AN ASSESSMENT OF THE EXTENDED CURRICULUM PROGRAMME AT A UNIVERSITY OF TECHNOLOGY USING QUALITY MANAGEMENT PRINCIPLES

A Dissertation by

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DECLARATION

I, Felicity Harris, hereby declare that the contents of this dissertation submitted for the degree Magister Technologiae at the Cape Peninsula University of Technology, represent my own original unaided work, and that the dissertation has not previously been submitted to any other institution of higher education towards any qualification. I further declare that all sources cited or quoted are indicated and acknowledged by means of a comprehensive list of references. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

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Felicity Harris

DATE:

DEDICATION

This study is dedicated to the two most important people in my life, my husband, Angelo, and my daughter, Lisa.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Professor Moll, my supervisor, and Professor Garraway, my co-supervisor: Thank you Prof Moll for your determination to see me through my studies despite all the obstacles presented to me. Thank you Prof. Garraway for your expert advice on issues of relevance during my research and in my draft.

A special thank you to the Department of Mechanical Engineering at Cape Peninsula University of Technology for allowing me to use the Extended Curriculum Programme as my sample. To the Extended Curriculum Programme 2007 graduates of the Department of Mechanical Engineering: Thank you for taking the time to complete the questionnaires. Thank you to the lecturers in the Extended Curriculum Programme of the Department of Mechanical Engineering for making time for me to interview them.

To the two most important people in my life: my husband, Angelo, and my daughter, Lisa, thank you for the continual motivation and patience. Angelo, you have so much faith in me and have kept me focused on what I want. Lisa, we made so many sacrifices and you did not complain once. I love you both so much.

To my extended family: we have been through so much. The tragic death of my brother-in-law rocked us to the core and changed our family dynamics for good. To my sisters, Millicent and Fiona and my mom, we are the glue that keeps this family together and we must never lose our strength to do so. Thank you for your confidence in me.

Finally, to my late father: we grew up under very challenging conditions, but you always maintained that education was the key to solving all our problems. Thank you for the sacrifices you made to bring me thus far.

ABSTRACT

Academic Development Programmes at higher education institutions in South Africa were implemented and funded in 2004 by the Department of Higher Education and Training as an initiative to address the low throughput rate and low graduation output. An example of the Academic Development Programmes is the Extended Curriculum Programme (ECP) where the length of the mainstream course is extended by six months to one year to allow for additional assistance in individual subjects and the offering of courses/programmes to assist students with basic life skills in adapting to tertiary education. The objective of this research was to look at whether ECP's were effective in improving throughput rates and graduation output and whether there were quality management practices in place to gauge the effectiveness of ECP's. The ECP in the Department of Mechanical Engineering at a university of technology was used as a sample. Academic histories of the ECP and Mainstream students of the 2007 cohort were analysed to draw comparisons on the throughput rate, graduation output and continuation to postgraduate studies of the two programmes. A questionnaire to graduates of the 2007 ECP cohort, who were now in the workplace, was administered and interviews were conducted with lecturers teaching on the ECP. It was found that the ECP was successful in improving throughput rates, graduation output and that graduates were well placed in industry. It was also found that although quality management practices were in place in the programme, it was not formalised and the results were not properly recorded. The main recommendations were firstly to concentrate on the first year experience for first time students in order to solidify their tertiary experience and so improve academic performance, and secondly, to implement more formalised quality management practices in order to accurately gauge the success of the ECP.

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CHAPTER ONE: INTRODUCTION

Higher education prepares citizens of a country to become distinguished contributors to their country's well-being. Higher education is not just a process of gaining academic knowledge in a chosen field, but it is meant to be a transformation of a person into one who has grown both socially and intellectually.

This research/ study was conducted to evaluate and confirm the efficacy of academic support programmes in assisting South African higher education students to work at overcoming the effects of an Apartheid education that saw people of different colour receiving different forms of education which resulted in a nation where the majority of the population is ill-equipped for higher education. A major obstacle, as identified by Scott, Yeld and Hendry (2007), is the lack of articulation which is the lack of continuity in the different levels of education (that is Primary, Secondary and Higher Education). Students therefore struggle to cope with the demands of higher education as they have not been adequately prepared for this by their secondary education. Scott, Yeld and Hendry (2007) go on to say that appropriate provision needs to be made at the interface between educational levels at higher education. If this is not made available, the expected graduation output will be directly affected.

In addition to offering academic support to assist with meeting academic standards at higher education institutions, academic support programmes like the Extended Curriculum Programme (ECP) can address other problems, like lack of basic life skills, lack of confidence, lack of motivation and difficulty with adjusting to tertiary education.

Scott, Yeld and Hendry (2007) further point out that *"no sector–wide study of the outcomes of extended programmes has yet been done"*. Reports to the Department of Education show that the role-out of ECP's has not been fully accomplished yet, and therefore no conclusive evidence that ECP's improve throughput and graduate output have been presented. Some

individual institutions can however attest to the significant impact that extended programmes have made.

The research is specifically aimed at the Department of Mechanical Engineering at a University of Technology. The ECP has been running in the department since 2007. The Department of Mechanical Engineering was specifically chosen as there is a definite skills shortage in the Science, Engineering and Technology field (SET) as pointed out by the Council on Higher Education (2000) in its recommendation to the Minister of Education. Scott, Yeld and Hendry (2007) showed that in 2007, between five and eleven percent of students completed their National Diplomas in Engineering in regulation time.

This chapter gives a brief literature overview on quality management in higher education and models used to implement quality management. The background is then set for the research in this thesis by looking at education in South Africa pre and post the 1994 democratic elections, the current situation in education and the implementation of interventions to address any shortcomings. The problem statement, research questions and objectives follow and then the research and data collection methodologies are discussed in detail.

1.1 LITERATURE OVERVIEW

How best to measure quality in higher education is an ongoing discussion. A variety of approaches which are based on industrial models have been analysed and, in some cases applied.

The emphasis on quality in higher education is placed on accountability. The question is: who should be held accountable for what aspect of education? In education there are both internal and external stakeholders who will have different views and different expectations of quality. Quality in education is therefore difficult to define. Cheng & Tam (1997:23) say that *"educational quality is a rather vague and controversial concept"*. Similarly, Brookes and

Becket (2008: 41) claim that *"managing quality in higher education has proved to be a challenging task"*.

External stakeholders in education have concerned themselves mainly with quality assurance in the processes implemented to provide an adequate service. Examples of external stakeholders in higher education would be the Department of Higher Education and Training, professional bodies, for example, the Engineering Council of South Africa (ECSA), industry and external funders. According to Brookes and Becket (2008), external stakeholders are *"concerned with the measurement and evaluation of institutional quality assurance procedures"* and *"the effectiveness and reliability of the quality assurance systems and processes in managing quality and academic standards"*. Quality assurance mechanisms are usually used by management to focus on course or programme accreditation.

This then places a focus on compliance of higher education institutions from external stakeholders rather than the enhancement of what happens at student-lecturer level. The question is: who focuses on the quality of teaching and learning that happens in the classroom? A stringent look at teaching and learning at any higher education institution is imperative because the needs of industry have changed over the years to globalization. What this means is that students, in order to be successful and to contribute to the economic success of a country, need to acquire skills that can be applied 'across the globe'.

Internal stakeholders are the providers of the education and the receivers of the education. Internal stakeholders should be focused on quality enhancement rather than quality assurance. Quality enhancement is the practice of focusing on quality teaching and learning through innovative practices (McKay and Kember, 1999).

According to McKay and Kember (1999), Elton (1992) said that quality assurance can be seen as addressing accountability, audit and assessment (three A's) whereas quality enhancement addresses issues such as empowerment, enthusiasm, expertise and excellence (E's). Quality

enhancement inculcates a desire by educators towards higher quality and more innovative practices.

Deming (1993:98) states that *"a service or a product possesses quality if it helps somebody"*. Good quality education must therefore be a process where the students can be seen as the inputs, good teaching and learning practices can be seen as the transformation that produces good outputs, who in this case are the graduates who are able to make a valuable contribution to the country's economy and to society as a whole.

Figure 1 below demonstrates the process of transformation through education.

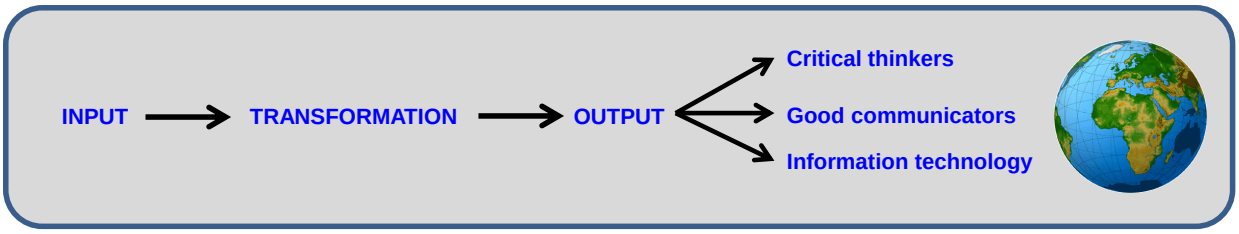

Figure 1: Transformation Process in Education

Harvey and Knight (1996) also describe quality in education as a transformative process. This means that issues related to education and the quality thereof cannot be viewed separately but needs to be looked at holistically. Harvey and Knight (1996) also go on to identify five approaches to quality for higher education and state that these approaches or dimensions are different but related. These approaches are:

- Quality as exceptional (excellence and high standards)
- Quality as performance or consistency (zero defects)
- Quality as fitness for purpose (meeting requirements and customer satisfaction)
- Quality as value for money (efficient, effective and affordable)
- Quality as transformation (enhancing and empowering the participant)

The question then comes down to "What Quality Management Model best suits Higher Education?" Several industry models of quality have been

implemented in higher education but they have however shown benefits and limitations.

Brookes and Becket (2008) list some of the quality management models used in higher education (Table 1 below). These models are quality management models used in industry and adapted to suit the higher education context. These models are described in detail in Chapter 3.

Table 1: "Quality Management Models" (adapted from Brookes and Becket, 2008: 18/102)

MODEL	DEFINITION
TQM	All members work toward quality, long term success through customer satisfaction and everyone benefits
EFQM	A framework that establishes 9 criteria to assess progress towards excellence.
Balanced Scoreboard	System of 4 measurement perspectives: financial, customer, internal process, learning and growth.
Malcolm Baldridge Award	7 categories of criteria: leadership; strategic planning; customer and market focus; measurement, analysis and knowledge management; human resource focus; process management; results.
ISO 9000 Series	Continuous improvement through preventative action
Business Process Reengineering	A redesign of business processes through change in strategy, processes, technology, organisation and culture.
SERVQUAL	Measurement of customer perceptions and expectations in: reliability, tangibles, responsiveness, assurance and empathy

Brookes and Becket (2008) then go on to say that the model most higher education institutions work from is TQM as it takes into consideration the

perspectives of all stakeholders. All the models do however require self-assessment against pre-defined criteria.

1.2 BACKGROUND TO THE PROBLEM

Differentiation and diversity at higher education institutions occur globally. This is as a result of different programmes offered, different teaching methodologies and research opportunities at individual institutions.

Differentiation is guided by the social, geographical and economic needs within a region and this sets the mandate for an institution of higher education in that region. Diversity is needed to ensure that a higher education institution offers a range of programmes so as not to limit the academic development of the people in the region.

In South Africa however, differentiation during the Apartheid era was based on race, with preference being given to the academic needs of white students at most of the institutions of higher learning.

After the first democratic elections in 1994, the challenge for higher education in South Africa was to redress this inequity and create opportunities for everyone to have access to a higher education institution of their choice based on programmes offered, teaching methodology and research opportunities (differentiation and diversity).

This however was not a simple process in South Africa, given the legacy of Apartheid which left huge disparities in the quality of education received by learners at secondary school level, which subsequently affected success rates at higher education institutions.

The higher education system was faced with many challenges in the process of trying to redress these inequalities, two of these challenges were:

- Increasing access to higher education to the historically and socially disadvantaged by creating opportunities or programmes at higher education institutions that assisted the under-prepared student,

- Improving throughput rates and graduation rates in all fields of study, especially the fields where graduation rates were low, for example, Science, Engineering and Technology (SET).

Higher Education in South Africa has come a long way during the transition from a minority government based on Apartheid policy, to a non-racial, democratic one. Policy development has been extensive and has attempted to redress the inequalities of the past.

The White Paper 3: *"A Programme for the Transformation of Higher Education in 1997"*, the Higher Education Act (Act 101of 1997), the report and recommendations by the Council on Higher Education: Towards a New Higher Education Landscape in 2000, and the National Plan for Higher Education in 2001 resulted in a framework for the restructuring of higher education in South Africa (South Africa, DoE, 1997).

The White Paper introduced the concept of quality assurance to higher education. The Council for Higher Education (CHE) is an independent body that was established in May 1998 as set out in the Education Act of 1997. The CHE is seen as the Quality Council for Higher Education. The Higher Education Quality Committee (HEQC) is a permanent sub-committee of the CHE assigned specifically with the responsibility of quality assurance (CHE: Higher Education Quality Committee, 2004).

The mandate of the HEQC includes *"quality promotion, institutional audit and programme accreditation"* as well as *"capacity development and training as a critical component of its programme activities"* (CHE: Higher Education Quality Committee, 2004). The responsibility for quality and its assurance however had to lie with individual institutions.

> *The role of the HEQC will be to provide external validation of the judgements of providers about their quality levels, based primarily on self-evaluation reports* (CHE: HEQC, 2001: 10).

Figure 2 below shows how everything mentioned above flowed from each other.

