjecture, but the critical issue is that unless all mills become as innovative as possible and can keep abreast of foreign competitors ... they will struggle to survive". Gottschalk (2003) indicates that manufacturing practices are often "sector specific", with considerable amounts of money being spent by market leaders, such as SANS and Gelvenor Textiles. This view is supported by Mason (2003), who states innovative manufacturing practices are "very fragmented ... some are and some are not ... in my experience to date the majority are not ... a lot of the companies are still in their protectionist mode", which stifles innovative practices. Mason (2003) argues that companies are often "set in their ways", while Gottschalk (2003) argues that although market leaders are spending considerable amounts of money on capital equipment, the high cost of equipment could be regarded as a constraint. Gottschalk (2003) argues that innovation is often driven by local market demands, and less by export initiatives. Swiegers (2003) indicates that although innovation in design is "generally good ... the same cannot be said for knitting yarn development" where development is slow. Both Barkhuysen (2003) and Loots (2003) reserve comment on this question.

5.4.2.4 Investment in technology

"Over the last five years the industry has spent approximately 5% of turnover on recapitalization. Although this is an impressive effort, given the position of the Rand, the benefits may not have been as great as they appear to be. Obviously, the process has to continue and be broadened to include all textile companies so that modern technology is the order of the day in the factories" (Bowen, 2003). Rasool (2003), Meeuwis (2003), Swiegers (2003) and Gottschalk (2003) support this view, while Gottschalk (2003) and Swiegers (2003) are concerned about the technical skills currently available in the industry to remain globally competitive.

According to Swiegers (2003) and Mason (2003), equipment could be regarded as outdated, although both agree that the high cost of replacement is a problem. As previously suggested by Swiegers (2003), Mason (2003) also supports the establishment incentive schemes to support industry to acquire new technology. "If you lose your textile industry, *you're not going to get it back ... the only way we can keep it going, is have state-of-the-art* equipment to be competitive ... the government really need to do something to assist companies" (Mason, 2003). Gottschalk (2003) recommends that investment in technology *"should largely be around, what I would call 'quick response equipment' and 'high value-*added ability equipment' ... to add value".

5.4.2.5 Investment in research and development

Gottschalk (2003) and Mason (2003) argue that very little investment in research and development is taking place, owing to limited financial capacity. Loots (2003) indicates that research and development should be "a function of government" and warns that government is neglecting this aspect "to the extent that the focus seems to be on craft level, instead of being on commercial activity". Although higher education institutions could play a role in this regard, owing to their limited capacity it would require "a major injection of funding for equipment and even more long-term funding of skilled people to work with industry" (Gottschalk, 2003). Another suggestion would be to persuade government to fund research and development initiatives through higher education institutions in partnership with industry to develop niche market products. Mason *(2003) is concerned about companies following* through on strategic plans and states that they "seem to be in 'survival mode' and not looking at putting money into research and development." Bowen (2003) is of the opinion that research and development is mainly focused on product development and that "the amount of research into educational aspects of the industry is woeful".

5.4.3 SKILLS DEVELOPMENT, EDUCATION & TRAINING Questions 12-15

5.4.3.1 Level of knowledge and skills of the labour market

All those interviewed agree that the present levels of knowledge and skills of the labour market in general, are not meeting the demands of globalisation, with specific reference to the use of advanced manufacturing technology. Bowen (2003), Rasool (2003) and Meeuwis

(2003) support the development of "highly specialised skills", yet according to Meeuwis (2003), "the industry is not big enough to warrant the specialised training required".

According to Gottschalk (2003), "the technikons are producing technologists ... in terms of knowledge and ability, between 50 – 75 per cent of what is required by the industry, ... if it is 50 per cent, then the technikons have to look at their input to the students, if it is 75 per cent, I believe that with the current level of financial input from industry and government, that's about the best we could do ... in any case, even overseas [students] would still require time in industry to upgrade that ... to get a 100 per cent you would have to import expatriates at this stage". Gottschalk (2003) indicates that technikons need to assess critically the success of the programmes currently being offered, but also agrees that the pool of industry experts with higher qualifications in clothing and textiles is limited in this country, which would require importing expertise from overseas. Swiegers (2003) recommends that technikons should be more active in recruiting students from industry to increase student numbers in textile technology. Mason (2003) believes that there is a critical shortage of technically competent employees at NQF level 4 in the industry and that training programmes should specifically be aimed at NQF level 4, followed by NQF level 6, as the next level being earmarked for development. The development of assessment instruments to determine learning potential is important, if employees who enter formal education are to be successful, especially those who have been in industry for a number of years (Mason, 2003).

5.4.3.2 Education and training programmes

Rasool (2003) is very critical of education and training programmes currently being offered by training providers and views curriculum change as being "slow, bureaucratic and ineffective", also lacking "creativity and innovation in curriculum design" and "not keeping up with the advances of industry". While Gottschalk (2003) indicates that if technikons do not satisfy industry requirements "it would be because the industry hasn't told you what their requirements are ... the majority of the problem is their fault and not yours [Peninsula Technikon's], because they haven't told you what they need and are not prepared to financially support you with their requirements". Barkhuysen (2003) contends that feedback from industry suggests that education and training programmes at tertiary level are not effectively addressing the needs of industry. According to Rasool (2003), "a decided lack of structured focus on experiential learning" is also impacting negatively on the effectiveness of programmes meeting the needs of industry.

Bowen (2003) is more optimistic, but is concerned about the quality of education that varies "from region to region with significant impact on organisations within the 'poorer' regions". Different delivery mechanisms should be investigated to increase the impact of training programmes and Bowen (2003) lists as examples: part-time offerings, distance learning, e-learning and internet-based learning.

Mason (2003) is confident that the "course content" of education and training programmes is designed to meet the needs of industry, but is concerned, once again, about the selection criteria used by industry to determine the learning potential of learners entering higher education.

Swiegers (2003) indicates that business and management skills were not included in the National Diploma Textile Technology programme at the Durban Institute of Technology when he obtained his qualification a few years ago, but recommends the inclusion of these skills in current and future programmes, since he had to acquire these skills after graduation in order to function in his current position as sales manager. Project management, information technology and product development are important aspects to be included in textile technology programmes, if textile technologists are to work effectively in a global market (Swiegers, 2003).

According to Gottschalk (2003) the Clothing, Textiles, Footwear and Leather SETA has a role to play in channelling funding to specialist training initiatives at technikons, for example, offering of seminars, staff exchange programmes with international institutions, etc.

5.4.3.3 The need for textile technologists

Barkhuysen (2003) confirms that there is a need for textile technologists in the industry of the future by stating, "this is a key element in the survival and sustainability of the industry". Swiegers (2003) confirms the need for textile technologists by stating, "good technologists can write their own pay cheques due to a critical shortage [of technologists]." All the interviewees confirm that there is definitely a need for textile technologists in the industry.

Gottschalk (2003) also believes that there is need to assess the training needs of retailers more critically with the view to meeting the demands of a global trade environment.

Gottschalk (2003) is concerned about low student numbers in textile technology at tertiary level, which might impact negatively on sustaining these programmes. According to Gottschalk (2003), if global trade increases, especially through the opportunities created by the African Growth and Opportunities Act and SADEC trade agreements, opportunities might be created for technikons to "grow their student base" through agreements with global companies to enrol students at technikons in South Africa.

5.4.3.4 The role of textile technologists

Mason (2003) defines a textile technologist as "a catalyst between all the disciplines" who should have "a general knowledge of all disciplines in the industry and bring those together to make a product". Mason (2003) warns that often the role of textile technologists is being confused with that of quality controllers or technicians.

Gottschalk (2003) indicates that textile technologists have a dual function in industry: "the one role is in the production side of business and the other role is in the product development side of business", which presents a challenge to ensure that textile technologists must be "rounded enough to work with their colleagues on either side of the business ... individuals require knowledge of both". In his view, Gottschalk (2003) defines "the production side of business" relating to productivity, production management, use of equipment, production capacity, throughput rates and problem solving of production problems, while the "product development side of business" relates to creativity, machine capabilities to produce new production, costing and marketing, as well as the ability to adapt a new product to suit both the market and the manufacturing environment. Mason (2003), based on his own experience, supports the view expressed by Gottschalk (2003), and emphasises the role of future textile technologists in the development of new products, especially within a competitive global textile market.

Swiegers (2003) recommends that textile technology graduates must be clear on what they "want to achieve in life ... if they achieve their objectives [in industry]... they will stay there [industry]".

In closing, Swiegers (2003) states: "Good textile technologists will become tomorrow's *leaders in our industry." This is supported by Bowen (2003), who states: "Technologists will* drive the future of the industry through their high levels of knowledge and skill" and Barkhuysen (2003) who regards the role of the textile technologist as that of an innovator of new products and processes.

The interpretation of the data obtained from the interviews with key role-players is presented in **Chapter 7** of this thesis, as well as implications for high-level textile technologist learning programmes.

Chapter 6

Curriculum-orientated evaluation
A quantitative study

6.1 INTRODUCTION

The qualitative research described in the previous chapter focuses mainly on the factors impacting on the changing environment of the textile industry and to what extent these factors would impact on curriculum-orientated evaluation of an outcomes-based textile technologist-learning programme at Peninsula Technikon, as well as to obtain confirmation regarding the need to establish an outcomes-based textile technologist learning programme at Peninsula Technikon in January 2001.

This chapter will focus on the quantitative research method selected as most appropriate to achieve the objectives of this research project as outlined in **Chapter 1**. The suitability of the method is substantiated and the methods of data collection and sampling are discussed. A description of the data obtained from the questionnaire is also provided.

6.2 BACKGROUND

Chapter 4 of this thesis outlines the curriculum design process of an outcomes-based textile technologist learning programme at the Peninsula Technikon, reflecting mainly on the literature review underpinning the curriculum design and the curriculum-orientated evaluation phases, which led to the implementation of the outcomes-based National Diploma in Textile Technology at the Peninsula Technikon in January 2001.

The purpose of this quantitative study is to critically evaluate the subject-specific knowledge and skills or enabling outcomes of the outcomes-based textile technologist learning programme designed for implementation of the National Diploma in Textile Technology at Peninsula Technikon in January 2001, with the view to determine "the success and effectiveness of the curriculum" (Carl, 1995: 49). **Paragraph 4.9** indicates that a distinction was made between learner-orientated evaluation, which implies "to determine the progress of the learners on the way to goal realization in respect of the lesson [unit of learning], or the annual programme [achievement of outcomes]", while curriculum evaluation "determines to what extent the objectives of the curriculum have been achieved" (Carl, 1995: 177). Curriculum-orientated evaluation, defined by Carl (1995: 177), could thus be regarded as a "broad and continuous effort to inquire into the effects of utilizing educational content and process according to clearly defined goals".

In an outcomes-based educational context curriculum-orientated evaluation would be concerned with the **value** of effectiveness of the curriculum and the **outcomes** [output] of the curriculum. "Curriculum evaluation therefore comprises the evaluation/value determination of the effectiveness/functionality of all curriculum actions and the curricula [learning programmes] that eminate from them" (Carl, 1995: 178). Human in Carl (1995: 180) argues that the effectiveness/value of a curriculum is not exclusively captured by the immediate outcome [output] thereof, but especially in the consequences/implications, which the curriculum has for individuals and community [industry] in the long-term. Curriculum anticipations of long-term effect usually arise from the rationale of the curriculum as being the basic purpose of the programme.

The purpose of the quantitative study is mainly:

- To determine the relevancy and effectiveness of the subject-specific knowledge and skills or enabling outcomes of the outcomes-based textile technologist learning programme designed by the curriculum design team before implementation of the National Diploma in Textile Technology at Peninsula Technikon in January 2001.
- To confirm the need for the establishment of an outcomes-based textile technologist learning programme at Peninsula Technikon in January 2001.

These objectives are being determined within the context of a changing external environment of the textile industry in South Africa in general, and the Western Cape in particular.

6.3 QUANTITATIVE RESEARCH METHOD & PREPARATION

Questionnaires are probably the most generally used, and most versatile instruments of quantitative research. The *New dictionary of social work* (1995: 51) in Delport (2002: 172) defines a questionnaire as "a set of questions on a form which is completed by the respondent in respect of a research project". The basic objective of a questionnaire, according to Delport (2002: 172), is to "obtain facts and opinions about a phenomenon from people who are informed on the particular issues".

6.3.1 RESEARCH INSTRUMENT

The researcher selected a mailed questionnaire as quantitative research method to achieve the objectives of the research project. Delahaye (2000: 198) confirms: "A well-designed questionnaire will provide accurate and usable data that will allow you [the researcher] to write confidently" about the research problem.

The purpose of the mailed questionnaire was:

- To detect the latest trends regarding the challenges facing the textile industry in the Western Cape.
- To critically evaluate the employability skills of textile technologists as defined by the industry at the contextual workshop that led to the development of a National Diploma in Textile Technology at Peninsula Technikon.
- To critically evaluate the subject-specific knowledge and skills or enabling outcomes of the National Diploma in Textile Technology implemented by Peninsula Technikon in 2001-2003, with the view to:
    - Inform the review process of the National Diploma in Textile Technology currently being offered at Peninsula Technikon.
    - Inform the curriculum development process of a BTech degree in Textile Technology at Peninsula Technikon.

The mailed questionnaire was aimed at measuring the knowledge and opinions of human resource managers, production managers or subject specialists of the Western Cape textile industry regarding the objectives of the research project by using the Likert Scale as response scale.

Using a mailed questionnaire as quantitative research instrument had the following advantages:

- At relatively low cost data could be obtained.
- A relatively large number of respondents could be reached in a brief period of time (Delport, 2002: 172).

However, mailed questionnaires also have certain limitations, in so far as the non-response rate is very high, some questions are left unanswered and questions are wrongly interpreted by respondents (Delport, 2002: 172-3). "Once a questionnaire is mailed out, it is at the mercy of the respondents – whether they decide to complete it; whether they interpret the questions as intended; and whether they answer the questions honestly" (Delahaye, 2000: 198).

In an attempt to increase the response rate, the researcher included a letter outlining the purpose of the research project, as well as an addressed, stamped envelope. Respondents were reminded that their participation in the research project would contribute towards the quest for excellence in textile education and training at Peninsula Technikon. Respondents were also invited to attend a feedback session on the findings of the research project in an attempt to stimulate interest. A field worker conducted a telephonic follow-up request to increase the response rate, which was followed by a second follow-up request to respondents who indicated their participation during the first telephonic follow-up requests.

The questionnaire (**Appendix R**) consisted of **three** sections:

- **Instruction section**: This section provided information to the respondents on how to complete the questionnaire.
- **Classification section**: This section, consisting of questions 1, 2 and 3, categorise the respondents according to nature of the business, size of the business, products being produced by the business and production processes being used by the business.
- **Factual and opinion-related data**: This section consisted of three closed questions seeking the knowledge and opinions of the respondents regarding the following aspects:
    - **Question 4:** Environmental change factors impacting on the textile industry during the next seven years (until 2010).
    - **Question 5:** Key competencies or employability skills required by textile technologists, with reference to the importance of these key competencies to the industry in general and the company in specific.

- **Question 6:** *Subject-specific skills and knowledge required by textile* technologists, with reference to the importance of these subject-specific skills and knowledge to the industry in general and the company in particular.
- **Question 7:** The development or recruitment of textile technologists in the next 5-7 years in terms of the number of textile technologists that would be required by the company and the area of specialisation (wet processing, dry processing or man-made fibre production and processing).

6.3.2 RESPONSE SYSTEM

The Likert Scale, consisting of the "breaking up [of] a continuum into a collection of equal intervals or categories" (Delport, 2002: 195) was used as response system to the following scaled questions in the questionnaire:

- **Question 4** consisted of closed questions [statements] using the four-point Likert Scale by allowing respondents to scale their response to the environmental change factors impacting on the textile industry during the next seven years.
- **Question 5** consisted of closed questions [statements] in two categories using the four-point Likert Scale by allowing respondents to scale their responses to key competencies of textile technologists in terms of general importance to the industry [Section 5A] and specific importance to their company [Section 5B]. Respondents were also invited to specify key competencies not listed in the questionnaire. It is important to note that the key competencies were randomly listed in the questionnaire.
- **Question 6** consisted of closed questions [statements] in two categories using the Likert Scale by allowing respondents to scale their responses to subject-specific skills and knowledge for textile technologists in terms of general importance to the industry [Section 6A] and specific importance to their company [Section 6B]. The four-point Likert scale statements [critical, very important, important and not important] as well as a fifth scale statement [not applicable] were included in this question to accommodate specialisation in production processes, for example textile manufacturers specialising in dry processing [spinning, weaving or knitting] would indicate 'not applicable' to learning outcomes associated wet processing [dyeing, printing and finishing], while textile manufacturers specialising in wet processing would do likewise by indicating 'not applicable' to learning outcomes associated with dry processing. Respondents were also invited to specify key competencies not listed in the questionnaire. It is important to

note that the learning outcomes were randomly listed in the questionnaire, preventing respondents from falling into a repetitive pattern. A subject heading per learning outcome was provided to avoid ambiguity.

6.3.3 DEFINITION AND SIZE OF THE SAMPLE

The researcher consulted reliable sources obtained from the Clothing, Textile, Footwear & Leather Sector Education & Training Authority (CTFL SETA) and the *Pursuit Index 2003* [South African clothing and textiles trade publication] to compile the sample for the quantitative research.

The sample constituted the total population of Western Cape textile manufacturers and retailers, textile auxiliary producers, suppliers & commissioners as well as knitwear manufacturers. A total of 98 questionnaires were mailed to these entities in November 2003. Five questionnaires were returned because of incorrect postal addresses and were excluded from the total population.

Appendix S provides a list of Western Cape textile and manufacturers and retailers.
Appendix T provides a list of textile auxiliary producers, suppliers & commissioners.
Appendix U provides a list of Western Cape knitwear manufacturers.

6.3.4 PILOTING THE QUESTIONNAIRE

"To obtain valid and reliable data one must ensure, before implementing the study, that the measurement procedures and the measurement instruments to be used have acceptable levels of reliability and validity" (Delport, 2002: 166). Pilot-testing of the questionnaire was conducted before the questionnaire was mailed to respondents to ensure content validity of the questionnaire. According to Bostwick and Kyte (1981: 105) in Delport (2002: 167) content validity is "a judgemental process"; by asking colleagues to assess the instrument "we rely on their judgement to establish its content validity".

The researcher requested two industry experts, representing vertically integrated Western Cape textile manufacturing companies in knitting and weaving respectively, to complete the questionnaire in a neutral environment under the supervision of an independent party before the questionnaire was mailed to respondents. Only after the recommended modifications were made to the questionnaire, was the questionnaire mailed to the full sample.

6.4 ANALYSIS OF THE DATA

6.4.1 INTRODUCTION

Kerlinger (1986: 125-126) in De Vos, Fouché and Venter (2002: 223), states that data analysis means "the categorising, ordering, manipulating and summarising of data to obtain answers to research questions". De Vos *et al.* (2002: 223) confirm that the purpose of data analysis is "to reduce data to an intelligible and interpretable form so that the relations of research problems can be studied, tested and conclusions drawn".

6.4.2 RESPONSE RATE

The sample constituted a total population of 98 entities of Western Cape textile manufacturers and retailers, textile auxiliary producers, suppliers & commissioners as well as knitwear manufacturers (5 entities were excluded as reported in Paragraph 6.3.3). **Table 6.1** indicates the response rate per category of the total population.

Table 6.1: Response rate per category of the total population

Category	Total number of entities per category	Total number of respondents per category	% Response rate per category
Western Cape textile manufacturers & retailers	62	26	41,94
Western Cape textile auxiliary producers, suppliers & commissioners	11	3	27,27
Western Cape knitwear manufacturers	20	3	15,00
Total	**93**	**32**	**34,41**

Two questionnaires were returned by the deadline with unanswered questions and one questionnaire was received after the deadline. These questionnaires had to be excluded from the statistical data analysis of the questionnaires, resulting in a total of 29 questionnaires being analysed, representing 30,8 per cent of the total population of 94 entities. When considering the relatively low response rate, it is important to remember that 62,07 per cent of the respondents were large textile manufacturing companies representing a large number of employees are reported in **Table 6.3**.

During the telephonic follow-up of the questionnaires a number of companies indicated that based on the size (small and medium) or the nature of their businesses (textile commissioners & knitwear manufacturers) they were unable to employ textile technologists and hence their reluctance to participate in the research project. The retrenchment of employees in larger textile manufacturing companies during the last quarter of 2003 as reported in **Paragraph 2.2.2** of this thesis, resulted in a depressing disposition in the industry in general, which impacted negatively on the willingness of human resource managers, production managers and subject specialists to participate in the research project.

The data obtained from questionnaires were statistically analysed with a well-known statistical computer package, SPSS (Statistical Package for the Social Sciences) by the Educational Development Centre at Peninsula Technikon. Univariate analysis of 290 variables was done, with frequency distributions being the most common form of analysis. (See **Appendix V.**) The frequency distribution tables are illustrated with graphic presentation in this chapter, using either bar graphs, doughnut graphs, histograms, frequency polygons, area charts or pie charts. Graphic presentations or figures are pictorial devices to illustrate data, which assist the researcher to "comprehend the essential features of frequency distributions and in the comparison of one frequency distribution with another" (Ferguson, 1976: 32 in De Vos *et al.* 2002: 230).

6.4.3 JOB TITLE OF RESPONDENTS

The researcher could compile the following data based on information obtained from the reply slips that were attached to the questionnaire (**Appendix R**).

Respondents according to job title constituted five broad categories:

- Human resource managers
- Chief Executive officers/directors/general managers/owners
- Training managers and skills development facilitators
- Technical managers
- Quality managers.

Human resource managers constituted 27,59 per cent of the total number of respondents to the questionnaire, followed by CEO/Director/General Managers with 20,69 per cent. Factory and production managers constituted 17,24 per cent of the total number of respondents. An equal number (10,34 per cent) of technical managers and quality managers respectively responded to the questionnaire. **Figure 6.1** depicts the distribution of respondents according to job title.

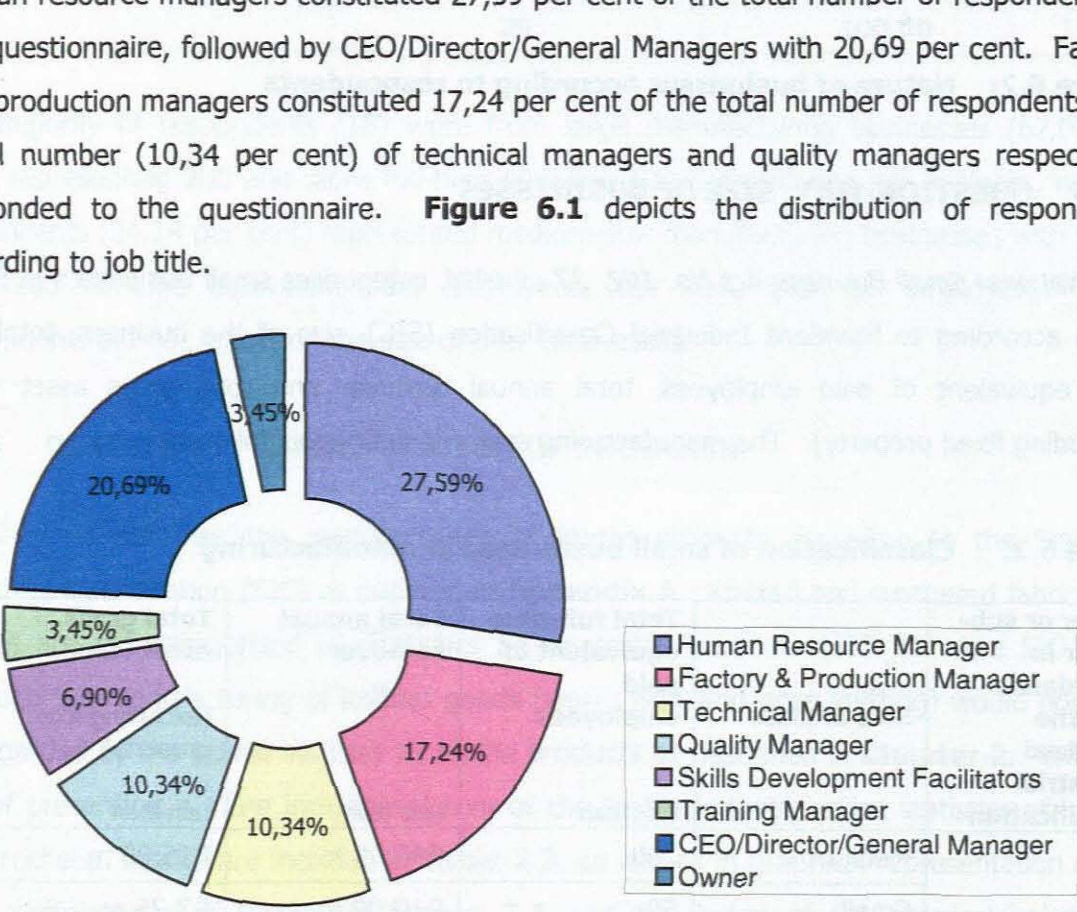


Figure 6.1: Job title of respondents

6.4.4 QUESTION 1(a): NATURE OF BUSINESSES

The majority of respondents (86,21 per cent) were manufacturers (including knitwear manufacturers), 10,34 per cent were retailers, while 3,45 per cent of respondents represented other categories (e.g. design).

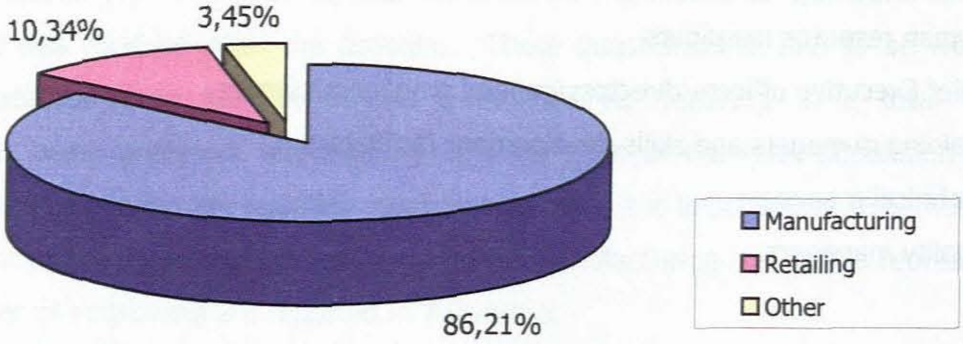


Figure 6.2: Nature of businesses according to respondents

6.4.5 QUESTION 1(b): SIZE OF BUSINESSES

The *National Small Business Act No. 102, 27 of 1996,* categorises small businesses in South Africa according to Standard Industrial Classification (SIC), size of the business, total full-time equivalent of paid employees, total annual turnover and total gross asset value (excluding fixed property). The manufacturing sector is defined as follows:

Table 6.2: Classification of small businesses in manufacturing

Sector or sub-sector in accordance with the Standard Industrial Classification	**Size or class**	**Total full-time equivalent of paid employees** Less than	**Total annual turnover** Less than	**Total gross asset value** (excluding fixed property) Less than
Manufacturing	Medium	200	R40,00 m	R15,00 m
	Small	50	R10,00 m	R3,75 m
	Very small	20	R4,00 m	R1,50 m
	Micro	5	R0,15 m	R0,10 m

Source: SA (1996)

Respondents were requested to classify their businesses according to the classification provided in the *National Small Business Act No. 102, 27 of 1996,* which resulted in the following number of responses as depicted in **Table 6.3**.

Table 6.3: Size of businesses according to respondents

Size of businesses		Frequency	Percentage
Very small	(less than 20)	1	3,45
Small	(less than 50)	1	3,45
Medium	(less than 200)	7	24,14
Large	(more than 201)	18	62,07
No response		2	6,90
		29	**100,00**

The majority of respondents (18) were from large manufacturing businesses (62,07 per cent) representing 200 and more full-time equivalent paid employees per business, while 7 respondents (24,14 per cent) represented medium-size manufacturing businesses with fewer than 200 full-time equivalent paid employees, but more than 50 employees. Two respondents did not report on the size of their businesses.

6.4.6 QUESTION 2: CLASSIFICATION OF PRODUCTS

Statistics SA classifies the manufacturing of textile products according to the Standard Industrial Classification (SIC) as outlined in **Appendix A**. Knitted and crocheted fabrics and articles are not categorised by Statistics SA as textile products (SIC 311 and SIC 312), although the manufacturing of knitted goods (warp, weft and hose knitting) would normally be regarded by the textile industry as textile products as described in **Chapter 2**. With the aim of presenting a more inclusive picture of the textile industry, sales statistics of knitted and crocheted fabrics are included in **Table 2.3**, as well as in graphical representation of the sales performance of textiles in **Figure 2.1** and the index of the physical volume of manufacturing production depicted in **Table 2.2** of thesis.

Respondents were required to indicate the textile products manufactured by their companies, according to the **sector or sub-sectors of the Standard Industrial Classification**. **Table 6.4** provides a summary of the frequency distribution of textile products produced by the respondents.

Table 6.4: Standard Industrial Classification of textile products of respondents to questionnaire

SIC Codes	Description	Frequency distribution Percentage		
		Yes	No	No response
311	**SPINNING, WEAVING AND FINISHING OF TEXTILES**			
3111	**Preparation and spinning of textile fibres; weaving of textiles**			
31111	*Preparatory activities in respect of animal fibres, including washing, combing and carding of wool*	0,00	72,40	27,60
31112	*Preparatory activities in respect of vegetable fibres*	10,30	62,10	27,60
31113	*Spinning, weaving and finishing of yarns and fabrics predominantly of wool and other animal fibres*	3,40	69,00	27,60
31114	*Spinning, weaving and finishing of yarns and fabrics predominantly of vegetable fibres*	10,30	65,50	24,10
3112	**Finishing of textiles**			
31120	*Finishing of purchased yarns and fabrics*	24,10	51,70	24,10
312	**MANUFACTURE OF OTHER TEXTILES**			
3121	**Manufacture of made-up textile articles, except apparel**			
31211	*Manufacture of blankets, made-up furnishing articles and stuffed articles*	10,30	62,10	27,60
31212	*Manufacture of tents, tarpaulins, sails and other canvas goods*	0,00	75,90	24,10
31213	*Manufacture of automotive textile goods (including safety belts, and seat covers)*	3,40	72,40	24,10
31219	*Manufacture of other textile articles (except apparel)*	10,30	65,50	24,10
3122	Manufacture of carpets, rugs and mats	3,40	72,40	24,10
3123	Manufacture of cordage, rope, twine and netting	0,00	75,90	24,10
3129	Manufacture of other textiles n.e.c.	17,20	55,20	27,60
313	**MANUFACTURE OF KNITTED AND CROCHETED FABRICS AND ARTICLES**			
31301	*Garment and hosiery knitting mills*	31,00	48,30	20,70
31309	*Other knitting mills*	13,80	62,10	24,10

A relatively high percentage of respondents did not indicate the textile products being manufactured by their companies, which could indicate that they are not familiar with the Standard Industrial Classification coding, hence a reluctance to respond accordingly. This reluctance can be contributed to the fact that 37,94 per cent of the respondents (human resource managers, skills development facilitators and training managers) who completed the questionnaire are not directly involved in manufacturing activities at their companies. The manufacture of garment and hosiery products constituted 31,0 per cent of products being manufactured, while 24,1 per cent of respondents indicated that their companies produced finished yarns and fabrics. Respondents indicated no active involvement in the following three sub-sector textile product categories:

- Preparatory activities in respect of animal fibres, including washing, combing and carding of wool.
- Manufacture of tents, tarpaulins, sails and other canvas goods.
- Manufacture of cordage, rope, twine and netting.

6.4.7 QUESTION 3: TEXTILE PRODUCTION PROCESSES

The textile clothing supply chain consists of fairly distinct production stages, as illustrated in **Figure 2.6**. These stages of production are characterised by elements relating to energy and water usage, labour and capital intensity and the lead-time required in bringing a new operation/investment into production. **Paragraph 2.6** of this thesis describes each production process and **Table 2.11** depicts the processes involved per broad sector of the textile industry.

Respondents were requested to indicate their company's involvement in the following broadly defined production processes:

- Spinning preparation and spinning
- Weaving preparation and weaving
- Dyeing preparation and dyeing
- Printing
- Fabric finishing
- Weft knitting
- Warp knitting
- Extrusion (including polymer manufacturing and melt extrusion)
- Non-wovens (including stitch bond and needle punch)
- Other production processes.

The highest percentage of respondents (44,80 per cent) indicated an involvement in dyeing preparation and dyeing, followed by 31,0 per cent who indicated an involvement in fabric finishing processes. A mean score of 24,38 per cent of no response data were also recorded. **Figure 6.3** provides an area chart of the frequency distribution of the data.

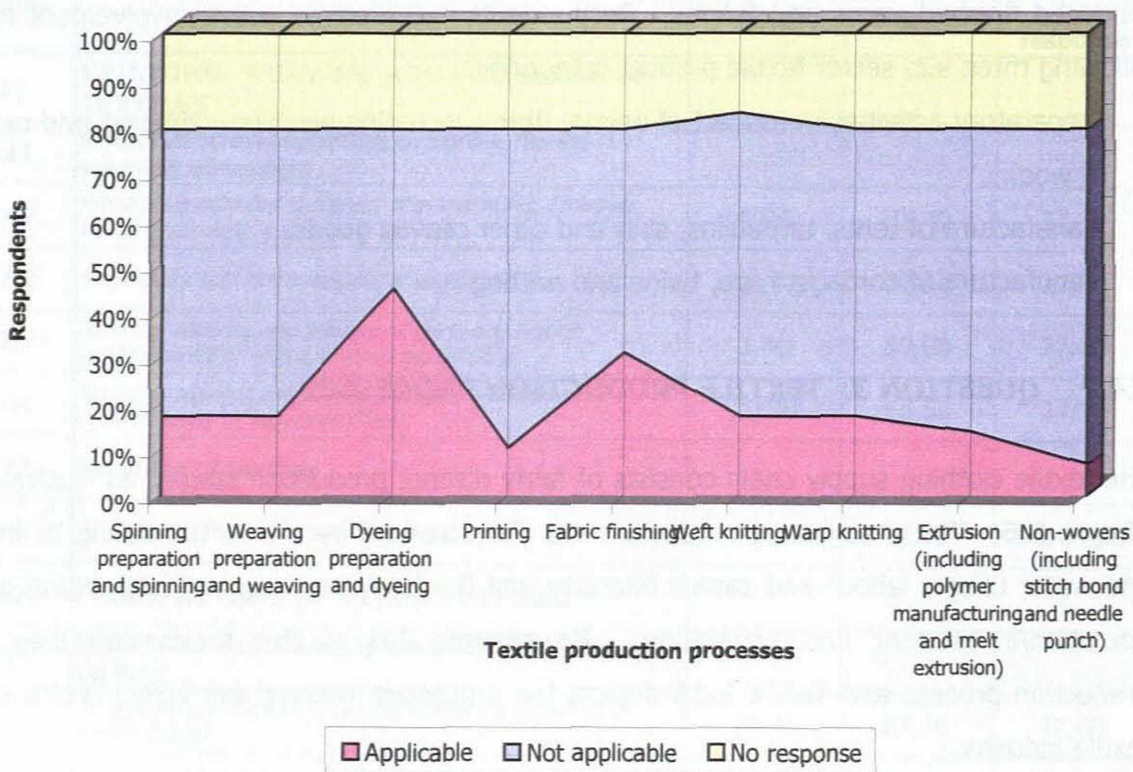


Figure 6.3: Textile production processes reported by respondents

Only 6,90 per cent of respondents reported an involvement in non-woven production processes. Printing is also relatively low with 10,30 per cent of respondents being involved in printing processes. An equal distribution of 17,20 per cent of respondents are involved in spinning preparation and spinning, weaving preparation and weaving, weft and warp knitting.

The following 'other' production processes were listed by respondents:

- Design.
- Assembly of textile products in finished products, e.g., sewing of curtains, garments, etc.
- Knotting, braiding and twisting of textile products.

6.4.8 QUESTION 4: FACTORS IMPACTING ON ENVIRONMENTAL CHANGE OF TEXTILE INDUSTRY UNTIL 2010

A list of eighteen environmental change factors was compiled for the purpose of the questionnaire based on:

- **Interviews conducted by Borland** during 1999 for an article titled 'Textiles beyond 2000' published in the clothing and textile industry trade publication *Pursuit*. Borland (1999) interviewed a number of key role players and technical experts representing a range of textile products and processes. The survival strategies for the textile industry emerging from these interviews could be summarised as follows:
    - Develop stronger marketing strategies.
    - Develop and produce quality end products for niche markets.
    - Increase exports of value-added products.
    - Change the customer's mindset that imported products are better than locally produced products, resulting in the establishment of Proudly South African campaign.
    - Become financially "fit" – reduce overheads.
    - Drop prices on bulk products to maintain plant, while focusing on one or two profit-generating products.
    - Investigate possibilities of amalgamations, joint ventures and inter-firm linkages to increase competitiveness.
    - Promote sub-contracting to create room for each role player in the industry to concentrate on their chosen core business – ginning, spinning, weaving, dyeing, finishing or printing.
    - Adopt a synergistic approach where members along the production line interact closely with and assist the other.
    - Become more export-orientated – become internationally competitive.
    - Need a paradigm shift in mindset – replace old-fashioned inward-looking approach with the foresight to see the 'bigger picture' and the willingness and ability to take calculated risks.
    - Develop innovative and proactive marketing strategies to increase exports.
    - Become less sales-orientated – sales techniques are perceived abroad as being too arrogant and demanding.

- Develop attractiveness to overseas manufacturers as an alternative source of innovative fabrics.
- Develop brand-name products and fabrics.
- Respond to trade agreements such as AGOA and EU trade agreements.
- Invest in research and development.
- Respond effectively to advanced technology.
- Develop effective training strategies.

- **Developments in textile manufacturing** as described in **Paragraph 2.7** of this thesis.
- The **strategic plan of the Textile Federation of South Africa**, titled *"Laying the foundations for a globally competitive national textile industry"*, which focuses on the strategic objectives formulated by the Textile Federation for realisation within the next seven years until 2010 (TEXFED, 2002). The strategic objectives are described in **Paragraph 2.8** of this thesis.
- **Interviews conducted by the researcher** as reported in the qualitative study of this thesis with eight industry experts during September – December 2003.

Respondents were required to rank the following environmental change factors, by using a four-point Likert Scale, ranging from critical (essential/vital for survival of the industry in a global environment) to not important (not important/minor for survival of the industry in a global environment). **Table 6.5** provides a summary of the findings obtained from respondents on the environmental change factors impacting on the textile industry during the next seven years (until 2010). The highest scores obtained per factor are printed in bold in **Table 6.5**, to assist with the interpretation of the data.

Table 6.5: Summary of the percentage frequency distribution to environmental change factors impacting on the textile industry during the next seven years until 2010 by the total number of respondents

Number	Environmental change factors impacting on the textile industry	Percentage response from respondents				
		Critical	Very Important	Important	Not Important	No response
1	Advances in **information technology** resulting in **improved management of product design, production processes and quality**.	3,40	**37,90**	34,50	24,10	0,00
2	Advances in **information technology** resulting in **improved supply chain management.**	0,00	**41,40**	37,90	20,70	0,00
3	Advances in **information technology** resulting in **intensified international competition by enhancing communication** with distant customers and suppliers.	6,90	**34,50**	27,60	31,00	0,00
4	**Advances in manufacturing technology** resulting in improved manufacturing performance.	0,00	20,70	37,90	**41,40**	0,00
5	**Advances in materials technology** resulting in improved performance capabilities of textile products, e.g., genetically engineered natural and man-made fibres and smart materials.	3,40	24,10	**44,80**	27,60	0,00
6	Development of **business strategies** to operate in increasingly diverse, dynamic, complex and hostile business environment.	0,00	13,80	**51,70**	31,00	3,40
7	Development of **high-level technical skills** through training and education.	3,40	10,30	37,90	**48,30**	0,00
8	Development of **international quality standards, including environmental standards of manufacturing.**	3,40	27,60	**37,90**	27,60	3,40
9	**Development of niche markets** resulting in a high level of industry segmentation.	0,00	20,70	**41,40**	37,90	0,00
10	Development of **world-class management systems and philosophies** to increase competitiveness.	3,40	31,00	24,10	**41,40**	0,00
11	Focus on **product development and design** by separating the creative functions from physical manufacturing, assembly and distribution of products.	17,20	**34,50**	31,00	17,20	0,00
12	Improvement of **labour productivity**	3,40	13,80	24,10	**58,60**	0,00
13	**Increased consumer sophistication**, by demanding more frequent innovation, greater exclusivity, more choice and better service.	10,30	31,00	**44,80**	13,80	0,00
14	Increased levels of **capital investment**.	10,30	27,60	**31,00**	**31,00**	0,00
15	**International sourcing** of products.	6,90	**31,00**	27,60	27,60	6,90
16	Reduction in **trade barriers** and increased globalisation of markets.	6,90	17,20	31,00	**41,40**	3,40
17	Strengthening of share in the **domestic market**.	0,00	13,80	41,40	**44,80**	0,00
18	Support **black economic empowerment** and employment equity.	10,30	27,60	**37,90**	24,10	0,00

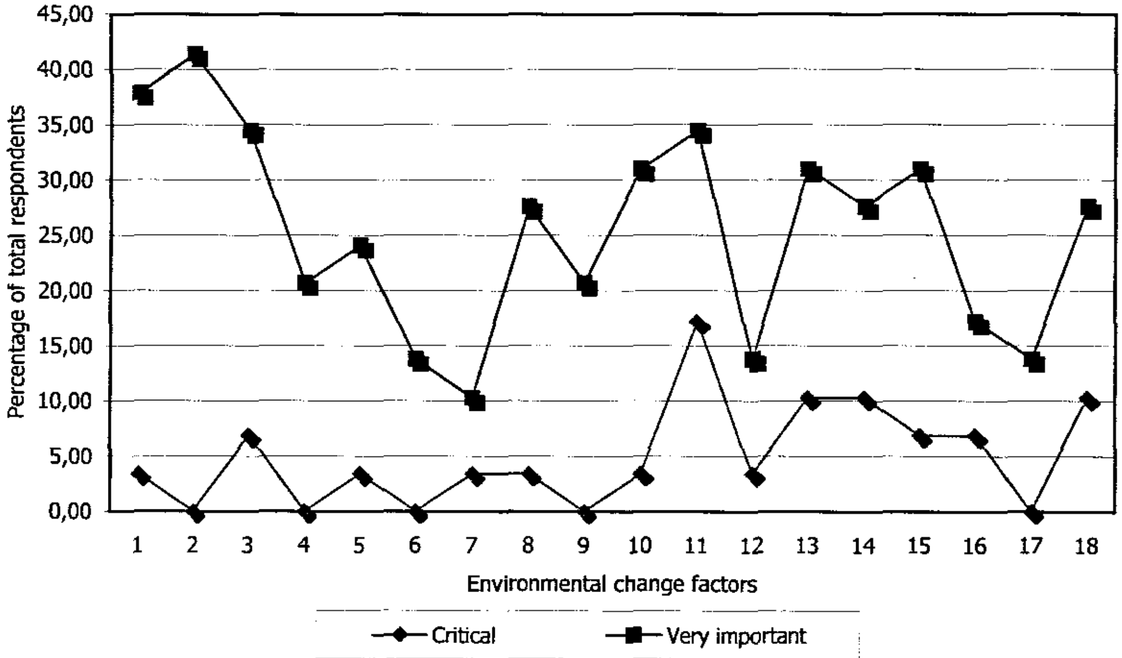


Figure 6.4: The percentage frequency distribution of critical and very important environmental change factors of the total number of respondents

The following interesting observations can be made from the summary of findings presented in **Table 6.5** and graphic presentation of critical and very important scores depicted in **Figure 6.4**:

- A focus on product development and design, by separating the creative functions from physical manufacturing, assembly and distribution of products [factor 11] was regarded as the most **critical** factor by **17,20 per cent** of the total number of respondents.
- The following three factors, i.e., increased consumer sophistication, by demanding more frequent innovation, greater exclusivity, more choice and better service [factor 13] and increased levels of capital investment [factor 14] as well as support black economic empowerment and employment equity [factor 18] were regarded by **10,30 per cent** of the total number of respondents as equally **important** in the second place of the environmental change factors regarded as being of critical importance.
- Although none of the respondents regarded advances in information technology resulting in improved supply chain management [factor 2] as a critical factor, the majority of respondents **(41,40 per cent)** regarded this factor as **very important.**
- The following factors relating to aspects of information technology, arranged in order of priority, were rated by respondents as being very important environmental change factors impacting on the textile industry in the next seven years:

- Advances in information technology resulting in improved supply chain management [factor 2] obtained a percentage response of **41,40 per cent** from respondents.
- Advances in information technology resulting in improved management of product design, production processes and quality [factor 1] obtained a percentage response of **37,90 per cent** from respondents.
- Advances in information technology resulting in intensified international competition by enhancing communication with distant customers and suppliers [factor 3] as well as a focus on product development and design [factor 11] were regarded by **34,50 per cent** of respondents as being very important.

- Only **3,40 per cent** of respondents regarded the development of high-level technical skills through training and development [factor 7] as **a critical factor,** while only **10,30 per cent** regarded this factor as a **very important factor**, which is most certainly an upsetting phenomenon taking into account that only three years ago the Western Cape textile industry regarded the establishment of a textile technology learning programme at NQF level 6 as a very important factor for its survival, hence the implementation of a National Diploma in Textile Technology at Peninsula Technikon. It is also not clear how the industry will be able to achieve a focus on product development and design, by separating the creative functions from physical manufacturing, assembly and distribution of products [factor 11], which 17,20 per cent of the respondents regarded as critical, without a focus on the development of high-level technical skills through training and development.

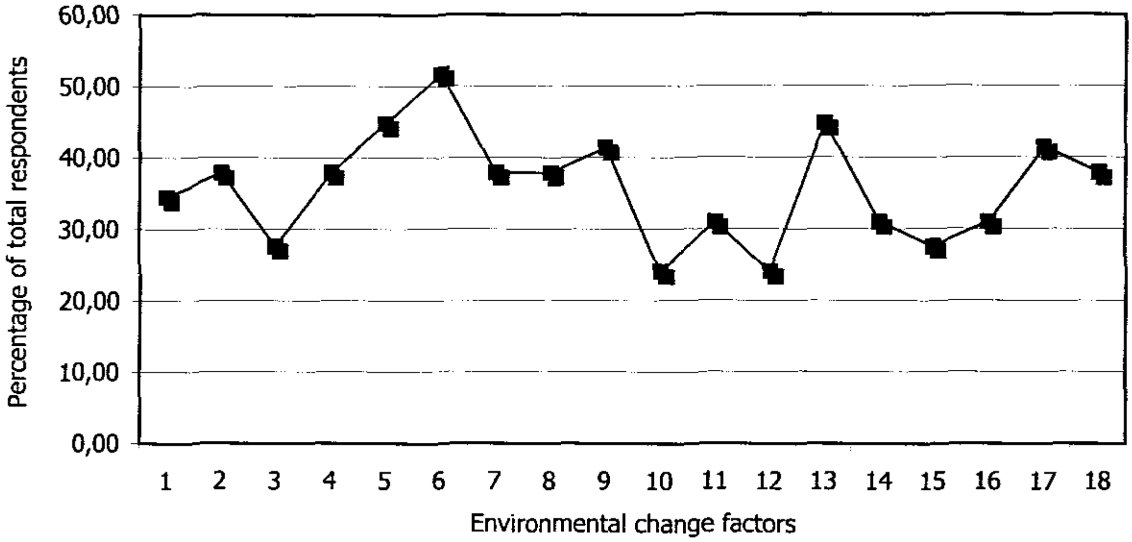


Figure 6.5: The percentage frequency distribution of <u>important</u> environmental change factors of the total number of respondents

Figure 6.5 reveals the following interesting trends:

- The development of business strategies to operate in increasingly diverse, dynamic, complex and hostile business environment [factor 6] was regarded by the majority of respondents (**51,70 per cent**) as an important factor impacting on the textile industry until 2010.
- Advances in materials technology resulting in improved performance capabilities of textile products [factor 5] as well as increased consumer sophistication [factor 13] obtained scores of **44,80 per cent.**
- The development of niche markets resulting in a high level of industry segmentation [factor 9] and the strengthening of the industry's share in the domestic market [factor 17] were regarded by **41,40 per cent** of respondents as of equal importance.
- Only **24,10 per cent** of respondents regarded improvement of labour productivity [factor 12] as important, while **58,60 per cent** of the respondents regarded this factor is **not important** for the survival of the industry in the next seven years.

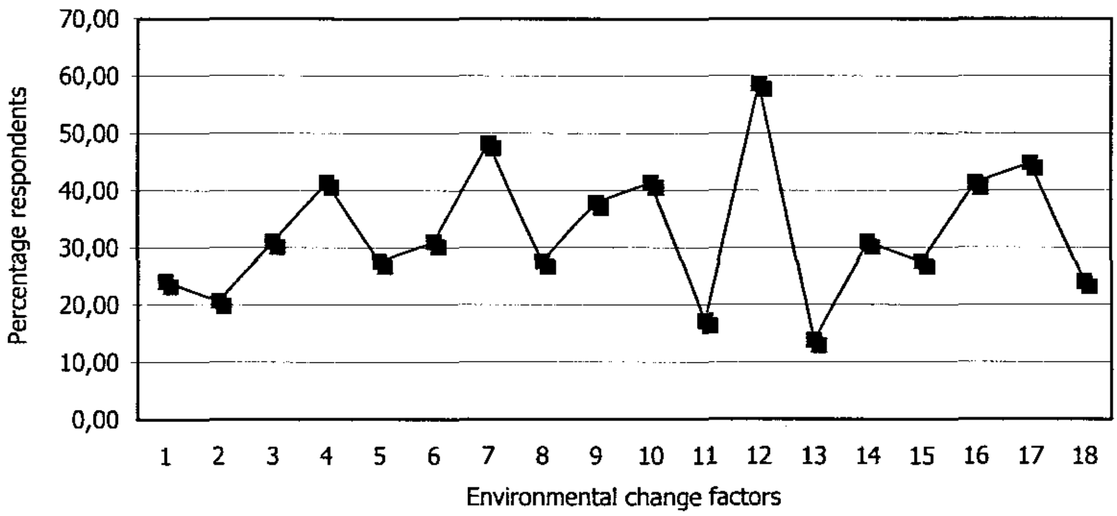


Figure 6.6: The percentage frequency distribution of <u>not important</u> environmental change factors of the total number of respondents

The following discomforting observations are evident from the factors listed by respondents as **not being important for change over the next seven years** as illustrated in **Figure 6.6** above:

- **Factor 12**: Improvement of labour productivity was regarded by **58,60 per cent** of the total number of respondents as **not** being an **important** factor impacting on the textile industry during the next seven years.
- **Factor 7**: Development of high-level technical skills through training and education was regarded by **48,30 per cent** of the total number of respondents as **not** being an **important** factor impacting on the textile industry during the next seven years.
- **Factor 17**: Respondents appear to be divided in their opinion regarding the strengthening of their share in the domestic market, **44,80 per cent** regarded this factor as **not important**, while 41,40 percent and 13,80 per cent regarded this factor as very important or critically important respectively.

These three findings stand in stark contrast to the strategic objectives of the Textile Federation of SA (TEXFED, 2002) that regards these three factors, amongst others, as important driving forces for change in the textile industry over the next seven years, as described in **Paragraph 2.8** of this thesis. Low productivity and a lack of highly skilled technical and management staff were also highlighted by interviewees as weaknesses of the textile industry as reported in **Paragraph 5.4.1.2** of this thesis.

6.4.9 KEY COMPETENCIES FOR TEXTILE TECHNOLOGISTS

With reference to the employability skills of future textile technologists defined by Barnard (1998: 2) as tabled in **Table 4.8** of this thesis, as well as the key competencies for effective participation in the emerging patterns of work and work organisation defined by the Mayer Committee in Australia (Kearns, 2001: 14) as tabled in **Table 4.11** of this thesis, a list of key competencies for textile technologists was compiled by the researcher.

The following list of key competencies, as listed in **Table 6.6**, was included in the questionnaires and respondents were requested to rate these key competences according to:

- General importance to the textile industry.
- Specific importance to their companies.

Table 6.6: Key competencies of textile technologists

1	**Analytical skills**: The ability to undertake statistical analysis, draw conclusions and make recommendations for production and business in general.
2	**Communication skills**: The ability to communicate effectively in English with others using the range of spoken, written, graphic and other non-verbal means of expression.
3	**Computer skills**: General computer literacy, use of software programmes e.g. word processing, spreadsheets, electronic communication media and production related scheduling.
4	**Design/innovation skills**: An ability to analyse current production processes and associated machinery and to identify areas of improvement with emphasis on cost effectiveness.
5	**Market research skills**: The ability to identify market trends and opportunities (local and international) and to determine how these trends will impact on production processes, product design and machinery capabilities.
6	**Performance improvement skills**: The ability to achieve optimum performance by training, developing and guiding staff at three levels: organisational, process and job performance.
7	**Production management skills**: The ability to manage complex production processes, including skills in costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management and continuous improvement.
8	**Technical skills**: An in-depth understanding of production processes across the textile spectrum with specialization in one or two main processes in terms of internationally recognised standards.
9	**Testing skills**: An understanding of a range of product and process tests and testing techniques.
10	**Thinking skills**: The ability to think critically, laterally, analytically and focus on results, outcomes and solutions rather than on problem identification.
11	**Working with others and in teams**: The ability to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of the client and working effectively as a member of a team to achieve a shared goal.

A summary of the percentage frequency distribution data is presented in ***Table 6.7****, which* focuses on the key competencies regarded as **important to the industry in general.**

Table 6.7: Summary of the percentage frequency distribution of the total number of respondents based on key competencies of <u>general importance to the industry</u>

Number	Key competencies of textile technologists	Percentage response from respondents				
		Critical	Very Important	Important	Not Important	No response
1	Analytical skills	34,50	37,90	27,60	0,00	0,00
2	Communication skills	17,20	51,70	31,00	0,00	0,00
3	Computer skills	24,10	37,90	37,90	0,00	0,00
4	Design/innovation skills	37,90	44,80	17,20	0,00	0,00
5	Market research skills	24,10	44,80	27,60	0,00	3,40
6	Performance improvement skills	27,60	51,70	17,20	3,40	0,00
7	Production management skills	31,00	44,80	20,70	3,40	0,00
8	Technical skills	41,40	48,30	10,30	0,00	0,00
9	Testing skills	17,20	51,70	31,00	0,00	0,00
10	Thinking skills	27,60	55,20	17,20	0,00	0,00
11	Working with others and in teams	27,60	37,90	34,50	0,00	0,00

Table 6.8 reveals the following interesting results. Three key competencies were rated by the majority of respondents as of **critical importance to the industry in general**:

- **Technical skills** [no 8], involving an in-depth understanding of production processes across the textile spectrum with specialisation in or two main processes in terms of internationally recognised standards (41,40 per cent).
- **Design and innovation skills** [no 4], involving the ability to analyse current production processes and associated machinery and to identify areas of improvement with emphasis on cost effectiveness (37,90 per cent).

- **Analytical skills** [no 1], involving the ability to undertake statistical analysis, draw conclusions and make recommendations for production and business in general (34,50 per cent).

With reference to the percentage frequency distribution depicted in **Table 6.7** the following key competencies were rated as **very important** by respondents **to the industry in general**:

- The ability to think critically, analytically and focus on results, outcomes and solutions rather than on problem identification [thinking skills] was regarded by **55,20 per cent** of the total number of respondents as a **very important** key competency.
- Three key competencies, i.e., communication skills [no 2], testing skills [no 9] and performance improvement skills [no 6] obtained equal scores of 51,70 per cent.

It is evident from **Figure 6.7** that there is **very little difference** between the perception of respondents regarding the key competencies that are critical to the industry in general and to those of critical importance to their companies.

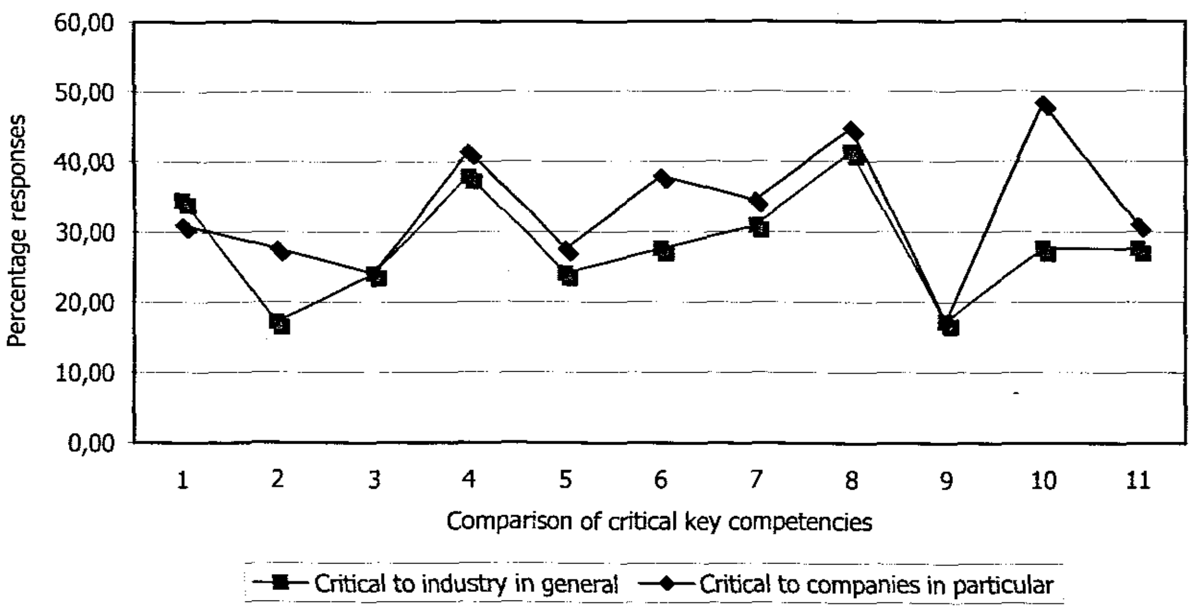


Figure 6.7: Comparative distribution of the percentage responses of <u>critical key competencies</u> – general importance to the industry and specific importance to companies

The only significant difference was noticed in the perception of respondents regarding thinking skills [no. 10], whereby 48,30 per cent of respondents regarded this key competency as being more critical to their companies, than to the industry in general [27.60 per cent].

Figure 6.8 depicts a different trend from that of **Figure 6.7** in so far as the highest percentage response rates are concerned. In **Figure 6.8** highest percentage response rates were obtained for key competencies that are very important to the **industry in general**, whereas in **Figure 6.7** the highest percentage response rates were obtained for key competencies of critical importance to **companies in particular**.

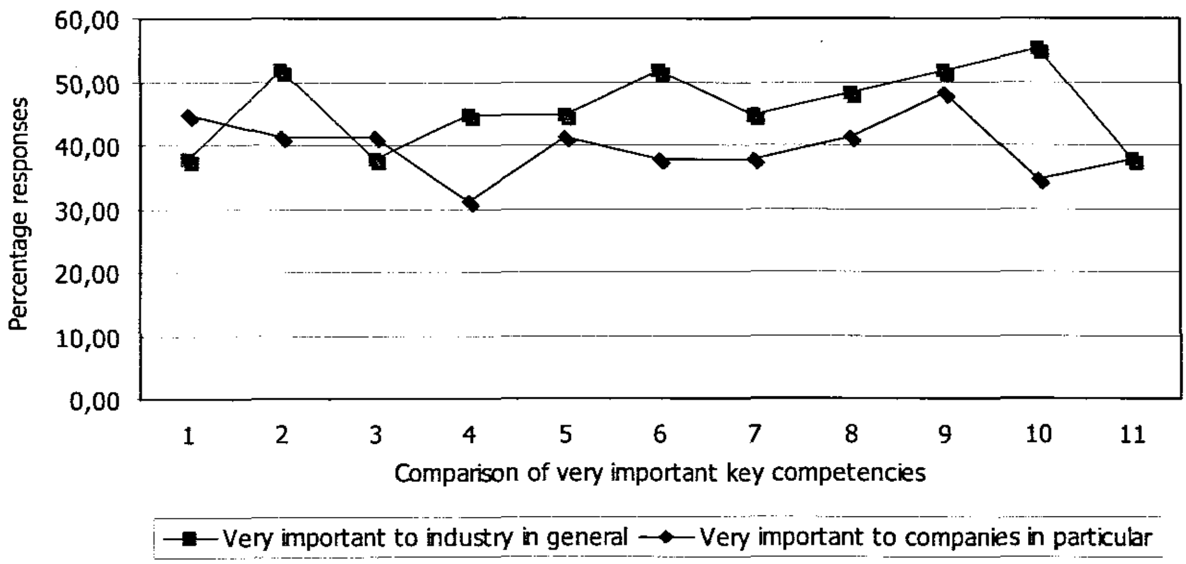


Figure 6.8: Comparative distribution of the percentage responses of <u>very important key competencies</u> – general importance to the industry and specific importance to companies

A summary of the percentage frequency distribution data is presented in **Table 6.8**, which focuses on the key competencies regarded as of specific importance to the companies of the respondents.

Table 6.8: Summary of the percentage frequency distribution of the total number of respondents based on key competencies of <u>specific importance to the companies of the respondents</u>

Number	Key competencies of textile technologists	Percentage response from respondents				
		Critical	Very Important	Important	Not Important	No response
1	Analytical skills	31,00	44,80	24,10	0,00	0,00
2	Communication skills	27,60	41,40	27,60	0,00	3,40
3	Computer skills	24,10	41,40	31,00	0,00	3,40
4	Design/innovation skills	41,40	31,00	24,10	0,00	3,40
5	Market research skills	27,60	41,40	24,10	6,90	0,00
6	Performance improvement skills	37,90	37,90	20,70	3,40	0,00
7	Production management skills	34,50	37,90	24,10	3,40	0,00
8	Technical skills	44,80	41,40	6,90	6,90	0,00
9	Testing skills	17,20	48,30	31,00	3,40	0,00
10	Thinking skills	48,30	34,50	17,20	0,00	0,00
11	Working with others and in teams	31,00	37,90	31,00	0,00	0,00

A total of 14 respondents [48,30 per cent] regarding thinking skills [no 10] as the most critical competency required by their companies. Two of the same key competencies, rated previously by respondents as of critical importance to the industry in general, were rated, once again, by a number of respondents as of **critical importance to their companies**:

- **Technical skills** [no 8], involving an in-depth understanding of production processes across the textile spectrum with specialisation in or two main processes in terms of internationally recognised standards (44,80 per cent).

- **Design and innovation skills** [no 4], involving the ability to analyse current production processes and associated machinery and to identify areas of improvement with emphasis on cost effectiveness (41,40 per cent).

6.4.10 QUESTION 6: SUBJECT-SPECIFIC SKILLS & KNOWLEDGE OF A TEXTILE TECHNOLOGIST LEARNING PROGRAMME

With reference to the curriculum design process outlined in **Paragraph 4.7.2** of this thesis, enabling outcomes formed the basic structure of the curriculum. The process used by the curriculum design team to develop the new outcomes-based curriculum structure, was mainly a **design-down curriculum development process**.

A design-down curriculum process begins with large, complex, workplace-orientated outcomes, which are derived from employability skills of textile technologists (specified outcomes), and ends with specific, simpler outcomes (enabling outcomes) and tasks. The design-down curriculum development process requires the classification of outcomes into three broad categories as defined by Spady (1994: 18):

- **Exit level** (culminating) **outcomes**: These outcomes define what the learners should be able to do on completion of the learning programme.
- **Enabling (learning) outcomes** are the key building blocks on which the exit level outcomes depend. These outcomes enable the achievement of exit level outcomes.
- **Discrete outcomes** are those outcomes that are not essential to the achievement of exit level outcomes by the learners and should be considered as those things that are 'nice to know'.

Creating the enabling (learning) outcomes academic structure by applying the design-down curriculum development process, the curriculum design team engaged in a process consisting mainly of four stages:

- **Stage one**: The first stage consisted of the unbundling or disaggregating of outcomes working down from large, complex, work-orientated outcomes (exit level outcomes) to be achieved by the learner on completion of the learning programme to more specific outcomes, which would accumulatively support the exit level outcomes. The exit level outcomes would consist of fundamental, core and elective outcomes.
- **Stage two**: In developing enabling outcomes, the following question would be considered: What skills, knowledge and value orientation did a learner need to

accomplish this specified outcome? These competencies translated into enabling outcomes, which meant that they enable the attainment of other, high-level outcomes, namely specified outcomes.

- **Stage three**: By unbundling or disaggregating the first-level enabling outcomes into more specific enabling outcomes, a second-level of outcomes or sub-enabling outcomes was developed.
- **Stage four**: These sub-enabling outcomes did not yet provide details about what the learner would be doing in order to show that they could achieve these outcomes, which require the development of tasks. Tasks should relate to the workplace, reflect critical cross-field outcomes and applied competence and relate to assessment criteria.

Question 6 of the questionnaire focused on the evaluation of the subject-specific knowledge and skills or enabling outcomes as described in **stage two** of the outcomes-based curriculum development process. By listing the enabling outcomes as subject-specific skills and knowledge required by textile technologists, respondents were required to rate these learning outcomes according to:

- **Section 6A**: General importance to the industry.
- **Section 6B**: Specific importance to the company of the respondent.

A total of 73 enabling outcomes based on subject-specific skills and knowledge of the textile technologist learning programme implemented by Peninsula Technikon in January 2001 were randomly arranged to prevent respondents from falling into a repetitive pattern when completing this question. Subject headings were provided to avoid ambiguity and to allow for clustering of the enabling outcomes into subject groups for data analysis.