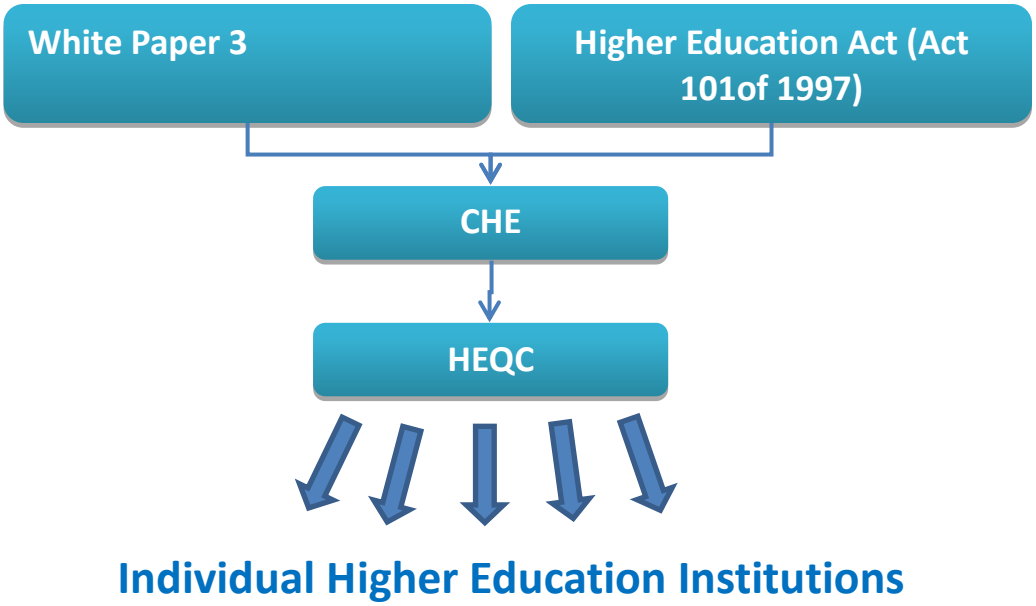

Figure 2: Policy Prescriptions for Quality Assurance in Higher Education

One of the main focus points of the policies mentioned above is to improve graduate output. One of the challenges highlighted by the Council on Higher Education (CHE) in their report to the Minister of Education was to increase the number of graduates and diplomats to meet the high-level skills shortage, especially in the Science, Engineering and Technology (SET) field (CHE, 2000). As a result the Minister of Education at the time, Kader Asmal, in the National Plan for Higher Education committed to bringing the participation rate for undergraduate programmes to 20-25% within five years of the implementation of the plan (South Africa, Ministry of Education, 2001).

Participation rates in higher education are usually expressed as a percentage representing the 20-24 age group. In 2001 South Africa's participation rate was estimated at 15%. This was low in comparison to countries of similar economic development which was estimated at 20% (Scott, Yeld and Hendry, 2007). According to the Advice and Monitoring

Directorate (2009) of the Council on Higher Education, by 2009 the participation rate had only increased to 16%.

Even though the participation rate is low, an important factor is the ability to cater for the academic needs of those who qualify for higher education so that these students can meet their full potential and graduate in minimum time. According to Scott, Yeld and Hendry (2007), the low participation rates have the following implications for higher education:

- Of the gross participation rate expressed above, only 12% of the black and coloured 20-24 age groups are participating in higher education. This inequitable proportion of participation in higher education of the majority of the population has direct political, social and economic implications.
- Participation in the Science, Engineering and Technology (SET) field is also an important factor in meeting the country's economic needs. Enrolment numbers indicate a low participation by particularly black students in this field of study. One of the main factors is the poor performance of students in mathematics and science at secondary school and thus excludes them from qualifying for study in this field.

When graduation rates were investigated, in 2004 when the 2000 cohort of students were supposed to graduate, only 30% of first time entering students had graduated. A total of 14% of this cohort was still in the system and 56% had left the institution without graduating (Scott, Yeld and Hendry, 2007).

Table 2 on page 11 is a layout of the above statistics by looking at institutional types.

Table 2: "2000 intake cohort: All first-time entering students" (Scott, Yeld and Hendry, 2007)

Institutions	Grad within 5 years	Still registered after 5 years	Left without graduating
Universities excl UNISA	50%	12%	38%
UNISA	14%	27%	59%
All universities	38%	17%	45%
Technikons excl TSA	32%	10%	58%
Technikons SA	2%	12%	85%
All Technikons	23%	11%	66%
All institutions	**30%**	**14%**	**56%**

NOTE: The above data is based on institutional types before the merger of institutions in 2005.

Statistics further show that within national diploma programmes the graduation rate for first-time entering students is 17% for graduating within five years and 14% of students are still registered after five years (Scott, Yeld and Hendry, 2007).

Several years have passed since the implementation of the plan to reform higher education in South Africa in 2001, and the desired results have not been achieved. This has forced a closer look at the varying learning needs of students and whether a higher education institution can accommodate this with the current programmes offered. One of several interventions is the introduction of Foundation Programmes / Academic Development Programmes at higher education institutions. The objective of the Foundation Programmes is to offer students who come from a disadvantaged secondary education background, the opportunity to gain the necessary academic and social support needed to cope with higher education and so improve the throughput rate and ultimately the graduation rate. Foundation Programmes allow the student to take the same course as the mainstream

but with additional academic support through the form of augmented classes (i.e. additional classes to the mainstream class) or extended classes where the offering time for the subject is extended to accommodate additional academic support. Essentially the additional academic support offered, means that the original mainstream course is extended by six to twelve months if offered in the Foundation Programme, hence the term Extended Curriculum Programme (ECP).

Foundation Programmes were introduced in South Africa in 2004 and are funded by the Department of Higher Education and Training. Initially funding was allocated in three year cycles but since 2013 the funding to specific programmes became permanent.

The Department of Mechanical Engineering at the Cape Peninsula University of Technology (CPUT) was one of the first departments at CPUT to adopt the Foundation Programme, and then the Extended Curriculum Programme, into its undergraduate course. This department's ECP is used as the case study in this research as it has a substantive database to draw from in order to apply all the investigative questions of this research.

1.3 PROBLEM STATEMENT

ECP's are an intervention put in place to address the problem of low throughput rate and low graduate output at higher education institutions. These problems were ascribed to students not having been fully prepared for tertiary education. The research problem statement against the background given, therefore reads as follows: Currently there are no quality management mechanisms in place to determine whether ECP's are effective.

1.4 RESEARCH QUESTION

The research question for this dissertation against the background given, reads as follows: What is the success rate of candidates of ECP at the Department of Mechanical Engineering at a University of Technology (UoT) in comparison to mainstream candidates in the same department?

1.4.1 Investigative sub-questions

In support of the primary research question for this dissertation, the following investigative sub-questions are considered.

- What percentage of students succeeds from S1 to S2, S2 to S3 and S3 to S4 in the minimum required time in the Department of Mechanical Engineering?
- What percentage of first time students graduate in minimum time at the Department of Mechanical Engineering?
- What percentage of students goes onto postgraduate studies in the Department of Mechanical Engineering?
- What employment prospects are available for students who graduate from ECP in the Department of Mechanical Engineering?
- What Quality Management Practices are in place in ECP in the Department of Mechanical Engineering to gauge the success of teaching and learning interventions?

1.5 RESEARCH OBJECTIVES

The research objectives therefore in support of the questions mentioned above, are as follows:

To determine how successful ECP is in addressing the problem of low throughput rate in engineering.

To determine how successful ECP is in addressing the problem of low graduation output in engineering.

To determine to what extent graduates of ECP go onto postgraduate studies.

To determine to what extent graduates of ECP are employed after graduating.

To determine what Quality Management Practices are in place for ECP in engineering at the UoT.

1.6 RESEARCH DESIGN AND METHODOLOGY

This research was conducted using both quantitative and qualitative methods of gathering data. Burke Johnson and Onwuegbzie (2004: 5) classify using both methods of data collection as *"mixed methods"* and call it the third research paradigm, after qualitative and quantitative research paradigms. They go on to define mixed methods as;

> *The class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language in a single study* (Burke Johnson and Onwuegbzie, 2004: 5).

Mixed methods are seen as the most effective way to address the research question and to investigate and prove how throughput rate and graduation rate can be used as a measure of quality in an academic programme.

The quantitative research component in this study is conducted by collecting and analyzing historical data on the 2007 intake of first-time students (both in ECP and mainstream studies) in the Department of Mechanical Engineering at the University of Technology. The data is used to determine the throughput rate from S1 to S2, S2 to S3 and S3 to S4 for this cohort, the graduation rate in the minimum time required to complete the course, and the number of students who go onto post-graduate studies.

Yin (1984) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context. In

the case of the 2007 cohort entering the course in Mechanical Engineering, actual final results for each student at each level of study will be carefully examined to determine which students successfully moved from S1 to S2 level of study. The results will then be analysed to determine how long students spent getting through the rest of their studies before graduating. This is termed "tagging" in quality management and allows for a more in-depth look at specific ECP students that will highlight the efficacy and shortcomings of the applied teaching interventions. All data will be presented as a percentage of the original cohort (intake). The student academic results will be raw data drawn from the institution's Mass Information System.

The survey administered to a sample of the 2007 ECP cohort who graduated with a National Diploma in Mechanical Engineering from the same University of Technology as above and who have now entered the work industry, has both a quantitative and qualitative component. The survey is aimed at determining the employment prospects for students who have graduated through the ECP course in Mechanical Engineering and the kinds of positions they hold in industry.

The selection of the sample is determined by the availability and currency of contact details for graduates from the 2007 cohort of ECP in the Department of Mechanical Engineering. Watkins (2010) refers to this as *"convenience sampling"* and goes on to explain that the sample in this case is chosen based on what is readily available.

Another qualitative component of the research is interviews conducted with staff members who teach on the ECP at the Department of Mechanical Engineering at the University of Technology referred to above. The aim of the interviews is to gauge the extent to which quality management practices are in place in the Department of Mechanical Engineering and to determine how this is related to success in the ECP.

Watkins (2010) explains that interviews, also known as *"in-depth surveys"*, obtain detailed evidence from a relatively small number of participants. The participants are allowed to speak freely, prompted by the interviewer who

guides the discussion with an interview list (guide questions). Cooper and Schindler (2006) speak of this as a semi-structured interview where the interview starts with a few specific questions and then allows for the individual participant to express his or her thoughts with some interviewer probes.

This method of data collection is relevant to the type of responses required from lecturers of ECP in the Department of Mechanical Engineering. The participants are a minimum of six lecturers who teach on one of the six subjects offered per semester. The passion and commitment to the programme need to come through when speaking to the lecturers.

Figure 3 below outlines the research methodology.

Figure 3: Research Methodology

To sum up, mixed methods research proves to be the best method of data collection to accurately gauge the success of the ECP in the Department of Mechanical Engineering. The motivation behind this is that firstly, one can use actual historical data to analyse throughput rate, graduate output and the number of students moving onto postgraduate studies. Secondly, after graduating students move on to different fields of work, their perception of their jobs are dependent on the job, organization and promotion prospects. Answers to survey questions will vary but one can draw some generalisations from it.

Thirdly, interviews with the lecturers need to take place in order to determine what happens at classroom level and how classroom practices have a direct impact on student growth, both socially and academically. This can feed into a discussion on whether the practices in the classroom have a direct impact on the throughput rate and graduation output.

1.7 LIMITATIONS AND DELIMITATIONS

This study is focused on trends in the Department of Mechanical Engineering. The focus areas that were selected cannot be generalised in all engineering disciplines and cannot be generalised in all disciplines.

Mechanical Engineering as a field of engineering draws heavily on Mathematics and technical acumen. The lack of this acumen in students entering university is a factor of concern in South Africa at the moment, hence the decision to narrow the research down to this specific discipline.

The study is approached from a quality perspective and focuses on the efficacy of the quality management practices in the ECP of the Department of Mechanical Engineering. From a quality perspective, the research looks at the number of graduates produced and to what extent the graduation outputs can be reversed by using a closer conformance to standards.

If the ECP was looked at from another perspective, the results would highlight other factors in the ECP. For example, if the research were approached from an educational perspective, the knowledge gained by the students and the value of the knowledge, would be of central focus. If approached from a Social Science perspective, the community and how it is affected through producing graduates, would be the focus.

The 2007 cohort of students in the Department of Mechanical Engineering was specifically chosen as the study sample for the following reasons:

- students from this cohort should have graduated within minimum time and beyond, by the time of the study,
- graduates who entered the job market after graduation or BTech studies will have been employed by the time of the study.

It must be noted that the 2007 cohort of students on which the study is based, completed their high school (matric) with a Senior Certificate. The Senior Certificate was replaced by the National Senior Certificate in 2008. With the National Senior Certificate all subjects are offered on the same level (grade) and not on higher or standard grade as with the Senior Certificate. With the transition from Senior Certificate to National Senior Certificate, the entrance requirements for courses in Mechanical Engineering remained the same, with a direct conversion of the entrance requirements. For example, a 50% in the Senior Certificate would be a 4 in the National Senior Certificate. The entrance requirements for study in Mechanical Engineering at Cape Peninsula University of Technology have made provision for both certificates and a holder of either a Senior Certificate or National Senior Certificate is accommodated without compromise to standard.

Table 3 below outlines the research questions, objectives and data collection methods.

Table 3: Research Plan

Research Question	**What is the success rate of candidates of ECP at the Department of Mechanical Engineering at a University of Technology (UoT) in comparison to mainstream candidates in the same department?**	
Sub-question	**Objective**	**Data Collection and Processing**
What percentage of students succeeds from S1 to S2 in the minimum required time in the Department of Mechanical Engineering?	To determine how successful ECP is in addressing the problem of low throughput rate in engineering	Analysis of historical data of 2007 ECP and mainstream intake in the Department of Mechanical Engineering
What percentage of first time students graduate in minimum time at the department of Mechanical Engineering?	To determine how successful ECP is in addressing the problem of low graduation output in engineering	Analysis of historical data of 2007 ECP and mainstream intake in the Department of Mechanical Engineering
What percentage of ECP students go onto postgraduate studies?	To determine to what extent graduates of ECP go onto postgraduate studies	Analysis of historical data of 2007 ECP and mainstream intake and historical data from postgraduate division in the Department of Mechanical Engineering
What employment prospects are available for students who graduate from ECP in the Department of Mechanical Engineering?	To determine to what extent graduates of ECP are employed after graduating	Survey by means of a questionnaire to sample of graduates of ECP who are currently employed

What Quality Management Practices are in place in ECP in the Department of Mechanical Engineering to gauge the success of teaching and learning interventions?	To determine what Quality management Practices are in place for ECP in engineering at a UoT	Interviews with ECP lecturers of the Department of Mechanical Engineering

CHAPTER TWO: RESEARCH ENVIRONMENT

The need for some form of academic support to higher education students became apparent after several measures put in place by the Department of Higher Education and Training (DoHET) still failed to achieve the goal of increasing academic success by seeing students graduating in minimum time.

Academic development programmes in the form of extended programmes were introduced in 2004. Mainstream courses were extended by between six months and one year to allow for foundation provision. This was offered to students who met the minimum entrance requirements for a course but who displayed, either in their grade 12 results or through tests administered by the higher education institution, that they were at risk of failing their first year and would either end up taking much longer to graduate or drop out.

The extended programmes are funded by the DoHET and until 2012 institutions received funding in three-year cycles. At the end of each funding cycle institutions had to re-apply for funding and meet certain criteria as set out by the DoHET. After 2012 the DoHET announced that any institution who qualified for the next cycle of funding would receive foundation provision funding permanently. In order for the DoHET to determine if the foundation provision was effective and if the funding was being used efficiently, the DoHET would conduct visitations to institutions and report to the Minister of Education and the Auditor-General. On these visitations institutions needed to provide evidence to the DoHET that showed that the funding was being used effectively.

This chapter sets the background on which the research was conducted by looking at education before the democratic election of 1994, strategies put in place after the 1994 elections to redress the inequalities in education and then looks at academic development programmes as a means to assist with improving throughput and graduate output.

2.1 HISTORY OF EDUCATION IN SOUTH AFRICA

Prior to the democratically elected government of South Africa in 1994, the overall policy of education in South Africa was that of segregation and huge disparity in the provision of education to the various race groups. This was during the Apartheid years of 1948 to 1994. More resources and facilities were available to the white population group and less to the black population. The aim was to ensure that the white population was equipped to do skilled work and blacks were coached and prepared for manual labour and menial work (OECD, 2010).

The Bantu Education Act (no. 47) of 1953, later renamed the Black Education Act, 1953, legalised separate education for different race groups. The Minister of Native Affairs at the time, Hendrik Verwoerd claimed that *"the aim was to solve South Africa's ethnic problems by creating complementary economic and political units for different ethnic groups"* (Wikipedia, 2013). All schools then fell under the direct control of the government. This meant that the government was responsible for all matters relating to the running of the schools, including teacher training, provision of facilities and educational material.

This segregation applied to universities as well. The Extension of the University Education Act (45 of 1959) provided for the provision of racially exclusive universities for Africans, Indians and Coloureds (Blumfield, 2008). It was considered a criminal offense for a non-white to register at a formally white university without the permission of the Minister of Internal Affairs. In 1959 the University of the Western Cape was established at Bellville, Cape Town. A school at Ngoye was created in Zululand for Zulus, at Durban (Natal Province) for Indians, at Turfloop (Transvaal) for the Sotho-Tswanans, while Fort Hare (in the former homelands) was for Xhosas. The University of Pretoria (formerly known as TUC), the University of Cape Town, the University of Stellenbosch, the University of South Africa (established 1916) and the University of the Witwatersrand (established 1921) became exclusively white universities (Blumfield, 2008).

This inequality in the provision of education at Primary, Secondary and Tertiary school level was to be felt for many years, even after the election of a democratic government in 1994.

In 1994 the Policy Framework for Education and Training expressed the need for a unified integrated system of education and training which would address the need to provide quality knowledge and skills for all citizens of South Africa in the workplace. In 1995 the Department of Education released the First White Paper on Education and Training (Blumfield, 2008). The aim of this White Paper was to address the inequality of education in South Africa and lay forth the new plan for education in this country. As stated in his opening message in the White Paper, then Minister of Education, Professor SME Bengu says,

> *This policy document describes the process of transformation in education and training which will bring into being a system serving all our people, our new democracy, and our Reconstruction and Development Programme* (South Africa. Department of Education, 1995).

Through the First Education White Paper, the Ministry of Education undertook the process to develop new policies of education and training to address the legacy of inequalities and provide equal education for all South Africans. This meant provision of education to all school-going children, higher education as well as providing skills for the upliftment of the working and unemployed.

The First White Paper stated that at the time (1995) one in five Black students chose Physical Science and Mathematics in Standard 8 (Grade 10). This was as a result of poor teacher preparation, inadequate facilities and materials, and inadequate preparation of students for examinations and entry to higher education. The First White Paper committed to *"Coordinated and certificated "second chance to learn" and recovery programmes for students in Science and*

Mathematics would offer alternative entry to higher education and employment" (South Africa. Department of Education, 1995).

The First White Paper and subsequent Second White Paper (1996) led to the development of the National Education Policy Act of 1996, and this defined the roles and duties of national and provincial education authorities.

2.2 RESTRUCTURING OF HIGHER EDUCATION

Three important steps in the restructuring of the higher education system in South Africa were the White Paper 3 from the Department of Education in 1997, recommendations from CHE in 2000 and the National Plan from the Minister of Education in 2001. All three steps clearly speak of a need to reform the higher education system in South Africa to meet the social and economic needs of the 21st century.

2.2.1 Education White Paper 3: A Programme for the Transformation of Higher Education (1997)

The Education White Paper 3: A Programme for the Transformation of Higher Education (1997) was released and its main purpose was to look at transforming any of the past inequalities in terms of skills and social order in higher education and to meet the *"moral, political, social and economic demands"* (South Africa. Department of Education, 1997) and opportunities of a democratic South Africa. The focus was on higher education, as higher education was seen as a vehicle for achieving equity through the development of skills, and to provide the labour market with competencies and expertise necessary for the growth of the economy.

The Education White Paper 3 outlined several needs and challenges that had to be addressed in higher education in order to meet the demands of an emerging economy in the new South Africa. They were:

- the inequity in access for students and staff because of race, gender, class and location
- the disparity between the output of modern education and the growing needs of the South African economy
- higher education's role in producing citizens with critical thinking minds, a willingness to debate and tolerance to accept differences (South Africa. Department of Education, 1997).

Based on the needs and challenges, the Education White Paper 3 lists several principles that should guide transformation in higher education. These are:

- Equity and redress – opportunities to *"enter higher education and succeed in them"*
- Democratisation – *"governance of the system of higher education should be democratic, representative and participatory"*. All who are affected by decisions made should have a say in making them
- Development – *"conditions must be created to facilitate transformation of the higher education system"*
- Quality – *"maintaining and applying academic and educational standards"* and a constant desire to achieve excellence
- Effectiveness and efficiency – all desired outcomes and objectives must be met. This must be done with the use of a system that works well and is sustainable
- Academic freedom – the right to acquire knowledge without the interference of censure or obstacles
- Institutional autonomy – self-governance by an academic institution with respect to administration, academic regulations, research, teaching and learning and internal management of resources

- Public accountability – academic institutions must be accountable to the broader community (South Africa. Department of Education, 1997).

2.2.2 Council on Higher Education: Towards a New Higher Education Landscape (2000)

At the request of the then Minster of Education, Kader Asmal, in January 2000, the Council on Higher Education (CHE) was tasked to look into the current higher education system and come up with a set of proposals for the restructuring of higher education in South Africa.

The CHE is an independent body established in May 1998 as an assignation by the Higher Education Act of 1997 with the responsibility of advising the Minister of Higher Education and Training on all matters regarding higher education, in order to meet the goals of equity and equality in the education system. The CHE has the responsibility of quality assurance in higher education in South Africa (CHE, 2014).

As stated in CHE (2014) on the history of the CHE, the functions of the CHE are as follows:

- *To provide advice to the Minister of Higher Education and Training on request or on its own initiative, on all aspects of higher education policy*
- *To develop and implement a system of quality assurance for higher education, including programme accreditation, institutional audits, quality promotion and capacity development, standards development and the implementation of the Higher Education Qualifications Sub-Framework (HEQSF)*
- *To monitor and report on the state of the higher education system, including assessing whether, how, to what extent and with what*

consequences the vision, policy goals and objectives for higher education are being realised

- *To contribute to the development of higher education through intellectual engagement with key national and systemic issues, including international trends, producing publications, holding conferences and conducting research to inform and contribute to addressing the short and long-term challenges facing higher education.*

In a report to the minister of Higher Education and Training, the CHE stated clearly that all the challenges of the higher education system cannot be solved by individual higher education institutions but will have to be approached in a systematic way. A systematic way means that the higher education system must be looked at in its entirety and must be reconfigured as a whole in order to create a new higher education landscape. Their motivation for this is as stated below:

> *Higher education institutions have interpreted the White Paper in widely divergent and sometimes even contradictory ways. As a result, institutional responses have in some cases placed institutions on trajectories that are at considerable variance with what should be their mandates in a reconfigured differentiated and diverse higher education system* (CHE, 2000: 48).

The CHE identified certain challenges facing higher education:

- To increase the number of graduates and diplomats to meet the high-level skills shortage, especially in the Science, Engineering and Technology (SET) field
- To reduce repeat, drop-out and failure rates of students. This is seen as a challenge to refine quality measures at an institutional and system level and an improved information communication technology (ICT) system to collect and process data is a challenge

- To increase the race, gender and social distribution of students in all fields of study (CHE, 2000).

Recommendations from the CHE were as follows:

- Reconfiguration of the higher education system should reflect a differentiated and diverse system that caters for the varied social needs of the country
- Re-examination of the qualifications structure to gear higher education to accommodate the *"changing knowledge and working environment"* (CHE, 2000: 59). Emphasis was placed on considering changing the three-year bachelor degree to a four-year bachelor degree with the first two years of study catering for generic and foundation skills in the broader discipline and specialization the following two years. Students could also opt to exit after the first two years
- The merging of certain higher education institutions to reduce the absolute number of the institutions, but not the number of campuses that an institution can operate from. The motivation behind this was the *"elimination of unnecessary duplication and rationalization of programmes"* (CHE, 2000: 52), meaning that more focus and attention could be placed on how effectively the programme is offered. Other motivations for this step included the elimination of fragmentation as a result of Apartheid, improving access to learners from all races, gender and social backgrounds (with an even geographical distribution of institutions), increasing the overall efficiency of the higher education system and better collaboration between institutions of higher education. At the time of compilation of the report from the CHE to the Minister of Education, there were 36 higher education institutions in South Africa (CHE, 2000).

In order to meet the responsibility of quality assurance in higher education, the CHE established a permanent committee, The Higher Education Quality Committee (HEQC) in 2001. This was at the same time as the publication of the

National Plan for Higher Education which will be discussed in detail in this chapter.

The HEQC planned to roll out its quality assurance plan in two cycles. The first cycle included:

> *the development and pilot testing of quality assurance instruments and criteria, the development of quality relevant capacity, the incorporation of existing quality assurance arrangements where appropriate and the forging of partnership arrangements with other role players* (CHE, 2001:10).

The second cycle which was based on what was gathered and derived from the first cycle, would be:

> *A full operational phase where the HEQC will validate the quality offerings of providers, using rigorous accountability criteria and invoking sanctions where required* (CHE: 2001:10).

The framework and roll out of the HEQC's quality plan is discussed further down in this chapter.

2.2.3 National Plan for Higher Education: Minster of Education (2001)

The National Plan for Higher Education was released in 2001 by the then Minister of Education, Professor Kader Asmal. The National Plan for Higher Education is a strategic plan that attempts to realise the policy goals of the Education White Paper 3 and the recommendations made by the CHE. In his foreword Professor Kader Asmal says,

> *The National Plan recognises the current strengths and weaknesses of the higher education system and is based on a developmental approach that is intended to guide institutions towards meeting the goals for the system as a whole* (South Africa, Ministry of Education, 2001).

The focus of the National Plan for Higher Education is therefore to ensure that firstly, transformation as set out in the White Paper 3, happens with the needs of society as its priority, secondly, that higher education provision is coherent on a national level, and thirdly, that resources are used responsibly and with accountability. Finally, the National Plan is in place to ensure that the quality of higher education programmes is improved to meet global demands (South Africa, Ministry of Education, 2001)

The goals of the National Plan are as follows:

- GOAL ONE: Increase access to higher education to all, irrespective of race, gender, age, creed, class or disability
- GOAL TWO: Promote equity in access and redress past inequalities
- GOAL THREE: Ensure diversity in programmes offered to address regional and national needs
- GOAL FOUR: Build research capacity
- GOAL FIVE: Collaboration between institutions (South Africa, Ministry of Education, 2001)

The Ministry of Education established that from 2003 funding for higher education would be based on approval of three-year "rolling" plans submitted by institutions rather than student enrolments as was the norm.

For the purposes of this research, goal one and goal five (as listed above) will be discussed in detail.

As stated above, the objective of goal one is to increase participation in higher education and to increase graduation in different fields of study. This is to meet the demands for high-level skills and competencies to be able to compete in the 21st century. This, however, did not pan out as predicted.

Firstly, the opening up for enrolment at all higher education institutions for all races led to a decline in enrolment numbers at historically black higher education institutions. Enrolment figures at historically black universities dropped from 111 000 in 1995 to 83 000 in 2000. Enrolment of black students at former white institutions increased from 30 000 in 1993 to 148 000 in 1999. However, enrolment numbers at the historically black technikons rose from 32 000 in 1995 to 45 500 in 2000. Overall, the participation rate in higher education decreased from 17% in 1996 to 15% in 2000 (South Africa, Ministry of Education, 2001).

This in itself could be seen from more than one perspective. Firstly, prospective students chose to further their education at the formerly white universities as it was perceived to provide a "better education" or, prospective students did not meet the entrance requirements for courses at universities and therefore were only left with the option to obtain a higher education at a technikon. *"Between 1994 and 2000, the number of school-leavers obtaining a matriculation exemption (entry to university) decreased from 89 000 to 68 626 (23% decrease)"* (South Africa, Ministry of Education, 2001).