Table 6.9 (page 252-262) provides a summary of the percentage frequency distribution data of subject-specific knowledge and skills of the textile technologist learning programme implemented at the Peninsula Technikon. These learning outcomes were rated by respondents with the view to determine the relevance and importance of these learning outcomes to the **industry in general.**

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
1	Work Organisation	Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs	27,60	34,50	34,50	3,40	0,00
2	Fabric Technology Knitting	Demonstrate understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples	17,20	31,00	27,60	10,30	13,80
3	CAD/CAM	Supervise a CAD/CAM department in a textile-manufacturing environment	3,40	34,50	48,30	0,00	13,80
4	Quality Management	Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment	31,00	58,60	10,30	0,00	0,00
5	Quality Management	Generate and present standards and tolerances of textile products	34,50	48,30	13,80	3,40	0,00
6	Human Resource Management	Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment	24,10	27,60	41,40	3,40	3,40
7	Statistics	Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment	13,80	37,90	44,80	0,00	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry							
			Percentage response from respondents				
Number	**Subject group**	**General importance to industry** **Subject-specific skills and knowledge**	**Critical**	**Very important**	**Important**	**Not important**	**Not applicable/ no response**
8	Management	Describe and interpret internal and external organisational constraints	17,20	41,40	31,00	6,90	3,40
9	Fabric TechnologyOther	Demonstrate understanding of other methods of fabric construction and relate these to structure and properties e.g. non-wovens, etc.	13,80	37,90	34,50	3,40	10,30
10	Quality Management	Analyse customer product specifications by relating these to tests and examination procedures	31,00	37,90	27,60	0,00	3,40
11	Colouration Technology	Develop understanding of different finishing processes, function and application	20,70	34,50	37,90	0,00	6,90
12	Work Organisation	Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance	10,30	31,00	51,70	0,00	6,90
13	Colouration Technology	Develop understanding of chemicals and their applications in pre-treatment of dyeing and finishing, dyeing, printing and finishing processes	27,60	44,80	20,70	0,00	6,90
14	Computer Aided Manufacturing	Supervise the production control function using Computer Integrated Machine monitoring	20,70	41,40	31,00	3,40	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
15	Colouration Technology	Develop understanding of different systems of printing	10,30	37,90	27,60	3,40	20,70
16	Quality Management	Motivate and initiate quality improvements of products and processes	37,90	34,50	24,10	3,40	0,00
17	Industrial Relations	Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA & OHASA	24,10	13,80	44,80	10,30	6,90
18	Fibre & Yarn Technology	Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use	13,80	51,70	34,50	0,00	0,00
19	Fabric Technology Knitting	Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type	10,30	44,80	20,70	3,40	20,70
20	Colouration Technology	Develop understanding of the different systems of dyeing	6,90	55,20	31,00	0,00	6,90
21	General Textile Science	Demonstrate understanding of the morphological structure and chemical composition of natural fibres and how these relate to fibre and fabric properties and end-uses	24,10	41,40	24,10	3,40	6,90

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
22	Colouration Technology	Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory	10,30	58,60	24,10	3,40	3,40
23	Management	Establish, describe and apply leadership techniques	27,60	41,40	31,00	0,00	0,00
24	General Textile processes	Perform textile calculations applicable to a particular section within a textile-manufacturing environment	17,20	44,80	34,50	0,00	3,40
25	Work Organisation	Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance	13,80	34,50	51,70	0,00	0,00
26	Quality Management	Identify quality faults and possible causes	34,50	48,30	17,20	0,00	0,00
27	Industrial Relations	Identify and describe the various role-players within the textile industry - SACTWU, TEXFED, etc.	13,80	24,10	48,30	13,80	0,00
28	Fabric Technology Weaving	Demonstrate understanding of weaving theory, woven structures, weights and yarn consumptions and relate these to practical examples	17,20	48,30	20,70	0,00	13,80

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
29	Quality Management	Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes	31,00	48,30	20,70	0,00	0,00
30	Fabric Technology General	Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems	27,60	55,20	13,80	0,00	3,40
31	Costing	Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment	27,60	34,50	37,90	0,00	0,00
32	Colouration Technology	Develop understanding of colour theory, colour measurement and assessment	17,20	48,30	27,60	3,40	3,40
33	Textile Science	Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses	20,70	31,00	41,40	0,00	6,90
34	General textile processes	Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment	6,90	58,60	31,00	0,00	3,40
35	Management	Establish, describe and apply management control strategies and tools	17,20	48,30	27,60	6,90	0,00

Table 6.9: Subject-specific skills and knowledge of general importance to industry							
			Percentage response from respondents				
Number	**Subject group**	**General importance to industry Subject-specific skills and knowledge**	**Critical**	**Very important**	**Important**	**Not important**	**Not applicable/ no response**
36	General textile processes	Classify fibres, yarns and fabrics according to grades	17,20	51,70	31,00	0,00	0,00
37	Work Organisation	Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment	10,30	31,00	44,80	10,30	3,40
38	Quality Management	Calculate the cost of poor quality of textile products	34,50	37,90	24,10	3,40	0,00
39	Human Resource Management	Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance	17,20	37,90	37,90	6,90	0,00
40	Textile testing & statistics	Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process	13,80	51,70	31,00	3,40	0,00
41	Factory Engineering	Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment	10,30	37,90	41,40	6,90	3,40
42	Management	Identify and apply the techniques of customer care	17,20	41,10	34,50	3,40	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
43	Apparel Technology	Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products	17,20	41,40	31,00	3,40	6,90
44	Business Economics	Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular	6,90	41,40	44,80	6,90	0,00
45	Physics	Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, thermodynamics, waves and sounds, optics, electricity, magnetism and electromagnetic induction as well as radioactivity	10,30	13,80	48,30	17,20	10,30
46	General textile processes	Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry	10,30	58,60	31,00	0,00	0,00
47	Colouration Technology	Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control these elements	17,20	48,30	31,00	0,00	3,40
48	General textile processes	Set and adjust complex parameters to fibres, yarn and fabric manufacturing processes	10,30	58,60	24,10	3,40	3,40
49	Work Organisation	Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment	13,80	17,20	58,60	10,30	0,00

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
50	Human Resource Management	Demonstrate understanding of the importance of job descriptions and work schedules and how these relate to successful teams in a textile-manufacturing environment	10,30	37,90	37,90	13,80	0,00
51	Marketing	Develop sourcing techniques relevant to international markets	24,10	31,10	27,60	13,80	3,40
52	Colouration Technology	Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process	20,70	41,40	27,60	0,00	10,30
53	Textile Science	Demonstrate understanding of organic chemistry, including drawing the structural formula or basic organic compounds, naming organic compounds, identifying functional groups and isomers, writing general equations for the reactions of groups of organic compounds and describing the uses of organic compounds and their reactions	13,80	34,50	41,40	6,90	3,40
54	Work Organisation	Maintain acceptable levels of productivity in a textile-manufacturing environment	27,60	48,30	17,20	3,40	3,40
55	General Textile processes	Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses	17,20	55,20	24,10	0,00	3,40
56	Economics	Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade	13,80	20,70	51,70	10,30	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents Critical	Very important	Important	Not important	Not applicable/ no response
57	Computer aided production planning	Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets	10,30	51,70	34,50	3,40	0,00
58	General Textile processes	Determine factors impacting on manufacturing processes of regenerated and synthetic fibres	6,90	51,70	41,40	0,00	0,00
59	Marketing	Conduct market research to determine competitive advantage of company	17,20	27,60	37,90	13,80	3,40
60	Waste management & environmental issues	Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics	13,80	44,80	34,50	3,40	3,40
61	Fabric Technology Weaving	Demonstrate understanding of weft insertion mechanisms, shuttle, projectile, rapier and fluid jet machines	13,80	34,50	37,90	0,00	13,80
62	General Textile processes	Describe the conversion process in the textile pipeline	6,90	31,00	51,70	0,00	10,30
63	Marketing	Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment	10,30	31,00	48,30	6,90	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
64	General Textile processes	Determine factors impacting on growth and production of natural fibres	6,90	34,50	51,70	3,40	3,40
65	Textile Science	Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and use of different man-made fibres	10,30	37,90	37,90	3,40	10,30
66	General Textile processes	Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses	13,80	48,30	34,50	0,00	3,40
67	Product development	Design and develop new textile products and conduct feasibility studies	27,60	24,10	41,40	0,00	6,90
68	Entrepreneurship	Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development	20,70	51,70	27,60	0,00	0,00
69	Computer aided textile design	Design and produce patterns and structures using computer aided design systems for weaving and knitting	6,90	51,70	34,50	0,00	6,90
70	Project management	Demonstrate ability to manage a project in a textile-manufacturing environment	13,80	24,10	58,60	0,00	3,40

Table 6.9: Subject-specific skills and knowledge of general importance to industry

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
71	Management	Demonstrate understanding of the role, functions and principles of management applicable to a textile-manufacturing/retailing environment	6,90	34,50	48,30	6,90	3,40
72	General Textile processes	Classify fibres, yarns, fabrics, dyes and chemicals	13,80	48,30	31,00	0,00	6,90
73	Factory Engineering	Demonstrate understanding of control and automation applicable to a textile-manufacturing environment	10,30	41,40	34,50	3,40	10,30

6.4.10.1 Subject-specific skills and knowledge (SSSK) of general importance to industry

An analysis of the percentage frequency distribution data contained in **Table 6.9** reveals the following findings:

- Enabling outcomes of quality management were regarded as the most **critical** subject-specific skills and knowledge (SSSK) of general importance to the industry as listed below in **Table 6.10.**

Table 6.10: Subject-specific skills and knowledge of critical importance to industry in general

Number	Subject group	General importance to industry Subject-specific skills and knowledge	Critical
16	Quality Management	Motivate and initiate quality improvements of products and processes	37,90
5	Quality Management	Generate and present standards and tolerances of textile products	34,50
26	Quality Management	Identify quality faults and possible causes	34,50
38	Quality Management	Calculate the cost of poor quality of textile products	34,50
4	Quality Management	Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment	31,00
10	Quality Management	Analyse customer product specifications by relating these to tests and examination procedures	31,00
29	Quality Management	Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes	31,00

- An analysis of the range of scores of the rating scale revealed that subject-specific skills and knowledge (SSSK) no. 38: Calculate the cost of poor quality of textile products, was also regarded by **58,60 per cent** of respondents [**highest score**] as a **very important** aspect of a textile technologist learning programme, while only **13,80 per cent** of respondents [**lowest score**] regarded the identification of global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade [SSSK no. 56] as being a **very important** aspect.

- Subject-specific skills and knowledge (SSSK) no. 45: Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, thermodynamics, waves and sounds, optics, electricity, magnetism and electromagnetic induction as well as radioactivity was regarded by 17,20 per cent of respondents [highest score] as **not important**.

6.4.10.2 Subject-specific skills and knowledge (SSSK) of specific importance to companies of respondents

Table 6.12 (page 267-277) provides a summary of the percentage frequency distribution data of subject-specific skills and knowledge (SSSK) of the textile technologist learning programme implemented at the Peninsula Technikon. Respondents rated these learning outcomes with the view to determine the relevance and importance of these learning outcomes to **the companies of the respondents in particular.**

An analysis of the percentage frequency distribution data contained in **Table 6.12** (page 267-277) reveals the following findings:

- Subject-specific skills and knowledge (SSSK) of quality management were also regarded as the most **critical** subject-specific skills and knowledge of specific importance to companies of the respondents as listed below in **Table 6.11**. SSSK no. 16 was regarded by the majority of respondents as the most critical learning outcomes of importance to both the industry in general [37,90 per cent] and companies in particular [44,80 per cent].

Table 6.11: Subject-specific skills and knowledge of quality management of specific importance to companies of respondents

Number	Subject group	Specific importance to companies Subject-specific skills and knowledge	Critical
16	Quality Management	Motivate and initiate quality improvements of products and processes	44,80
26	Quality Management	Identify quality faults and possible causes	44,80
38	Quality Management	Calculate the cost of poor quality of textile products	41,40
4	Quality Management	Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment	37,90

- The following two subject-specific skills and knowledge (SSSK) were regarded by 58,60 per cent [highest score] of respondents as very important to their companies:
    - **SSSK 35**: Establish, describe and apply management control strategies and tools.

  - **SSSK 66**: Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses.

- The performance of product and performance tests of a variety of textile products, analysis of test results and reporting of data to aid the decision-making process [SSSK no. 40] was regarded by 51,70 per cent of respondents as very important to both the industry in general and their companies in particular.
- It was evident from the data that very few respondents regarded an understanding of other methods of fabric construction, e.g., non-woven structures [SSSK no. 9] as necessary, with 20,70 per cent who regarded this outcome as not important and 24,10 per cent as not applicable to their companies.
- The majority of respondents also indicated that an understanding of different systems of printing [SSSK no. 15] was either not important [20,70 per cent] or not applicable [44,80 per cent] to their companies.
- An understanding of the limitations and capabilities of a broad range of processing equipment and machinery in a textile-manufacturing environment [SSSK no. 34] was regarded as very important to the industry in general by 58,60 per cent of respondents, while only 31,00 per cent regarded this subject-specific skill as important to their companies in particular and 13,80 per cent of respondents regarded this SSSK as not important to their companies in particular.
- Apparel technology [SSSK no. 43] was regarded by 41.40 per cent of respondents as very important to the industry in general, but only 13,80 per cent of respondents regarded this SSSK as very important to their companies.
- Only 24,10 per cent and 27,60 per cent of respondents regarded the setting and adjustment of complex parameters to fibres, yarns and fabric manufacturing processes [SSSK no. 48] as critical and very important respectively. It is interesting to note that 17,20 per cent of respondents indicated that this outcome is not important to their companies. This SSSK is directly related to the unit standards at NQF level 6.
- Although 10,30 per cent and 20,70 per cent of respondents regarded the use of computer-aided design systems for weaving and knitting [SSSK no. 69] as critical and very important respectively for their companies, 6,90 per cent and 51,70 per cent of respondents regarded the same SSSK as critical and very important to the industry in general.

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company *Subject-specific skills and knowledge*	Percentage response from respondents: Critical	Very important	Important	Not important	Not applicable/ no response
1	Work Organisation	Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs	34,50	34,50	24,10	3,40	3,40
2	Fabric Technology Knitting	Demonstrate understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples	24,10	24,10	10,30	6,90	34,50
3	CAD/CAM	Supervise a CAD/CAM department in a textile-manufacturing environment	10,30	10,30	37,90	13,80	27,60
4	Quality Management	Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment	37,90	37,90	17,20	3,40	3,40
5	Quality Management	Generate and present standards and tolerances of textile products	34,50	41,40	13,80	10,30	0,00
6	Human Resource Management	Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment	24,10	10,30	48,30	10,30	6,90
7	Statistics	Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment	13,80	24,10	34,50	17,20	10,30

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
8	Management	Describe and interpret internal and external organisational constraints	17,20	37,90	27,60	10,30	6,90
9	Fabric Technology Other	Demonstrate understanding of other methods of fabric construction and relate these to structure and properties e.g. non-wovens, etc.	13,80	27,60	13,80	20,70	24,10
10	Quality Management	Analyse customer product specifications by relating these to tests and examination procedures	34,50	31,00	31,00	0,00	3,40
11	Colouration Technology	Develop understanding of different finishing processes, function and application	34,50	31,00	24,10	0,00	10,30
12	Work Organisation	Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance	13,80	31,00	34,50	6,90	13,80
13	Colouration Technology	Develop understanding of chemicals and their applications in pre-treatment of dyeing and finishing, dyeing, printing and finishing processes	34,50	27,60	20,70	6,90	10,30
14	Computer Aided Manufacturing	Supervise the production control function using Computer Integrated Machine monitoring	17,20	24,10	37,90	10,30	10,30

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
15	Colouration Technology	Develop understanding of different systems of printing	13,80	10,30	10,30	20,70	44,80
16	Quality Management	Motivate and initiate quality improvements of products and processes	44,80	24,10	24,10	0,00	6,90
17	Industrial Relations	Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA & OHASA	20,70	17,20	34,50	20,70	6,90
18	Fibre & Yarn Technology	Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use	20,70	27,60	44,80	0,00	6,90
19	Fabric Technology Knitting	Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type	27,60	17,20	27,60	0,00	27,60
20	Colouration Technology	Develop understanding of the different systems of dyeing	27,60	24,10	41,40	0,00	6,90
21	General Textile Science	Demonstrate understanding of the morphological structure and chemical composition of natural fibres and how these relate to fibre and fabric properties and end-uses	20,70	24,10	37,90	10,30	6,90

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents							
			Percentage response from respondents				
Number	**Subject group**	**Specific importance to company Subject-specific skills and knowledge**	**Critical**	**Very important**	**Important**	**Not important**	**Not applicable/ no response**
22	Colouration Technology	Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory	24,10	27,60	27,60	10,30	10,30
23	Management	Establish, describe and apply leadership techniques	27,60	44,80	24,10	0,00	3,40
24	General Textile processes	Perform textile calculations applicable to a particular section within a textile-manufacturing environment	20,70	17,20	44,80	6,90	10,30
25	Work Organisation	Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance	13,80	37,90	44,80	3,40	0,00
26	Quality Management	Identify quality faults and possible causes	44,80	44,80	6,90	0,00	3,40
27	Industrial Relations	Identify and describe the various role-players within the textile industry - SACTWU, TEXFED, etc.	10,30	17,20	41,40	27,60	3,40
28	Fabric Technology Weaving	Demonstrate understanding of weaving theory, woven structures, weights and yarn consumptions and relate these to practical examples	24,10	13,80	13,80	10,30	37,90

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
29	Quality Management	Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes	31,00	41,40	17,20	3,40	6,90
30	Fabric Technology General	Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems	27,60	41,40	13,80	3,40	13,80
31	Costing	Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment	27,60	24,10	27,60	10,30	10,30
32	Colouration Technology	Develop understanding of colour theory, colour measurement and assessment	24,10	41,40	13,80	10,30	10,30
33	Textile Science	Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses	17,20	13,80	44,80	3,40	20,70
34	General textile processes	Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment	10,30	31,00	37,90	13,80	6,90
35	Management	Establish, describe and apply management control strategies and tools	6,90	58,60	24,10	6,90	3,40

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
36	General textile processes	Classify fibres, yarns and fabrics according to grades	10,30	34,50	31,00	10,30	13,80
37	Work Organisation	Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment	6,90	20,70	41,40	20,70	10,30
38	Quality Management	Calculate the cost of poor quality of textile products	41,40	41,40	6,90	3,40	6,90
39	Human Resource Management	Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance	13,80	37,90	37,90	6,90	3,40
40	Textile testing & statistics	Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process	13,80	51,70	20,70	10,30	3,40
41	Factory Engineering	Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment	0,00	34,50	44,80	10,30	10,30
42	Management	Identify and apply the techniques of customer care	34,50	48,30	13,80	3,40	0,00

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
43	Apparel Technology	Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products	13,80	13,80	48,30	6,90	17,20
44	Business Economics	Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular	13,80	24,10	48,30	13,80	0,00
45	Physics	Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, thermodynamics, waves and sounds, optics, electricity, magnetism and electromagnetic induction as well as radioactivity	10,30	6,90	34,50	34,50	13,80
46	General textile processes	Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry	20,70	34,50	34,50	6,90	3,40
47	Colouration Technology	Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control these elements	13,80	37,90	20,70	10,30	17,20
48	General textile processes	Set and adjust complex parameters to fibres, yarn and fabric manufacturing processes	24,10	27,60	13,80	17,20	17,20
49	Work Organisation	Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment	13,80	17,20	44,80	13,80	10,30

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
50	Human Resource Management	Demonstrate understanding of the importance of job descriptions and work schedules and how these relate to successful teams in a textile-manufacturing environment	10,30	31,00	37,90	20,70	0,00
51	Marketing	Develop sourcing techniques relevant to international markets	17,20	34,50	17,20	24,10	6,90
52	Colouration Technology	Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process	20,70	31,00	10,30	17,20	20,70
53	Textile Science	Demonstrate understanding of organic chemistry, including drawing the structural formula or basic organic compounds, naming organic compounds, identifying functional groups and isomers, writing general equations for the reactions of groups of organic compounds and describing the uses of organic compounds and their reactions	13,80	13,80	31,00	27,60	13,80
54	Work Organisation	Maintain acceptable levels of productivity in a textile-manufacturing environment	20,70	48,30	13,80	3,40	13,80
55	General Textile processes	Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses	24,10	27,60	31,00	6,90	10,30
56	Economics	Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade	10,30	27,60	34,50	20,70	6,90

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
57	Computer aided production planning	Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets	20,70	31,00	27,60	17,20	3,40
58	General Textile processes	Determine factors impacting on manufacturing processes of regenerated and synthetic fibres	6,90	37,90	27,60	10,30	17,20
59	Marketing	Conduct market research to determine competitive advantage of company	13,80	34,50	34,50	13,80	3,40
60	Waste management & environmental issues	Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics	10,30	44,80	31,00	3,40	10,30
61	Fabric Technology Weaving	Demonstrate understanding of weft insertion mechanisms, shuttle, projectile, rapier and fluid jet machines	3,40	17,20	27,60	17,20	34,50
62	General Textile processes	Describe the conversion process in the textile pipeline	3,40	34,50	37,90	10,30	13,80
63	Marketing	Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment	10,30	31,00	41,40	10,30	6,90

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents

Number	Subject group	Specific importance to company Subject-specific skills and knowledge	Percentage response from respondents				
			Critical	Very important	Important	Not important	Not applicable/ no response
64	General Textile processes	Determine factors impacting on growth and production of natural fibres	6,90	34,50	51,70	3,40	3,40
65	Textile Science	Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and use of different man-made fibres	17,20	17,20	27,60	20,70	17,20
66	General Textile processes	Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses	3,40	58,60	24,10	3,40	10,30
67	Product development	Design and develop new textile products and conduct feasibility studies	17,20	31,00	44,80	0,00	6,90
68	Entrepreneurship	Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development	13,80	37,90	44,80	3,40	0,00
69	Computer aided textile design	Design and produce patterns and structures using computer aided design systems for weaving and knitting	10,30	20,70	31,00	17,20	20,70
70	Project management	Demonstrate ability to manage a project in a textile-manufacturing environment	13,80	24,10	44,80	6,90	10,30

Table 6.12: Subject-specific skills and knowledge of specific importance to companies of respondents							
			Percentage response from respondents				
Number	**Subject group**	**Specific importance to company Subject-specific skills and knowledge**	**Critical**	**Very important**	**Important**	**Not important**	**Not applicable/ no response**
71	Management	Demonstrate understanding of the role, functions and principles of management applicable to a textile-manufacturing/retailing environment	3,40	41,40	27,60	17,20	10,30
72	General Textile processes	Classify fibres, yarns, fabrics, dyes and chemicals	17,20	34,50	31,00	10,30	6,90
73	Factory Engineering	Demonstrate understanding of control and automation applicable to a textile-manufacturing environment	10,30	34,50	27,60	17,20	10,30

6.4.11 RECRUITMENT & DEVELOPMENT OF TEXTILE TECHNOLOGISTS

The majority of respondents [71,4 per cent] reported that their companies would be interested in developing or recruiting textile technologists in the next 5-7 years, with only 28,6 per cent of respondents who indicated no interest. A total of 20 respondents [69,0 per cent] completed this question on the number of textile technologists to be developed or recruited by their companies until 2010. According to them a total of 52-69 textile technologists would be recruited or developed by those companies during this period. Two respondents indicated that their companies aimed to develop one textile technologist per annum for the next seven years, while others indicated an approximate number of technologists to be developed, ranging from 5 to 8. Nine respondents [31.0 per cent] indicated that their companies would not develop or recruit textile technologists in the next seven years.

Table 6.13: Elective areas for the development/recruitment of textile technologists

Elective area	Percentage response from respondents
Dry processing	54,5
Wet processing	22,7
Man-made fibre production and processing	22,7
Total	100,0

In summary, it appears from responses to the questionnaire that a need to develop textile technologists exists in the Western Cape and that more dry processing specialists will be required than wet or man-made fibre processing specialists during the next seven years as presented in **Table 6.14**. It is also important to take into account that the strategic plan of the Textile Federation of South Africa will focus on various aspects to increase sales and employment over the next few years as described in **Paragraph 2.8** of this thesis, which might impact positively on the number of textile technologists required by the industry.

The interpretation of the data obtained from the quantitative research is presented in more detail in the next chapter.

Chapter 7

Research findings, interpretation and conclusions

7.1 INTRODUCTION

In **Chapter 5** and **Chapter 6**, the data collected by the interviews and questionnaires were presented.

The purpose of this chapter is to present the findings of the research data, offer a reflection on the methodology used and present conclusions on the research project. Recommendations for future research and implications for the development of higher education programmes are also included.

7.2 INTERPRETATION OF THE DATA

The interpretation of the data of a research project of this nature is most certainly a difficult, complex and challenging undertaking. This analytical process requires a heightened awareness of the data as well as a focused attention on those subtle, tacit undercurrents of the textile industry setting. De Vos (2002b: 344) defines interpretation of data as part of the data analysis process and suggests that it should involve "making sense of the data". The volume of data obtained from the questionnaires [290 variables] hampered the effective analysis of the data and required the identification of categories, themes or dimensions of information by the researcher as presented in this chapter.

According to De Vos (2002b: 344), "at this point in their analysis, researchers step back and form larger opinions of what is going on in the situation", by engaging in the "critical act of challenging the pattern that seems so apparent". Kerlinger (1998: 125-126) in De Vos *et al.* (2002: 223) indicates that the interpretation "takes the results of analysis, makes inferences pertinent to the research relations studied and draws conclusions about these relations".

The interpretation of the data in this chapter will focus mainly on the following objectives of the research project:

- To determine the factors impacting on the changing environment of the textile industry and to what extent these factors would impact on curriculum-orientated evaluation of an outcomes-based textile technologist-learning programme at Peninsula Technikon.
- To critically evaluate the learning outcomes of the National Diploma in Textile Technology implemented by Peninsula Technikon in 2001-2003.
- To confirm the rationale/need for the establishment of an outcomes-based textile technologist learning programme at Peninsula Technikon in January 2001.

7.2.1 ENVIRONMENTAL CHANGE FACTORS IMPACTING ON CURRICULUM-ORIENTATED EVALUATION OF AN OUTCOMES-BASED TEXTILE TECHNOLOGIST LEARNING PROGRAMME AT PENINSULA TECHNIKON

The fundamental nature of curriculum-orientated evaluation is to determine "to what extent the objectives of the curriculum have been achieved" (Carl, 1995: 177). In an outcomes-based educational context, curriculum-orientated evaluation would be concerned with the value or effectiveness of the curriculum and the outcomes [output] of the curriculum. As previously stated in **Paragraph 4.9**, the value or effectiveness of a curriculum should also focus on the consequences/implications that the curriculum would have on learners and the industry in the long term, hence the attempt by the researcher to detect a relationship between these aspects.

Table 6.5 depicts a summary of the percentage frequency distribution to environmental change factors impacting on the textile industry during the next seven years until 2010. By clustering the environmental change factors into the following subject-related groups as listed in **Table 7.1**, the researcher was able to compile a table of average scores per subject-related cluster of environmental change factors as detailed in **Table 7.3** according to the classification presented in **Table 7.2**.

Table 7.1: Clusters of environmental change factors

Number	Cluster of environmental change factors	Environmental change factors impacting on the textile industry
1	**Information Technology**	Advances in **information technology** resulting in **improved management of product design, production processes and quality**.
2		Advances in **information technology** resulting in **improved supply chain management**.
3		Advances in **information technology** resulting in **intensified international competition by enhancing communication** with distant customers and suppliers.
4	**Manufacturing & materials technology**	**Advances in manufacturing technology** resulting in improved manufacturing performance.
5		**Advances in materials technology** resulting in improved performance capabilities of textile products, e.g. genetically engineered natural and man-made fibres and smart materials.
7		Development of **high-level technical skills** through training and education.
14		Increased levels of **capital investment**.
6	**Business & management strategies**	Development of **business strategies** to operate in increasingly diverse, dynamic, complex and hostile business environment.
10		Development of **world-class management systems and philosophies** to increase competitiveness.
9	**Niche market development**	**Development of niche markets** resulting in a high level of industry segmentation.
11		Focus on **product development and design** by separating the creative functions from physical manufacturing, assembly and distribution of products.
13		**Increased consumers sophistication**, by demanding more frequent innovation, greater exclusivity, more choice and better service.
8	**Globalisation**	Development of **international quality standards, including environmental standards of manufacturing.**
12		Improvement of **labour productivity.**
15		**International sourcing** of products.
16		Reduction in **trade barriers** and increased globalisation of markets.
17	**Local trade conditions**	Strengthening of share in the **domestic market**.
18		Support **black economic empowerment** and employment equity.

In **Question 3** of the questionnaire, respondents were requested to indicate the production processes associated with their companies. **Table 7.2** lists these production processes per industry sector.

Table 7.2: Industry sectors based on production processes

Dry processing	Wet processing	Wet & dry processing	Man-made fibre production and other production processes
❑ Spinning preparation and spinning ❑ Weaving preparation and weaving ❑ Weft knitting ❑ Warp knitting	❑ Dyeing preparation and dyeing ❑ Printing ❑ Fabric finishing	❑ Spinning preparation and spinning ❑ Weaving preparation and weaving ❑ Weft knitting ❑ Warp knitting Dyeing preparation and dyeing ❑ Printing ❑ Fabric finishing	❑ Extrusion (including polymer manufacturing and melt extrusion) ❑ Non-wovens (including stitch bond and needle punch) ❑ Other production processes

By clustering these production processes into four categories, i.e., wet processing, dry processing, wet and dry processing and other processes as depicted in **Table 7.2**, the researcher was able to compare average scores expressed in a percentage of the environmental change factors per cluster between different industry sectors as outlined in **Table 7.3**.

Table 7.3: Average percentage scores of clusters of environmental change factors per industry sector

Cluster of environmental change factors	Dry processing	Wet processing	Dry & wet processing	Man-made fibre & other processes	Total
Information Technology	55,50	79,25	51,25	54,50	55,00
Manufacturing & materials technology	52,00	56,25	42,75	51,75	48,00
Business & management strategies	58,25	50,00	41,25	48,75	46,50
Niche market development	58,25	62,50	54,50	56,00	56,00
Globalisation	50,00	56,25	46,75	44,25	46,75
Local trade conditions	45,75	62,50	52,00	44,25	49,25

The following findings are evident from this analysis of the available data as outlined in **Table 7.3**:

- The dry processing sector of the Western Cape textile industry regarded environmental change factors relating to business and management strategies [58,25 per cent] and niche market developments [58,25 per cent] as the most important factors impacting on the industry in the next seven years until 2010.
- The wet processing sector of the Western Cape textile industry regarded environmental change factors relating to information technology as the most important factor [79,25 per cent], followed by two factors that obtained scores of equal value, i.e., niche market development and local trade conditions [62,50 per cent].
- Both wet and dry processing sectors of the industry regarded the development of niche markets as a priority for the next seven years.
- Those sectors of the industry involved in man-made fibre production and other production processes (including non-wovens) regarded the development of niche markets as the most important factor [56,0 per cent] during the next seven years.

The data reveals a definite trend towards the **development of niche markets** by the Western Cape textile industry. Could this indicate that the textile industry in the Western Cape has recognised the fact that "the industry's opportunity for success resides in its ability to adopt world class manufacturing principles, create more value, and expand its presence in high value-added, technically demanding international markets" (TEXFED, 2002: 3)? If this is the case, the question remains, how will the industry achieve this objective, if only 3,40 per cent of respondents to the questionnaire [**Table 6.5**] regarded the development of high-level technical skills through training and development as **a critical factor,** while only **10,30 per cent** regarded this factor as **very important** for the next seven years? In order to develop high value-added textile products investment in research and development should be a high priority, yet the key role-players confirmed during the interviews [**Chapter 5**] that investment in research and development is currently limited. When considering the comparative strengths and weaknesses of the South African textile industry, it is clear that the major threats facing the textile industry pertain to its "inability to compete in standard commodity based market segments where labour costs are a key competitiveness determinant" (TEXFED, 2002: 9, Meeuwis, 2003 & Bowen, 2003), while its opportunities rest "in relation to its transformation into a world class converter of fibre, yarn, fabric and finished textiles for discerning, high value-added markets" (TEXFED, 2002: 9).

The **importance of information technology** is highlighted by the wet processing sector [79,25 per cent], with emphasis on product, design, production processes, quality, supply chain management and communication systems. (See **Table 7.1**.)

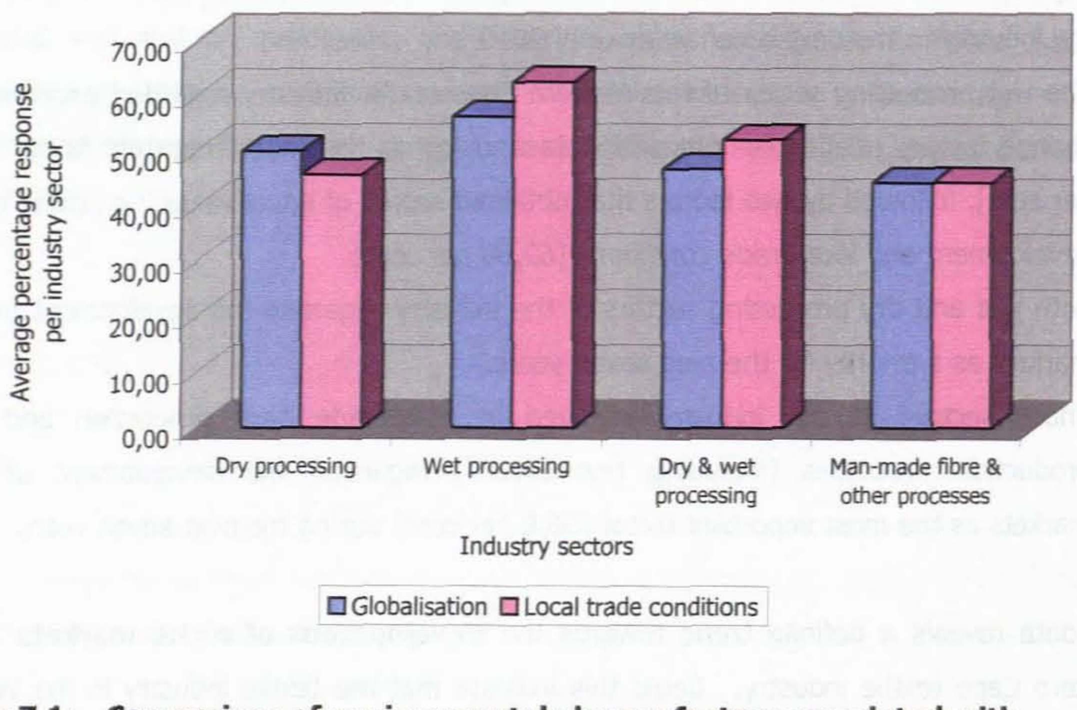


Figure 7.1: Comparison of environmental change factors associated with globalisation and local trade conditions among different industry sectors

Figure 7.1 illustrates that aspects relating to globalisation, i.e., development of international quality standards, improvement of labour productivity, international sourcing of products and reduction in trade barriers, are regarded as less important in comparison to those aspects associated with local trade conditions.