Secondly, the retention rate of registered students dropped. The number of students who initially enrolled for a course did not match the number of students who progressed to the next year of study. It was suggested that the possible cause for this could be due to financial and/or academic exclusions or students simply not remaining in the higher education system to graduate or moving on to postgraduate studies due to not being able to cope academically.

The challenge for the National Plan was therefore to redress the inequalities of resources (both physical and human) at universities. Former black universities were now not the only higher education institutions that had to deal with under-

prepared students (a result of the Apartheid education system) but it was spread across the spectrum. Part of the redress was a social redress which had to look at the provision of financial aid to poor students and the provision of resources to assist under-prepared students.

Several outcomes for goal one were reached. Below are the outcomes that are most pertinent to this thesis:

OUTCOME 1: Based on the economic development goals of the government and an indication of a shortage of high-level skills to meet these goals, the ministry has indicated a need to increase the participation rate in higher education. A recommendation by the Council on Higher Education (CHE) stated that participation rates for the age group 20-24 should increase by 20% in public higher education over the next 10-15 years (CHE, 2000).

OUTCOME 2: Coupled with increased participation rates, the Ministry also expects to see an increase in graduate outputs. This is to be achieved by producing benchmarks that institutions must follow to produce graduates.

These benchmarks are outlined in Table 4 below.

Table 4: Benchmarks for Graduation Rates (South Africa, Ministry of Education, 2001)

Qualification-type	***Graduation rate***	
	Contact	***Distance***
Up to 3-years: Undergraduate	*25%*	*15%*
4 years or more: Undergraduate	*20%*	*10%*
Postgraduate: up to honours	*60%*	*30%*
Masters	*33%*	*25%*
Doctoral	*20%*	*20%*

The benchmarks were calculated on a combination of retention rates, drop-out rates and graduation rates in the country over a five year period. It was however borne in mind that the South African education condition is one of many under-prepared students entering higher education (South Africa, Ministry of Education, 2001).

In addition to benchmarking the number of graduates per institution, the Ministry had also established "national student planning targets" which specify the expected graduate outputs per field of study. At the beginning of each three-year planning cycle a table of expected graduate outputs per field of study will also be developed. Several fields were identified: Natural and Mathematical Sciences, Engineering and other Applied Sciences, Health Sciences, Business/Commerce, Education, Social Sciences and Applied Humanities and finally Humanities (South Africa, Ministry of Education, 2001).

If the benchmarks are to be achieved and the enrolment numbers do not increase substantially, but the graduation outputs increase, then the benchmarks predict an improvement of 33% in graduate outputs (South Africa. Ministry of Education, 2001).

With the number of under-prepared students entering higher education in mind, funding was made available for development programmes in the form of extended programmes to assist in addressing the educational disadvantage that many students enter higher education with.

It is also clear that the objective of this outcome is not just in increasing graduate outputs and putting programmes in place to assist under-prepared students, but in also producing graduates who are an asset to society and who will meet the social and economic demands of the 21st century.

Increased graduate outputs must not come at the expense of quality graduates. The Higher Education Quality Committee (HEQC) put a framework in place to guide institutions in developing a quality assurance system.

The objective for goal five (as stated on page 29) was to promote collaboration between higher education institutions. This would alleviate duplication of courses offered, unnecessary expenses to provide for courses and ultimately make higher education more accessible to all.

As recommended by the CHE, a reduction in the number of higher education institutions would allow for more effective use of resources and ensure sustainability. The CHE recommendation states that *"current landscape and institutional configuration of higher education has its roots in Apartheid past, is inadequate to meet socio-economic needs and is no longer sustainable"* (CHE, 2000:51).

A merger of several higher education institutions was therefore a recommendation made to the Minister of Education in this regard.

The following were some of the strategies that came from the National Plan for Higher Education with regard to goal one (increase access to higher education to all irrespective of race, gender, age, creed, class or disability) and goal five (collaboration between institutions) above:

- The target is to increase the number of graduates by a minimum of 1000 per annum over the next five years. Universities must prove this in their three-year rolling plans
- Universities must in their three-year rolling plans indicate
    - strategies put in place to reduce drop-out rates
    - the minimum criteria for automatic selection
    - the process to be followed for candidates who do meet minimum criteria for automatic selection
    - minimum criteria for re-admission for students

    - an exclusion policy i.e. number of times a student will be allowed to repeat subjects

- Funding will be linked to the number of graduates produced
- Funding will be made available for academic development programmes
- The establishment of a National Working Group to facilitate the mergers of certain higher education institutions (South Africa. Ministry of Education, 2001).

In 2002 Minister of Education, Professor Kader Asmal, announced that certain mergers of higher education institutions will take place between 1 January 2004 and 1 January 2005. Below are the mergers that were to take place:

- Potchefstroom University for Christian Higher Education and the University of North-West merged to form North-West University
- Durban-Westville and Natal University merged to form the University of KwaZulu-Natal
- The University of the North and the Medical University of Southern Africa (Medunsa) merged into the University of Pretoria
- Rand Afrikaans University, Technikon Witwatesrand and Vista University's Johannesburg campus merged to form the University of Johannesburg
- Port Elizabeth Technikon, the University of Port Elizabeth and Vista University's Port Elizabeth campus merged to form the Nelson Mandela Metropolitan University
- Technikon SA and Vista University's distance education division merged to form the University of South Africa
- Border Technikon, Eastern Cape Technikon and the University of the Transkei merged to form Walter Sisulu University
- Cape Technikon, Peninsula Technikon and the Wellington Teachers' Training College merged to form the Cape Peninsula University of Technology

- Technikon Free State and Vista University's Welkom campus merged to form the Central University of Technology
- ML Sultan Technikon and Natal Technikon merged to form the Durban University of Technology
- Northern Gauteng Technikon, North West Technikon and Pretoria Technikon merged to form Tshwane University of Technology (SouthAfrica.info, 2012).

A full list of all the current higher education institutions in South Africa is provided in the next section of this chapter.

To sum up the history of Education in South Africa, it is the work of the White Paper 3 from the Department of Education, recommendations from CHE and the National Plan from the Minister of Education that led to the restructuring of higher education in South Africa.

2.3 CURRENT EDUCATION STRUCTURE IN SOUTH AFRICA

In order to best describe the higher education structure in South Africa, basic education, which is the feeder to higher education, needs to be looked at in detail.

2.3.1 Basic Education

Compulsory education in South Africa begins at 6 years of age (Grade 1) and ends at 15 years of age (Grade 9). The South African Schools Act of 1996 states that education is compulsory for all South Africans from the age of six to fifteen or the completion of Grade 9 (South Africa, 1996).

The Basic Education system consists of primary school (6 – 13 years, Grade 1 – Grade 7), junior secondary school (13 – 15 years, Grade 8 – Grade 9) and senior secondary school (15-18 years, Grade 10 – Grade 12). Education is compulsory till junior secondary school and then learners choose to continue with senior secondary school which lasts three years or technical secondary school which lasts for two years.

A Further Education and Training (FET) system is in place for learners who wish to continue their senior secondary schooling in a more specialized technical field. There are 50 technical colleges on 256 campuses across the country (International Education Association of South Africa (Higher Education in Context), 2009). FET colleges fall under the Department of Education and their role is to closely align with the universities, especially the universities of technology.

Access to tertiary education requires a senior certificate which is obtained by completing the senior secondary or technical secondary school phase (FET) (South Africa, 2008).

2.3.2 Higher Education

South Africa has three types of universities that offer courses leading to internationally recognised qualifications. These universities are: traditional universities, comprehensive universities and universities of technology.

Currently there are 11 traditional universities, 6 comprehensive universities and 6 universities of technology.

Table 5 on page 38 outlines the higher education institutions and their enrolments as at 2009.

Table 5: Institutions of higher education in South Africa (Higher Education in Context, 2009)

	TYPE	NAME	STUDENT POPULATION
1	Universities	University of Cape Town	22,298
2		Rhodes University	6,319
3		University of Pretoria	53,106
4		University of the Free State	26,189
5		University of Fort Hare	9,339
6		North-West University	47,008
7		University of KwaZulu-Natal	37,170
8		University of Limpopo	17,132
9		University of the Western Cape	15,070
10		University of Stellenbosch	23,983
11		University of the Witwatersrand	26,000
12	Comprehensive University	Nelson Mandela Metropolitan University	22,657
13		UNISA	262,680
14		University of Johannesburg	44,430
15		University of Venda	10,909
16		University of Zululand	10,316
17		Walter Sisulu University	24,970
18	Universities of Technology	Cape Peninsula University of Technology	29,361
19		Central University of Technology, Free State	10,895
20		Durban University of Technology	22,164
21		Tshwane University of Technology	51,628
22		Mangosuthu University of Technology	9,128
23		Vaal University of Technology	16,946

These were the final revised higher education institutions as set out by the Minister of Education through mergers which took place between 1 January 2004 and 1 January 2005 (South Africa, Ministry of Education, 2001).

In 2008 in the "Minimum Admission Requirements", the then Minister of Education in South Africa, Grace Naledi Mandisa Pandor, gave full authority to Higher Education South Africa (HESA) to set the minimum admission requirements for specific Higher Certificate, Diploma and Bachelor's Degree Programmes (South Africa, DoE, 2008).

2.4 QUALITY ASSURANCE IN HIGHER EDUCATION IN SOUTH AFRICA

As touched on earlier in the chapter, the CHE, which was tasked with looking into the higher education system in South Africa and advising the Minister of Higher Education and Training on meeting the goals of equity and equality in education in South Africa, established the HEQC who was assigned with the responsibility of quality assurance in higher education. The HEQC was formally launched in May 2001.

The HEQC is required to work within the parameters of the South African Qualifications Authority (SAQA). SAQA is a statutory body that oversees the development and implementation of the National Qualifications Framework (NQF). The NQF is a framework of principles and guidelines for the development of a qualifications system, a system that takes all education and training nationally and aligns it into a unified qualifications system.

As stated in the vision and mission of the HEQC,

> *The HEQC is committed to a quality driven higher education system that contributes to socio-economic development, social justice and innovative scholarship in South Africa. To achieve this end, the HEQC*

will support the development, maintenance and enhancement of the quality of public and private higher education provision in order to enable a range of stakeholders to benefit from effective higher education and training. The central objective of the HEQC is to ensure that providers effectively and efficiently deliver education, training, research and community service which are of high quality and which produce socially useful and enriching knowledge as well as a relevant range of graduate skills and competencies necessary for social and economic progress (CHE, 2001:6).

The functions of the HEQC are to promote quality assurance in higher education institutions, audit the quality mechanisms of the institution and accredit programmes at the institution. The audit of the institutions will focus, and to date have focused, on the *"policies, systems, procedures, strategies and resources for quality management of the core functions of teaching and learning, research and community engagement, including all relevant academic support services"* (CHE, 2004: 4). The HEQC quality system focused and utilized four elements of quality assurance: programme accreditation, national reviews, institutional audit and quality promotion (CHE, 2011).

In view of the above and taking policy and the educational context into consideration, the HEQC's approach to quality according to CHE (2011), is based on:

- fitness for purpose- this will relate to the ability of institutions to fulfill their vision and mission within the context of their core functions, available resources, location and international relationships

- value for money – this relates to the efficiency and effectiveness with which institutions deliver their functions (teaching and learning, research and community engagement) and within reach of all members of society

- transformation – this relates to how education has added qualitative value to a student, enhanced a student's knowledge and skills and has empowered the student. It also relates to, within the South African context, how an institution represents the diversity of South African society

- fitness of purpose – this relates to how institutions have managed to deliver their service within societal and individual aspirations as well as fitting in within national imperatives and goals.

Figure 4 below illustrates the scope of the HEQC's audit system.

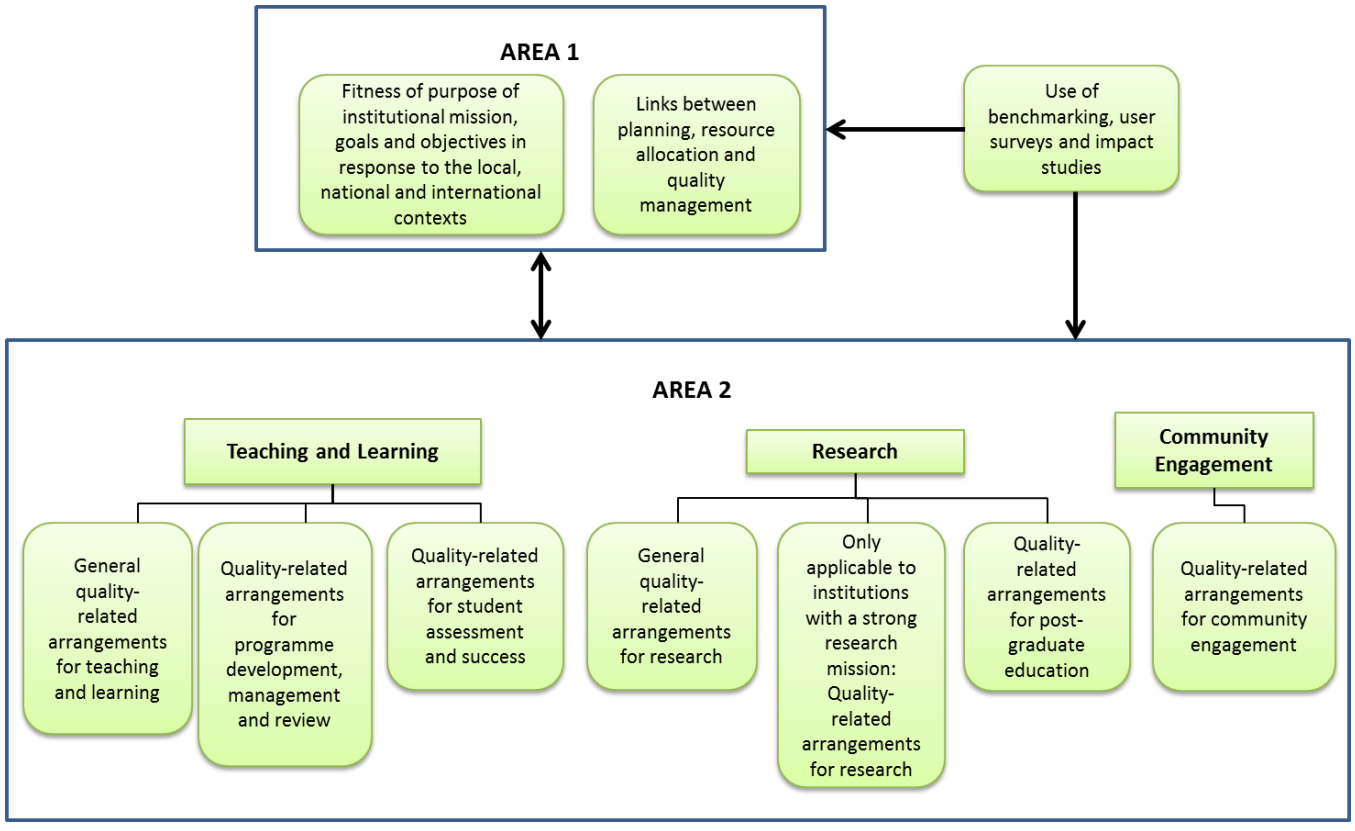

Figure 4: Scope of the HEQC's audit system (CHE, 2004 : 12)

2.4.1 Cycle One

The HEQC implemented its quality assurance process in two cycles. The first cycle ran from 2004 to 2011, and two broad areas were evaluated as stipulated in CHE (2004:6):

> *Area 1: Mission of the institution; links between planning, resource allocation and quality management;*
>
> *Area 2: Teaching and learning, research and community engagement.*

The findings of the first cycle were reviewed by the HEQC and used in the preparations for the second cycle. The basic methodology for the first cycle involved an institutional self-evaluation, which involved the compilation of an institutional audit portfolio in which the effectiveness and efficiency of the institution's activities were evaluated against a set of criteria, as detailed by the HEQC.

This was followed by a visit by a delegation from the HEQC (peers and experts appointed by the HEQC) which had to validate the institution's portfolio. A report of the outcome of this visit was then generated by the HEQC (CHE, 2004).

The first cycle of quality assurance spanned from 2004 to 2011 and is illustrated in Figure 5 on page 43. Some of the findings of this cycle will be discussed in chapter 3.

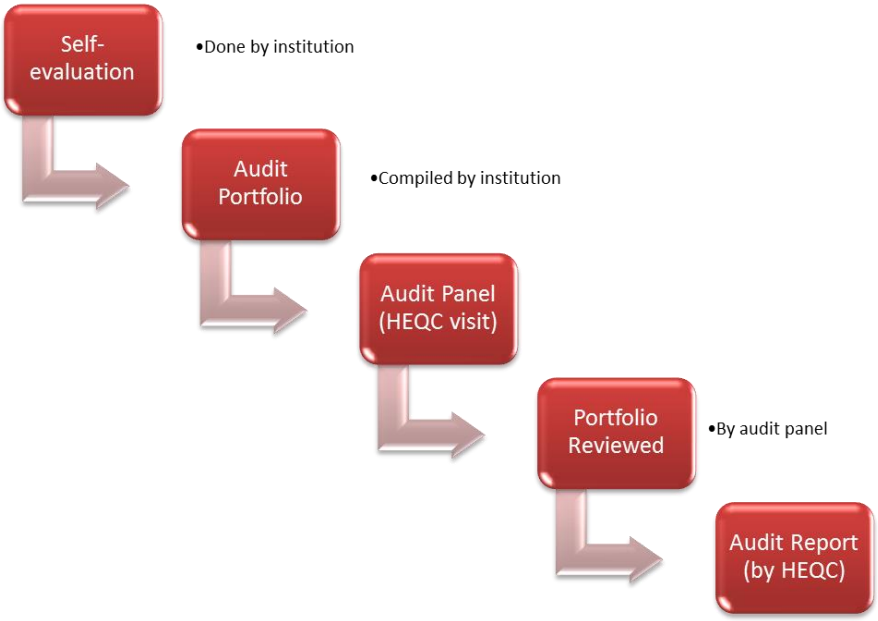

Figure 5: Cycle 1 – Institutional Audits

2.4.2 Cycle Two

The second cycle of quality assurance focuses on teaching and learning, with the emphasis on the delivery of quality teaching at undergraduate level. The second cycle started in 2012 and will run till 2017. In 2009, as a recommendation from the review panel in an external evaluation of the HEQC and its activities, it was stated that the second cycle should focus on quality promotion of one of the three core functions of higher education, namely, teaching and learning. The three core functions of higher education are: Teaching and Learning, Research and Community Engagement. As stated in CHE (2014:2):

> *South Africa cannot advance socially or economically if the current low participation and high attrition rates in higher education persist. Concerted, coordinated and well-conceived efforts are needed to increase the number of quality graduates.*

The HEQC therefore decided that the second cycle will not be another cycle of institutional audits, but rather a focus on enhancing teaching and learning, which they named the Quality Enhancement Project (QEP). The focus of the QEP will be on undergraduate teaching and learning.

As stated in CHE (2011: 14) the objectives of the second cycle are:

- *to contribute to an overall improvement in the retention and progression of students in the higher education system*
- *to identify the internal (pertaining to the institution and its functional units) and external (pertaining to the higher education policy environment) constraints to good teaching and learning in the higher education system*
- *to support epistemological access and student success*
- *to support pedagogic and curriculum innovation as well as the professionalization and recognition of academic staff involved in teaching and learning*
- *to ensure that there are minimum levels of quality in programme design and capacity to offer a programme across the higher education system*
- *to develop conscious and systematic approaches to the conceptualisation and monitoring of student outcomes and characteristics, taking into account institutions' diverse missions and focus*
- *to facilitate and promote articulation across and between the different levels of the NQF*
- *to contribute to the knowledge base on higher education and the advice and monitoring responsibilities of the CHE.*

In order to address the problem of poor student success, information and resources need to be gathered and developed. Gathering of information and resources will involve individual institutions as well as national input. Information will flow from institutions and will be nationally coordinated and vice versa as shown in figure 5 below.

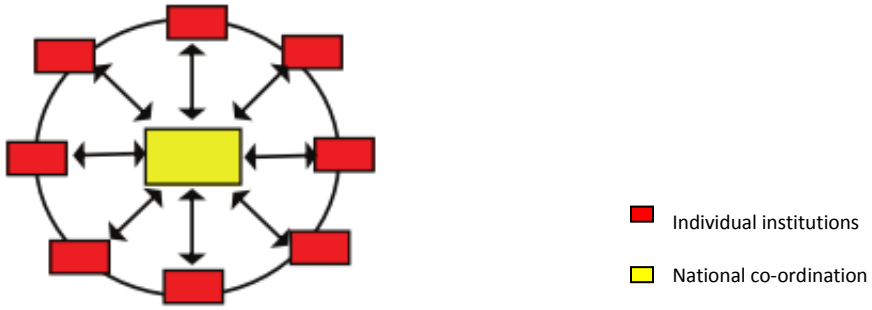

Figure 6: "Information flow between institutions, shown in red, and the centre (national level) shown in yellow" (CHE, 2014: 1)

The QEP will happen over two phases of approximately two years each. In each phase focus areas related to student success will be identified and institutions will have to submit documents that provide information on *"institutional priorities, good practices and problems related to these focus areas"* (CHE, 2014:16). Information from different institutions will be put together into one document which will form the basis for discussion to generate further knowledge on these focus areas.

At the end of the phase each institution will have to submit a report on how they plan to address or have addressed interventions for improvement in the focus areas. Several months later institutions will receive feedback on their information submitted in which areas for improvement will be identified. The second phase will then start with new focus areas identified (CHE, 2014).

The focus areas identified are:

- Teaching
- Curriculum
- Assessment
- Learning Resources
- Student Enrolment Management
- Academic Student Support
- Non-academic Support and Development

Figure 7 on page 47 shows the process involved in each phase.

> *Yellow represents nationally co-ordinated and red represents institutional activities. Green represents spin-off activities that could take place at many points in the project and involve one or more role players. The size of the blocks indicates the size of the role players* (CHE, 2014: 16).

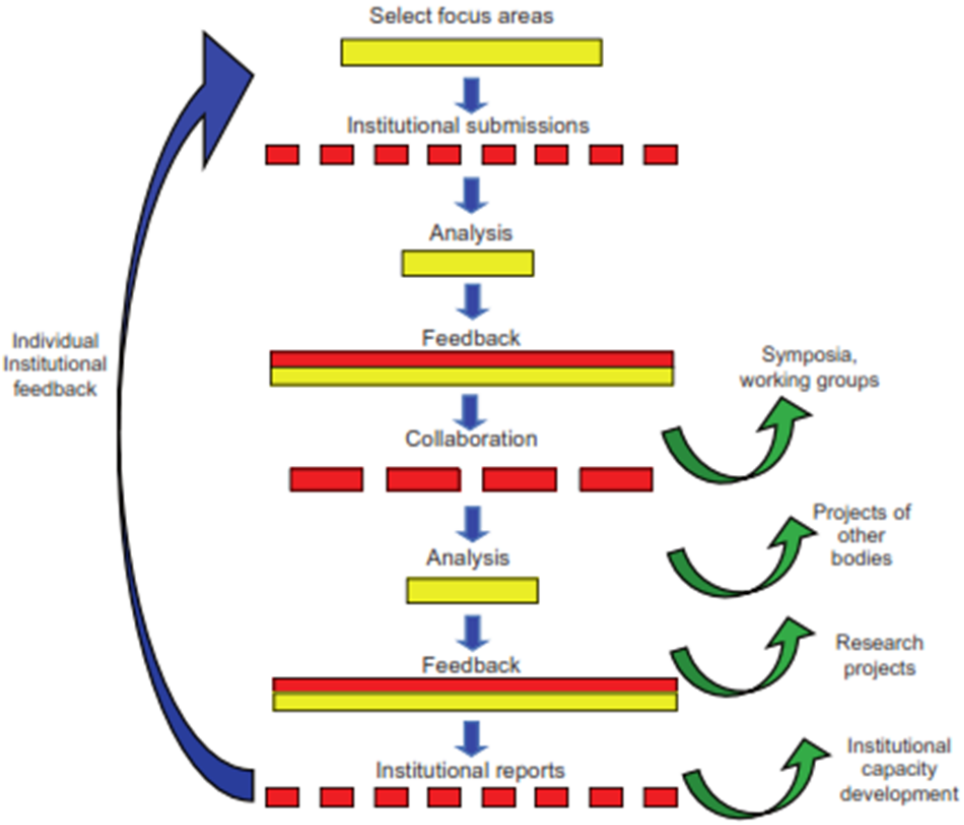

Figure 7: "Flow diagram indicating the process involved in each phase of the QEP" (CHE, 2014:17)

With the focus on the QEP in higher education institutions, academic development programmes, which have been running at several higher education institutions for some time will be an area for analysis as these academic development programmes were put in place to look at improving student success.

2.5 QUALITY ASSURANCE AT CAPE PENINSULA UNIVERSITY OF TECHNOLOGY

The Cape Peninsula University of Technology (CPUT) was established in January 2005 with the merge of Cape Technikon and Peninsula Technikon. CPUT is the only university of technology in the Western Cape with more than 30 000 students and more than 70 programmes on offer (CPUT, 2014).

The Quality Management Directorate is a department at CPUT that leads quality management at the institution. After the merger and in preparation for the Institutional Audit, an initial evaluation of programmes was made with reference to the HEQC's programme accreditation criteria, and in 2005 the CPUT's Quality Assurance Policy was established.

According to CPUT (2005: 3), the Cape Peninsula University of Technology defines quality as:

> *Mission-driven, effective and efficient delivery of academic and support*
>
> - *contextually aligned with each other and key national imperatives,*
> - *embedded in a culture of ongoing improvement and benchmarking,*
>
> *with the aim of producing socially useful, career-focused knowledge as well as a relevant range of undergraduate and postgraduate skills and competencies necessary for social reconstruction, economic growth and technological development.*

This definition is set to fit within the South African higher education context and is in line with what most experts define quality to be. Quality is defined by most quality experts as getting it right the first time, conformance to requirements, prevention, satisfying the customer or fit for purpose.

In line with the HEQC requirements, CPUT's quality framework is based on fitness of purpose, fitness for purpose, value for money and transformation. This is elaborated on in the CPUT Quality Assurance Policy (2005: 3) as:

> ***Fitness of purpose*** *– the extent to which CPUT relates to national policy and framework, including the Higher Education Act, SAQA, CHE/HEQC, and other DOE requirements which includes governance, planning (PQM), funding and resource.*
>
> ***Fitness for purpose*** *– the extent to which CPUT's academic and support structures and embedded processes align with their chosen mission statements and that of the institution.*
>
> ***Value for money****- judged in relation to the full range of higher education purposes as set out in the White Paper on Education.*
>
> ***Transformation*** *– developing the capabilities of individual students for personal enrichment, as well as the requirements of social development and economic employment growth.*

The principles on which the CPUT Quality Management System is based closely resemble those of TQM. As described in Chapter Three, TQM is based on the philosophy that everyone who is involved in some way in the process of producing a product or delivering a service, plays an active role in ensuring the quality management thereof. Customer focus, leadership, a system approach to management and continual improvement are some of the TQM principles.

As outlined in CPUT (2005), some of the principles on which CPUT's Quality Management System is based are:

- The national needs as outlined in the Higher Education Act of 1997, the National Plan for Higher Education (2001), the HEQC's institutional and programme accreditation criteria, relevant professional body requirements, SAQA and the NQF/Higher Education Qualifications Framework.

- The institution's strategic objectives, targets and measures. These are subject to regular review by the relevant committees.

- Policies and procedures for maintaining, monitoring, reviewing, evaluating and improving CPUT's academic cycle "*and its associated processes of programme design and coordination, teaching and learning, research, technology development and community engagement are regarded as core processes of the institution"* (CPUT, 2005:4) will be in place.