In summary, it is evident from this data analysis that aspects relating to niche market development and information technology are being recognised as important factors for future success of the textile industry. Emphasis should be placed on learning outcomes and subject-specific skills and knowledge associated with these environmental change factors, if a textile technologist learning programme at Peninsula Technikon is to respond effectively to the needs of the industry in future. In order to address this need, a focus on product development, project management and computer-aided design and manufacturing skills will be required.

7.2.2 EVALUATION OF LEARNING OUTCOMES OF AN OUTCOMES-BASED TEXTILE TECHNOLOGIST LEARNING PROGRAMME AT PENINSULA TECHNIKON

7.2.2.1 Learning outcomes of general importance to industry

In an attempt to prioritise learning outcomes among different sectors of the industry, the researcher used the classification as listed in **Table 7.2** to compile a comparative analysis of learning outcomes per industry sector. It was not practical to compare the total number of the learning outcomes listed in the questionnaire [**Question 6**] per industry sector, but by clustering learning outcomes into subject-related groups as detailed below in **Table 7.4**, the researcher was able to compare these subject groups among the four different sectors of the industry.

Table 7.4: Subject-related groups of learning outcomes

Subject group	No. of learning outcomes	Description of learning outcomes
Work Organisation	1	Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs
	12	Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance
	25	Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance
	37	Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment
	49	Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment
	54	Maintain acceptable levels of productivity in a textile-manufacturing environment
Quality management & testing	4	Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment
	5	Generate and present standards and tolerances of textile products
	7	Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment
	10	Analyse customer product specifications by relating these to tests and examination procedures
	16	Motivate and initiate quality improvements of products and processes
	26	Identify quality faults and possible causes
	29	Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes
	38	Calculate the cost of poor quality of textile products
	40	Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process
General management & business	8	Describe and interpret internal and external organisational constraints
	23	Establish, describe and apply leadership techniques
	35	Establish, describe and apply management control strategies and tools
	42	Identify and apply the techniques of customer care
	44	Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular
	56	Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade
	70	Demonstrate ability to manage a project in a textile-manufacturing environment
	71	Demonstrate understanding of the role, functions and principles of management applicable to a textile-manufacturing/retailing environment
Human Resouces & Industrial Relations	6	Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment
	17	Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA & OHASA
	27	Identify and describe the various role-players within the textile industry - SACTWU, TEXFED, etc.
	39	Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance
	50	Demonstrate understanding of the importance of job descriptions and work schedules and how these relate to successful teams in a textile-manufacturing environment

Subject group	No. of learning outcomes	Description of learning outcomes
Fabric Technology Wet processing	11	Develop understanding of different finishing processes, function and application
	13	Develop understanding of chemicals and their applications in pre-treatment of dyeing and finishing, dyeing, printing and finishing processes
	15	Develop understanding of different systems of printing
	20	Develop understanding of the different systems of dyeing
	22	Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory
	30	Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems
	32	Develop understanding of colour theory, colour measurement and assessment
	47	Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control these elements
	52	Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process
	61	Demonstrate understanding of weft insertion mechanisms, shuttle, projectile, rapier and fluid jet machines
Fabric Technology Dry processing	2	Demonstrate understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples
	9	Demonstrate understanding of other methods of fabric construction and relate these to structure and properties e.g. non-wovens, etc.
	18	Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use
	19	Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type
	28	Demonstrate understanding of weaving theory, woven structures, weights and yarn consumptions and relate these to practical examples
	30	Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems
Computer aided-design & manufacturing	3	Supervise a CAD/CAM department in a textile-manufacturing environment
	14	Supervise the production control function using Computer Integrated Machine monitoring
	57	Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets
	69	Design and produce patterns and structures using computer aided design systems for weaving and knitting
General textile processes	24	Perform textile calculations applicable to a particular section within a textile-manufacturing environment
	34	Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment
	36	Classify fibres, yarns and fabrics according to grades
	46	Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry
	48	Set and adjust complex parameters to fibres, yarn and fabric manufacturing processes
	55	Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses
	58	Determine factors impacting on manufacturing processes of regenerated and synthetic fibres
	62	Describe the conversion process in the textile pipeline
	64	Determine factors impacting on growth and production of natural fibres
	66	Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses
	72	Classify fibres, yarns, fabrics, dyes and chemicals

Subject group	No. of learning outcomes	Description of learning outcomes
Factory Engineering	41	Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment
Factory Engineering	73	Demonstrate understanding of control and automation applicable to a textile-manufacturing environment
Applied Textile Science	21	Demonstrate understanding of the morphological structure and chemical composition of natural fibres and how these relate to fibre and fabric properties and end-uses
Applied Textile Science	33	Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses
Applied Textile Science	45	Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, thermodynamics, waves and sounds, optics, electricity, magnetism and electromagnetic induction as well as radioactivity
Applied Textile Science	53	Developing sourcing techniques relevant to international markets
Applied Textile Science	65	Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and use of different man-made fibres
Textile costing, marketing & entrepreneurship	31	Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment
Textile costing, marketing & entrepreneurship	51	Developing sourcing techniques relevant to international markets
Textile costing, marketing & entrepreneurship	59	Conduct market research to determine competitive advantage of company
Textile costing, marketing & entrepreneurship	63	Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment
Textile costing, marketing & entrepreneurship	68	Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development
Specialist skills	43	Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products
Specialist skills	60	Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics

Table 7.5 outlines the average percentage scores per industry sector regarding the subject-related groups of learning outcomes, which were regarded as being of **general importance to the industry** [**Question 6: Section 6A**]. It is important to note that learning outcomes associated with fabric technology were grouped into three subject groups:

- Learning outcomes of **both** wet and dry processing (all categories).
- Learning outcomes **only** associated with **wet** processes.
- Learning outcomes **only** associated with **dry** processes.

Table 7.5: Average percentage scores per industry sector of subject related groups of learning outcomes – general importance to industry

General importance to industry Subject specific skills and knowledge per subject group	Dry processing	Wet processing	Dry & wet processing	Man-made fibre & other processes	Total
Work organisation	70,75	66,75	60,50	67,00	64,50
Quality management & testing	81,50	61,00	72,25	79,00	75,00
General management & business	69,75	62,50	59,75	68,50	64,25
Human Resources & Industrial Relations	76,75	62,50	54,25	68,75	62,50
Fabric Technology (all categories)	40,00	60,25	62,50	74,25	64,50
Fabric Technology: Wet processing	40,00	61,25	63,75	76,25	65,75
Fabric Technology: Dry processing	37,50	60,50	61,00	74,50	63,75
Computer aided-design & manufacturing	50,00	56,25	61,00	70,00	63,00
General textile processes	66,75	55,75	64,25	70,25	66,25
Factory Engineering	70,75	56,25	56,75	62,50	60,25
Applied Textile Science	68,25	55,00	57,00	63,75	60,50
Textile costing, marketing & entrepreneurship	80,00	60,00	60,00	70,50	66,00
Specialist skills	62,50	62,50	57,75	75,00	65,00

Based on an analysis of the data revealed in **Table 7.5**, the following can be concluded:

- **Dry processing sector of the industry**:
  - Quality management and testing obtained the highest average score of 81,50 per cent, followed by textile costing, marketing and entrepreneurship with an average score of 80,00 per cent.
  - Computer-aided design and manufacturing obtained the third lowest score of 50,00 per cent.
  - The average scores ranged from 81,50 per cent [highest score] to 37,50 [lowest score].

- **Wet processing sector of the industry**:
    - The highest average score of 66,75 per cent was assigned to learning outcomes associated with work organisation.
    - The lowest average score of 55,00 per cent was assigned to learning outcomes associated with applied textile science.

- **Man-made fibre production and other processes**:
    - Quality management and testing obtained the highest average score of 79,00 per cent.
    - The lowest average score of 62.50 per cent was assigned to learning outcomes associated with Factory Engineering.
    - An interesting phenomenon emerged from this data: A relatively high average score of 75,00 per cent was assigned to learning outcomes associated with specialist skills, i.e. environmental issues and legislation as well as garment manufacturing technology.

Table 7.6: Subject specific skills and knowledge per subject group according to all sectors of the industry in order of priority – general importance to the industry

General importance to industry **Subject specific skills and knowledge per subject group**	**Total**
Quality management & testing	75,00
General textile processes	66,25
Textile costing, marketing & entrepreneurship	66,00
Fabric Technology: Wet processing	65,75
Specialist skills	65,00
Work organisation	64,50
Fabric Technology (all categories)	64,50
General management & business	64,25
Fabric Technology: Dry processing	63,75
Computer aided-design & manufacturing	63,00
Human Resources & Industrial Relations	62,50
Applied Textile Science	60,50
Factory Engineering	60,25

The results depicted in **Table 7.6** confirm the data of **Table 6.10,** indicating the importance of quality management and testing to the industry in general; for this reason subject-specific skills and knowledge associated with quality management and testing will require special attention during the curriculum review process of the textile technology programme at Peninsula Technikon. It is also important to note that a textile testing laboratory has been established at Peninsula Technikon to ensure that learners are fully equipped with both theoretical and practical knowledge and skills in quality management and testing.

Another important finding from the data presented in **Table 7.6** is that learning outcomes associated with fundamental elements of the curriculum [Factory Engineering and Applied Textile Sciences] obtained the lowest average scores. This confirms that an underlying tension exists between the world of work [industry] and the world of education [technikon] as described in **Paragraph 3.6**. Although workplace learning practitioners [human resource managers, production managers, etc.] acknowledge the value of fundamental learning outcomes, the emphasis is being placed on those learning outcomes that are embedded in real work experience. For example, the learning outcomes associated with real work experience obtained the highest average scores in **Table 7.6**, while those associated with fundamental elements of science and technology education obtained the lowest average scores. It is important to acknowledge the fact that practical workplace-based learning outcomes are inextricably linked to fundamental learning outcomes in a textile technology curriculum. It is also important to note that the majority of industry learners lack fundamental skills and knowledge in these subject areas as reported in **Paragraph 4.6.3.2**.

7.2.2.2 Learning outcomes of specific importance to companies

Table 7.7 outlines the average percentage scores per industry sector regarding the subject-related groups of learning outcomes which were regarded as being of **specific importance to companies of respondents in the Western Cape** [**Question 6: Section 6B**].

Table 7.7: Average percentage scores per industry sector of subject related groups of learning outcomes – specific importance to companies of respondents in the Western Cape

Specific importance to companies in the Western Cape Subject specific skills and knowledge per subject group	Dry processing	Wet processing	Dry & wet processing	Man-made fibre & other processes	Total
Work organisation	69,50	58,25	63,50	53,75	60,00
Quality management & testing	82,50	52,75	74,75	69,50	72,00
General management & business	67,75	62,50	60,75	63,00	62,50
Human Resources & Industrial Relations	76,75	52,50	52,25	58,75	57,25
Fabric Technology (all categories)	47,50	41,50	62,00	57,25	57,25
Fabric Technology: Wet processing	45,00	46,25	63,75	54,25	57,00
Fabric Technology: Dry processing	39,00	25,00	57,75	59,00	54,00
Computer aided-design & manufacturing	48,00	37,50	61,50	42,50	51,25
General textile processes	66,75	30,75	59,00	55,25	56,25
Factory Engineering	62,50	56,25	58,75	42,00	52,50
Applied Textile Science	68,25	30,00	54,25	42,75	49,75
Textile costing, marketing & entrepreneurship	78,25	50,00	58,00	60,50	60,50
Specialist skills	70,75	56,25	48,00	59,00	55,25

The data presented in **Table 7.7** indicates that a relatively low average score of 39,00 per cent was assigned to learning outcomes associated with Fabric Technology (dry processing) by the dry processing sector of the industry, while 46,25 per cent was assigned to learning outcomes associated with Fabric Technology (wet processing) by the wet processing sector of the industry.

Table 7.8 depicts the average percentage scores, in order of priority, assigned by all sectors of the industry based on those groups of learning outcomes being of specific importance to their companies.

Table 7.8: Subject specific skills and knowledge per subject group according to all sectors of the industry in order of priority – specific importance to companies in the Western Cape

Specific importance to companies in the Western Cape Subject specific skills and knowledge per subject group	**Total**
Quality Management & testing	72,00
General management & business	62,50
Textile costing, marketing & entrepreneurship	60,50
Work organisation	60,00
Human Resources & Industrial Relations	57,25
Fabric Technology (all categories)	57,25
Fabric Technology: Wet processing	57,00
General textile processes	56,25
Specialist skills	55,25
Fabric Technology: Dry processing	54,00
Factory Engineering	52,50
Computer aided-design & manufacturing	51,25
Applied Textile Science	49,75

As previously noted, learning outcomes associated with quality management and testing were again regarded as a priority, with an average score of 72,00 per cent assigned to this subject group by companies in the Western Cape. Low average scores were recorded for learning outcomes associated with Factory Engineering, Computer aided-design and manufacturing (CAD/CAM) and Applied Textile Science.

Figure 7.2 on page 295 presents a comparative distribution of average scores of all the sectors of the industry between those learning outcomes being regarded as important to the industry in general and those being of importance to companies in particular.

The data displayed in **Figure 7.2** illustrates that a similar pattern is detected when comparing the average scores, with a significant increase in scores of quality management and testing and a drop in scores of Factory Engineering, Applied Textile Science and Computer-aided design and manufacturing by both those of importance to the industry in general and those of importance to companies in particular.

In summary, with reference to the data presented in **Table 7.5 and Table 7.7**, learning outcomes associated with quality management and testing were regarded as critical elements of a high-level textile technologist learning programme. The inclusion of specialist skills, i.e., environmental issues and legislation, as well as garment manufacturing technology should be considered during the curriculum review process. Learning outcomes associated with textile costing, marketing and entrepreneurship were regarded as important elements by the dry processing sector of the industry, while learning outcomes associated with work organisation as well as general management and business were regarded as important elements by the wet processing sector of the industry.

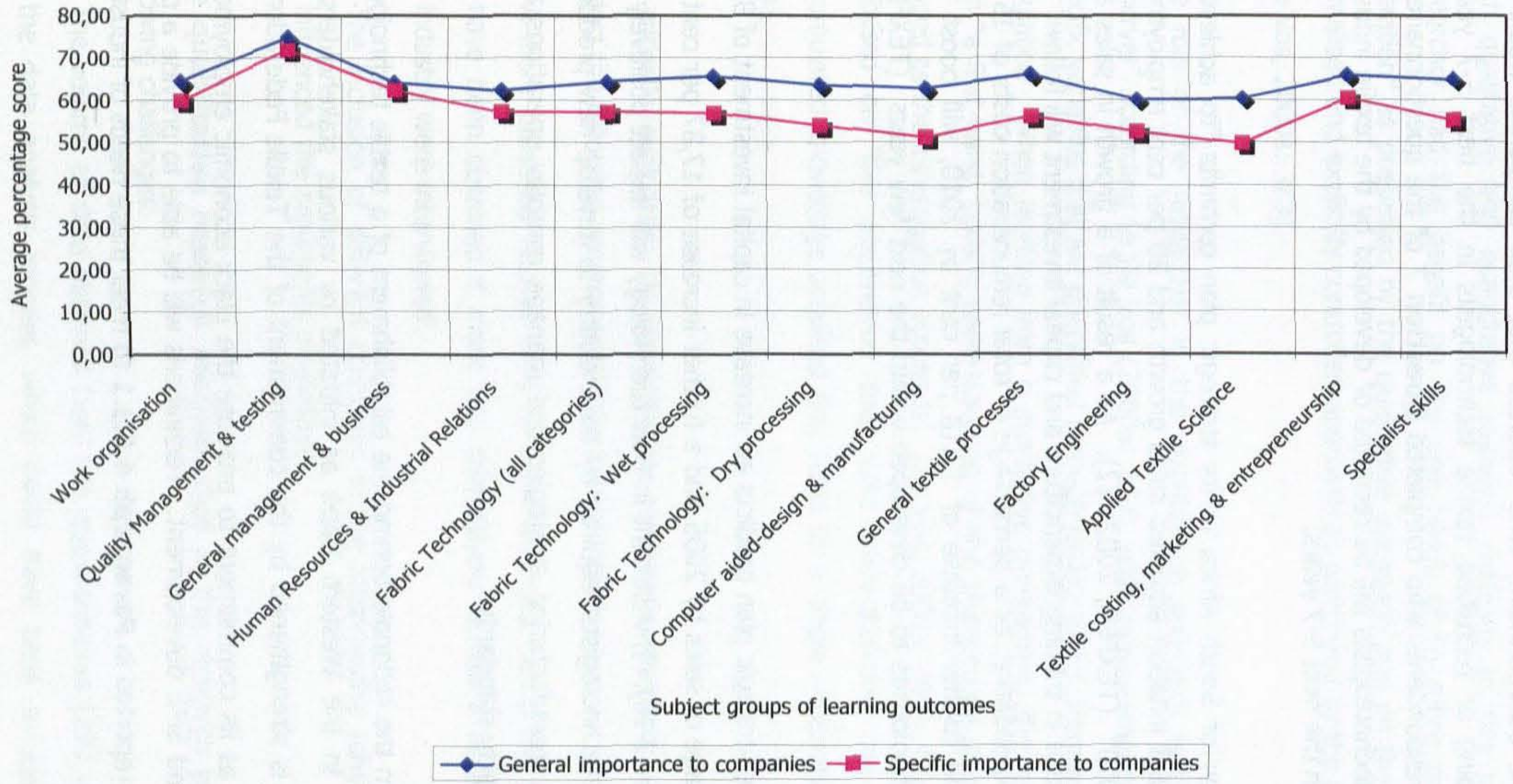


Figure 7.2: Comparative distribution of average scores of all sectors of the industry per subject group of learning outcomes

7.2.3 CONFIRMATION OF THE NEED TO ESTABLISH A TEXTILE TECHNOLOGY PROGRAMME AT PENINSULA TECHNIKON

The qualitative data analysis revealed the important role of textile technologists in the textile industry of the future, which was confirmed by the majority of respondents [71,4 per cent] to the questionnaire, who reported that their companies would be interested in developing or recruiting textile technologists in the next 5-7 years. According to the 20 respondents who completed **Question 7** of the questionnaire, a total of 52-69 textile technologists will be recruited or developed by the textile industry in the Western Cape in the next 5-7 years.

The Textile Federation of South Africa in its strategic plan commits "to achieve a minimum of 80 per cent inflation adjusted sales growth and 20 per cent employment growth through to 2010" (TEXFED, 2002: 12). As a result of a growth in sales and employment, an increase in training expenditure and capital investment will follow. An increase in training expenditure, as a percentage of total remuneration costs of 15,60 per cent by 2005 and further increase of 17,18 per cent by 2010, will boost the number of textile technologists to be developed within the next few years (TEXFED, 2002: 17).

In addition to this, the strategic plan predicts an increase in capital investment of 9,40 per cent as a percentage of sales by 2005 and a further increase of 17,87 per cent by 2010 (TEXFED, 2002: 17-18). Investment in new technology will impact positively on the number of textile technologists required by the industry to develop new products, implement innovative manufacturing strategies and manage complex operations and meet international quality standards.

These findings confirm the rationale behind the establishment of a textile technologist learning programme in the Western Cape as initiated by various stakeholders in October 1998, which is strengthened by the commitment of the Textile Federation in South Africa "as well as its commitment to promote the black economic employment, employment equity and SME development. Technikons will be able to provide a pool of African learners as reported in **Paragraph 4.6.3.1** to meet these needs of industry.

7.3 REFLECTION ON RESEARCH METHODS

Riley, Wood, Clark, Wilkie and Szivas (2000: 99) state: "Often, quantitative and qualitative methods are employed in the same research project, qualitative methods being employed to elaborate the quantitative dimensions of the research." By using both qualitative and quantitative research methods in this research project, the researcher had the benefit on the one hand, of "a more philosophical mode of operation" as presented by the qualitative approach and on the other hand, a more formalised and explicitly controlled approach as presented by the quantitative approach (De Vos, 2000a: 363).

The role of the researcher in the quantitative approach is that of "an objective observer" according to De Vos (2000a: 363), with measurements that are focused on specific variables that are quantified through rating scales, frequency counts and cross-tabulation. When working from a qualitative perspective, the researcher attempts to gain "a first-hand, holistic understanding of the phenomena, and data collection gets shaped as the investigation proceeds" (De Vos, 2000a: 364). Qualitative methodology is based on "the assumption that valid understanding can be gained through accumulated knowledge acquired first hand by a single researcher" (De Vos, 2000a: 364).

By critically evaluating the **qualitative research method** used in this research project the following recommendations can be made:

- A more balanced holistic view of the challenges facing the textile industry could have been obtained if more key role-players across a broader spectrum of the industry were interviewed.
- The inclusion of different questions in the interviewing schedule could also have influenced the arguments presented.

The **quantitative research method** used in this research project presented the following challenges:

- The volume of data obtained from the questionnaires [290 variables] complicated the data analysis process, which could have been avoided if the number of questions and variables were restricted. However, this would have resulted in less information available for data analysis.

- **Question 6** represented a comprehensive list of learning outcomes or subject-specific skills and knowledge drawn from the enabling outcomes-based curriculum presented in **Figure 4.13**; evaluating the learning outcomes in clusters, subject-related groups or modules by using focus group discussions as research method, could be another way of conducting a curriculum-orientated evaluation.

7.4 RECOMMENDATIONS FOR FUTURE RESEARCH

Future research on aspects relating to outcomes-based curriculum development and evaluation could flow from this research project, with specific reference to:

- The development of an outcomes-based curriculum evaluation model to effectively gauge the needs of industry and how these needs could be accommodated in an outcomes-based curriculum.
- The implementation of learning and teaching strategies that would effectively address the development of employability skills of textile technologists.
- The impact of strategic human resource management as a result of globalisation on the textile industry in South Africa.
- Whether outcomes-based education is more effective than content-based education in textile technology education and training in South Africa?

7.5 CONCLUSIONS

The critical need to develop high-level technical skills and knowledge, associated with a value orientation of world-class manufacturing performance and international quality standards, has been recognised by the textile industry in South Africa. The outcomes-based training model for textile technologists presented in this thesis indicates that the need to develop high-level technical skills and knowledge in textiles can only be developed through education and training systems based on a long-term strategic human resource development plan, by curricula that are educationally transformative; and by bridging the world of discipline-based learning and the world of work through learner-based, experiential and outcomes-orientated learning programmes that are focused on continued learning in a world of technological change.

I know of no more encouraging fact
than the unquestionable ability of man
to elevate his life by conscious endeavor.

Henry David Thoreau
In Covey (1989: 66).

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List of appendices

Appendix A

Classification of the Textile and Clothing Industry according to SIC and HS Code

SIC Classification for the Textile Industry (Statistics SA): 2002

Description	SIC Code Level		
	3-digit	4-digit	5-digit
SPINNING, WEAVING AND FINISHING OF TEXTILES	**311**		
Preparation and spinning of textile fibres; weaving of textiles		3111	
Preparatory activities in respect of animal fibres, including washing, combing and carding of wool			31111
Preparatory activities in respect of vegetable fibres			31112
Spinning, weaving and finishing of yarns and fabrics predominantly of wool and other animal fibres			31113
Spinning, weaving and finishing of yarns and fabrics predominantly of vegetable fibres			31114
Finishing of textiles		3112	
Finishing of purchased yarns and fabrics			31120
MANUFACTURE OF OTHER TEXTILES	**312**		
Manufacture of made-up textile articles, except apparel		3121	
Manufacture of blankets, made-up furnishing articles and stuffed articles			31211
Manufacture of tents, tarpaulins, sails and other canvas goods			31212
Manufacture of automotive textile goods (including safety belts, and seat covers)			31213
Manufacture of other textile articles (except apparel)			31219
Manufacture of carpets, rugs and mats		3122	
Manufacture of cordage, rope, twine and netting		3123	
Manufacture of other textiles n.e.c.		3129	
MANUFACTURE OF KNITTED AND CROCHETED FABRICS AND ARTICLES	**313**	-	
Garment and hosiery knitting mills			31301
Other knitting mills			31309
Source: Statistics SA (2002)			

Appendix B

Human development index (HDI) trends of selected countries

HDI rank	**1995**	**2000**
High human development		
Norway	0,925	0,942
Sweden	0,925	0,941
Australia	0,927	0,939
United States	0,925	0,939
Japan	0,923	0,933
United Kingdom	0,916	0,928
Germany	0,907	0,925
Israel	0,877	0,896
Greece	0,868	0,885
Chile	0,811	0,831
Medium human development		
Mexico	0,774	0,796
Saudi Arabia	0,737	0,759
Brazil	0,737	0,757
China	0,681	0,726
South Africa	**0,724**	**0,695**
Egypt	0,605	0,642
Namibia	0,629	0,610
India	0,545	0,577
Swaziland	0,620	0,577
Botswana	0,620	0,572
Zimbabwe	0,563	0,551
Low human development		
Pakistan	0,473	0,499
Bangladesh	0,445	0,478
Haiti	0,457	0,471
Madagascar	0,441	0,469
Nigeria	0,448	0,462
Uganda	0,404	0,444
Zambia	0,432	0,433
Malawi	0,403	0,400
Mozambique	0,313	0,322

Statistics, S.A. 2002

Appendix C

NATED 151 OF 1999

NATIONAL DIPLOMAS

3208065 NATIONAL DIPLOMA: TEXTILE TECHNOLOGY: DRY PROCESSING

DATE OF IMPLEMENTATION: JANUARY 1997

MINIMUM EXPERIENTIAL TIME IN YEARS: 1,5

MINIMUM FORMAL TIME IN YEARS: 1,5

CODE	**INSTRUCTIONAL OFFERING**	**CREDITS**
60200312	COMMUNICATION T1	0,083
81602212	BASIC FACTORY ENGINEERING T1	0,083
80803012	ELECTRICAL ENGINEERING T1	0,083
110201212	DYEING AND PRINTING TECHNOLOGY T1	0,083
110205012	FIBRES	0,083
110202312	INTRODUCTION TO TEXTILES T1	0,083
150407112	TEXTILE SCIENCE T1	0,083
80808022	TEXTILE ELECTRONICS T2	0,083
110202122	CONVERSION OF FIBRES TO YARNS T2	0,083
110201422	DYEING TECHNOLOGY T2	0,083
110205222	FABRIC MANUFACTURING	0,083
110205322	FIBRES AND YARN TECHNOLOGY AND STATISTICS T2	0.083
110205122	KNITTING AND NON-WOVEN TECHNOLOGY T2	0,083
150407022	TEXTILE CHEMISTRY T2	0,083
110200003	FINISHING TECHNOLOGY T3	0,083
110200203	KNITTING AND NON-WOVEN TECHNOLOGY T3	0,083
110200303	PHYSICAL AND POLYMER CHEMISTRY T3	0,083
110202403	SPECIAL PROJECT T3	0,083
110204403	TEXTILE COLOURATION AND BLEACHING T3	0,083
110204303	TEXTILE QUALITY TESTING T3	0,083
110205403	WEAVING TECHNOLOGY T3	0,083
110200403	YARN TECHNOLOGY T3	0,083

REMARKS

(1) OPTIONAL INSTRUCTIONAL OFFERINGS:

(1.1) **FIRST YEAR**:

BASIC FACTORY ENGINEERING I OR ELECTRICAL ENGINEERING T1

(1.2) **SECOND YEAR**:

TEXTILE CHEMISTRY T2 OR TEXTILE ELECTRONICS T2

(1.3) **THIRD YEAR**:

WEAVING TECHNOLOGY T3 OR KNITTING AND NON-WOVEN TECHNOLOGY T3 OR PHYSICAL AND POLYMER CHEMISTRY T3

(2) THIS INSTRUCTIONAL PROGRAMME REPLACES THE NATIONAL DIPLOMA: TEXTILE TECHNOLOGY: DRY PROCESSING 3208031

Appendix D

NATED 151 OF 1999

NATIONAL DIPLOMAS

3208069 NATIONAL DIPLOMA: TEXTILE TECHNOLOGY: WET PROCESSING

DATE OF IMPLEMENTATION:	JANUARY 1997
MINIMUM EXPERIENTIAL TIME IN YEARS:	1,5
MINIMUM FORMAL TIME IN YEARS:	1,5

CODE	INSTRUCTIONAL OFFERING	CREDITS
60200312	COMMUNICATION T1	0,083
81602212	BASIC FACTORY ENGINEERING T1	0,083
80803012	ELECTRICAL ENGINEERING T1	0,083
110201212	DYEING AND PRINTING TECHNOLOGY T1	0,083
110205012	FIBRES	0,083
110202312	INTRODUCTION TO TEXTILES T1	0,083
150407112	TEXTILE SCIENCE T1	0,083
110202122	CONVERSION OF FIBRES TO YARNS T2	0,083
110201422	DYEING TECHNOLOGY T2	0,083
110205222	FABRIC MANUFACTURING	0,083
110205322	FIBRES AND YARN TECHNOLOGY AND STATISTICS	0.083
110205122	KNITTING AND NON-WOVEN TECHNOLOGY T2	0,083
150407022	TEXTILE CHEMISTRY T2	0,083
110201303	DYEING AND PRINTING TECHNOLOGY T3	0,083
110200003	FINISHING TECHNOLOGY T3	0,083
110200303	PHYSICAL AND POLYMER CHEMISTRY T3	0,083
110202403	SPECIAL PROJECT T3	0,083
110204303	TEXTILE QUALITY TESTING T3	0,083
150406903	TEXTILE CHEMISTRY T3	0,083

REMARKS

(1) OPTIONAL INSTRUCTIONAL OFFERINGS:

(1.1) **FIRST YEAR**:

BASIC FACTORY ENGINEERING I OR ELECTRICAL ENGINEERING T1

(2) THIS INSTRUCTIONAL PROGRAMME REPLACES THE NATIONAL DIPLOMA:

TEXTILE TECHNOLOGY: WET PROCESSING 3208542

Appendix E

COMMITTEE OF
TECHNIKON
PRINCIPALS

\shrt2dip

SUBMISSION OF A NEW TECHNIKON QUALIFICATION

1 **NAME OF INSTITUTION**
CTP (Convenor: Technikon Natal)

2 **TITLE OF QUALIFICATION**
Diploma in Textile Technology

3 **QUALIFICATION TYPE**
Diploma

4 **FIELD**
NSB 06 - Manufacturing, Engineering and Technology

5 **NQF LEVEL OF QUALIFICATION**
NQF level 5

6 **PURPOSE OF QUALIFICATION**
Persons achieving this qualification will be able to identify problems, determine appropriate responses, develop and improve products and processes, implement and maintain systems and policy over a wide range of textile related areas using technical knowledge, skills and experience.

7 **ENTRANCE REQUIREMENTS / ASSUMPTIONS OF LEARNING IN PLACE**
FET certificate at NQF 4, with Numeracy skills at NQF 4, English second language at NQF level 4, and Physical Science at NQF level 4.
Or equivalent industrial experience.

8 **EXIT LEVEL OUTCOMES**

- Apply a generalist knowledge of textile technology to the efficient running of a textile process.
- To make fundamental technical decisions founded in the principals of applied maths, science and sound engineering practice.
- Implement basic production organisation and control measures for a textile process.
- Apply fundamental principles of management and business practice to the textile context.
- To communicate effectively using language and numbers.

9 TOTAL CREDITS
240

10 MINIMUM / MAXIMUM CREDITS
240 credits with a minimum of 144 credits at level 5

11 INTEGRATED ASSESSMENT
Formative assessment:
The knowledge, skills and values relating to academic and professional competencies will be assessed through tutorials, assignments, laboratory work, projects, and experiential learning placement assessments.

Summative assessment:
A number of methods of assessment are used to assess the result of the learning and accredit the learner. These include written examinations, tests and presentations.

12 ARTICULATION POSSIBILITIES
A student may continue to study for a First Degree in Textile Technology. Movement between any of the Qualifications at an appropriate level on the Textile Qualification Framework is also possible.

13 CRITERIA FOR THE REGISTRATION OF ASSESSORS
SERTEC, SETA and ETQA requirements.

14 MODERATION OPTIONS
As approved by SERTEC.

15 SIGNATURE

16 DATE OF SUBMISSION
24/5/2000

Submitted by: Mr A. Judd
HOD Textile Technology
Technikon Natal
Tel (031) 204 2148
E-mail alanj@umfolozi.ntech.ac.za

Appendix F

COMMITTEE OF
TECHNIKON
PRINCIPALS

\shrt2dip

SUBMISSION OF A NEW TECHNIKON QUALIFICATION

1 **NAME OF INSTITUTION**
CTP (Convenor: Technikon Natal)

2 **TITLE OF QUALIFICATION**
First degree in Textile Technology

3 **QUALIFICATION TYPE**
First degree

4 **FIELD**
NSB 06 - Manufacturing, Engineering and Technology

5 **NQF LEVEL OF QUALIFICATION**
NQF level 6

6 **PURPOSE OF QUALIFICATION**
Persons achieving this qualification will be able to conduct basic research, formulate appropriate responses, develop and improve systems and policy, and combine a wide range of textile related technological knowledge, skills and experience within a specialised area of textile technology.

7 **ENTRANCE REQUIREMENTS / ASSUMPTIONS OF LEARNING IN PLACE**
Diploma in Textile Technology (240 credits)

8 **EXIT LEVEL OUTCOMES**

- Apply a knowledge of a particular area of textile processing to the efficient running of a textile process.
- Make decisions founded in the principals of applied maths, science, and sound engineering practice.
- Implement sound production organisation and control measures to a textile process.
- Apply sound management and business practice to the textile context.
- Specify, evaluate, and develop new textile products.

9 **TOTAL CREDITS**
360 (including 240 credits at NQF level 5)

10 MINIMUM / MAXIMUM CREDITS
120 credits with a minimum of 72 credits at level 6.

11 INTEGRATED ASSESSMENT
Formative assessment:
The knowledge, skills and values relating to academic and professional competencies will be assessed through tutorials, assignments, laboratory work, projects, and experiential learning placement assessments.

Summative assessment:
A number of methods of assessment are used to assess the result of the learning and accredit the learner. These include written examinations, tests and presentations.