- CPUT's quality system will internally accredit academic programmes *"which are relevant and responsive to economic and developmental needs, and which produce graduates with enhanced competencies for a knowledge economy"* (CPUT, 2005:4).

- CPUT's approach should ensure that teaching and learning is through the practical application of and development of scientific knowledge and that quality should be demonstrated by continuous review and update of the curriculum.

- CPUT's quality assurance system should strive to *"assure the quality of the total student experience"* (CPUT, 2005:4). Learner and other stakeholder viewpoints and feedback are deemed as important for improving quality within the institution.

- CPUT is committed to internal and external peer review and benchmarking.

CPUT (2005) also states that the CPUT Quality Model is based on the European Foundation for Quality Management (EFQM) which focuses on input, process and output. The EFQM is discussed in Chapter Three. The CPUT quality model is illustrated in Figure 8 on page 51 with clear descriptions of the input, process and output and impact.

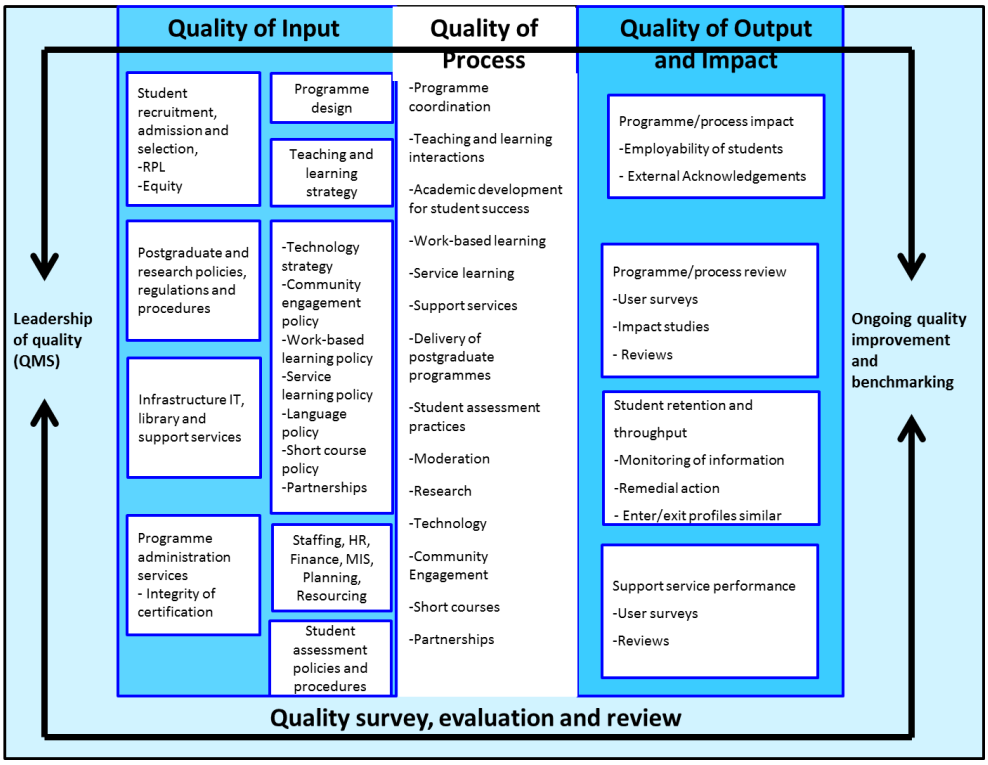

Figure 8: "CPUT Quality Model" (CPUT, 2005: 6)

Quality Assurance at CPUT is managed and facilitated by the Director: Quality, and the process, is an all-inclusive one that attempts to include all stakeholders at the institution.

Figure 9 on page 52 outlines the participants in the Quality Assurance process and their roles and responsibilities.

Figure 9: Responsibility for Quality Assurance on Various Organisational Levels

2.6 ACADEMIC DEVELOPMENT PROGRAMMES AT HIGHER EDUCATION INSTITUTIONS IN SOUTH AFRICA

Academic development programmes (known as "foundation provision") was a government approved initiative to address the high dropout rate, low throughput rate and low graduation output at higher education institutions. Funding for foundation provision was first made available in 2004 (South Africa, Department of Higher Education, 2012).

The main purpose of foundation provision is to assist students who are at risk due to their educational backgrounds. What this essentially means is that a great number of students meet the minimum admission requirements for higher education but they are nevertheless underprepared or unprepared for

mainstream programmes offered at the higher education institution because of a lack of infrastructure, resources and proper guidance during their secondary education phase.

These students will then be placed on an extended curriculum that will give them the academic foundation for completing their studies. An ECP is a whole degree or diploma programme which runs for six months to one year longer than the mainstream programme and in which foundation provision is embedded (South Africa, Department of Higher Education, 2012).

Foundation provision can take various forms or models for different courses, based on the model that works best for the course. These models could be either one of the four below:

- Fully Foundational Course – In this type of foundational offering, students complete a course that will adequately prepare them for the mainstream course that the students will feed into after completion of the foundational offering

- Extended Course – In this type of foundational offering, the mainstream course is combined with foundational material. The course would therefore cover the same material as the mainstream course but additional time is allocated to incorporate assistance (foundational) to students. For example, where a mainstream course would take six months to complete, the extended course would be offered over a year

- Augmented Course - In this type of foundational offering, the duration of the course is the same as the mainstream but additional classes are provided to provide foundational support. This essentially means the number of subjects offered in a block (for example, semester) would be halved to allow for the additional foundation support

- Augmenting course – In this type of foundational offering, the foundational support runs simultaneously with the mainstream course but is offered as an

additional and separate module (South Africa, Department of Higher Education, 2012).

As foundation provision is an initiative to improve the throughput rate and the graduation output rate as recommended by the Council on Higher Education in their recommendations to the Minster of Education in 2000 and one of the outcomes outlined by the Minister of Education in his National Plan for Higher Education in 2001, the idea is not to take on more students with the funding received, but to work with the normal intake, identify students who would benefit from the academic support, and so improve overall throughput rates and ultimately graduation outputs. Foundation provision is linked with the government's "performance based funding framework" (South Africa, Department of Higher Education, 2012).

The "performance based funding framework" essentially takes a university's planned weighted Full-time Equivalent (FTE) enrolment and determines how the foundation provision funds are distributed. The planned weighted FTE is calculated by multiplying the FTE enrolled students and multiplied by the weightings for the three CESM categories that all courses are slotted into. The CESM weighting for Science and Technology is 2.0, Business and Management is 1.5 and Humanities is 1.0. FTE enrolment is calculated by multiplying the headcount in a course in a particular year by the credit value of the course and then multiplying this by all courses for completion of the qualification (South Africa, Department of Higher Education, 2012).

An example of this calculation would be:

> The planned weighted FTE for an engineering course = FTE enrolled students X 2.0
>
> Funding per foundation student is calculated by using the teaching input subsidy and the earmarked state funding for foundation purposes ((South Africa, Department of Higher Education, 2012).

Table 6 on page 55 shows the value (in Rand) per weighted FTE foundation student as funded by the state from 2007 – 2013.

Table 6: Rand value per weighted foundation student (South Africa, Department of Higher Education, 2012)

Year	Block grant (Rand)	Earmarked grant (Rand)
2007/8	7729	7900
2008/9	8560	8100
2009/10	9040	8200
2010/11	9956	9000
2011/12	10619	9800
2012/13	10877	10500

In 2009, 248 such state funded programmes for foundation provision existed across South Africa's higher education institutions (South Africa, Department of Higher Education, 2012).

It is important to understand the calculation of the funding because funding was initially allocated in three-year cycles and at the end of each cycle, universities had to submit ECP reports and proposals to re-apply for funding, where amongst other things the accomplishments with assisting underprepared students and the statistics of the throughput from year to year had to be reported on. This played a role in determining the granting of funds for the next cycle and the amount of funding granted.

Subsequently the Department of Higher Education and Training announced that from 2013 funding will no longer be allocated for three-year block periods. Programmes approved for funding in 2012 will continue to be funded in the future (South Africa, Department of Higher Education, 2012).

The new funding arrangement does not mean that universities no longer have to regularly report on the quality of ECP's or the success thereof. Quality Management of ECP's will now be conducted by visitations from the Department of Higher Education and Training where the following will be audited and

reported back to the Minister of Higher Education and the Auditor-General (South Africa, Department of Higher Education, 2012):

- records of the layout and structure of ECP's in yearbook/prospectus/calendar
- evidence that shows that the foundation provision articulates with the mainstream courses
- procedures used to guide students into doing ECP
- proof of tests written to determine at-risk students
- details of staff involved in the recruitment and selection of ECP foundation students
- details of staff involved in instructing foundation students (employment status, qualification, experience)
- timetables of foundation courses
- class lists of foundation students
- assignments, tests and exams conducted
- marksheets/results of assessments
- details of expenditure of funds
- written evaluation of staff and the course by foundation students

This chapter has set the background for the research into the success of the ECP at the University of Technology and how the application of quality management practices can gauge the impact of the programme on teaching and learning, and, more specifically, student success.

The next chapter will review some literature related to quality management in both industry and higher education and how these two compare.

CHAPTER THREE: LITERATURE REVIEW

A 21st century employee needs 21st century skills. This statement is so appropriate if employees of the 21st century are going to be instrumental in solving economic, civil and global challenges (Saavedra and Opfra, 2012). Graduates of higher education institutions need to be equipped with the skills to be able to contribute significantly, not only with knowledge of their field of study, but also displaying skills that demonstrate a well-rounded citizen that can make a meaningful contribution to the development of their country.

As a result of the pressure from industry for quality graduates and from students for an education that will make them competitive in industry, Quality Management in higher education has been placed at the top of the list of priorities of many higher education institutions. This chapter relates literature from both national and international authors on quality management in higher education. Quality Management in higher education can be separated into the quality management practices of service provision in the area of admissions, registrations and finance, and the quality management practices in teaching and learning that happens in the classroom at higher education institutions. This thesis is focused on the quality management practices of teaching and learning.

To get to the point where one can take an in-depth look at the attempts at quality management in higher education and the results thereof, one firstly needs to understand the meaning of quality and quality management. This chapter looks at the different perceptions of quality and the understanding of quality management. The theory of quality management as described by the leaders in the field and the application of different quality models in industry are then analysed.

Secondly, one needs to look at higher education, specifically at what happens in the classroom. This chapter focuses on teaching and learning in higher education by looking at the application of teaching and learning models over the years and how effective these are. Specific statistics of the South African state of education in terms of throughput and

graduation rates are discussed. Interventions by the South African Department of Higher Education and Training to address these issues of concern are discussed.

Finally, the chapter marries quality management and teaching and learning and looks at the attempts of applying quality management to teaching and learning in higher education and the results thereof.

Figure 10 below is a graphic representation of the different sections of this chapter and how they fit together.

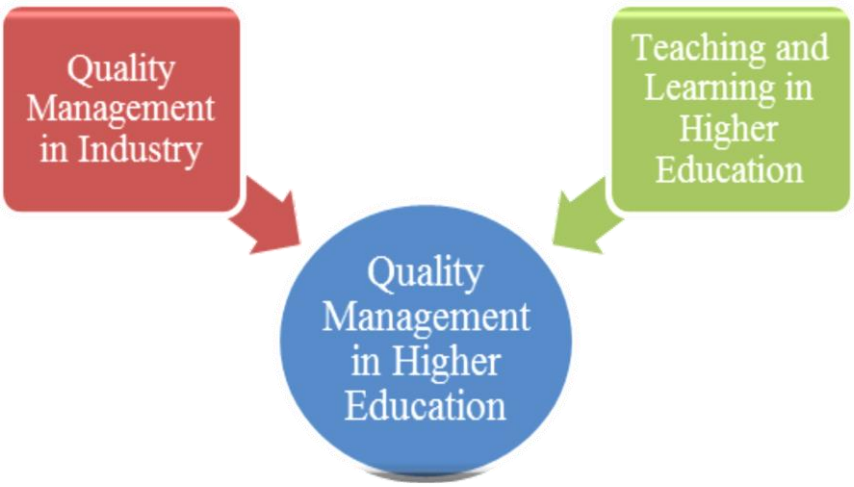

Figure 10: Understanding Quality Management in Higher Education

3.1 QUALITY DEFINED

The meaning of quality is vast and varied and depends on the type of business and the context in which it is used. Quality could be described as getting it right the first time, conformance to requirements, prevention, satisfying the customer or fit for purpose.

Foster (2010) explains that different people have different understandings of quality. What matters is that an organisation adopts an understanding of quality that is relevant to the business and that the organisation ensures, through good communication, that

this understanding of quality is understood and adopted throughout the organisation. Functional alignment and consistency in an organisation are important when it comes to quality and quality management

- Quality as getting it right the first time: Crosby (1984) sees the definition of quality as everyone getting it right the first time. He refers to this as DIRFT (doing it right first time) and states that the success of this approach is getting requirements clearly understood and setting performance standards for every process of an operation or procedure.
- Quality as conformance to requirements: Crosby (1984) explains that management plays an important role in establishing the requirements that employees must meet, ensuring that everything is in place for employees to meet the requirements and then spending time on encouraging and helping employees to meet the requirements. Juran & Godfrey (1999) however state that an adoption of this approach to quality could mean a lack of attention to customer needs, as the emphasis is placed on the product.
- Quality as prevention: Corrective action is seen as unreliable and an expensive way of ensuring quality. So some quality experts define quality as prevention rather than appraisal and corrective action. Crosby (1984: 67) explains this as *"the error that does not exist, cannot be missed"*.
- Quality as meeting customer requirements: This is all about keeping the customer satisfied. Juran & Godfrey (1999) state that with this being the premise for quality in an organisation, the purpose could be to increase income, because a satisfied customer is a repeat customer. This however also requires capital investment from the organisation into ensuring quality.
- Quality as fit for purpose: This has been a widely used approach in the manufacturing industry where the purpose of the product may be determined by the manufacturer, the marketing department or the customer. This approach basically states that if a product or service meets its goal then it has quality. A weakness of this approach, as explained by Campbell & Rozsnyai (2002), is that it may seem as though "anything goes" as long as it has a purpose.