12 ARTICULATION POSSIBILITIES
A student may continue to study for a Btech in Textile Technology. Movement between any of the Qualifications at an appropriate level on the Textile Qualification Framework is also possible.

13 CRITERIA FOR THE REGISTRATION OF ASSESSORS
SERTEC, SETA and ETQA requirements.

14 MODERATION OPTIONS
As approved by SERTEC.

15 SIGNATURE

16 DATE OF SUBMISSION
24/5/2000

Submitted by: Mr A. Judd
HOD Textile Technology
Technikon Natal
Tel (031) 204 2148
E-mail alanj@umfolozi.ntech.ac.za

Appendix G

\shrt2dip

SUBMISSION OF A NEW TECHNIKON QUALIFICATION

1 **NAME OF INSTITUTION**
CTP (Convenor: Technikon Natal)

2 **TITLE OF QUALIFICATION**
B. Tech degree in Textile Technology

3 **QUALIFICATION TYPE**
B. Tech degree

4 **FIELD**
NSB 06 - Manufacturing, Engineering and Technology

5 **NQF LEVEL OF QUALIFICATION**
NQF level 7

6 **PURPOSE OF QUALIFICATION**
Persons achieving this qualification will be able to conduct research in a specialised area of textile technology and create appropriate responses to contribute towards deeper knowledge of the of the textile industry.

7 **ENTRANCE REQUIREMENTS / ASSUMPTIONS OF LEARNING IN PLACE**
First Degree in Textile Technology (360 credits)

8 **EXIT LEVEL OUTCOMES**

- Apply a specialist knowledge of a particular area of the textile industry to the efficient running of a textile process.
- Make higher level technical decisions founded in the principles of applied maths, science, and sound engineering practice.
- Implement higher level production organisation and control measures to a specific area of textile processing.
- Apply a higher level of management and business practice to a specific area of textile processing.
- Specify, evaluate, and develop new textile products at a higher level in a specific area.

9 TOTAL CREDITS
480 (including 120 credits at NQF level 6, and 240 credits at level 5).

10 MINIMUM / MAXIMUM CREDITS
120 credits with a minimum of 72 credits at level 6.

11 INTEGRATED ASSESSMENT
Formative assessment:
The knowledge, skills and values relating to academic and professional competencies will be assessed through tutorials, assignments, laboratory work, projects, and experiential learning placement assessments.

Summative assessment:
A number of methods of assessment are used to assess the result of the learning and accredit the learner. These include written examinations, tests and presentations.

12 ARTICULATION POSSIBILITIES
Movement between any of the Qualifications at an appropriate level on the Textile Qualification Framework.
Higher level qualifications in related disciplines are offered at a number of institutions within the country.

13 CRITERIA FOR THE REGISTRATION OF ASSESSORS
SERTEC, SETA and ETQA requirements.

14 MODERATION OPTIONS
As approved by SERTEC.

15 SIGNATURE

16 DATE OF SUBMISSION
24/5/2000

Submitted by: Mr A. Judd
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Appendix H

WORKSHOP: TECHNOLOGIST LEVEL LEARNING
CAPE TECHNIKON
CAPE TOWN

28 October 1998

1	Registration: Tea and coffee		08:00 – 08:30
2	Welcome	David Bowen	08:30 - 08:40
3	Retail Perspective	Peter Thickett Foschini	08:45 – 09:05
4	Retail Perspective	Stuart Gottschalk Woolworths	09:05 – 09:25
5	Labour Perspective	Ralph Alexander SACTWU	09:30 – 09:50
6	Manufacturer Perspective	Frans Barnard Aranda Textiles	09:50 – 10:10
7	Tea		
8	Current Provision:		
	Technikon Natal	Alan Judd	10:30 – 10:50
	University of Stellenbosch	Adine Gericke	10:50 – 11:10
	Cape Technikon	CV Botha	11:15 – 11:35
	Marianne Bester	Marianne Bester	11:35 – 11:55
	CSIR	Tina Eboka	12:00 – 12:20
9	Hogeschool Enschede (Holland)	Albert van Oudhuesden UNSA	12:20 – 12:45
10	Lunch		12:50 – 13:30
11	Workshop: The Way Forward		13:45 – 15:15
12	Tea		15:15 – 15:30
13	Report back	David Bowen	15:30 – 15:45
14	Closure	David Bowen	15:45 – 15:50

Appendix I

CURRICULUM DESIGN TASK TEAM
1998-1999

NAME OF MEMBER	INSTITUTION/ COMPANY	E-MAIL ADDRESS
Mr David Bowen (Chair person)	Textile Industry Training Board	Titb.dir@dbn.lia.net
Mr Arthur Nilsen	Textile Industry Training Board	Arthur.nilsen@kingsley.co.za
Mr Alan Taylor	SANS Fibres	taylora@sans.co.za
Ms Tina Eboka	CSIR Textek	
Mr Francois Barkhuizen	CSIR Textek	fbarkhuy@csir.co.za
Mr Bert Pictor	Falke Eurosocks	
Mr Stuart Gottschalk	Woolworths	stuartg@iafrica.com
Mr Sebastiaan Janssens	Triumph International	
Mr Andre Kriel	S.A. Clothing & Textiles Workers Union	
Mrs. Marianne Bester	Peninsula Technikon	besterm@pentech.ac.za
Ms Adine Gericke	University of Stellenbosch	agericke@sun.ac.za
Ms Lee Voges	Cape Technikon	leevoges@ctech.ac.za
Mr Alan Judd	Natal Technikon	textnet@cis.co.za
Mr Richard Majewski	CLOTEX	textnet@cis.co.za
Prof Bessie Visser	University of Stellenbosch	emv@sun.ac.za

Appendix J

COMPULSORY		ELECTIVE
FUNDAMENTAL	THE TEXTILE PROCESSES (CONTEXTUAL STANDARDS)	MANUFACTURED FIBRES AND POLYMERS, MANUFACTURING FABRIC THROUGH THE WET AND DRY PROCESS TO INCLUDE DYEING AND PRINTING AND WEAVING, KNITTING, SPINNING AND NON-WOVEN
NQF level 6		
• Communication studies and language • Physical, mathematical, computer and life sciences.	22. Plan and implement a waste management system. 23. Design a quality management system for a particular area of specialisation in the textile industry. 24. Draw up and maintain a production plan for a particular area of specialisation in the textile industry. 25. Promote employer / employee relationships in a textile plant. 26. Classify raw materials in grades.	42. Set and adjust complex parameters to a wet process. 43. Set and adjust complex parameters to a dry process. 44. Set and adjust complex parameters to a man made fibre process. 45. Modify and develop processes to enhance the wet process. 46. Modify and develop processes to enhance the dry process. 47. Modify and develop processes to enhance the man made fibre process. 48. Create new textile products in a wet process. 49. Create new textile products in a dry process. 50. Create new textile products in a man made fibre process.
NQF level 4		
• Communication studies and language • Physical, mathematical, computer and life sciences.	14. Apply housekeeping practices in a textile plant. 15. Apply safe working practices in a textile plant. 16. Apply waste regulations and processes to reduce waste in a textile plant. 17. Monitor and improve employer / employee practices in a textile plant. 18. Contribute to and improve on the operation of a quality assurance system. 19. Relate a specific area of work to the textile industry. 20. Lead teams in textile processes. 21. Describe material flow in the manufacture of textiles.	16. Monitor and maintain a warping and sizing process 17. Monitor and maintain a weaving process. 18. Monitor and maintain a knitting process. 19. Monitor and maintain a non-woven process. 20. Complete a product change over in a weaving process. 21. Complete a product change over in a knitting process. 22. Complete a product change over in a non-woven process. 23. Monitor and maintain a spinning preparation process. 24. Monitor and maintain a spinning process. 25. Complete a product change over in a spinning process. 26. Complete a product change over in a spinning preparation process. 27. Monitor and maintain dyeing process. 28. Monitor and maintain printing process. 29. Complete a product change over in a dyeing process. 30. Complete a product change over in a printing process. 31. Develop recipes and print colouration. 32. Make up screens for printing. 33. Start up and shut down a polymer manufacturing process. 34. Start up and shut down an extrusion process to manufacture fibres. 35. Start up and shut down a polymer preparation process. 36. Start up and shut down a fibre finishing process. 37. Develop and adjust additives for the manufacture of polymers and fibres. 38. Complete a product change over to a polymer

COMPULSORY		ELECTIVE
FUNDAMENTAL	**THE TEXTILE PROCESSES (CONTEXTUAL STANDARDS)**	**MANUFACTURED FIBRES AND POLYMERS, MANUFACTURING FABRIC THROUGH THE WET AND DRY PROCESS TO INCLUDE DYEING AND PRINTING AND WEAVING, KNITTING, SPINNING AND NON-WOVEN**
		manufacturing process. 39. Complete a product change over to an extrusion process. 40. Complete a product change over to a fibre finishing process. 41. Complete a product change over to a polymer preparation process.
	NQF level 2	
• Communication studies and language • Physical, mathematical, computer and life sciences.	1. Comply with housekeeping practices. 2. Comply with safe working practices. 3. Comply with waste reduction practices. 4. Maintain positive employer / employee practices. 5. Supply raw and processed material to production line. 6. Describe and relate to production sectors, end uses and competitors to the textile industry. 7. Maintain a textile quality assurance system. 8. Conduct minor routine and breakdown maintenance on equipment and machines. 9. Read and react to machine control variables. 10. Use and maintain hand tools and equipment. 11. Interact with people in textiles processes. 12. Identify calculations, terms and concepts. 13. Identify materials used to manufacture polymer, fibre, yarn or fabric.	1. Start up and shut down a warping and sizing process. 2. Start up and shut down a weaving process. 3. Start up and shut down a knitting process. 4. Start up and shut down a non-woven process. 5. Start up and shut down a spinning process. 6. Start up and shut down a spinning preparation process. 7. Start up and shut down a dyeing process. 8. Start up and shut down a printing process. 9. Reproduce recipes and print paste. 10. Monitor and maintain a polymer manufacturing process. 11. Monitor and maintain an extrusion process to manufacture fibres. 12. Monitor and maintain a polymer preparation process. 13. Monitor and maintain fibre finishing processes. 14. Prepare additives for manufacture of polymers and fibres. 15. Cut, bale and weigh fibres.

Appendix K

Textile Manufacturing

National First Degree in Textile Technology

NQF Level 6

Purpose

To provide a higher qualification in textile technology in either wet, dry or man made processes, where learners can combine elective areas to broader processes. Learners will be able to combine learning in particular processes to either wet, dry or man-made and will be able to enhance and improve on the process.

Learning assumed to be in place

NQF Level 4, Textile processes or RPL equivalent.

Range Statement

This certificate is aimed at learners wishing to generalise across elective areas where learners will either qualify in dry, wet or man made processes. Learners will therefore broaden their competence through generalising across specific elective standards.

Standards Comprising this Qualification

Fundamental

- Use sophisticated communication media.
- Set up and monitor computer aided systems to enhance textile processes.

Core

- Plan and implement a waste management system.
- Design a quality management system for a particular area of specialisation in the textile industry.
- Draw up and maintain a production plan for a particular area of specialisation in the textile industry.
- Promote employer / employee relationships in textile plant.
- Classify raw materials in grades.

Elective

- Wet processes.
- Dry processes.
- Man made processes.

Rules of Combination

- Fundamental standards from field of communication studies and language and physical, computer and life sciences - **72 credits.**
- All 5 core standards totalling **208 credits.**
- Remaining **100 credits** elected as follows:
    - Dry processes - 43 plus 46 plus 49.
    - Wet processes - 42 plus 45 plus 48.
    - Man made fibre processes - 44 plus 47 plus 50.

Integrated Assessment

Learners who are learning towards this qualification or learners who can be qualified through recognition of prior learning should use the following guidelines when producing evidence of competence.

- **Systems are developed and implemented** within a dry, wet or man-made environment to include a quality system, waste management system and IR system.
- **A new product or process** is developed or an existing product or process enhanced within the dry, wet or man-made contexts.

Production plans to show all aspects of processes within dry, wet or man-made contexts.

Appendix L

Name of panel member	Name of employer	Postal address	Town/City	Postal code
Mr Martin Rohner	Rotex Fabrics	P.O. Box 1465	Dassenberg	7350
Mr Peter Lourens	SBH Cotton Mills	P.O. Box 25	Cape Town	8000
Mr Juan Laubscher	Berg River Textiles	P.O. Box 306	Paarl	7620
Mr Andre Kriel	SACTWU	P.O. Box 194	Salt River	7924
Mr Alan Judd	Technikon Natal	P.O. Box 953	Durban	4000
Mr Peter Thickett	Foschini (TFG)	P.O. Box 6020	Parow East	7501
Mr Arthur Nielsen	CTFL SETA	P.O. Box 935	Pinetown	3600
Mr Paul Duveen	Dutest Agencies	P.O. Box 84	Milnerton	7435
Prof. L. Hunter	CSIR	P.O. Box 1124	Port Elizabeth	6000
Mr Alan Taylor	SANS Fibres	P.O. Box 272	Bellville	7530
Mr. John Stothers	Woolworths	P.O. Box 680	Cape Town	8000
Mr Ettienne Weideman	CSIR	21 Dummer Street	Somerset West	7130
Dr. Francois Barkhuysen	CSIR	P.O. Box 1124	Port Elizabeth	6000
Mr Richard Majewski	Narich/SADFA	P.O. Box 203	Milnerton	7435
Mr Stuart Gottschalk	Woolworths	P.O. Box 680	Cape Town	8000

Appendix M

NATED 151 OF 2001

NATIONAL DIPLOMAS

3208080 NATIONAL DIPLOMA: TEXTILE TECHNOLOGY

DATE OF IMPLEMENTATION: JANUARY 2001

MINIMUM EXPERIENTIAL TIME IN YEARS: 0,0

MINIMUM FORMAL TIME IN YEARS: 3,0

CODE	INSTRUCTIONAL OFFERING	CREDITS
60505912	INFORMATION TECHNOLOGY I	0,083
110214212	INDUSTRIAL STUDIES I	0,083
110213512	PRODUCT ENGINEERING I	0,042
110213412	PRODUCTION ORGANISATION & CONTROL I	0,167
110213312	TEXTILE TECHNOLOGY I	0,500
150420312	TEXTILE SCIENCE I	0,125
60506022	INFORMATION TECHNOLOGY II	0,042
110214322	INDUSTRIAL STUDIES II	0,042
110213822	PRODUCT ENGINEERING II	0,021
110213722	PRODUCTION ORGANISATION & CONTROL II	0,083
110213622	TEXTILE TECHNOLOGY II	0,250
110214922	TEXTILE TECHNOLOGY IIB	0,500
150420422	TEXTILE SCIENCE II	0,062
60506103	INFORMATION TECHNOLOGY III	0,042
110214403	INDUSTRIAL STUDIES III	0,062
110214103	PRODUCT ENGINEERING III	0,083
110214003	PRODUCTION ORGANISATION III	0,062
110213903	TEXTILE TECHNOLOGY III	0,209
110215003	TEXTILE TECHNOLOGY IIIB	0,500
150420503	TEXTILE SCIENCE III	0,042

REMARKS

1) COMPULSORY INSTRUCTIONAL OFFERINGS:
   ALL THE INSTRUCTIONAL OFFERINGS
2) POINTS OF EXIT:
   a. NATIONAL HIGHER CERTIFICATE TEXTILE TECHNOLOGY (3108052)
      THIS QUALIFICATION MAY BE AWARDED TO A CANDIDATE ON COMPLETION OF AT LEAST TWO (2.0) FORMAL CREDITS OF THIS INSTRUCTIONAL PROGRAMME
3) THIS INSTRUCTIONAL PROGRAMME REPLACES THE NATIONAL DIPLOMA TEXTILE TECHNOLOGY (3208077)

NATED 151 OF 2001

BACCULAUREI TECHNOLOGIAE

3308017 BACCALAUREUS TECHNOLOGIAE: TEXTILE TECHNOLOGY

DATE OF IMPLEMENTATION:	JANUARY 2001
MINIMUM EXPERIENTIAL TIME IN YEARS:	0,0
MINIMUM FORMAL TIME IN YEARS:	3,0

CODE	**INSTRUCTIONAL OFFERING**	**CREDITS**
60506206	INFORMATION TECHNOLOGY IV	0,083
110214706	INDUSTRIAL STUDIES IV	0,125
110214806	PRODUCT ENGINEERING IV	0,333
110214606	PRODUCTION ORGANISATION & CONTROL IV	0,125
110214506	TEXTILE TECHNOLOGY IV	0,333

REMARKS

1) COMPULSORY INSTRUCTIONAL OFFERINGS:
   ALL THE INSTRUCTIONAL OFFERINGS

NATIONAL DIPLOMA TEXTILE TECHNOLOGY I
ACADEMIC STRUCTURE 2001

FIRST SEMESTER								
SAPSE CODE	HOST SAPSE CREDIT	HOST SUBJECT CODE	HOST SUBJECT NAME	MODULE SUBJECT CODE	MODULE SAPSE CREDIT	MODULE SUBJECT NAME	NUMBER OF HRS PER WEEK	PREREQUISITE MODULE SUBJECT(S)
60505912	0,0420	TITX10	Information Technology I	TIT111	0,0420	Communication IA	2	None
11021412	0,0420	TISX10	Industrial Studies I	TIS111	0,0420	General Business Skills IA	2	None
110213512	0,0210	TPNX10	Product Engineering I	TPN111	0,0210	Factory Engineering IA	4	None
110213412	0,0830	TPOX10	Production Organisation & Control I	TPO111	0,0830	Work Organisation IA	2	None
110213312	0,2500	TXTX10	Textile Technology I	TXT111	0,0625	Fibre & Yarn Technology IA	2	None
				TXT112	0,0625	Fabric Technology IA	4	None
				TXT113	0,0625	Colouration Technology IA	4	None
				TXT114	0,0625	General Textiles IA	2	None
150420312	0,0620	TSCX10	Textile Science I	TSC111	0,0620	Chemistry IA	6	None
TOTAL:	**0,5000**				**0,5000**		**28**	

SECOND SEMESTER								
SAPSE CODE	HOST SAPSE CREDIT	HOST SUBJECT CODE	HOST SUBJECT NAME	MODULE SUBJECT CODE	MODULE SAPSE CREDIT	MODULE SUBJECT NAME	NUMBER OF HRS PER WEEK	PREREQUISITE MODULE SUBJECT(S)
60505912	0,0420	TITX10	Information Technology I	TIT121	0,0420	Computer Studies IB	2	None
11021412	0,0420	TISX10	Industrial Studies I	TIS121	0,0420	General Business Skills IB	2	General Business Skills IA
110213512	0,0210	TPNX10	Product Engineering I	TPN121	0,0210	Factory Engineering IB	4	Factory Engineering IA
110213412	0,0830	TPOX10	Production Organisation & Control I	TPO121	0,0830	Work Organisation IB	2	Work Organisation IA
110213312	0,2500	TXTX10	Textile Technology I	TXT121	0,0625	Fibre & Yarn Technology IB	2	Fibre & Yarn Technology IA
				TXT122	0,0625	Fabric Technology IB	4	Fabric Technology IA
				TXT123	0,0625	Colouration Technology IB	4	Colouration Technology IA
				TXT124	0,0625	General Textiles IB	2	General Textiles IA
150420312	0,0620	TSCX10	Textile Science I	TSC121	0,0620	Physics IB	6	None
TOTAL:	**0,5000**				**0,5000**		**28**	

IMPLEMENTATION: January 2001

NATIONAL DIPLOMA TEXTILE TECHNOLOGY II
ACADEMIC STRUCTURE 2002

SAPSE CODE	HOST SAPSE CREDIT	HOST SUBJECT CODE	HOST SUBJECT NAME	MODULE SUBJECT CODE	MODULE SAPSE CREDIT	MODULE SUBJECT NAME	NUMBER OF HRS PER WEEK	PREREQUISITE MODULE SUBJECT(S)
FIRST SEMESTER								
60506022	0,0420	TITX20	Information Technology II	TIT211	0,0420	Computer Studies IIA	4	Computer Studies IB
110214322	0,0420	TISX20	Industrial Studies II	TIS211	0,0420	Management IA	2	None
110213822	0,0210	TPNX20	Product Engineering II	TPN211	0,0210	Factory Engineering IIA	4	Factory Engineering IB
110213722	0,0830	TPOX20	Production Organisation & Control II	TPO211	0,0830	Quality Management IA	2	None
110213622	0,2500	TXTX20	Textile Technology II	TXT211	0,1250	Yarn & Fabric Technology IIA	4	General Textiles IB Fibre & Yarn Technology IB Fabric Technology IB Colouration Technology IB
				TXT212	0,1250	Colouration Technology IIA	4	General Textiles IB Fibre & Yarn Technology IB Fabric Technology IB Colouration Technology IB
150420422	0,0620	TSCX20	Textile Science II	TSC211	0,0620	Applied Textile Science IA	4	Chemistry IA Physics IB
Sub-total:	**0,5000**				**0,5000**		**28**	
SECOND SEMESTER								
SAPSE CODE	**HOST SAPSE CREDIT**	**HOST SUBJECT CODE**	**HOST SUBJECT NAME**	**MODULE SUBJECT CODE**	**MODULE SAPSE CREDIT**	**MODULE SUBJECT NAME**	**NUMBER OF HRS PER WEEK**	**PREREQUISITE MODULE SUBJECT(S)**
60505912	0,0420	TITX20	Information Technology II			None		
11021412	0,0420	TISX20	Industrial Studies II			None		
110213512	0,0210	TPNX20	Product Engineering II			None		
110213412	0,0830	TPOX20	Production Organisation & Control II			None		
110214822	0,5000	TTLX20	Textile Technology IIB	TTL221	0,5000	General Experiential Learning	28	Yarn & Fabric Technology IIA Colouration Technology IIA
150420312	0,0620	TSCX20	Textile Science II			None		
Sub-total:	**0,5000**				**0,5000**			
TOTAL:	**1,0000**						**28**	

IMPLEMENTATION: January 2002

NATIONAL DIPLOMA TEXTILE TECHNOLOGY III
ACADEMIC STRUCTURE 2003

FIRST SEMESTER								
SAPSE CODE	**HOST SAPSE CREDIT**	**HOST SUBJECT CODE**	**HOST SUBJECT NAME**	**MODULE SUBJECT CODE**	**MODULE SAPSE CREDIT**	**MODULE SUBJECT NAME**	**NUMBER OF HRS PER WEEK**	**PREREQUISITE MODULE SUBJECT(S)**
60506103	0,0420	TITX30	Information Technology III	TIT311	0,0420	CAD/CAM Systems IA	4	Computer Studies IIB
110214403	0,0625	TISX30	Industrial Studies III	TIS311	0,0625	Human Resource Management IA	4	Management IB
110214103	0,0833	TPNX30	Product Engineering III	TPN311	0,0833	Product Development IA	4	Factory Engineering IIB
110214003	0,0625	TPOX30	Production Organisation & Control III	TPO311	0,0625	Textile Testing & Statistics IA	4	Quality Management IB
110213903	0,2070	TXTX30	Textile Technology III	TXT311	0,2070	Yarn & Fabric Technology IIIA (Elective module)	8	Yarn & Fabric Technology IIA Colouration Technology IIA
				TXT312	0,2070	Colouration Technology IIIA (Elective module)	8	Yarn & Fabric Technology IIA Colouration Technology IIA
150420503	0,0420	TSCX30	Textile Science III	TSC311	0,0420	Polymer Science IA (Elective module)	4	Applied Textile Science IB
				TSC312	0,0420	Colouration Science IA (Elective module)	4	Applied Textile Science IB
				TSC313	0,0420	Applied Textile Science IIA (Elective module)	4	Applied Textile Science IB
Sub-total:	**0,4993**				**0,4993**		**28**	

SECOND SEMESTER								
SAPSE CODE	**HOST SAPSE CREDIT**	**HOST SUBJECT CODE**	**HOST SUBJECT NAME**	**MODULE SUBJECT CODE**	**MODULE SAPSE CREDIT**	**MODULE SUBJECT NAME**	**NUMBER OF HRS PER WEEK**	**PREREQUISITE MODULE SUBJECT(S)**
60506103	0,0420	TITX30	Information Technology III			None		
110214403	0,0625	TISX30	Industrial Studies III			None		
110214103	0,0830	TPNX30	Product Engineering III			None		
110214003	0,0625	TPOX30	Production Organisation & Control III			None		
110215003	0,5000	TTLX30	Textile Technology IIIB	TTL321	0,5000	Experiential Learning of Elective Area	28	Yarn & Fabric Technology IIIA OR Colouration Technology IIIA
150420503	0,0420	TSCX30	Textile Science III			None		
Sub-total:	**0,5000**				**0,5000**			
TOTAL:	**0,9993**				**0,9993**		**28**	

IMPLEMENTATION: January 2003

PENINSULA TECHNIKON

Appendix O

FACULTY OF ENGINEERING
Department : Clothing & Textile Technology

Enquiries:
Ref No:

15 August 2003

Name of respondent
Name of company
Postal address
CITY
Postal code

Dear colleague

CHANGING NEEDS OF THE TEXTILE INDUSTRY

There are fundamental forces at work that affect the scope and focus of Higher Education in South Africa. As the impact of globalisation, the rate of technological development and the move toward a knowledge economy increase, the workforce requires more sophisticated education and training to sustain its competitiveness. It has become essential for Higher Education institutions, especially Technikons, to ensure that students are better skilled, more competent, more employable and more employer-focused. Consultation with stakeholders (industry, labour, providers, learners and other special interest groups) is therefore a critical element of training needs analysis, curriculum design and development, learning material development, presentation and offering types, as well as assessment.

The Textile Industry Training Board based the rationale for the design, development and implementation of a high-level textile technologist qualification at the Peninsula Technikon at the time on an industry wide skills audit conducted in 1997-1998, which revealed the following:

- Only 161 qualified textile technologist existed in South Africa;
- A breakdown of regional statistics revealed that 88 technologists were employed in Kwazulu-Natal, 27 in the Eastern Cape, 34 in the Western Cape and 12 in other parts of the country;
- It was estimated at the time of the survey that 165 textile technologists had to be trained during the next five years to meet the needs of the industry.

The first group of successful ND Textile Technology students will obtain their qualifications at the end of this academic year. It has become important to review the learning outcomes of the textile technology programme at Peninsula Technikon, in an attempt to respond more effectively to challenges affecting the textile industry in a global trade environment.

P O Box 1906 Bellville 7535 • Symphony Way (off Modderdam Rd) Bellville 7530 • Tel: (021) 959 6466/ 959 6468
Fax/ (021) 959 6497 • Website: http://www.pentech.ac.za • E-Mail: besterm@mail.pentech.ac.za

I am currently conducting **research** into the changing needs of the South African textile industry in general, and the Western Cape in particular. The emphasis of the research is to determine how education and training in textile technology at Peninsula Technikon can more effectively respond to these needs by adapting the learning outcomes of the programme. **Your participation in this process, as important role player and/or subject specialist in the textile industry, will be valued.** It will be appreciated if you could devote approximately 45 minutes of your time to answer questions on critical issues facing the textile industry in South Africa during a personal interview. I am enclosing a list of the questions for your information.

If you are willing to participate in the research, you are kindly requested to **complete the attached reply slip and to fax the slip back to the Department Clothing & Textile Technology at Peninsula Technikon: Attention: Mrs. Marianne Bester** (Fax no. 021-959 6497) by no later than **Friday, 29 August 2003**. An interview date and time will be scheduled during September 2003 at a time convenient to you.

If you are unable to participate personally, but would like to nominate a colleague for participation, kindly enter his/her name as respondent.

This is an opportunity for you to contribute towards our quest for excellence in textile education and training by assisting us in developing, implementing, assessing and reviewing learning programmes that respond effectively to the needs of the clothing and textile industries.

Yours sincerely

Mrs. Marianne Bester
Head: Clothing & Textile Technology

REPLY SLIP

FAX TO: 959-6497 or 959-6357
Attention: Marianne Bester

Name of respondent: ______________________

Job title: ______________________

Name of company: ______________________

Telephone no.: ______________________

Fax no.: ______________________

E-mail address: ______________________

I am willing to participate in the research by answering questions on the challenges facing the textile industry in South Africa and by discussing issues pertaining to the training needs of the textile industry.	**Yes**
	No

If you are willing to participate, kindly indicate the dates and times during September 2003 that would be suitable for the interview to take place:

Best possible dates:
Best possible times:

Signed: ______________________ Date: ______________________

QUESTIONS

1. What in your opinion are the **strengths and weaknesses** of the textile industry in South Africa?
2. What in your opinion are the **opportunities and threats** of the textile industry in South Africa?
3. Do you believe that there is a **future** for the textile industry in South Africa?
4. What are the **critical aspects** that will determine the future of the textile industry?
5. Which **sectors in the industry** do you believe will survive and grow in the future and why?
6. What **strategies** need to be developed to meet the challenges of the future?
7. What **human qualities, skills and knowledge** are required to meet these challenges?
8. Do you believe that there is **a need for cooperation** between textile companies in areas such as research and development, education and training and the development of "best practice methods" for the industry?
9. Is the S.A. textile industry sufficiently innovative in their **manufacturing practices** to meet the future needs of their customers?
10. To what extent is the industry investing in **technology** to be globally competitive?
11. To what extent is the industry investing in **research and development** to be globally competitive?
12. Are the **present levels of knowledge and skills** in the labour market sufficient to meet the future needs of the textile industry in SA?
13. Are **education and training programmes** at tertiary level effectively addressing the needs of the industry? If not, why not?
14. Do you believe there is a **need for textile technologists** in the industry of the future?
15. What in your opinion is the **role** of a textile technologist?

Appendix P

LIST OF NAMES OF KEY ROLE PLAYERS FOR INTERVIEWS

Category/ Sector	Person	Job title	Company	Address	Tel. No.	Fax. No.	Date and time of interview
Skills development and training	Dr Hoosen Rasool	CEO	Clothing, Textiles, Footwear & Leather SETA	P.O. Box 935 Pinetown 3600	(031) 702 4482 hoosen@ctflseta.org.za	(031) 702 4113	5 September
Skills development and training	Mr David Mason	Sector Skills Facilitator – Western Cape	Clothing, Textiles, Footwear and Leather SETA	1 Steen Avenue Somerset West	(021) 855 2036 or dmason@mweb.co.za	(021) 855 2036	1 September
Industry (spinning, weaving, dyeing & finishing)	Mr David Bowen	Training Director	Frame Textiles including three Western Cape textile manufacturing companies	P.O. Box 81 New Germany 3620	(031) 710 4450 david.bowen@frame.co.za	(031) 710 4616	19 September
Industry (spinning)	Mr Shane Swiegers	Sales manager	S.A. Fine Worsteds	P.O. Box 88 Maitland 7405	(021) 593 9100 yarnsales@safine.co.za	(021) 593 1410	2 September
Industry (knitting)	Mr Murray Meeuwis	Human resource manager	BMD Knitting Mills	P.O. Box 72 Plumstead 7801	(021) 700 2000 meeuwis@bmd.co.za	(021) 700 2005	1 September
Industry (wool and mohair cluster project & retail)	Mr Stuart Gottschalk	Textile technologist	Wool and Mohair cluster project c/o Woolworths	P.O. Box 680 Cape Town 8000	(021) 671 1702 stuartg@iafrica.com	(021) 671 1605	16 September
Industry (fibre production)	Mr Frans Loots	General manager	Mohair South Africa		(041) 487 1386 frans@mohair.co.za	(041) 487 1336	9 December
Other stakeholders	Dr Francois Barkhuysen	Centre specialist & textile technologist	CSIR Centre for Fibres, textiles and clothing	P.O. Box 1124 Port Elizabeth 6000	(041) 508 3238 fbarkhuy@csir.co.za	(041) 508 3268	12 December

APPENDIX Q

3 September 2003

Dear colleague

CHANGING NEEDS OF THE TEXTILE INDUSTRY

There are fundamental forces at work that affect the scope and focus of Higher Education in South Africa. As the impact of globalisation, the rate of technological development and the move toward a knowledge economy increase, the workforce requires more sophisticated education and training to sustain its competitiveness. It has become essential for Higher Education institutions, especially Technikons, to ensure that students are better skilled, more competent, more employable and more employer-focused. Consultation with stakeholders (industry, labour, providers, learners and other special interest groups) is therefore a critical element of training needs analysis, curriculum design and development, learning material development, presentation and offering types, as well as assessment.

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- It was estimated at the time of the survey that 165 textile technologists had to be trained during the next five years to meet the needs of the industry.

The first group of successful ND Textile Technology students will obtain their qualifications at the end of this academic year. It has become important to review the learning outcomes of the textile technology programme at Peninsula Technikon, in an attempt to respond more effectively to challenges affecting the textile industry in a global trade environment.

I am currently conducting **research** into the changing needs of the South African textile industry in general, and the Western Cape in particular. The emphasis of the research is to determine how education and training in textile technology at Peninsula Technikon can more effectively respond to these needs by adapting the learning outcomes of the programme. **Your participation in this process, as important role player and/or subject specialist in the textile industry, will be invaluable.**

Unfortunately, due to financial and time constraints, I am unable to meet with you personally, but it will be appreciated if you could answer questions on critical issues facing the textile industry in South Africa, by replying to the attached list of questions.

If you are willing to participate in the research, **you are kindly requested to e-mail your reply to**: BesterM@pentech.ac.za or Marianne@educable.co.za as soon as possible or the fax your response to fax no. (021) 959-6466. It will be appreciated if you could reply **before the end of November 2003**. Kindly **save the file** containing your answers to the questions under **your name**, before returning the file to me via e-mail.

If you are unable to participate personally, but would like to nominate a colleague for participation, kindly forward his or her details to the e-mail address listed above.

This is an opportunity for you to contribute towards our quest for excellence in textile education and training by assisting us in developing, implementing, assessing and reviewing learning programmes that respond effectively to the needs of the clothing and textile industries.

Yours sincerely

Mrs Marianne Bester
Head: Clothing & Textile Technology

QUESTIONS

Name of respondent:	
Job title:	
Name of company:	
Telephone no.:	
Fax no.:	
E-mail address:	

1. What in your opinion are the **strengths and weaknesses** of the textile industry in South Africa?

Answer:

2. What in your opinion are the **opportunities and threats** of the textile industry in South Africa?

Answer:

3. Do you believe that there is a **future** for the textile industry in South Africa?

Answer:

4. What are the **critical aspects** that will determine the future of the textile industry?

Answer:

5. Which **sectors in the industry** do you believe will survive and grow in the future and why?

Answer:

6. What **strategies** need to be developed to meet the challenges of the future?

Answer:

7. What **human qualities, skills and knowledge** are required to meet these challenges?

Answer:

8. Do you believe that there is **a need for cooperation** between textile companies in areas such as research and development, education and training and the development of "best practice methods" for the industry?

Answer:

9. Is the S.A. textile industry sufficiently innovative in their **manufacturing practices** to meet the future needs of their customers?

Answer:

10. To what extent is the industry investing in **technology** to be globally competitive?

Answer:

11. To what extent is the industry investing in **research and development** to be globally competitive?

Answer:

12. Are the **present levels of knowledge and skills** in the labour market sufficient to meet the future needs of the textile industry in SA?

Answer:

13. Are **education and training programmes** at tertiary level effectively addressing the needs of the industry? If not, why not?

Answer:

14. Do you believe there is a **need for textile technologists** in the industry of the future?

Answer:

15. What in your opinion is the **role** of a textile technologist?

Answer:

Any other information you wish to add:

Thank you, your participation is appreciated!

FACULTY OF ENGINEERING
Department : Clothing & Textile Technology

11 November 2003

Enquiries:
Ref No:

Name of respondent
Name of company
Postal address
CITY
Postal code

Dear colleague

CHANGING NEEDS OF THE TEXTILE INDUSTRY

There are fundamental forces at work that affect the scope and focus of Higher Education in South Africa. As the impact of globalisation, the rate of technological development and the move toward a knowledge economy increase, the workforce requires more sophisticated education and training to sustain its competitiveness. It has become essential for Higher Education institutions, especially Technikons, to ensure that students are better skilled, more competent, more employable and more employer-focused. Consultation with stakeholders (industry, labour, providers, learners and other special interest groups) is therefore a critical element of training needs analysis, curriculum design and development, learning material development, presentation and offering types, as well as assessment.

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- It was estimated at the time of the survey that 165 textile technologists had to be trained during the next five years to meet the needs of the industry.

The first group of successful ND Textile Technology students will obtain their qualifications at the end of this academic year. It has become important to review the learning outcomes of the textile technology programme at Peninsula Technikon, in an attempt to respond more effectively to challenges affecting the textile industry in a global trade environment.

P O Box 1906 Bellville 7535 • Symphony Way (off Modderdam Rd) Bellville 7530 • Tel: (021) 959 6466/ 959 6468
Fax/ (021) 959 6497 • Website: http://www.pentech.ac.za • E-Mail: besterm@mail.pentech.ac.za

I am currently conducting **research** into the changing needs of the South African textile industry in general, and the Western Cape in particular. The emphasis of the research is to determine how education and training in textile technology at Peninsula Technikon can more effectively respond to these needs by adapting the learning outcomes of the programme. **Your participation in this process, as human resource manager, production manager and/or subject specialist in the textile, will be valued**. It will be appreciated if you could devote approximately 45 minutes of your time to answer questions on critical issues facing the textile industry by completing the enclosed questionnaire.

In order to effect the necessary changes to the ND Textile Technology programme for 2004, it is essential that you **respond immediately by completing the enclosed questionnaire by no later than Friday, 28 November 2003**. Please use the enclosed self-addressed envelope to return the questionnaire to the Department Clothing & Textile Technology at Peninsula Technikon. Your participation in this research project is highly appreciated.

If you wish to be invited to a feedback session on the findings of the research project, kindly complete the attached reply slip and return the slip with the questionnaire in the self-addressed envelope.

This is an opportunity for you to contribute towards our quest for excellence in textile education and training by assisting us in developing, implementing, assessing and reviewing learning programmes that respond effectively to the needs of the textile industry.

Yours sincerely

Mrs. Marianne Bester
Head: Clothing & Textile Technology

Appendix R

REPLY SLIP

FAX TO: 959-6497 or 959-6357
Attention: Marianne Bester

Name of respondent: ______________________

Job title: ______________________

Name of company: ______________________

Telephone no.: ______________________

Fax no.: ______________________

E-mail address: ______________________

I would like to be invited to a feedback session on the findings of the research project.	**Yes**
	No

Signed: ______________ Date: ______________

APPENDIX R

TEXTILE TECHNOLOGY

Curriculum-orientated evaluation

QUESTIONNAIRE

The purpose of this questionnaire is:

- To detect the latest trends regarding challenges facing the textile industry in the Western Cape;
- To critically evaluate the employability skills of textile technologists as defined by the industry at the contextual workshop which led to the development of a National Diploma in Textile Technology at Peninsula Technikon;
- To critically evaluate the learning outcomes of the National Diploma in Textile Technology implemented by Peninsula Technikon in 2001-2003, with the view to:
    - Inform the review process of the National Diploma in Textile Technology currently being offered at Peninsula Technikon;
    - Inform the curriculum development process of a B. Tech degree in Textile Technology at Peninsula Technikon.

To complete the questionnaire, please note the following:

- The Human Resources Manager of your business/company or any other member of your staff who is adequately suited to answer the questions on behalf of the business/company, should complete the questionnaire.
- **The data collected from the questionnaire will <u>only be used for academic purposes</u> and will not used to identify you as an individual or as a company.**
- **<u>Retail</u> companies** are **<u>not</u>** required to complete **question 2 and question 3** of the questionnaire. Kindly complete all other questions to be best of your ability and available information.
- **<u>Manufacturing</u> companies** are required to complete **<u>all</u>** the questions and all sections to each question of the questionnaire to be best of your ability and available information.
- Kindly indicate with a **[√]** your response to each question in the appropriate block or provide additional information in the space provided (if and when necessary).
- Please return your completed questionnaire in the enclosed addressed envelope to:
  Mrs. Marianne Bester
  Head: Clothing & Textile Technology
  Peninsula Technikon
  P.O. Box 1906
  Bellville
  7535
  by **no later than Wednesday, 19 November 2003.**
- Kindly direct any enquiries regarding the questionnaire to: Mrs. Marianne Bester at tel. (021) 959-6468 or e-mail: <u>BesterM@pentech.ac.za</u> or Dr. Elspa Hovgaard at tel. (021) 959 6062 or e-mail: <u>HovgaardE@pentech.ac.za</u>
- **Kindly respond immediately, your response to this questionnaire is a critical component of the curriculum-orientated evaluation process at Peninsula Technikon. Without your input it will not be possible to review the current curriculum of the National Diploma in Textile Technology.**
- **Thank you** for your willingness to participate in the research project and for your time and effort in responding to this questionnaire.

Demographic information

Kindly provide the following demographic detail applicable to **your company. This information is only for academic purposes and will not be used to identify you as an individual or as a company.**

1. Kindly mark the appropriate block with (√):

Nature of the business	**Manufacturing**		**Retailing**	
Size of the business in terms of number of employees	**Very small Less than 20**	**Small Less than 50**	**Medium Less than 200**	**Large 201 and more**

2. From the list below, kindly select the product(s) produced by your company and the mark the appropriate block(s) with [√] (this question is not applicable to retail companies):

Major Group SIC 311: "Spinning, Weaving and Finishing"		
Preparation and spinning of textile fibres; weaving of textiles		
Preparatory activities in respect of animal fibres, including washing, combing and carding of wool	Yes	No
Preparatory activities in respect of vegetable fibres	Yes	No
Spinning, weaving and finishing of yarns and fabrics predominantly of wool and other animal fibres	Yes	No
Spinning, weaving and finishing of yarns and fabrics predominantly of vegetable fibres	Yes	No
Finishing of textiles		
Finishing of purchased yarns and fabrics	Yes	No
Major Group SIC 312: "Other Textiles"		
Manufacture of made-up textile articles (except apparel)		
Manufacture of blankets, made-up furnishing articles and stuffed articles	Yes	No
Manufacture of tents, tarpaulins, sails and other canvas goods	Yes	No
Manufacture of automotive textile goods (safety belts, seat covers, etc.)	Yes	No
Manufacture of other made-up textile articles (except apparel)	Yes	No
Manufacture of carpets, rugs and mats	Yes	No
Manufacture of cordage, rope, twine and netting	Yes	No
Manufacture of other textiles (not elsewhere classified)	Yes	No
Major Group 313: "Knitted and crocheted fabrics and articles"		
Garment and hosiery knitting mills	Yes	No
Other knitting mills	Yes	No

3. Kindly select the production process(es) applicable to your company and mark these block(s) with [√] (this question is not applicable to retail companies):

Production process	Applicable	Not applicable
Spinning preparation & spinning		
Weaving preparation & weaving		
Dyeing preparation & dyeing		
Printing		
Finishing		
Weft knitting		
Warp knitting		
Extrusion (including polymer manufacturing and melt extrusion)		
Non-wovens (including stitch bond and needle punch)		
Other (specify):		

4. **The environmental change factors listed below will impact on the textile industry during the next seven (7) years until 2010. Kindly rate these factors as they would impact on your company during the next seven (7) years until 2010 by marking the appropriate block with a (√):**

Factors impacting environmental change of textile industry until 2010	1 Critical	2 Very important	3 Important	4 Not important
Advances in **information technology** resulting in **improved management of product design, production processes and quality**.				
Advances in **information technology** resulting in **improved supply chain management**.				
Advances in **information technology** resulting in **intensified international competition by enhancing communication** with distant customers and suppliers.				
Advances in manufacturing technology resulting in improved manufacturing performance.				
Advances in materials technology resulting in improved performance capabilities of textile products, e.g. genetically engineered natural and man-made fibres and smart materials.				
Development of **business strategies** to operate in increasingly diverse, dynamic, complex and hostile business environment.				
Development of **high-level technical skills** through training and education.				
Development of **international quality standards, including environmental standards of manufacturing.**				
Development of niche markets resulting in a high level of industry segmentation.				
Development of **world-class management systems and philosophies** to increase competitiveness.				
Focus on **product development and design** by separating the creative functions from physical manufacturing, assembly and distribution of products.				
Improvement of **labour productivity**				
Increased consumers sophistication, by demanding more frequent innovation, greater exclusivity, more choice and better service.				
Increased levels of **capital investment**.				
International sourcing of products.				
Reduction in **trade barriers** and increased globalisation of markets.				
Strengthening of share in the **domestic market**.				
Support **black economic empowerment** and employment equity.				
List any other factor(s) you wish to add:				

Key competencies for textile technologists

5. Kindly rate the following key competencies according to:

5A: General importance to the textile industry, **and;**

5B: Specific importance to your company.

By marking the appropriate block in Section 5A and Section 5B of this question with a (√):

Please remember to answer <u>both</u> sections of this question. **Key generic competencies for textile technologists**	Section 5A General importance to the industry				Section 5B Specific importance to your company			
	1 Critical	2 Very important	3 Important	4 Not important	1 Critical	2 Very important	3 Important	4 Not important
Analytical skills: The ability to undertake statistical analysis, draw conclusions and make recommendations for production and business in general.								
Communication skills: The ability to communicate effectively in English with others using the range of spoken, written, graphic and other non-verbal means of expression.								
Computer skills: General computer literacy, use of software programmes e.g. word processing, spreadsheets, electronic communication media and production related scheduling.								
Design/innovation skills: An ability to analyse current production processes and associated machinery and to identify areas of improvement with impact on the cost effectiveness.								
Market research skills: The ability to identify market trends and opportunities (local and international) and to determine how these trends will impact on production processes, product design and machinery capabilities.								
Performance improvement skills: The ability to achieve optimum performance by training, developing and guiding staff at three levels: organisational, process and job performance.								
Production management skills: The ability to manage complex production processes, including skills in costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management and continuous improvement.								
Technical skills: An in-depth understanding of production processes across the textile spectrum with a specialization in one or two main processes in terms of internationally recognized standards.								
Testing skills: An understanding of a range of product and process tests and testing techniques.								
Thinking skills: The ability to think critically, laterally, analytically and focus on results, outcomes and solutions rather than on problem identification.								
Working with others and in teams: The ability to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of the client and working effectively as a member of a team to achieve a shared goal.								
List any other key competencies:								

Subject specific skills and knowledge for textile technologists

6. Kindly rate the following subject specific skills and knowledge according to:

A: General importance to the textile industry, **and;**

B: Specific importance to your company.

By marking the appropriate block in Section A and Section B of this question with a (√).

For office use only	**Please remember to answer <u>both</u> sections of this question.** **Subject specific learning outcomes**	Section 6A General importance to the industry					Section 6B Specific importance to your company				
		1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
1	**Work Organisation** Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs.										
2	**Fabric Technology: knitting** Demonstrate understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples.										
3	**Computer aided design and manufacturing** Supervise a CAD/CAM department in a textile-manufacturing environment.										
4	**Quality Management** Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment.										
5	**Quality Management** Generate and present standards and tolerances of textile products.										
6	**Human Resource Management** Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment.										
7	**Statistics** Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment.										
8	**Management** Describe and interpret internal and external organisational constraints.										
9	**Fabric Technology: other** Demonstrate understanding of other methods of fabric constructions and relate these to structure and properties, e.g. non-wovens, etc.										
10	**Quality Management** Analyse customer product specifications by relating these to tests and examination procedures										
11	**Colouration Technology** Develop understanding of different finishing processes, function and application.										
12	**Work Organisation** Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance.										

For office use only	Please remember to answer <u>both</u> sections of this question. Subject specific learning outcomes	Section 6A General importance to the industry					Section 6B Specific importance to your company				
		1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
13	**Colouration Technology** Develop understanding of chemicals and their applications in pre-treatment for dyeing and finishing, dyeing, printing and finishing processes.										
14	**Computer aided manufacturing** Supervise the production control function using Computer Integrated Machine Monitoring.										
15	**Colouration Technology** Develop understanding of different systems of printing.										
16	**Quality Management** Motivate and initiate quality improvements to products and processes.										
17	**Industrial Relations** Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA, OHASA, etc.										
18	**Fibre & Yarn Technology** Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use.										
19	**Fabric Technology: knitting** Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type.										
20	**Colouration Technology** Develop understanding of the different systems of dyeing.										
21	**Textile Science** Demonstrate understanding of morphological structure and chemical composition of fibres of natural fibres and how these relate to fibre and fabric properties and end-uses.										
22	**Colouration Technology** Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory.										
23	**Management** Establish, describe and apply leadership techniques.										
24	**General textile processes** Perform textile calculations applicable to a particular section within a textile-manufacturing environment.										
25	**Work Organisation** Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance.										
26	**Quality Management** Identify quality faults and possible causes.										
27	**Industrial Relations** Identify and describe the various role-players within the textile industry SACTWU; TEXFED, etc.										
28	**Fabric Technology: weaving** Demonstrate understanding of weaving theory, woven structures, weights and yarn										

For office use only	Please remember to answer both sections of this question. **Subject specific learning outcomes**	Section 6A General importance to the industry					Section 6B Specific importance to your company				
		1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
	consumptions and relate these to practical examples.										
29	**Quality Management** Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes										
30	**Fabric Technology: general** Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems.										
31	**Costing** Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment.										
32	**Colouration Technology** Develop understanding of colour theory, colour measurement and assessment.										
33	**Textile Science** Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses.										
34	**General textile processes** Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment.										
35	**Management** Establish, describe and apply management control strategies and tools.										
36	**General textile processes** Classify fibres, yarns and fabrics according to grades.										
37	**Work Organisation** Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment.										
38	**Quality Management** Calculate the cost of poor quality of textile products.										
39	**Human Resource Management** Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance.										
40	**Textile testing & Statistics** Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process.										
41	**Factory Engineering** Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment.										
42	**Management** Identify and apply the techniques of customer care.										
43	**Apparel technology**										

For office use only	Please remember to answer both sections of this question. **Subject specific learning outcomes**	Section 6A General importance to the industry					Section 6B Specific importance to your company				
		1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
	Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products.										
44	**Business economics** Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular.										
45	**Physics** Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, thermodynamics, waves and sounds, optics, electricity, magnetism and electromagnetic induction as well as radioactivity.										
46	**General textile processes** Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry.										
47	**Colouration Technology** Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control these elements.										
48	**General textile processes** Set and adjust complex parameters to fibre, yarn and fabric manufacturing processes.										
49	**Work Organisation** Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment.										
50	**Human Resource Management** Demonstrate understanding of the importance of job descriptions and work schedules and how they relate to successful teams in a textile-manufacturing environment.										
51	**Marketing** Develop sourcing techniques relevant to international markets.										
52	**Colouration Technology** Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process.										
53	**Textile Science** Demonstrate understanding of organic chemistry, including drawing the structural formula or basic organic compounds, naming organic compounds, identifying functional groups and isomers, writing general equations for the reactions of groups of organics compounds and describing the uses of organic compounds and their reactions.										
54	**Work Organisation** Maintain acceptable levels of productivity in a textile-manufacturing environment.										
55	**General textile processes** Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses.										
56	**Economics**										

For office use only	Please remember to answer **both** sections of this question. Subject specific learning outcomes	Section 6A General importance to the industry: 1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	Section 6B Specific importance to your company: 1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
	Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade.										
57	**Computer aided production planning** Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets.										
58	**General textile processes** Determine factors impacting on manufacturing processes of regenerated and synthetic fibres.										
59	**Marketing** Conduct market research to determine competitive advantage of company.										
60	**Waste management & environmental issues** Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics.										
61	**Fabric Technology: weaving** Demonstrate understanding of weft insertion mechanisms; shuttle, projectile, rapier and fluid jet machines.										
62	**General textile processes** Describe the conversion process in the textile pipeline.										
63	**Marketing** Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment.										
64	**General textile processes** Determine factors impacting on growth and production of natural fibres.										
65	**Textile Science** Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and uses of different man-made fibres.										
66	**General textile processes** Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses.										
67	**Product development** Design and develop new textile products and conduct feasibility studies.										
68	**Entrepreneurship** Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development.										
69	**Computer aided textile design** Design and produce patterns and structures using computer aided design systems for weaving and knitting										
70	**Project management** Demonstrate ability to manage a project in a textile-manufacturing environment.										

For office use only	**Please remember to answer both sections of this question.** **Subject specific learning outcomes**	Section 6A General importance to the industry					Section 6B Specific importance to your company				
		1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable	1 Critical	2 Very important	3 Important	4 Not important	5 Not applicable
71	**Management** Demonstrate understanding of the role, functions and principles of management applicable to a textile manufacturing/retailing environment.										
72	**General textile processes** Classify fibres, yarns, fabrics, dyes and chemicals.										
73	**Factory Engineering** Demonstrate understanding of control and automation applicable to a textile-manufacturing environment.										
74	**Other learning outcomes not included, that you wish to add:**										

7. Kindly answer the following questions:

Is your company interested in developing/recruiting textile technologist(s) in the next 5-7 years?	Yes	No	
If yes, how many textile technologist(s) would your company develop/recruit during this period?	Number of textile technologists:		
Indicate the elective area(s) for the development/recruitment of a textile technologist(s) by your company during this period:	Dry processing	Wet processing	Man-made fibre production and processing

Thank you for your time and effort!

Appendix S

Western Cape Textile manufacturers

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
1	ACA Group	Mr. Andy Sandison	P.O. Box 100 Brackenfell 7561	(021) 981 1133	(021) 981 6749	acagroup@icon.co.za
2	Ahlesa Blankets	Mr. Andre van Deventer	P.O. Box 1409 Dassenberg 7350	(021) 577 2270	(021) 577 3795	ahlesa@netactive.co.za
3	AK Knit CC	Mr. A.R. Kieslich or Petula	P.O. Box 234 Elsies River 7480	(021) 591 6536	(021) 592 4115	
4	Alnet	Mr. Klaus Gessner	Private Bag X308 Eppindust 7475	(021) 530 2411	(021) 534 4003	klausg@alnet.co.za
5	ARWA & Burhose	Ms. Janit Coetzee	P.O. Box 520 Brackenfell 7561	(021) 9822458	(021) 981 8984	janit@burhose.co.za
6	Barbour Bitrim Threads	Mr. Lloyd Benjamin	P.O. Box 425 Eppindust 7475	(021) 507 6500	(021) 534 4020	lbenjamin@sabias.co.za
7	Belgotex Belgo Textiles & Colibri Towelling	Ms. Louna Lohann	P.O. Box 3002 Somerset West 7129	(021) 853 8666	(021) 853 8668	sales@belgotex.co.za
8	Berg River Textiles	Ms. Diane Oliver	P.O. Box 306 Paarl 7620	(021) 868 2230	(021) 868 3505 or (031) 710 4444	bergriver@romatex.co.za
9	BMD Knitting Mills	Mr. Murray Meeuwis	P.O. Box 72 Plumstead 7801	(021) 700 2000	(021) 700 2005	meeuwis@bmd.co.za
10	Braitex/Tensilon	Mr. Anned Engels or Ronelle	P.O. Box 101 Elsiesriver 7480	(021) 577 1290	(021) 577 4155	

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
11	Brits Textiles	Mr. Enver Abrahams Mr. Richard Fester	P.O. Box 7024 Roggebaai 8012	(021) 577 1490	(021) 577 1791	enver@brits.co.za
12	Cape Linen	Mr. Shaun Simpson	P.O. Box 51021 Waterfront 8002	(021) 511 8094		
13	Cape Threads	Mr. Collins	30 Salt River Road Salt River 7925	(021) 448 0025		
14	Court Fabrics	Mr. Andre de Beer	P.O. Box 319 Paarl 7620	(021) 868 3000	(021) 868 1904	tbspinn@iafrica.com
15	Creative Textiles/Treehouse	Mr. Nick de Vivo	P.O. Box 4320 Cape Town 8000	(021) 930 5525	(021) 939 5100	info@treehouse.co.za
16	Downtex CC	Ms. Ashley Eastman	P.O. Box 3028 Cape Town 8000	(021) 461 8327	(021) 461 4585	
17	Falke Eurosocks	Mr. Carel Malan	P.O. Box 228 Bellville 7535	(021) 951 2137	(021) 951 2832	carelm@falke.co.za
18	Fibermill SA	Mr. Chris Grime	P.O. Box 1669 Dassenberg 7350	(021) 577 2160	(021) 5774101	techfab@fibremill.co.za
19	Finitex	Mr Marc Gordon	P.O. Box 20 Parow 7499	(021) 937 7400	(021) 937 7466	info@finitex.co.za gordong@finitex.co.za www.finitex.co.za
20	Foschini	Mr. Peter Thickett	P.O. Box 6020 Parow East 7501	(021) 937 4194	(021) 938 1093	petert@tfgm.co.za
21	Freudenburg Non-wovens	Mr. Freddie Feurer or Carmen	P.O. Box 3903 Cape Town 8000	(021) 933 3501	(021) 932 6515	vilene@freudenburg.co.za freddiefeurer@freudenberg.co.za www.freudenberg.de
22	Herdmans	Umberto Micheletti Alida Grobbelaar	P.O. Box 1476 Dassenberg 7350	(021) 577 1980	(021) 577 1881	umicheletti@herdmans.co.za agrobbelaar@herdmans.co.za

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
23	Hextex	Mr. Marius Johannes	Private Bag X3054 Worcester 6849	(023) 347 0814	(023) 342 8142	hextex@romatex.co.za www.frame.co.za
24	Imaterial Textile Printers CC	C. Nieuwenhuizen or Marsha	39 Eleventh Avenue Maitland 7405	(021) 593 3110	(021) 593 0736	
25	Le' Bergo Textiles	Mr. Williams	P.O. Box 83 Eppindust 7475	(021) 535 0739	(021) 535 0743	info@le-bergo.co.za www.lebergofashions.co.za
26	Mattex	Ms. Anisca Engelbrecht	P.O. Box 113 Elsies River 7480	(021) 592 1420	(021) 591 3618	aniscae@mattex.co.za
27	Maxmore Knitting Mills	Ms. Heike Evans	P.O. Box 226 Goodwood 7460	(021) 535 2391	(021) 534 1800	heikeevans@xsinet.co.za
28	Migra Textiles	Mr. Mike Phillips	P.O. Box 278 Eppindust 7475	(021) 534 5467	(021) 534 8982	
29	Miss Lyn CC	Ms. Lilian Currer	P.O. Box 53126 Kenilworth 7745	(021) 447 3419	(021) 447 3419	
30	Nettex	Mr. Leon Garrish	Private Bag X5 Kasselsvlei 7533	(021) 951 1205	(021) 951 1597	lg@nettex.co.za
31	Nova Knits		P.O. Box 1316 Cape Town 8000	(021) 448 4388		
32	Novel Spinners T/A Novel Weavers SA	Ms. J. Flusk	P.O. Box 1429 Dassenberg 7350	(021) 573 9500		
33	Paltex	Mr. D. Mackness	P.O. Box 13508 Mowbray 8050			
34	Pres-les	Mr. Jeff Brand	P.O. Box 24474 Lansdowne 7779	(021) 577 3210	(021) 577 3401	

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
35	Romatex Fabrics Romatex Home Textiles	Mr. Alan de Villiers	P.O. Box 91 Goodwood 7459	(021) 933 5200		www.frame.co.za
36	Rotex Fabrics	Mr. Robert Rohner Mr. Tobit Biggs	P.O. Box 1465 Dassenberg 7350	(021) 577 1640	(021) 577 1777	rotex.atlantis@cis.co.za
37	Rubitex		444 Albert Road Salt River 7925			
38	SA Bias Industries International Trimmings	Mr. Abdullah Thebus	P.O. Box 174 Maitland 7404	(021) 590 0110	(021) 590 1151	athebus@sabias.co.za
39	SA Cotton Spinners		P.O. Box 1597 Dassenberg 7350	(021) 577 4210	(021) 577 3365	dalene@acenet.co.za
40	SA Fine Worsteds	Mr. Jacques du Preez	P.O. Box 88 Maitland 7405	(021) 593 9100	(021) 593 1410	worsted@safine.co.za
41	SANS Fibres	Mr. Alan Taylor	P.O. Box 272 Bellville 7535	(021) 959 4911	(021) 959 4644	taylora@sans.co.za
42	SBH Cotton Mills	Mr. Peter Lourens Mr. K. Jehle	P.O. Box 25 Cape Town 8000	(021) 534 4431	(021) 534 6737	training@sbhcotton.co.za
43	Spilo	Mr. Francois Perold	P.O. Box 282 Paarl 7620	(021) 862 6100	(021) 862 4103	
44	Sun Fabrics	Mr. M.F. Davisen	P.O. Box 3687 Cape Town 8000	(021) 461 4235	(021) 564 2724	sunfab@mweb.co.za
45	Svenmill	Ms. Heather Swanepoel	P.O. Box 908 Cape Town 8000	(021) 937 8600	(021) 937 8787	svenmill@iafrica.com
46	Table Bay Spinners	Mr. Andre de Beer	P.O. Box 101 Wellington 7655	(021) 873 1031	(021) 873 3513	

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
47	Team Puma	Mr. David Struthers	P.O. Box 2054 Cape Town 8000	(021) 699 9000	(021) 699 9063	
48	Texglass Manufacturers	Ms. Antoinette Veldtman	P.O. Box 1045 Sanlamhof 7532	(021) 949 2800	(021) 949 0037	
49	Towles Edgar Jacobs (TEJ)	Ms. Sue Wright Mr. Alan Renton	Private Bag 1 Steenberg 7947	(021) 7011200	(021) 7018866	suewright@tej.co.za alan@tej.co.za
50	United Bias and Trimmings Enterprises	Ms. Caroline Parker	P.O. Box 53197 Kenilworth 7745	(021) 761 3546	(021) 761 3546	hrmatter@netactive.co.za
51	Truworths	Mr. Doug Holmes Mr. Nazeem Jabaar	P.O. Box 600 Cape Town 8000	(021) 460 7362	(021) 460 7051	njabaar@truworths.co.za
52	Veefor	Mr. Mark Siddons	P.O. Box422 Stikland 7532	(021) 948 0760	(021) 949 9055	V4mark@iafrica.com
53	Vrede Textiles	Ms. Lima Dudley	P.O. Box 1321 Dassenberg 7350	(021) 577 2327	(021) 577 2419	lima@vrede.co.za
54	Waltex Carpets	Mr. Herman Hendrickse	P.O. Box 12150 Parowvalley 7530	(021) 931 7311		jhgint@mweb.co.za
55	Weavewell CC		P.O. Box 38756 Pinelands 7430			
56	WG Textiles		P.O. Box 194 Kuilsriver 7579	(021) 949 1770	(021) 949 1716	wgwaste@cybertrade.co.za
57	Wilmill Narrow Fabrics	Mr. C.R. Volkwyn	P.O. Box 19 Steenberg 7947	(021) 701 1280	(021) 701 2350	wilmill@icon.co.za
58	Woolworld International CC	Zubeida	332 Victoria Road Salt River 7925	(021) 448 4004		

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
59	Woolworths	Mr. Trevor Mitrovich Mr. Gary Lombard	P.O. Box 680 Cape Town 8000	(021) 407 3366	(021) 407 3979	garylombard@woolworths.co.za
60	WP Yarn dyers	Dirk Schmidt or Julian	P.O. Box 1201 Brackenfell 7601	(021) 981 3215	(021) 981 8865	wpyarndyers@intekom.co.za
61	Yarn Converters CC		P.O. Box 194 Kuilsriver 7579	(021) 959 7200	(021) 951 8792	wgwaste@cybertrade.co.za
62	Zhaun's Group Inc. Haier SA		P.O. Box 45 Cape Town 8000	(021) 447 3665	(021) 447 5747	

Appendix T

Western Cape textile auxiliary producers, suppliers & commissioners

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
1	Clariant Southern Africa	Mr. John Hook	P.O. Box 38089 Point KwaZulu-Natal 4069	(031) 579 8217 (021) 556 7400	(031) 579 1931 (021) 556 7405	johnhook@clariant.com
2	Dyeboss		17 Noll Avenue Athlone Industria 1 7764	(021) 633 1904	(021) 638 5147	renchiaa@iafrica.com
3	Dyebrite Garment Dyers CC		P.O. Box 1243 Woodstock 7915	(021) 447 1743		
4	DyStar	Mr. Dirk Pietersen	P.O. Box 1421 Pinetown 3600 Or 16 Milner Street Metro Township Paarden Eiland 7405	(031) 710 6509 (021) 510 4080	(031) 709 3732 (021) 511 9974	
5	Lamberti Speciality Chemicals	Mrs. Peterson	1 First Avenue Observatory 7925	(021) 447 5399	(021) 447 3181	
6	Laser Chemicals	Petra	8 Bolt Avenue Montague Gardens 7441	(021) 551 7690		laserkem@icon.co.za
7	Prochem T/A Protea Chemicals	Mr. Jehiel Lawrence	P.O. Box 4535 Cape Town 8000	(021) 550 8100	(021) 550 8180	jlawrence@prochem.co.za
8	Qualichem	Eve	5 Moddy Avenue Epping Industria 7460	(021) 531 3771	(021) 521 0911	
9	Swiss Spectrum Dyers			(021) 511 2404		

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
10	Zamfos Dyers	Colin Foster	Unit G2 Five Howe Street Observatory 7925	(021) 448 0877	(021) 448 0878	zamfos@mweb.co.za
11	DuTest Agencies	Mr. Paul Duveen	P.O. Box 84 Milnerton 7435			

Appendix U

Western Cape knitwear manufacturers

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
1	A.C. Clothing Manufacturers	Mr. R. Cloete	P.O. Box 1037 Woodstock 7915	(021) 447 2623		
2	A.M. Clothing Promotions	Mr. J. Johnson	18 Collingwood Road Observatory 7925	(021) 447 7369		
3	Almega Knitwear	Mr. R. Chong	P.O. Box 5210 Cape Town 8000	(021) 762 3207	(021) 683 2043	almega@iafrica.com
4	Angore Designs CC	Mr. Terry Shulver	P.O. Box 2468 Glenridge 7740	(021) 683 5437		
5	Annie Hills Design CC	Mr. William van Oudshoorn	21 Queenspark Road Queenspark Avenue Salt River 7925	(021) 447 4700		anniehil@iafrica.com
6	Baisch Knitwear	Mr. G. Roodt	P.O. Box 252 Maitland 7405	(021) 593 1166		
7	Barrie Cline CC	Mr. Barrie Cline or Lindsay	P.O. Box 27216 Rhine Road Salt River 8050	(021) 448 1301	(021) 448 1412	barrie@barriecline.co.za
8	Class togs	Mr. J. Kieser	P.O. Box 9 Maitland 7404	(021) 510 2320		
9	Coastline Promotions CC	Mr. Mark Goslett	P.O. Box 43289 Salt River 7925			