All definitions of quality point out the importance of the role that management plays in quality and quality management. It is important that management buys into quality and quality management. It is important that the procedures and implementation of quality and quality management is well-thought through and well-planned by management. Crosby (1984: 59) states: *"Hassle comes about because of vacillation in management's dedication to the policies and processes"*.

3.2 QUALITY MANAGEMENT

In the past, quality management in an organisation was seen as a function performed by, and only by, a department in the organisation. But by the late 1950's this perception of quality management changed when leading contributors to quality management, like Armand Feigenbaum, put forward the idea that quality management is the responsibility of all employees and that all employees should be involved. This is where the concept of Total Quality Management (TQM) stemmed from. The quality department in an organisation now took on the role of support, training and coaching of employees in the quality process (Foster, 2010).

Quality management is explained by Foster (2010) using the three spheres of quality as illustrated in Figure 11. In his explanation, Foster (2010) says that Quality Control is seen as the scientific method of breaking down processes, monitoring the capability and stability of processes, and the developing and maintaining of control charts. Quality Assurance is the guaranteeing of the quality of a product or service by the designing of methods such as failure modes and effects analysis, reliability/durability product testing, off-line experimentation, etcetera, to ensure that the product or service meets quality standards.

Quality Management is what ties Quality Control and Quality Assurance together, and is what ensures that all managers, supervisors and employees are involved in activities. Quality Management is the support, training and coaching of everyone in an organisation in the quality process.

Figure 11: Three Spheres of Quality (Foster, 2010: 47)

3.3 LEADERS IN QUALITY MANAGEMENT THEORY

The leading contributors to the theory around quality and quality management are W. Edwards Deming, Joseph M. Juran, Kaoru Ishikawa, Armand Feigenbaum, Philip Crosby and Genichi Taguchi.

Deming introduced his fourteen points for management to emphasise the fact that poor quality was not the fault of labour but rather resulted from poor management of a system for continual improvement (Foster, 2010). His fourteen points as listed in Table 7 is therefore a guide for establishing quality management in organisations.

Table 7: Deming's 14 points (Foster, 2010: 62)

1. Create constancy of purpose. 2. Adopt a new philosophy. 3. Cease mass inspection. 4. End awarding business on the basis of price tag. 5. Constantly improve the system 6. Institute training on the job. 7. Improve leadership.	8. Drive out fear. 9. Break down barriers between departments. 10. Eliminate slogans. 11. Eliminate work standards. 12. Remove barriers to pride. 13. Institute education and self-improvement. 14. Put everybody to work

Juran is well-known for his trilogy that describes three basic principles for managing and improving quality. He emphasised the fact that organisational quality problems were as a result of ineffective and insufficient planning (Foster, 2010). The trilogy is illustrated in Figure 12 below.

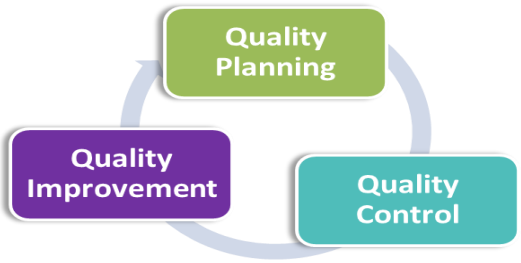

Figure 12: Juran's triology

The trilogy places the emphasis on good planning on how to produce a product or service that will meet the customer's needs. During the production of a product or delivering of a service, it is important to control the quality of the product or the service and not wait for things to go wrong before reacting. Finally, there must always be room for improvement to work towards satisfying the customer.

Deming and Juran established the TQM in the 1950's and it was adopted in Japan. Ishikawa, Shingo and Ohio became the Japanese experts in TQM. Ishikawa is best known for his Basic Seven Tools of Quality (B7). In B7 Ishikawa explains a process where data is collected using check sheets, the data is analysed using graphs or control charts, the causes of problems are then identified using a cause-and-effect diagram and then the causes are prioritised using Pareto analysis (Foster, 2010).

Figure 13 below is a map of the order of B7 as laid out by Foster (2010).

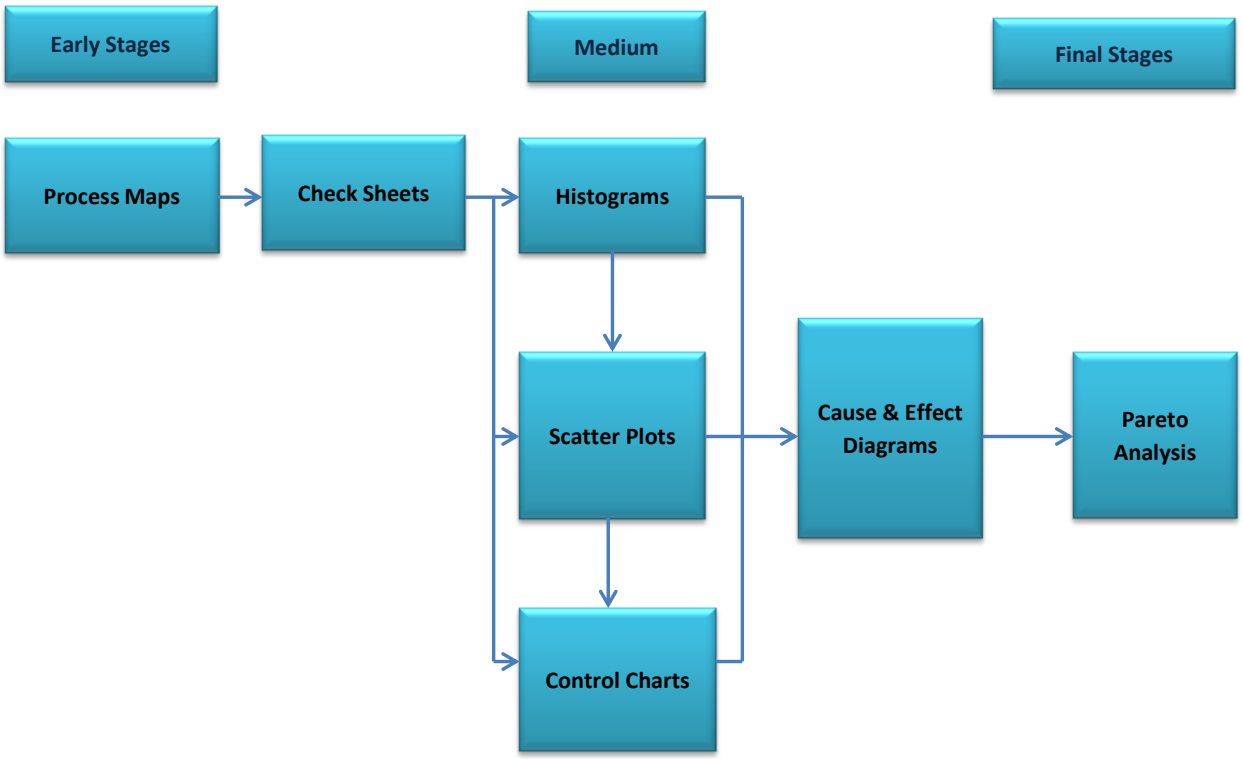

Figure 13: Logical Map of the Order for the Basic Seven (B7) Tools (Foster, 2010: 318)

Armand Feigenbaum emphasised the fact that the entire organisation should be involved in quality improvement. Feigenbaum was the one who pushed for the fact that quality should not be borne on the shoulders of one department only. He introduced a 3-step process that involved quality leadership, quality technology and organisational

commitment. Quality Leadership was the driving force and the motivation for quality improvement, Quality Technology was the equipment that was used to improve processes and Organisational Commitment meant everyone was involved (Foster, 2010).

Philip Crosby was well-known for promoting the fact that quality that is well-managed can be profitable to an organisation. He produced a quality improvement programme of fourteen steps. It emphasised his belief in zero-defects and the fact that the behavioural and motivational aspects of quality were more important than the statistical approach. The fourteen steps are listed in Table 8 below.

Table 8: Crosby's 14 Steps (Foster, 2010: 74)

1. Make it clear that management is committed to quality. 2. Form quality improvement teams with representatives from each department. 3. Determine how to measure where current and potential quality problems lie. 4. Evaluate the costs of quality and explain its use as a management tool. 5. Raise the quality awareness and personal concern of all employees. 6. Take formal actions to correct problems. 7. Establish a committee for the zero defects programme. 8. Train all employees to actively carry out their part of the quality improvement programme.	9. Hold a zero-defects day to let all employees realise that there has been a change. 10. Encourage individuals to establish improvement goals for themselves and their groups. 11. Encourage employees to communicate to management the obstacles they face attaining their improvement goals. 12. Recognise and appreciate those who participate. 13. Establish quality councils to communicate on a regular basis. 14. Do it all over again.

Finally, one of the leading contributors to quality theory was Dr. Genichi Tagichi. He based his principle of quality on the fact that quality is measured in terms of loss to the

user if the product or service does not perform as expected. A product therefore must perform its intended function well throughout its expected lifespan and if used under reasonable conditions. A service is judged by a customer's perception and satisfaction (Foster, 2010).

To sum up what the leaders in quality theory have to say, quality and quality management can only be achieved if all employees embrace the principle of quality, and management adopts and promotes a climate of quality and quality management in the organisation and leads this culture in the organisation.

3.4 QUALITY MANAGEMENT MODELS

Several quality management models have been put forward and tried and tested extensively in industry. This section looks at some of the more well-known models of quality management.

3.4.1 Total Quality Management (TQM)

TQM is based on the philosophy that everyone who is involved in some way in the process that led to the final product or service plays an active role in ensuring the quality management thereof. Deming and Juran established the TQM in the 1950's and it was adopted in Japan. Ishikawa, Shingo and Oho became the Japanese experts in TQM. By the 1970's the TQM was widely accepted in Japan.

TQM is based on the principle of everyone being involved in the quality process and is based on eight principles.

- Customer focus
- Leadership

- Involvement of people
- Process approach
- System approach to management
- Factual approach to decision making
- Mutually accepted supplier relationship
- Continual improvement

3.4.2 European Framework for Quality Management (EFQM)

The EFQM model is based on nine criteria that an organisation can follow to reach excellence. The criteria consist of five enablers and four results. Enablers are what an organisation needs to do to implement its quality strategy. The results are what an organisation will achieve towards meeting its quality goals (EFQM, 2012).

Figure 14 below demonstrates the relationship between enablers and results.

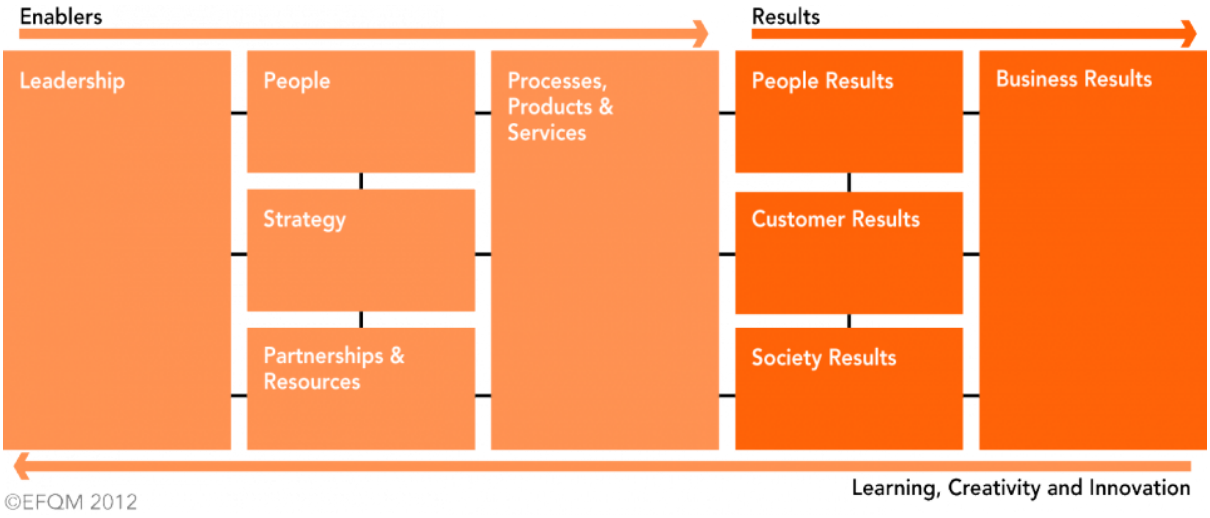

Figure 14: EFQM Model Criteria (EFQM, 2012)

3.4.3 Balanced Scorecard

This is a tool used for measuring performance and utilises four measurement elements: Financial Performance, Customer Satisfaction, Process Improvement and Employee Satisfaction. The information to these four elements is communicated in the form of a spreadsheet to management. Table 9 below is a simplified example of a balanced scorecard (Foster, 2010).

Table 9: Example of Balanced Scorecard (Foster, 2010:348)

Strategic Theme	Objectives	Measurement	Target	Initiative
Financial Performance	Profitability More Customers Less Investment	Market Value Truckload Rev. EVA Charge	Increase Market Share by 5% Increase Truck Revenue by 10%	Promote Delivery Service
Customer Satisfaction	Orders Delivered On Time Lowest Prices	Number of Orders Delivered on Date Promised	Exceed Customer Expectations 95%	Establish Specific Delivery Routes by Customer
Process Improvement	Efficient Staging and Loading of Customer Orders	Number of Orders Prestaged on Time for Loading	85% by June 20XX	Optimise Order Prestaging Process
Employee Satisfaction	Improved Communication Channels	Percent of Staff Trained in Teamwork	90% by June 20XX	Teamwork and Communication Skills Training

3.4.4 Malcolm Baldridge Award

The Malcolm Baldridge National Quality Award is awarded to organisations in the United States of America. It is a formal recognition of performance excellence and is managed by the National Institute of Standards and Technology (NIST). The award

serves two purposes; firstly, to help organisations assess their quality improvement efforts and identify their strengths and opportunities for improvement, and secondly, to identify organisations to serve as role models for other organisations (Foster, 2010). The award is based on seven criteria: leadership; strategic planning; customer and market focus; measurement, analysis and knowledge management; human resource focus; process management; and results.