	Name of company	Contact person	Address	Telephone number	Fax number	E-mail address and/or website address
10	Continental Knitwear	Ms. Diane Swanson	P.O. Box 38 Elsiesriver 7480	(021) 592 6666	(021) 591 7341	
11	Cornstalk Investments CC	Mrs. G. Pieper	23 Medburn Road Camps Bay 8005	(021) 438 8828	(021) 438 8828	artinternational@adept.co.za
12	Goldknit	Mr. P. Kawizki	P.O. Box 620 Maitland 7404	(021) 593 8826		
13	Gratia Knitwear Fashions CC	Stanley	P.O. Box 149 Steenberg 7945	(021) 701 8837		
14	Knitwitch knitwear	Mr. Steve Theron	P.O. Box 37113 Chempet 7442	(021) 972 1807		
15	MG Knitwear CC	Mr. V.M.P. Carreira	17 River Park De Waal Road Diep River 7800	(021) 705 4952		
16	Muller Knitwear	Mr. Michael Schwartzkoff	21A Lauda Street Killarney Gardens 7441	(021) 556 3380	(021) 558 3382	
17	Seaf Fabrics Manufacturers	Mr. E. Adonis	Dacres Avenue Epping Industria 7560	(021) 535 0942		
18	Silver Knits	Mr. F. da Silva	P.O. Box 604 Maitland 7404	(021) 593 2343	(021) 593 2399	
19	Star-Knit	Ms. Marlene Oosthuizen	33 8th Avenue Maitland 7405	(021) 593 5050		
20	Verona Knitwear	Ms. A. Miszewski	75 Voortrekker Road Maitland 7405	(021) 511 0365	(021) 511 2766	Verona.k@iafrica.com

Appendix V

Frequency distribution tables

Statistical analysis of data by means of Statistical Package for the Social Sciences (SPSS computer package)

Frequency Table

Job title of respondent

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner	1	3.4	3.4	3.4
	HRM	7	24.1	24.1	27.6
	Production Manager	4	13.8	13.8	41.4
	Quality Assurance/Executive	2	6.9	6.9	48.3
	CEO	1	3.4	3.4	51.7
	Tech. Manager	2	6.9	6.9	58.6
	General Manager	1	3.4	3.4	62.1
	Training Manager	2	6.9	6.9	69.0
	H K Manager	1	3.4	3.4	72.4
	Technical Manager	1	3.4	3.4	75.9
	Managing Director	1	3.4	3.4	79.3
	Assistant Quality Manager/Service Officer	1	3.4	3.4	82.8
	Factory Manager	1	3.4	3.4	86.2
	SDF	2	6.9	6.9	93.1
	B U Head Textiles	1	3.4	3.4	96.6
	Director	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

Company name

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Barrie Cline Clothing CC	1	3.4	3.4	3.4
	BMD	1	3.4	3.4	6.9
	Clariant SA	1	3.4	3.4	10.3
	Ahlesa Blankets	1	3.4	3.4	13.8
	Hermans SA (Pty)Ltd	1	3.4	3.4	17.2
	Intern. Trimming & Labels	1	3.4	3.4	20.7
	Nettex	1	3.4	3.4	24.1
	Pres Les (Pty) Ltd	1	3.4	3.4	27.6
	Rotex Fabrics (Pty) Ltd	1	3.4	3.4	31.0
	The Foschini Group	1	3.4	3.4	34.5
	Zamfos Dyers	1	3.4	3.4	37.9
	Alnet (Pty)Ltd	1	3.4	3.4	41.4
	TEJ	1	3.4	3.4	44.8
	Mattex	1	3.4	3.4	48.3
	American Exfird	1	3.4	3.4	51.7
	Maxmore	1	3.4	3.4	55.2
	SANS	1	3.4	3.4	58.6
	Table Bay Spinners	1	3.4	3.4	62.1
	Truworths	1	3.4	3.4	65.5
	Protea Chemicals	1	3.4	3.4	69.0
	Almega Knitwear	1	3.4	3.4	72.4
	Brits Textiles	1	3.4	3.4	75.9
	Woolworths	1	3.4	3.4	79.3
	SBH Cotton Mills	1	3.4	3.4	82.8
	Burhose	1	3.4	3.4	86.2
	Verona Knitwear	1	3.4	3.4	89.7
	Veefer	1	3.4	3.4	93.1
	Svenmill	1	3.4	3.4	96.6
	Falke Eurosocks	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

Invited to feedback

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	20	69.0	80.0	80.0
	No	5	17.2	20.0	100.0
	Total	25	86.2	100.0	
Missing	System	4	13.8		
Total		29	100.0		

Nature of business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Manufacturing	25	86.2	89.3	89.3
	Retailing	3	10.3	10.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

Size of business ito no. of employees

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very small	1	3.4	3.7	3.7
	Small	1	3.4	3.7	7.4
	Medium	7	24.1	25.9	33.3
	Large	18	62.1	66.7	100.0
	Total	27	93.1	100.0	
Missing	System	2	6.9		
Total		29	100.0		

SIC 311: Preparatory activities in respect of animal fibres, including washing, combing and carding of wool

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	21	72.4	100.0	100.0
Missing	System	8	27.6		
Total		29	100.0		

SIC 311: Preparatory activities in respect of vegetable fibres

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	10.3	14.3	14.3
	no	18	62.1	85.7	100.0
	Total	21	72.4	100.0	
Missing	System	8	27.6		
Total		29	100.0		

SIC 311: Spinning, weaving and finishing of yarns and fabrics predominantly of wool and other animal fibres

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	3.4	4.8	4.8
	no	20	69.0	95.2	100.0
	Total	21	72.4	100.0	
Missing	System	8	27.6		
Total		29	100.0		

SIC 311: Spinning, weaving and finishing of yarns and fabrics predominantly of vegetable fibres

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	10.3	13.6	13.6
	no	19	65.5	86.4	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

SIC 311: Finishing of purchased yarns and fabrics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	7	24.1	31.8	31.8
	no	15	51.7	68.2	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

SIC 312: Manufacture of blankets, made-up furnishing articles and stuffed articles

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	10.3	14.3	14.3
	no	18	62.1	85.7	100.0
	Total	21	72.4	100.0	
Missing	System	8	27.6		
Total		29	100.0		

SIC 312: Manufacture of tents, tarpaulins, sails and other canvas goods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	22	75.9	100.0	100.0
Missing	System	7	24.1		
Total		29	100.0		

SIC 312: Manufacture of automotive textile goods (safety belts, seat covers, etc.)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	3.4	4.5	4.5
	no	21	72.4	95.5	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

SIC 312: Manufacture of other made-up textile articles (except apparel)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	3	10.3	13.6	13.6
	no	19	65.5	86.4	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

SIC 312: Manufacture of carpets, rugs and mats

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	1	3.4	4.5	4.5
	no	21	72.4	95.5	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

Manufacture of cordage, rope, twine and netting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	22	75.9	100.0	100.0
Missing	System	7	24.1		
Total		29	100.0		

Manufacture of other textiles (not elsewhere classified)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	5	17.2	23.8	23.8
	no	16	55.2	76.2	100.0
	Total	21	72.4	100.0	
Missing	System	8	27.6		
Total		29	100.0		

313: Garment and hosiery knitting mills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	9	31.0	39.1	39.1
	no	14	48.3	60.9	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

313: Other knitting mills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	4	13.8	18.2	18.2
	no	18	62.1	81.8	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

Spinning preparation & spinning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	5	17.2	21.7	21.7
	not applicable	18	62.1	78.3	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Weaving preparation & weaving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	5	17.2	21.7	21.7
	not applicable	18	62.1	78.3	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Dyeing preparation & dyeing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	13	44.8	56.5	56.5
	not applicable	10	34.5	43.5	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Printing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	3	10.3	13.0	13.0
	not applicable	20	69.0	87.0	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Finishing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	9	31.0	39.1	39.1
	not applicable	14	48.3	60.9	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Weft knitting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	5	17.2	20.8	20.8
	not applicable	19	65.5	79.2	100.0
	Total	24	82.8	100.0	
Missing	System	5	17.2		
Total		29	100.0		

Warp knitting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	5	17.2	21.7	21.7
	not applicable	18	62.1	78.3	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Extrusion (including polymer manufacturing and melt extrusion)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	4	13.8	17.4	17.4
	not applicable	19	65.5	82.6	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Non-wovens (including stitch bond and needle punch)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	2	6.9	8.7	8.7
	not applicable	21	72.4	91.3	100.0
	Total	23	79.3	100.0	
Missing	System	6	20.7		
Total		29	100.0		

Other (specify):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	applicable	9	31.0	90.0	90.0
	not applicable	1	3.4	10.0	100.0
	Total	10	34.5	100.0	
Missing	System	19	65.5		
Total		29	100.0		

FIEC: 1. Advances in information technology resulting in improved management of product design, production processes and quality.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	7	24.1	24.1	24.1
	important	10	34.5	34.5	58.6
	very important	11	37.9	37.9	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 2. Advances in information technology resulting in improved supply chain management.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	6	20.7	20.7	20.7
	important	11	37.9	37.9	58.6
	very important	12	41.4	41.4	100.0
	Total	29	100.0	100.0	

FIEC: 3. Advances in information technology resulting in intensified international competition by enhancing communication with distant customers and suppliers.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	9	31.0	31.0	31.0
	important	8	27.6	27.6	58.6
	very important	10	34.5	34.5	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC: 4. Advances in manufacturing technology resulting in improved manufacturing performance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	12	41.4	41.4	41.4
	important	11	37.9	37.9	79.3
	very important	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

FIEC: 5. Advances in materials technology resulting in improved performance capabilities of textile products, e.g. genetically engineered natural and man-made fibres and smart materials.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	8	27.6	27.6	27.6
	important	13	44.8	44.8	72.4
	very important	7	24.1	24.1	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 6. Development of business strategies to operate in increasingly diverse, dynamic, complex and hostile business environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	9	31.0	31.0	34.5
	important	15	51.7	51.7	86.2
	very important	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

FIEC: 7. Development of high-level technical skills through training and education.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	14	48.3	48.3	48.3
	important	11	37.9	37.9	86.2
	very important	3	10.3	10.3	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 8. Development of international quality standards, including environmental standards of manufacturing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	8	27.6	27.6	31.0
	important	11	37.9	37.9	69.0
	very important	8	27.6	27.6	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 9. Development of niche markets resulting in a high level of industry segmentation.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	11	37.9	37.9	37.9
	important	12	41.4	41.4	79.3
	very important	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

FIEC: 10. Development of world-class management systems and philosophies to increase competitiveness.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	12	41.4	41.4	41.4
	important	7	24.1	24.1	65.5
	very important	9	31.0	31.0	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 11. Focus on product development and design by separating the creative functions from physical manufacturing, assembly and distribution of products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	5	17.2	17.2	17.2
	important	9	31.0	31.0	48.3
	very important	10	34.5	34.5	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

FIEC: 12. Improvement of labour productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	17	58.6	58.6	58.6
	important	7	24.1	24.1	82.8
	very important	4	13.8	13.8	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC: 13. Increased consumers sophistication, by demanding more frequent innovation, greater exclusivity, more choice and better service.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	4	13.8	13.8	13.8
	important	13	44.8	44.8	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

FIEC: 14. Increased levels of capital investment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	9	31.0	31.0	31.0
	important	9	31.0	31.0	62.1
	very important	8	27.6	27.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

FIEC: 15. International sourcing of products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	8	27.6	27.6	34.5
	important	8	27.6	27.6	62.1
	very important	9	31.0	31.0	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC: 16. Reduction in trade barriers and increased globalisation of markets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	12	41.4	41.4	44.8
	important	9	31.0	31.0	75.9
	very important	5	17.2	17.2	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC: 17. Strengthening of share in the domestic market.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	13	44.8	44.8	44.8
	important	12	41.4	41.4	86.2
	very important	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

FIEC: 18. Support black economic empowerment and employment equity.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	7	24.1	24.1	24.1
	important	11	37.9	37.9	62.1
	very important	8	27.6	27.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

FIEC: 19. List any other factor(s) you wish to add:

		Frequency	Percent
Missing	System	29	100.0

KC General: Analytical skills -The ability to undertake statistical analysis, draw conclusions and make recommendations for production and business in general.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	8	27.6	27.6	27.6
	very important	11	37.9	37.9	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

KC Specific: Analytical skills -The ability to undertake statistical analysis, draw conclusions and make recommendations for production and business in general.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	7	24.1	24.1	24.1
	very important	13	44.8	44.8	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

KC General: Communication skills - The ability to communicate effectively in English with others using the range of spoken, written, graphic and other non-verbal means of expression.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	15	51.7	51.7	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

KC Specific: Communication skills -The ability to communicate effectively in English with others using the range of spoken, written, graphic and other non-verbal means of expression.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	8	27.6	27.6	31.0
	very important	12	41.4	41.4	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

KC General: Computer skills - General computer literacy, use of software programmes e.g. word processing, spreadsheets, electronic communication media and production related scheduling.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	11	37.9	37.9	37.9
	very important	11	37.9	37.9	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

KC Specific: Computer skills - General computer literacy, use of software programmes e.g. word processing, spreadsheets, electronic communication media and production related scheduling.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	12	41.4	41.4	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

KC General: Design/innovation skills - An ability to analyse current production processes and associated machinery and to identify areas of improvement with impact on the cost effectiveness.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	5	17.2	17.2	17.2
	very important	13	44.8	44.8	62.1
	critical	11	37.9	37.9	100.0
	Total	29	100.0	100.0	

KC Specific: Design/innovation skills - An ability to analyse current production processes and associated machinery and to identify areas of improvement with impact on the cost effectiveness.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	9	31.0	31.0	58.6
	critical	12	41.4	41.4	100.0
	Total	29	100.0	100.0	

KC General: Market research skills - The ability to identify market trends and opportunities (local and international) and to determine how these trends will impact on production processes, product design and machinery capabilities.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	8	27.6	27.6	31.0
	very important	13	44.8	44.8	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

KC Specific: Market research skills - The ability to identify market trends and opportunities (local and international and to determine how these trends will impact on production processes, product design and machinery capabilities.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	2	6.9	6.9	6.9
	important	7	24.1	24.1	31.0
	very important	12	41.4	41.4	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

KC General: Performance improvement skills - The ability to achieve optimum performance by training, developing and guiding staff at three levels: organisational, process and job performance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	5	17.2	17.2	20.7
	very important	15	51.7	51.7	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

KC Specific: Performance improvement skills - The ability to achieve optimum performance by training, developing and guiding staff at three levels: organisational, process and job performance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	6	20.7	20.7	24.1
	very important	11	37.9	37.9	62.1
	critical	11	37.9	37.9	100.0
	Total	29	100.0	100.0	

KC General: Production management skills - The ability to manage complex production processes, including skills in costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management and continuous improvement.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	6	20.7	20.7	24.1
	very important	13	44.8	44.8	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

KC Specific: Production management skills - The ability to manage complex production processes, including skills in costing, cost benefit analysis, planning, scheduling, high levels of problem solving, quality management and continuous improvement.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	11	37.9	37.9	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

KC General: Technical skills - An in-depth understanding of production processes across the textile spectrum with a specialization in one or two main processes in terms of internationally recognized standards.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	3	10.3	10.3	10.3
	very important	14	48.3	48.3	58.6
	critical	12	41.4	41.4	100.0
	Total	29	100.0	100.0	

KC Specific: Technical skills - An in-depth understanding of production processes across the textile spectrum with a specialization in one or two main processes in terms of internationally recognized standards.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	2	6.9	6.9	6.9
	important	2	6.9	6.9	13.8
	very important	12	41.4	41.4	55.2
	critical	13	44.8	44.8	100.0
	Total	29	100.0	100.0	

KC General: Testing skills - An understanding of a range of product and process tests and testing techniques.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	15	51.7	51.7	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

KC Specific: Testing skills - An understanding of a range of product and process tests and testing techniques.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	14	48.3	48.3	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

KC General: Thinking skills - The ability to think critically, laterally, analytically and focus on results, outcomes and solutions rather than on problem identification.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	5	17.2	17.2	17.2
	very important	16	55.2	55.2	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

KC Specific: Thinking skills - The ability to think critically, laterally, analytically and focus on results, outcomes and solutions rather than on problem identification.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	5	17.2	17.2	17.2
	very important	10	34.5	34.5	51.7
	critical	14	48.3	48.3	100.0
	Total	29	100.0	100.0	

KC General: Working with others and in teams - The ability to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of the client and working effectively as a member of a team

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	10	34.5	34.5	34.5
	very important	11	37.9	37.9	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

KC Specific: Working with others and in teams - The ability to interact effectively with other people both on a one-to-one basis and in groups, including understanding and responding to the needs of the client and working effectively as a member of a team

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	11	37.9	37.9	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

KC General: List any other key competencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	29	100.0	100.0	100.0

KC Specific: List any other key competencies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	29	100.0	100.0	100.0

SSSK 1 General: Work Organisation - Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	10	34.5	34.5	37.9
	very important	10	34.5	34.5	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 1 Specific: Work Organisation - Produce production plans by demonstrating understanding of lead times, machine capabilities and outputs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	7	24.1	24.1	31.0
	very important	10	34.5	34.5	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 2 General: Fabric Technology: Knitting - Demonstrates understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	3	10.3	10.3	24.1
	important	8	27.6	27.6	51.7
	very important	9	31.0	31.0	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 2 Specific: Fabric Technology: Knitting - Demonstrates understanding of knitting theory, structures, stitch notations and stitch formation and relate these to practical examples.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	10	34.5	34.5	34.5
	not important	2	6.9	6.9	41.4
	important	3	10.3	10.3	51.7
	very important	7	24.1	24.1	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 3 General: Computer aided design and manufacturing - Supervise a CAD/CAM department in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	important	14	48.3	48.3	62.1
	very important	10	34.5	34.5	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SSSK 3 Specific: Computer aided design and manufacturing - Supervise a CAD/CAM department in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	8	27.6	27.6	27.6
	not important	4	13.8	13.8	41.4
	important	11	37.9	37.9	79.3
	very important	3	10.3	10.3	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 4 General: Quality Management - Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	3	10.3	10.3	10.3
	very important	17	58.6	58.6	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

SSSK 4 Specific: Quality Management - Demonstrate understanding of the importance of quality and implement a quality assurance system in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	5	17.2	17.2	24.1
	very important	11	37.9	37.9	62.1
	critical	11	37.9	37.9	100.0
	Total	29	100.0	100.0	

SSSK 5 General: Quality Management - Generate and present standards and tolerances of textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	4	13.8	13.8	17.2
	very important	14	48.3	48.3	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 5 Specific: Quality Management - Generate and present standards and tolerances of textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	3	10.3	10.3	10.3
	important	4	13.8	13.8	24.1
	very important	12	41.4	41.4	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 6 General: Human Resource Management - Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	12	41.4	41.4	48.3
	very important	8	27.6	27.6	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 6 Specific: Human Resource Management - Demonstrate understanding of techniques of manpower planning and the impact of human resource management on effectiveness and efficiency of production processes in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	14	48.3	48.3	65.5
	very important	3	10.3	10.3	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 7 General: Statistics - Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	13	44.8	44.8	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 7 Specific: Statistics - Apply quantitative and qualitative assessment methods and techniques applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	5	17.2	17.2	27.6
	important	10	34.5	34.5	62.1
	very important	7	24.1	24.1	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 8 General: Management - Describe and interpret internal and external organisational constraints.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	9	31.0	31.0	41.4
	very important	12	41.4	41.4	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 8 Specific: Management - Describe and interpret internal and external organisational constraints.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	8	27.6	27.6	44.8
	very important	11	37.9	37.9	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 9 General: Fabric Technology: other - Demonstrate understanding of other methods of fabric constructions and relate these to structure and properties, e.g. non-wovens, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	1	3.4	3.4	13.8
	important	10	34.5	34.5	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 9 Specific: Fabric Technology: other - Demonstrate understanding of other methods of fabric constructions and relate these to structure and properties, e.g. non-wovens, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	7	24.1	24.1	24.1
	not important	6	20.7	20.7	44.8
	important	4	13.8	13.8	58.6
	very important	8	27.6	27.6	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 10 General: Quality Management - Analyse customer product specifications by relating these to tests and examination procedures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	8	27.6	27.6	31.0
	very important	11	37.9	37.9	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

SSSK 10 Specific: Quality Management - Analyse customer product specifications by relating these to tests and examination procedures

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	9	31.0	31.0	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 11 General: Colouration Technology - Develop understanding of different finishing processes, function and application.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	11	37.9	37.9	44.8
	very important	10	34.5	34.5	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 11 Specific I: Colouration Technology - Develop understanding of different finishing processes, function and application.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	important	7	24.1	24.1	34.5
	very important	9	31.0	31.0	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 12 General: Work Organisation - Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	15	51.7	51.7	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 12 Specific: Work Organisation - Implement housekeeping practices in a textile-manufacturing environment and determine impact of non-conformance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	2	6.9	6.9	20.7
	important	10	34.5	34.5	55.2
	very important	9	31.0	31.0	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 13 General: Colouration Technology - Develop understanding of chemicals and their applications in pre-treatment for dyeing and finishing, dyeing, printing and finishing processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	6	20.7	20.7	27.6
	very important	13	44.8	44.8	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 13 Specific: Colouration Technology - Develop understanding of chemicals and their applications in pre-treatment for dyeing and finishing, dyeing, printing and finishing processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	2	6.9	6.9	17.2
	important	6	20.7	20.7	37.9
	very important	8	27.6	27.6	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 14 General: Computer aided manufacturing - Supervise the production control function using Computer Integrated Machine Monitoring.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	9	31.0	31.0	37.9
	very important	12	41.4	41.4	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 14 Specific: Computer aided manufacturing - Supervise the production control function using Computer Integrated Machine Monitoring.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	3	10.3	10.3	20.7
	important	11	37.9	37.9	58.6
	very important	7	24.1	24.1	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 15 General: Colouration Technology - Develop understanding of different systems of printing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	6	20.7	20.7	20.7
	not important	1	3.4	3.4	24.1
	important	8	27.6	27.6	51.7
	very important	11	37.9	37.9	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 15 Specific: Colouration Technology - Develop understanding of different systems of printing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	13	44.8	44.8	44.8
	not important	6	20.7	20.7	65.5
	important	3	10.3	10.3	75.9
	very important	3	10.3	10.3	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 16 General: Quality Management - Motivate and initiate quality improvements to products and processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	10	34.5	34.5	62.1
	critical	11	37.9	37.9	100.0
	Total	29	100.0	100.0	

SSSK 16 Specific: Quality Management - Motivate and initiate quality improvements to products and processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	7	24.1	24.1	31.0
	very important	7	24.1	24.1	55.2
	critical	13	44.8	44.8	100.0
	Total	29	100.0	100.0	

SSSK 17 General: Industrial Relations - Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA, OHASA, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	13	44.8	44.8	62.1
	very important	4	13.8	13.8	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 17 Specific I: Industrial Relations - Identify and describe key principles of relevant labour legislation e.g. LRA, EEA, SDA, OHASA, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	6	20.7	20.7	27.6
	important	10	34.5	34.5	62.1
	very important	5	17.2	17.2	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 18 General: Fibre & Yarn Technology - Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	10	34.5	34.5	34.5
	very important	15	51.7	51.7	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 18 Specific: Fibre & Yarn Technology - Identify and describe yarns by composition, spinning systems, carding systems, structure, properties, type and end use.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	13	44.8	44.8	51.7
	very important	8	27.6	27.6	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 19 General: Fabric Technology: knitting - Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	6	20.7	20.7	20.7
	not important	1	3.4	3.4	24.1
	important	6	20.7	20.7	44.8
	very important	13	44.8	44.8	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 19 Specific I: Fabric Technology: knitting - Demonstrate understanding of flat knitting, circular, fully-fashioned, hose, warp and raschel machines, the knitted structures associated with each type and fabric properties of each type.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	8	27.6	27.6	27.6
	important	8	27.6	27.6	55.2
	very important	5	17.2	17.2	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 20 General: Colouration Technology - Develop understanding of the different systems of dyeing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	9	31.0	31.0	37.9
	very important	16	55.2	55.2	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 20 Specific: Colouration Technology - Develop understanding of the different systems of dyeing.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	12	41.4	41.4	48.3
	very important	7	24.1	24.1	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 21 General: Textile Science - Demonstrate understanding of morphological structure and chemical composition of fibres of natural fibres and how these relate to fibre and fabric properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	1	3.4	3.4	10.3
	important	7	24.1	24.1	34.5
	very important	12	41.4	41.4	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 21 Specific: Textile Science - Demonstrate understanding of morphological structure and chemical composition of fibres of natural fibres and how these relate to fibre and fabric properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	11	37.9	37.9	55.2
	very important	7	24.1	24.1	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 22 General: Colouration Technology - Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	7	24.1	24.1	31.0
	very important	17	58.6	58.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 22 Specific: Colouration Technology - Develop the ability to perform correct lab practices and techniques within safety rules and regulations applicable to a chemistry and wet processing laboratory.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	3	10.3	10.3	20.7
	important	8	27.6	27.6	48.3
	very important	8	27.6	27.6	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 23 General: Management - Establish, describe and apply leadership techniques.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	12	41.4	41.4	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 23 Specific: Management - Establish, describe and apply leadership techniques.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	13	44.8	44.8	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 24 General: General textile processes - Perform textile calculations applicable to a particular section within a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	10	34.5	34.5	37.9
	very important	13	44.8	44.8	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 24 Specific: General textile processes - Perform textile calculations applicable to a particular section within a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	2	6.9	6.9	17.2
	important	13	44.8	44.8	62.1
	very important	5	17.2	17.2	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 25 General: Work Organisation - Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	15	51.7	51.7	51.7
	very important	10	34.5	34.5	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 25 Specific: Work Organisation - Apply safe working practices in a textile-manufacturing environment and determine impact of non-conformance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	13	44.8	44.8	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 26 General: Quality Management - Identify quality faults and possible causes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	5	17.2	17.2	17.2
	very important	14	48.3	48.3	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 26 Specific I: Quality Management - Identify quality faults and possible causes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	2	6.9	6.9	10.3
	very important	13	44.8	44.8	55.2
	critical	13	44.8	44.8	100.0
	Total	29	100.0	100.0	

SSSK 27 General: Industrial Relations - Identify and describe the various role-players within the textile industry SACTWU; TEXFED, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	4	13.8	13.8	13.8
	important	14	48.3	48.3	62.1
	very important	7	24.1	24.1	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 27 Specific I: Industrial Relations - Identify and describe the various role-players within the textile industry SACTWU; TEXFED, etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	8	27.6	27.6	31.0
	important	12	41.4	41.4	72.4
	very important	5	17.2	17.2	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 28 General: Fabric Technology: weaving - Demonstrate understanding of weaving theory, woven structures, weights and yarn consumptions and relate these to practical examples.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	important	6	20.7	20.7	34.5
	very important	14	48.3	48.3	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 28 Specific: Fabric Technology: weaving - Demonstrate understanding of weaving theory, woven structures, weights and yarn consumptions and relate these to practical examples.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	11	37.9	37.9	37.9
	not important	3	10.3	10.3	48.3
	important	4	13.8	13.8	62.1
	very important	4	13.8	13.8	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 29 General: Quality Management - Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	6	20.7	20.7	20.7
	very important	14	48.3	48.3	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

SSSK 29 Specific: Quality Management - Demonstrate understanding of national and international quality assurance practices and their application to manufacturing processes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	1	3.4	3.4	10.3
	important	5	17.2	17.2	27.6
	very important	12	41.4	41.4	69.0
	critical	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

SSSK 30 General: Fabric Technology: General - Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	4	13.8	13.8	17.2
	very important	16	55.2	55.2	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 30 Specific: Fabric Technology: General - Demonstrate understanding of fabric faults, determine reasons for the occurrence of these faults and provide solutions to these problems.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	1	3.4	3.4	17.2
	important	4	13.8	13.8	31.0
	very important	12	41.4	41.4	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 31 General: Costing - Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	11	37.9	37.9	37.9
	very important	10	34.5	34.5	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 31 Specific: Costing - Demonstrate ability to cost a textile product and to conduct cost benefit analysis applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	3	10.3	10.3	20.7
	important	8	27.6	27.6	48.3
	very important	7	24.1	24.1	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 32 General: Colouration Technology - Develop understanding of colour theory, colour measurement and assessment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	8	27.6	27.6	34.5
	very important	14	48.3	48.3	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 32 Specific: Colouration Technology - Develop understanding of colour theory, colour measurement and assessment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	3	10.3	10.3	20.7
	important	4	13.8	13.8	34.5
	very important	12	41.4	41.4	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 33 General: Textile Science - Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	12	41.4	41.4	48.3
	very important	9	31.0	31.0	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 33 Specific: Textile Science - Demonstrate understanding of morphological structure and chemical composition of man-made fibres and how these relate to fibre and fabric properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	6	20.7	20.7	20.7
	not important	1	3.4	3.4	24.1
	important	13	44.8	44.8	69.0
	very important	4	13.8	13.8	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 34 General: General textile processes - Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	17	58.6	58.6	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 34 Specific: General textile processes - Demonstrate understanding of the limitations and capabilities of a broad range processing equipment and machinery in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	4	13.8	13.8	20.7
	important	11	37.9	37.9	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 35 General: Management - Establish, describe and apply management control strategies and tools.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	2	6.9	6.9	6.9
	important	8	27.6	27.6	34.5
	very important	14	48.3	48.3	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 35 Specific: Management - Establish, describe and apply management control strategies and tools.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	7	24.1	24.1	34.5
	very important	17	58.6	58.6	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 36 General: General textile processes - Classify fibres, yarns and fabrics according to grades.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	15	51.7	51.7	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 36 Specific: General textile processes - Classify fibres, yarns and fabrics according to grades.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	3	10.3	10.3	24.1
	important	9	31.0	31.0	55.2
	very important	10	34.5	34.5	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 37 General: Work Organisation - Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	3	10.3	10.3	13.8
	important	13	44.8	44.8	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 37 Specific: Work Organisation - Demonstrate understanding of the principles and functions of ergonomics and how these relate to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	6	20.7	20.7	31.0
	important	12	41.4	41.4	72.4
	very important	6	20.7	20.7	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 38 General: Quality Management - Calculate the cost of poor quality of textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	11	37.9	37.9	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 38 Specific: Quality Management - Calculate the cost of poor quality of textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	1	3.4	3.4	10.3
	important	2	6.9	6.9	17.2
	very important	12	41.4	41.4	58.6
	critical	12	41.4	41.4	100.0
	Total	29	100.0	100.0	

SSSK 39 General: Human Resource Management - Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	2	6.9	6.9	6.9
	important	11	37.9	37.9	44.8
	very important	11	37.9	37.9	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 39 Specific: Human Resource Management - Demonstrate understanding of systems and procedures in relation to the handling of conflict, discipline, dismissal and grievance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	11	37.9	37.9	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 40 General: Textile testing & Statistics - Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	15	51.7	51.7	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 40 Specific: Textile testing & Statistics - Perform product and performance tests of a variety of textile products, analyse data and report data to aid decision-making process.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	3	10.3	10.3	13.8
	important	6	20.7	20.7	34.5
	very important	15	51.7	51.7	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 41 General: Factory Engineering - Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	12	41.4	41.4	51.7
	very important	11	37.9	37.9	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 41 Specific: Factory Engineering - Demonstrate understanding of basic engineering principles of electrical and electronic engineering applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	3	10.3	10.3	20.7
	important	13	44.8	44.8	65.5
	very important	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 42 General: Management - Identify and apply the techniques of customer care.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	10	34.5	34.5	41.4
	very important	12	41.4	41.4	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 42 Specific: Management - Identify and apply the techniques of customer care.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	4	13.8	13.8	17.2
	very important	14	48.3	48.3	65.5
	critical	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

SSSK 43 General: Apparel technology - Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	1	3.4	3.4	10.3
	important	9	31.0	31.0	41.4
	very important	12	41.4	41.4	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 43 Specific: Apparel technology - Demonstrate understanding of manufacturing processes and techniques applicable to garment manufacturing and how these relate to textile products.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	5	17.2	17.2	17.2
	not important	2	6.9	6.9	24.1
	important	14	48.3	48.3	72.4
	very important	4	13.8	13.8	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 44 General: Business economics - Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	2	6.9	6.9	6.9
	important	13	44.8	44.8	51.7
	very important	12	41.4	41.4	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 44 Specific: Business economics - Demonstrate understanding of basic macro and micro economic principles and how these influence the SA economy in general and the textile industry in particular.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	4	13.8	13.8	13.8
	important	14	48.3	48.3	62.1
	very important	7	24.1	24.1	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 45 General: Physics - Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, therm

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	5	17.2	17.2	27.6
	important	14	48.3	48.3	75.9
	very important	4	13.8	13.8	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 45 Specific: Physics - Demonstrate understanding of basic concepts of physical sciences, including vectors, scalars, kinematics, Newton's Law, dynamics, momentum, moment of a force, work, energy and power, density and relative density, pressure, ther

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	10	34.5	34.5	48.3
	important	10	34.5	34.5	82.8
	very important	2	6.9	6.9	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 46 General: General textile processes - Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	9	31.0	31.0	31.0
	very important	17	58.6	58.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 46 Specific: General textile processes - Demonstrate understanding of terminology used in the classification of polymers, fibres, yarns, fabrics, additives, auxiliaries and chemicals applicable to the textile industry.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	10	34.5	34.5	44.8
	very important	10	34.5	34.5	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 47 General: Colouration Technology - Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	9	31.0	31.0	34.5
	very important	14	48.3	48.3	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 47 General: Colouration Technology - Develop ability to work in a wet processing laboratory performing pre-treatment, dyeing and finishing techniques of different substrates, understanding the reaction between dyes and fibre types and how to control

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	5	17.2	17.2	17.2
	not important	3	10.3	10.3	27.6
	important	6	20.7	20.7	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 48 General: General textile processes - Set and adjust complex parameters to fibre, yarn and fabric manufacturing processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	7	24.1	24.1	31.0
	very important	17	58.6	58.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 48 Specific: General textile processes - Set and adjust complex parameters to fibre, yarn and fabric manufacturing processes.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	5	17.2	17.2	17.2
	not important	5	17.2	17.2	34.5
	important	4	13.8	13.8	48.3
	very important	8	27.6	27.6	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 49 General: Work Organisation - Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	3	10.3	10.3	10.3
	important	17	58.6	58.6	69.0
	very important	5	17.2	17.2	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 49 Specific: Work Organisation - Demonstrate understanding of time and motion studies and how these relate to effectiveness and efficiency within a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	4	13.8	13.8	24.1
	important	13	44.8	44.8	69.0
	very important	5	17.2	17.2	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 50 General: Human Resource Management - Demonstrate understanding of the importance of job descriptions and work schedules and how they relate to successful teams in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	4	13.8	13.8	13.8
	important	11	37.9	37.9	51.7
	very important	11	37.9	37.9	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 50 Specific: Human Resource Management - Demonstrate understanding of the importance of job descriptions and work schedules and how they relate to successful teams in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	6	20.7	20.7	20.7
	important	11	37.9	37.9	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 51 General: Marketing - Develop sourcing techniques relevant to international markets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	4	13.8	13.8	17.2
	important	8	27.6	27.6	44.8
	very important	9	31.0	31.0	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 51 Specific: Marketing - Develop sourcing techniques relevant to international markets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	7	24.1	24.1	31.0
	important	5	17.2	17.2	48.3
	very important	10	34.5	34.5	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 52 General: Colouration Technology - Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	important	8	27.6	27.6	37.9
	very important	12	41.4	41.4	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 52 Specific: Colouration Technology - Demonstrate understanding and perform in practice the role of auxiliaries, the significance of pH and the performance of different agents in the dyeing process.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	6	20.7	20.7	20.7
	not important	5	17.2	17.2	37.9
	important	3	10.3	10.3	48.3
	very important	9	31.0	31.0	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 53 General: Textile Science - Demonstrate understanding of organic chemistry, including drawing the structural formula or basic organic compounds, naming organic compounds, identifying functional groups and isomers, writing general equations for the

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	12	41.4	41.4	51.7
	very important	10	34.5	34.5	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 53 Specific: Textile Science - Demonstrate understanding of organic chemistry, including drawing the structural formula or basic organic compounds, naming organic compounds, identifying functional groups and isomers, writing general equations for the

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	8	27.6	27.6	41.4
	important	9	31.0	31.0	72.4
	very important	4	13.8	13.8	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 54 General: Work Organisation - Maintain acceptable levels of productivity in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	5	17.2	17.2	24.1
	very important	14	48.3	48.3	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 54 Specific: Work Organisation - Maintain acceptable levels of productivity in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	1	3.4	3.4	17.2
	important	4	13.8	13.8	31.0
	very important	14	48.3	48.3	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 55 General: General textile processes - Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	7	24.1	24.1	27.6
	very important	16	55.2	55.2	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 55 Specific: General textile processes - Differentiate between natural, synthetic and regenerated fibres, describing characteristics, properties and end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	2	6.9	6.9	17.2
	important	9	31.0	31.0	48.3
	very important	8	27.6	27.6	75.9
	critical	7	24.1	24.1	100.0
	Total	29	100.0	100.0	

SSSK 56 General: Economics - Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	3	10.3	10.3	13.8
	important	15	51.7	51.7	65.5
	very important	6	20.7	20.7	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 56 Specific: Economics - Identify global economic trends in textiles by demonstrating understanding of legislation relating to tariffs and trade.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	6	20.7	20.7	27.6
	important	10	34.5	34.5	62.1
	very important	8	27.6	27.6	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 57 General: Computer aided production planning - Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	10	34.5	34.5	37.9
	very important	15	51.7	51.7	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 57 Specific: Computer aided production planning - Demonstrate understanding of the use of appropriate computer systems to ensure that production plans meet targets.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	5	17.2	17.2	20.7
	important	8	27.6	27.6	48.3
	very important	9	31.0	31.0	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 58 General: General textile processes - Determine factors impacting on manufacturing processes of regenerated and synthetic fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	12	41.4	41.4	41.4
	very important	15	51.7	51.7	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 58 Specific: General textile processes - Determine factors impacting on manufacturing processes of regenerated and synthetic fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	5	17.2	17.2	17.2
	not important	3	10.3	10.3	27.6
	important	8	27.6	27.6	55.2
	very important	11	37.9	37.9	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 59 General: Marketing - Conduct market research to determine competitive advantage of company.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	4	13.8	13.8	17.2
	important	11	37.9	37.9	55.2
	very important	8	27.6	27.6	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 59 Specific: Marketing - Conduct market research to determine competitive advantage of company.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	4	13.8	13.8	17.2
	important	10	34.5	34.5	51.7
	very important	10	34.5	34.5	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 60 General: Waste management & environmental issues - Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	10	34.5	34.5	41.4
	very important	13	44.8	44.8	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 60 Specific: Waste management & environmental issues - Demonstrate an understanding of environmental issues and legislation as these issues impact on manufacturing processes of fibres, yarns and fabrics.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	1	3.4	3.4	13.8
	important	9	31.0	31.0	44.8
	very important	13	44.8	44.8	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 61 General: Fabric Technology: weaving - Demonstrate understanding of weft insertion mechanisms; shuttle, projectile, rapier and fluid jet machines.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	important	11	37.9	37.9	51.7
	very important	10	34.5	34.5	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 61 Specific: Fabric Technology: weaving - Demonstrate understanding of weft insertion mechanisms; shuttle, projectile, rapier and fluid jet machines.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	10	34.5	34.5	34.5
	not important	5	17.2	17.2	51.7
	important	8	27.6	27.6	79.3
	very important	5	17.2	17.2	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SSSK 62 General: General textile processes - Describe the conversion process in the textile pipeline.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	important	15	51.7	51.7	62.1
	very important	9	31.0	31.0	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 62 Specific: General textile processes - Describe the conversion process in the textile pipeline.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	3	10.3	10.3	24.1
	important	11	37.9	37.9	62.1
	very important	10	34.5	34.5	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SSSK 63 General: Marketing - Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	14	48.3	48.3	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 63 Specific: Marketing - Demonstrate understanding of the principles of supply and demand applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	12	41.4	41.4	58.6
	very important	9	31.0	31.0	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 64 General: General textile processes - Determine factors impacting on growth and production of natural fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	1	3.4	3.4	6.9
	important	15	51.7	51.7	58.6
	very important	10	34.5	34.5	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 64 Specific: General textile processes - Determine factors impacting on growth and production of natural fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	4	13.8	13.8	13.8
	not important	9	31.0	31.0	44.8
	important	8	27.6	27.6	72.4
	very important	6	20.7	20.7	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 65 General: Textile Science - Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and uses of different man-made fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	1	3.4	3.4	13.8
	important	11	37.9	37.9	51.7
	very important	11	37.9	37.9	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 65 Specific: Textile Science - Demonstrate understanding of inorganic chemistry, including esterification, polymerisation and synthesis of different man-made fibres, as well as manufacture, properties, benefits and uses of different man-made fibres.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	5	17.2	17.2	17.2
	not important	6	20.7	20.7	37.9
	important	8	27.6	27.6	65.5
	very important	5	17.2	17.2	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 66 General: General textile processes - Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	10	34.5	34.5	37.9
	very important	14	48.3	48.3	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 66 Specific: General textile processes - Demonstrate an in-depth understanding of the relationship between end products and raw materials as these apply to fabric structure, characteristics and performance of desired end-uses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	1	3.4	3.4	13.8
	important	7	24.1	24.1	37.9
	very important	17	58.6	58.6	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SSSK 67 General: Product development - Design and develop new textile products and conduct feasibility studies.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	12	41.4	41.4	48.3
	very important	7	24.1	24.1	72.4
	critical	8	27.6	27.6	100.0
	Total	29	100.0	100.0	

SSSK 67 Specific: Product development - Design and develop new textile products and conduct feasibility studies.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	13	44.8	44.8	51.7
	very important	9	31.0	31.0	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 68 General: Entrepreneurship - Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	important	8	27.6	27.6	27.6
	very important	15	51.7	51.7	79.3
	critical	6	20.7	20.7	100.0
	Total	29	100.0	100.0	

SSSK 68 Specific: Entrepreneurship - Apply entrepreneurial flair and innovative skills to enhance manufacturing processes and stimulate new product development.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not important	1	3.4	3.4	3.4
	important	13	44.8	44.8	48.3
	very important	11	37.9	37.9	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 69 General: Computer aided textile design - Design and produce patterns and structures using computer aided design systems for weaving and knitting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	10	34.5	34.5	41.4
	very important	15	51.7	51.7	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 69 Specific: Computer aided textile design - Design and produce patterns and structures using computer aided design systems for weaving and knitting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	6	20.7	20.7	20.7
	not important	5	17.2	17.2	37.9
	important	9	31.0	31.0	69.0
	very important	6	20.7	20.7	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 70 General: Project management - Demonstrate ability to manage a project in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	important	17	58.6	58.6	62.1
	very important	7	24.1	24.1	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 70 Specific: Project management - Demonstrate ability to manage a project in a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	2	6.9	6.9	17.2
	important	13	44.8	44.8	62.1
	very important	7	24.1	24.1	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 71 General: Management - Demonstrate understanding of the role, functions and principles of management applicable to a textile manufacturing/retailing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	1	3.4	3.4	3.4
	not important	2	6.9	6.9	10.3
	important	14	48.3	48.3	58.6
	very important	10	34.5	34.5	93.1
	critical	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SSSK 71 Specific: Management - Demonstrate understanding of the role, functions and principles of management applicable to a textile manufacturing/retailing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	5	17.2	17.2	27.6
	important	8	27.6	27.6	55.2
	very important	12	41.4	41.4	96.6
	critical	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SSSK 72 General: General textile processes - Classify fibres, yarns, fabrics, dyes and chemicals.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	important	9	31.0	31.0	37.9
	very important	14	48.3	48.3	86.2
	critical	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SSSK 72 Specific: General textile processes - Classify fibres, yarns, fabrics, dyes and chemicals.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	2	6.9	6.9	6.9
	not important	3	10.3	10.3	17.2
	important	9	31.0	31.0	48.3
	very important	10	34.5	34.5	82.8
	critical	5	17.2	17.2	100.0
	Total	29	100.0	100.0	

SSSK 73 General: Factory Engineering - Demonstrate understanding of control and automation applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	1	3.4	3.4	13.8
	important	10	34.5	34.5	48.3
	very important	12	41.4	41.4	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 73 Specific: Factory Engineering - Demonstrate understanding of control and automation applicable to a textile-manufacturing environment.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	3	10.3	10.3	10.3
	not important	5	17.2	17.2	27.6
	important	8	27.6	27.6	55.2
	very important	10	34.5	34.5	89.7
	critical	3	10.3	10.3	100.0
	Total	29	100.0	100.0	

SSSK 74 General: Other learning outcomes not included, that you wish to add

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	29	100.0	100.0	100.0

SSSK 74 Specific: Other learning outcomes not included, that you wish to add

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not applicable	29	100.0	100.0	100.0

Is your company interested in developing/recruiting textile technologist(s) in the next 5-7 years?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	20	69.0	71.4	71.4
	no	8	27.6	28.6	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

If yes, how many textile technologist(s) would your company develop/recruit during this period?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	7	24.1	35.0	35.0
	2.00	6	20.7	30.0	65.0
	3.00	3	10.3	15.0	80.0
	4.00	1	3.4	5.0	85.0
	8.00	2	6.9	10.0	95.0
	10.00	1	3.4	5.0	100.0
	Total	20	69.0	100.0	
Missing	System	9	31.0		
Total		29	100.0		

Indicate the elective area(s) for the development/recruitment of a textile technologist(s) by your company during this period:

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dry processing	12	41.4	54.5	54.5
	wet processing	5	17.2	22.7	77.3
	man-made fibre p&p	5	17.2	22.7	100.0
	Total	22	75.9	100.0	
Missing	System	7	24.1		
Total		29	100.0		

Industry type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	dry processing	3	10.3	10.3	10.3
	wet processing	2	6.9	6.9	17.2
	wet & dry processing	13	44.8	44.8	62.1
	other	11	37.9	37.9	100.0
	Total	29	100.0	100.0	

GLO category: 1. Work organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9.00	1	3.4	3.4	3.4
	10.00	1	3.4	3.4	6.9
	11.00	2	6.9	6.9	13.8
	13.00	5	17.2	17.2	31.0
	14.00	4	13.8	13.8	44.8
	15.00	3	10.3	10.3	55.2
	16.00	2	6.9	6.9	62.1
	17.00	3	10.3	10.3	72.4
	18.00	2	6.9	6.9	79.3
	19.00	2	6.9	6.9	86.2
	20.00	2	6.9	6.9	93.1
	21.00	1	3.4	3.4	96.6
	24.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO category: 1. Work organisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00	1	3.4	3.4	3.4
	6.00	2	6.9	6.9	10.3
	7.00	1	3.4	3.4	13.8
	9.00	1	3.4	3.4	17.2
	11.00	4	13.8	13.8	31.0
	13.00	1	3.4	3.4	34.5
	14.00	2	6.9	6.9	41.4
	15.00	1	3.4	3.4	44.8
	16.00	3	10.3	10.3	55.2
	17.00	7	24.1	24.1	79.3
	18.00	3	10.3	10.3	89.7
	20.00	2	6.9	6.9	96.6
	24.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO category: 2. QM & testing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18.00	1	3.4	3.4	3.4
	20.00	2	6.9	6.9	10.3
	21.00	1	3.4	3.4	13.8
	22.00	2	6.9	6.9	20.7
	23.00	1	3.4	3.4	24.1
	24.00	1	3.4	3.4	27.6
	25.00	4	13.8	13.8	41.4
	26.00	2	6.9	6.9	48.3
	27.00	1	3.4	3.4	51.7
	28.00	2	6.9	6.9	58.6
	29.00	4	13.8	13.8	72.4
	30.00	2	6.9	6.9	79.3
	31.00	1	3.4	3.4	82.8
	33.00	1	3.4	3.4	86.2
	34.00	2	6.9	6.9	93.1
	35.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SLO category: 2. QM & testing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	1	3.4	3.4	3.4
	18.00	1	3.4	3.4	6.9
	20.00	3	10.3	10.3	17.2
	21.00	1	3.4	3.4	20.7
	22.00	2	6.9	6.9	27.6
	23.00	2	6.9	6.9	34.5
	24.00	3	10.3	10.3	44.8
	25.00	1	3.4	3.4	48.3
	26.00	1	3.4	3.4	51.7
	28.00	3	10.3	10.3	62.1
	29.00	2	6.9	6.9	69.0
	30.00	3	10.3	10.3	79.3
	32.00	1	3.4	3.4	82.8
	33.00	3	10.3	10.3	93.1
	35.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO category: 3. Gen. Man. & business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11.00	1	3.4	3.4	3.4
	13.00	1	3.4	3.4	6.9
	14.00	3	10.3	10.3	17.2
	16.00	3	10.3	10.3	27.6
	17.00	1	3.4	3.4	31.0
	18.00	1	3.4	3.4	34.5
	19.00	2	6.9	6.9	41.4
	21.00	3	10.3	10.3	51.7
	22.00	2	6.9	6.9	58.6
	23.00	3	10.3	10.3	69.0
	24.00	4	13.8	13.8	82.8
	25.00	1	3.4	3.4	86.2
	27.00	1	3.4	3.4	89.7
	28.00	2	6.9	6.9	96.6
	30.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO category: 3. Gen. Man. & business

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.00	1	3.4	3.4	3.4
	12.00	2	6.9	6.9	10.3
	14.00	2	6.9	6.9	17.2
	15.00	2	6.9	6.9	24.1
	17.00	1	3.4	3.4	27.6
	18.00	2	6.9	6.9	34.5
	19.00	2	6.9	6.9	41.4
	20.00	2	6.9	6.9	48.3
	21.00	3	10.3	10.3	58.6
	22.00	1	3.4	3.4	62.1
	23.00	3	10.3	10.3	72.4
	24.00	3	10.3	10.3	82.8
	25.00	1	3.4	3.4	86.2
	26.00	1	3.4	3.4	89.7
	27.00	2	6.9	6.9	96.6
	30.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO category: 4. HR & IR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	1	3.4	3.4	3.4
	5.00	1	3.4	3.4	6.9
	7.00	1	3.4	3.4	10.3
	8.00	1	3.4	3.4	13.8
	9.00	1	3.4	3.4	17.2
	10.00	5	17.2	17.2	34.5
	11.00	3	10.3	10.3	44.8
	12.00	1	3.4	3.4	48.3
	13.00	5	17.2	17.2	65.5
	14.00	1	3.4	3.4	69.0
	15.00	2	6.9	6.9	75.9
	16.00	1	3.4	3.4	79.3
	17.00	2	6.9	6.9	86.2
	19.00	3	10.3	10.3	96.6
	20.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO category: 4. HR & IR

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	3.4	3.4	3.4
	3.00	1	3.4	3.4	6.9
	5.00	1	3.4	3.4	10.3
	6.00	1	3.4	3.4	13.8
	7.00	2	6.9	6.9	20.7
	8.00	2	6.9	6.9	27.6
	10.00	4	13.8	13.8	41.4
	11.00	2	6.9	6.9	48.3
	12.00	4	13.8	13.8	62.1
	13.00	3	10.3	10.3	72.4
	14.00	2	6.9	6.9	79.3
	16.00	1	3.4	3.4	82.8
	17.00	2	6.9	6.9	89.7
	19.00	1	3.4	3.4	93.1
	20.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO category: 5. Fabric tech. -all categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	17.00	1	3.4	3.4	3.4
	20.00	1	3.4	3.4	6.9
	28.00	1	3.4	3.4	10.3
	32.00	2	6.9	6.9	17.2
	34.00	2	6.9	6.9	24.1
	36.00	1	3.4	3.4	27.6
	37.00	2	6.9	6.9	34.5
	39.00	2	6.9	6.9	41.4
	40.00	2	6.9	6.9	48.3
	41.00	1	3.4	3.4	51.7
	43.00	1	3.4	3.4	55.2
	45.00	2	6.9	6.9	62.1
	46.00	2	6.9	6.9	69.0
	47.00	3	10.3	10.3	79.3
	49.00	1	3.4	3.4	82.8
	50.00	1	3.4	3.4	86.2
	55.00	1	3.4	3.4	89.7
	56.00	2	6.9	6.9	96.6
	58.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO category: 5. Fabric tech. -all categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18.00	1	3.4	3.4	3.4
	20.00	1	3.4	3.4	6.9
	22.00	1	3.4	3.4	10.3
	24.00	2	6.9	6.9	17.2
	25.00	1	3.4	3.4	20.7
	27.00	1	3.4	3.4	24.1
	28.00	1	3.4	3.4	27.6
	31.00	1	3.4	3.4	31.0
	32.00	3	10.3	10.3	41.4
	35.00	3	10.3	10.3	51.7
	36.00	1	3.4	3.4	55.2
	38.00	2	6.9	6.9	62.1
	43.00	2	6.9	6.9	69.0
	44.00	2	6.9	6.9	75.9
	45.00	1	3.4	3.4	79.3
	47.00	1	3.4	3.4	82.8
	48.00	1	3.4	3.4	86.2
	51.00	1	3.4	3.4	89.7
	53.00	1	3.4	3.4	93.1
	55.00	1	3.4	3.4	96.6
	57.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO Category: 6. Fabric tech. - Wet Process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.00	1	3.4	3.4	3.4
	11.00	1	3.4	3.4	6.9
	17.00	1	3.4	3.4	10.3
	19.00	1	3.4	3.4	13.8
	20.00	2	6.9	6.9	20.7
	22.00	1	3.4	3.4	24.1
	23.00	1	3.4	3.4	27.6
	24.00	2	6.9	6.9	34.5
	25.00	1	3.4	3.4	37.9
	26.00	2	6.9	6.9	44.8
	27.00	2	6.9	6.9	51.7
	29.00	3	10.3	10.3	62.1
	30.00	1	3.4	3.4	65.5
	31.00	3	10.3	10.3	75.9
	32.00	1	3.4	3.4	79.3
	33.00	2	6.9	6.9	86.2
	34.00	2	6.9	6.9	93.1
	35.00	1	3.4	3.4	96.6
	36.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 6. Fabric tech. - Wet Process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5.00	1	3.4	3.4	3.4
	6.00	1	3.4	3.4	6.9
	8.00	1	3.4	3.4	10.3
	12.00	1	3.4	3.4	13.8
	13.00	1	3.4	3.4	17.2
	14.00	1	3.4	3.4	20.7
	17.00	2	6.9	6.9	27.6
	19.00	3	10.3	10.3	37.9
	20.00	1	3.4	3.4	41.4
	21.00	1	3.4	3.4	44.8
	23.00	1	3.4	3.4	48.3
	24.00	1	3.4	3.4	51.7
	25.00	2	6.9	6.9	58.6
	26.00	1	3.4	3.4	62.1
	27.00	1	3.4	3.4	65.5
	28.00	2	6.9	6.9	72.4
	30.00	2	6.9	6.9	79.3
	31.00	1	3.4	3.4	82.8
	33.00	2	6.9	6.9	89.7
	34.00	1	3.4	3.4	93.1
	35.00	1	3.4	3.4	96.6
	40.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO Category: 7. Fabric tech. - Dry Process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	1	3.4	3.4	3.4
	9.00	1	3.4	3.4	6.9
	10.00	2	6.9	6.9	13.8
	11.00	2	6.9	6.9	20.7
	12.00	3	10.3	10.3	31.0
	14.00	3	10.3	10.3	41.4
	15.00	2	6.9	6.9	48.3
	16.00	2	6.9	6.9	55.2
	17.00	3	10.3	10.3	65.5
	18.00	5	17.2	17.2	82.8
	19.00	1	3.4	3.4	86.2
	20.00	2	6.9	6.9	93.1
	22.00	1	3.4	3.4	96.6
	23.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 7. Fabric tech. - Dry Process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	3.4	3.4	3.4
	7.00	1	3.4	3.4	6.9
	8.00	2	6.9	6.9	13.8
	9.00	2	6.9	6.9	20.7
	10.00	3	10.3	10.3	31.0
	11.00	2	6.9	6.9	37.9
	12.00	6	20.7	20.7	58.6
	13.00	1	3.4	3.4	62.1
	14.00	1	3.4	3.4	65.5
	15.00	1	3.4	3.4	69.0
	16.00	2	6.9	6.9	75.9
	17.00	1	3.4	3.4	79.3
	18.00	2	6.9	6.9	86.2
	19.00	1	3.4	3.4	89.7
	20.00	1	3.4	3.4	93.1
	22.00	1	3.4	3.4	96.6
	23.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO Category: 8. CAD/CAM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.00	1	3.4	3.4	3.4
	7.00	3	10.3	10.3	13.8
	8.00	5	17.2	17.2	31.0
	9.00	1	3.4	3.4	34.5
	10.00	7	24.1	24.1	58.6
	11.00	4	13.8	13.8	72.4
	12.00	5	17.2	17.2	89.7
	13.00	1	3.4	3.4	93.1
	14.00	1	3.4	3.4	96.6
	15.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 8. CAD/CAM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	1	3.4	3.4	3.4
	3.00	1	3.4	3.4	6.9
	4.00	1	3.4	3.4	10.3
	5.00	1	3.4	3.4	13.8
	6.00	3	10.3	10.3	24.1
	7.00	5	17.2	17.2	41.4
	8.00	3	10.3	10.3	51.7
	9.00	5	17.2	17.2	69.0
	10.00	5	17.2	17.2	86.2
	13.00	2	6.9	6.9	93.1
	14.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO Category: 9. Gen. textile process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	11.00	1	3.4	3.4	3.4
	21.00	1	3.4	3.4	6.9
	22.00	2	6.9	6.9	13.8
	23.00	1	3.4	3.4	17.2
	25.00	2	6.9	6.9	24.1
	26.00	1	3.4	3.4	27.6
	27.00	2	6.9	6.9	34.5
	28.00	1	3.4	3.4	37.9
	29.00	3	10.3	10.3	48.3
	30.00	2	6.9	6.9	55.2
	31.00	1	3.4	3.4	58.6
	32.00	3	10.3	10.3	69.0
	33.00	4	13.8	13.8	82.8
	35.00	2	6.9	6.9	89.7
	36.00	1	3.4	3.4	93.1
	37.00	1	3.4	3.4	96.6
	39.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 9. Gen. textile process

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	3.4	3.4	3.4
	7.00	1	3.4	3.4	6.9
	8.00	1	3.4	3.4	10.3
	11.00	1	3.4	3.4	13.8
	17.00	1	3.4	3.4	17.2
	18.00	1	3.4	3.4	20.7
	19.00	1	3.4	3.4	24.1
	20.00	2	6.9	6.9	31.0
	21.00	1	3.4	3.4	34.5
	23.00	2	6.9	6.9	41.4
	24.00	2	6.9	6.9	48.3
	25.00	1	3.4	3.4	51.7
	26.00	2	6.9	6.9	58.6
	30.00	1	3.4	3.4	62.1
	31.00	1	3.4	3.4	65.5
	32.00	1	3.4	3.4	69.0
	33.00	2	6.9	6.9	75.9
	34.00	3	10.3	10.3	86.2
	35.00	1	3.4	3.4	89.7
	36.00	2	6.9	6.9	96.6
	37.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

GLO Category: 10. Factory eng.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	3.4	3.4	3.4
	2.00	3	10.3	10.3	13.8
	3.00	1	3.4	3.4	17.2
	4.00	6	20.7	20.7	37.9
	5.00	6	20.7	20.7	58.6
	6.00	8	27.6	27.6	86.2
	7.00	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

SLO Category: 10. Factory eng.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	2	6.9	6.9	6.9
	1.00	1	3.4	3.4	10.3
	2.00	4	13.8	13.8	24.1
	3.00	1	3.4	3.4	27.6
	4.00	5	17.2	17.2	44.8
	5.00	8	27.6	27.6	72.4
	6.00	6	20.7	20.7	93.1
	7.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO Category: 11. Gen. & textile science

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	1	3.4	3.4	3.4
	4.00	1	3.4	3.4	6.9
	7.00	1	3.4	3.4	10.3
	9.00	4	13.8	13.8	24.1
	10.00	5	17.2	17.2	41.4
	11.00	1	3.4	3.4	44.8
	12.00	1	3.4	3.4	48.3
	13.00	3	10.3	10.3	58.6
	14.00	5	17.2	17.2	75.9
	15.00	2	6.9	6.9	82.8
	16.00	1	3.4	3.4	86.2
	17.00	1	3.4	3.4	89.7
	18.00	2	6.9	6.9	96.6
	20.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 11. Gen. & textile science

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	1	3.4	3.4	3.4
	2.00	1	3.4	3.4	6.9
	4.00	2	6.9	6.9	13.8
	5.00	2	6.9	6.9	20.7
	6.00	1	3.4	3.4	24.1
	7.00	1	3.4	3.4	27.6
	8.00	4	13.8	13.8	41.4
	9.00	3	10.3	10.3	51.7
	10.00	2	6.9	6.9	58.6
	11.00	3	10.3	10.3	69.0
	12.00	1	3.4	3.4	72.4
	13.00	1	3.4	3.4	75.9
	14.00	2	6.9	6.9	82.8
	15.00	1	3.4	3.4	86.2
	16.00	1	3.4	3.4	89.7
	18.00	1	3.4	3.4	93.1
	20.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO Category: 12. Text. cost, market & entrep

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7.00	2	6.9	6.9	6.9
	9.00	1	3.4	3.4	10.3
	10.00	2	6.9	6.9	17.2
	11.00	7	24.1	24.1	41.4
	12.00	1	3.4	3.4	44.8
	13.00	3	10.3	10.3	55.2
	14.00	2	6.9	6.9	62.1
	15.00	2	6.9	6.9	69.0
	16.00	4	13.8	13.8	82.8
	17.00	1	3.4	3.4	86.2
	18.00	3	10.3	10.3	96.6
	19.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

SLO Category: 12. Text. cost, market & entrep

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6.00	1	3.4	3.4	3.4
	7.00	1	3.4	3.4	6.9
	8.00	2	6.9	6.9	13.8
	9.00	3	10.3	10.3	24.1
	10.00	4	13.8	13.8	37.9
	11.00	3	10.3	10.3	48.3
	12.00	4	13.8	13.8	62.1
	13.00	3	10.3	10.3	72.4
	15.00	1	3.4	3.4	75.9
	16.00	3	10.3	10.3	86.2
	17.00	2	6.9	6.9	93.1
	19.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

GLO Category: 13. Specialist skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	3.4	3.4	3.4
	3.00	3	10.3	10.3	13.8
	4.00	6	20.7	20.7	34.5
	5.00	3	10.3	10.3	44.8
	6.00	13	44.8	44.8	89.7
	7.00	1	3.4	3.4	93.1
	8.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

SLO Category: 13. Specialist skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	1	3.4	3.4	3.4
	3.00	7	24.1	24.1	27.6
	4.00	8	27.6	27.6	55.2
	5.00	9	31.0	31.0	86.2
	6.00	1	3.4	3.4	89.7
	7.00	2	6.9	6.9	96.6
	8.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC Category: 1. Informaton technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	2	6.9	6.9	6.9
	4.00	3	10.3	10.3	17.2
	5.00	4	13.8	13.8	31.0
	6.00	5	17.2	17.2	48.3
	7.00	6	20.7	20.7	69.0
	8.00	2	6.9	6.9	75.9
	9.00	5	17.2	17.2	93.1
	10.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC Category: 2. Man. & materials technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4.00	2	6.9	6.9	6.9
	5.00	3	10.3	10.3	17.2
	6.00	6	20.7	20.7	37.9
	7.00	5	17.2	17.2	55.2
	8.00	3	10.3	10.3	65.5
	9.00	3	10.3	10.3	75.9
	10.00	3	10.3	10.3	86.2
	11.00	1	3.4	3.4	89.7
	12.00	2	6.9	6.9	96.6
	13.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC Category: 3. Bus. & Man. strategies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	5	17.2	17.2	17.2
	3.00	7	24.1	24.1	41.4
	4.00	10	34.5	34.5	75.9
	5.00	5	17.2	17.2	93.1
	6.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC Category: 4. Niche markets

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	4.00	2	6.9	6.9	6.9
	5.00	5	17.2	17.2	24.1
	6.00	5	17.2	17.2	41.4
	7.00	8	27.6	27.6	69.0
	8.00	7	24.1	24.1	93.1
	10.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

FIEC Category: 5. Globalisation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3.00	1	3.4	3.4	3.4
	4.00	1	3.4	3.4	6.9
	5.00	2	6.9	6.9	13.8
	6.00	5	17.2	17.2	31.0
	7.00	6	20.7	20.7	51.7
	8.00	2	6.9	6.9	58.6
	9.00	10	34.5	34.5	93.1
	10.00	1	3.4	3.4	96.6
	12.00	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

FIEC Category: 6. Local trade conditions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2.00	5	17.2	17.2	17.2
	3.00	6	20.7	20.7	37.9
	4.00	6	20.7	20.7	58.6
	5.00	10	34.5	34.5	93.1
	6.00	2	6.9	6.9	100.0
	Total	29	100.0	100.0	

Tables

	Industry type				Total
	dry processing	wet processing	wet & dry processing	other	
FIEC Category Average: 1. Informaton technology	2.22	3.17	2.05	2.18	2.20
FIEC Category Average: 2. Man. & materials technology	2.08	2.25	1.71	2.07	1.92
FIEC Category Average: 3. Bus. & Man. strategies	2.33	2.00	1.65	1.95	1.86
FIEC Category Average: 4. Niche markets	2.33	2.50	2.18	2.24	2.24
FIEC Category Average: 5. Globalisation	2.00	2.25	1.87	1.77	1.87
FIEC Category Average: 6. Local trade conditions	1.83	2.50	2.08	1.77	1.97

Tables

	Industry type				Total
	dry processing	wet processing	wet & dry processing	other	
GLO category average: 1. Work organisation	2.83	2.67	2.42	2.68	2.58
GLO category average: 2. QM & testing	3.26	2.44	2.89	3.16	3.00
GLO category average: 3. Gen. Man. & business	2.79	2.50	2.39	2.74	2.57
GLO category average: 4. HR & IR	3.07	2.50	2.17	2.75	2.50
GLO category average: 5. Fabric tech. -all categories	1.60	2.41	2.50	2.97	2.58
GLO Category average: 6. Fabric tech. - Wet Process	1.60	2.45	2.55	3.05	2.63
GLO Category average: 7. Fabric tech. - Dry Process	1.50	2.42	2.44	2.98	2.55
GLO Category average: 8. CAD/CAM	2.00	2.25	2.44	2.80	2.52
GLO Category average: 9. Gen. textile process	2.67	2.23	2.57	2.81	2.65
GLO Category average: 10. Factory eng.	2.83	2.25	2.27	2.50	2.41
GLO Category average: 11. Gen. & textile science	2.73	2.20	2.28	2.55	2.42
GLO Category average: 12. Text. cost, market & entrep	3.20	2.40	2.40	2.82	2.64
GLO Category average: 13. Specialist skills	2.50	2.50	2.31	3.00	2.60

Tables

	Industry type				
	dry processing	wet processing	wet & dry processing	other	Total
SLO category average: 1. Work organisation	2.78	2.33	2.54	2.15	2.40
SLO category average: 2. QM & testing	3.30	2.11	2.99	2.78	2.88
SLO category average: 3. Gen. Man. & business	2.71	2.50	2.43	2.52	2.50
SLO category average: 4. HR & IR	3.07	2.10	2.09	2.35	2.29
SLO category average: 5. Fabric tech. -all categories	1.90	1.66	2.48	2.29	2.29
SLO Category average: 6. Fabric tech. - Wet Process	1.80	1.85	2.55	2.17	2.28
SLO Category average: 7. Fabric tech. - Dry Process	1.56	1.00	2.31	2.36	2.16
SLO Category average: 8. CAD/CAM	1.92	1.50	2.46	1.70	2.05
SLO Category average: 9. Gen. textile process	2.67	1.23	2.36	2.21	2.25
SLO Category average: 10. Factory eng.	2.50	2.25	2.35	1.68	2.10
SLO Category average: 11. Gen. & textile science	2.73	1.20	2.17	1.71	1.99
SLO Category average: 12. Text. cost, market & entrep	3.13	2.00	2.32	2.42	2.42
SLO Category average: 13. Specialist skills	2.83	2.25	1.92	2.36	2.21