3.4.5 ISO 9000

This quality management system was developed as an international standard for the documentation and recording of quality standards. It is one that is internationally accepted and used by many organisations (400 000 registered) to document their quality system (Foster, 2010).

The ISO 9000:2008 document is the most recent series of standards produced by the Organisation for International Standards of Geneva, Switzerland. ISO 900:2008 contains information about the fundamentals, requirements and guidelines for quality management systems and five clauses that address the following:

- Clause 4: Quality Management System
- Clause 5: Management System
- Clause 6: Resource Management
- Clause 7: Product Realisation
- Clause 8: Measurement, Analysis and Improvement

3.4.6 Business Process Reengineering (BPR)

This system enables organisations to analyse and redesign their business processes and systems to improve quality. Figure 15 below shows the process. According to Brookes and Becket (2008: 44), BPR is *"concerned with change in five components: strategy, processes, technology, organisation and culture"*.

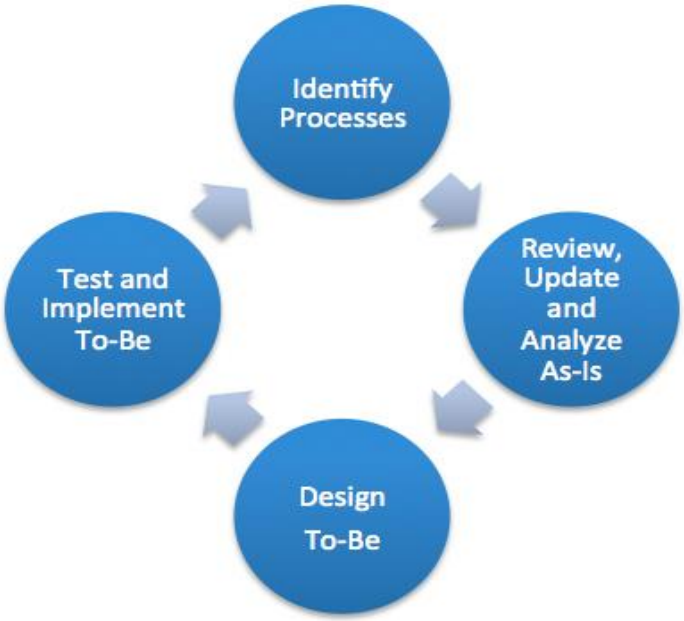

Figure 15: Business Process Reengineering

3.4.7 SERVQUAL

SERVQUAL is a survey that is completed by customers to communicate customer expectations and customer perception. It is a tool developed by Parasuraman, Zeithamel and Berry and focuses on the customer's perspective. The objective of the tool is to help

service providers understand customer expectations and perceptions and assess the gap. The survey could be grouped into five dimensions as listed in Table 10 below.

Table 10: SERVQUAL Items and Dimensions (Foster, 2010: 259)

Dimension	Items
Tangibles	1 – 4
Reliability	5 – 9
Responsiveness	10 – 13
Assurance	14 17
Empathy	18 – 22

3.5 TEACHING AND LEARNING IN HIGHER EDUCATION

According to Saavedra and Opfra (2012), Levy and Murnane (2005) state that employers are more and more seeking people with not only the basic skills sets, but excellent communication skills and complex thinking skills. These complex skills cannot be acquired through rote learning but require engagement with real-life situations and application of a set of skills and not just one skill at a time.

The Assessment and Teaching of 21st Century Skills (AT21CS), a consortium with its headquarters at the University of Melbourne, Australia, launched an international research effort involving 60 universities in finding ways of *"empowering students with the right skills to succeed in the 21st century workplace"*. AT21CS (2012) has identified four broad categories that 21st century skills can be placed into: Ways of thinking (creativity, critical thinking, problem-solving, decision-making and learning), Ways of working (communication and collaboration), Tools for working (information and communication technology and information literacy) and Skills for living in the world (citizenship, life and career, personal and social responsibility).

No education environment or context is exempted from being influenced, and having an influence on, global activity. The South African higher education environment is faced with a multitude of challenges to conquer in order to contribute to the global demand for students who are independent thinkers, dynamic project managers, excellent communicators and all-round citizens of the world. Attempting to rectify the imbalances of equal education during the Apartheid era and meet the global demand for well-rounded students who will become effective citizens, is a struggle that higher education in South Africa is still trying to overcome.

CHE (2014) states that for change in higher education there needs to be a convergence of three imperatives (Figure 16 below). The first is to address national needs (social justice and economic development). The second is what they refer to as the Zeitgeist (spirit of the time) which involves a realization by all universities that the responsibility for student success must be shared. The third is to ensure that students are equipped with the necessary skills to succeed in the 21st century.

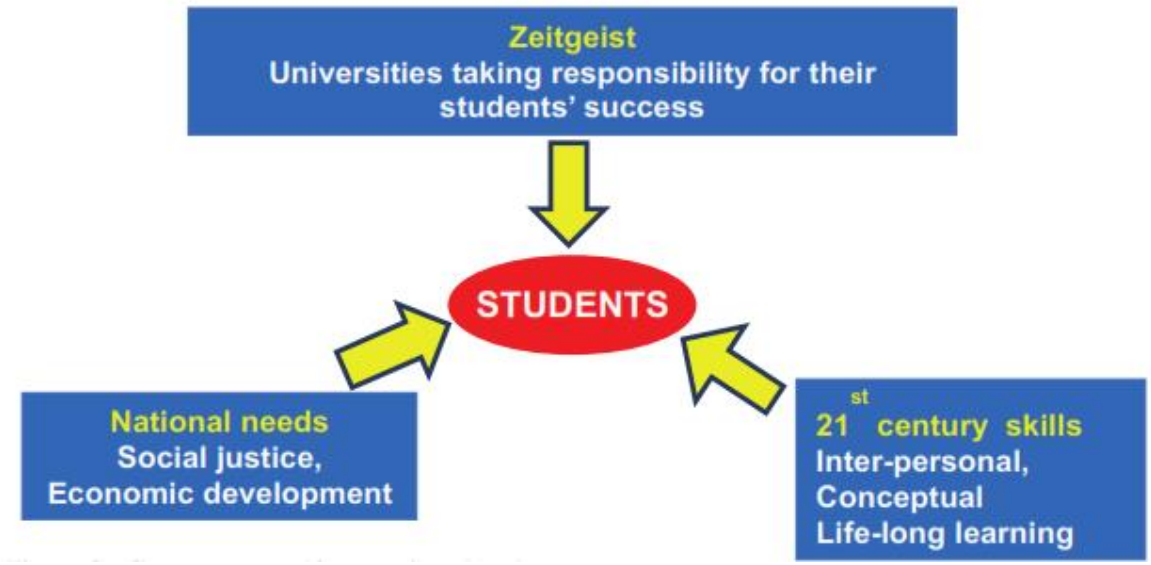

Figure 16: Convergence of imperatives for change (CHE, 2014:9)

Access to education for all is uppermost on the agenda. Morrow (2007) highlights that the solution is not a simple one as there are two kinds of access to higher education that can be distinguished – formal access and epistemological access. Formal access is gaining entry into an institution of higher education by factors such as meeting minimum entrance requirements, personal finance, etcetera. Epistemological access is access to knowledge (Morrow, 2007). Epistemological access lies in the teaching and opening the minds of students to the knowledge available.

Formal access in South African higher education institutions was a necessary step toward the redressing of inequalities of the Apartheid education system. Morrow (2007: 39) motivates this by saying that *"fair distribution of this goods (access to higher education) is a necessary feature of a just society"*.

Epistemological access is the teaching and learning methodology employed by the professional teacher that will enable the student to use the limited secondary school background and teach the student ways to understand not only the content of what is being taught, but to understand why it is being taught and most importantly how it can be used in the future. Morrow (2007) explains epistemological access as *"access to the goods it (the institution) distributes to those it formally admits"*.

The challenge then remains in dealing with the reality of larger classes as a result of increased formal access since the democratic elections in South Africa in 1994. With the required skills for the 21st century in mind, an analysis of current teaching and learning methods is necessary to determine if 21st century skills are being acquired successfully.

3.6 TEACHING AND LEARNING MODELS

Several teaching and learning models have been written about but can generally be placed within three models, namely: Transmission Model, Generative Model and Transformative Model. These are the models of teaching and learning as best described

by Wink (2005) in which she states that teaching and learning styles have had to change over time to meet the needs of a changing society.

It must be noted that these are not the only models of teaching and learning but the three models focused on are useful for an analysis of and comparison of quality management practices in teaching and learning. What follows is an analysis of these models and how they cater for a student who will succeed in the 21st century.

3.6.1 Transmission Model

The transmission model of teaching and learning relies on the educator imparting knowledge to the learners. The learners are seen as the vessels in need of the knowledge and the educator clearly plays a role of authority in the learning environment. University of Roehampton (2013) describes the learner in the transmission model of teaching and learning as a *"passive container, waiting to be filled with knowledge"*. Transmission teaching and learning is the traditional way of transferring knowledge and was the dominant way of teaching through the 1960's and 1970's. Blumfeld *et al* (1997) attribute this method of teaching to the behaviourism theory that states that learning is based on expected behaviour and this behavior is controlled by the educator and how the lesson is structured and conducted. One of the assumptions is that *"learning is hierarchical"* (Blumfeld et al, 1997) and that students learn in stages starting at the simplest or lowest stage, mastering this stage and so gaining access to the next/higher stage.

Assessment of the stage of learning was based on how well a learner can repeat what was taught, based on a common set of elements as criteria. University of Roehampton (2013) states that the purpose of assessment in this model of teaching and learning was to determine the effectiveness of the knowledge communicated by the teacher to the student. Blumfeld *et al* (1997) further go on to say that teacher behaviour had a direct impact on student performance in transmission teaching and learning.

3.6.2 Generative Model

In the generative model of teaching and learning the communication flow between teacher and student is two-way. The student is allowed more opportunity for asking questions to gain clarity. According to Esfandiari (2003), in a presentation on the application of the generative teaching model in the subject of Applied Statistics at the University of California, USA, the objective of the generative model of teaching is to *"minimize the role of students as passive recipients of information and to maximize their role in the learning process"*. This is done through the use of case-studies in their teaching and letting students understand the relationships and links in the different parts of the case study and connecting the prior knowledge of the student with the new information and so helping to solve a real-world problem.

Wittrock (1992), a promoter of the generative teaching theory, attributes this method of teaching to allowing neural and cognitive processes of the brain to take place so that students can reach understanding of knowledge. One of these processes is the opportunity to build relations between the newly acquired knowledge and prior knowledge. This leads to a better understanding of the new knowledge and the creation of what Wittrock (1974) calls "new schema". Figure 17 on page 75 demonstrates the steps during generative learning.

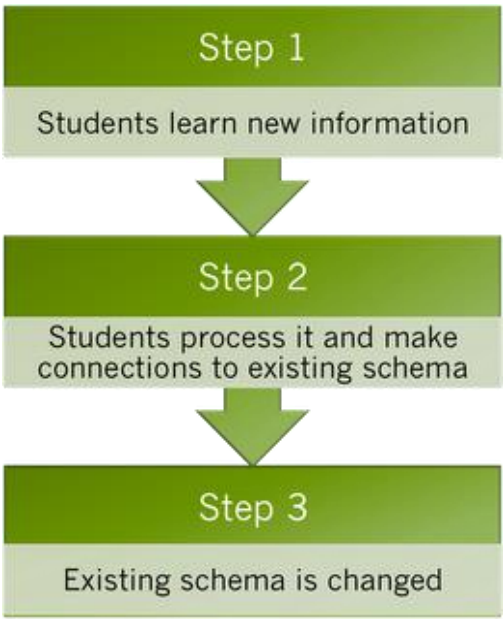

Figure 17: Generative Learning Theory (Wittrock, 1992)

Wittrock (1992) further goes on to explain four components in generative learning. These components are: motivation, learning, knowledge creation and generation. Motivation is heightened when students can see a relationship between what they already know and the new knowledge that they have just acquired. Learning takes place through activities that are relevant and can hold a student's attention. Knowledge creation is possible when students understand how they learn i.e. the learning process (also known as metacognition) and finally generation is possible through showing the relationship between concepts by looking at headings, titles, summaries, objectives (organizational relationships) and showing the relationship through demonstrations, examples, analogies (integrative relationships) (Wittrock, 1992).

Generative teaching and learning is thus essentially a neural process and the brain is in control of the learning and in order for learning to take place, instruction must be designed in such a way that students are given opportunities to create relationships between what they already know and the new knowledge.

Although there is a real-world application of knowledge through, for example, case studies, the limitation to this method is that there is very little actual exposure to real-world experiences, which could leave the student with an unrealistic visualization of the knowledge.

3.6.3 Transformative Model

As a more modern approach to teaching and learning, the transformative model allows for students to learn through participating in real-world activities. Communication flows freely from learner to learner and the lecturer is a partner in the learning process (Wink, 2005). The lecturer plays the role of facilitator and ensures that opportunities are made available for learning, but the actual learning and discovering is done by the learner. This is seen as a more lasting way of learning than the learner listening to the lecturer and trying to write down as much information as possible where the information does not necessarily mean anything to the learner.

Many researchers have termed this type of learning as "life-long learning" as the retention of knowledge becomes the responsibility of the learner. When learners take responsibility for their learning, the knowledge gained is not only relevant but also stays with the learner as he or she participates in the working world.

Harvey and Knight (1996: 21) describe transformation in education as a *"process of transmutation of one form into another"*. They go on to describe the transformation where the learner develops independence, commits to continued learning through the process of reflection, uses all his or her frames of references to empower and develops critical, dialectical thinking.

Transformative education can therefore be seen as the process where the inputs (students) are transformed (through real-life experiences, self-reflection, stimulating critical thinking) into outputs (graduates) who are able to participate in a globally competitive work environment. Figure 18 on page 77 demonstrates this transformation process.

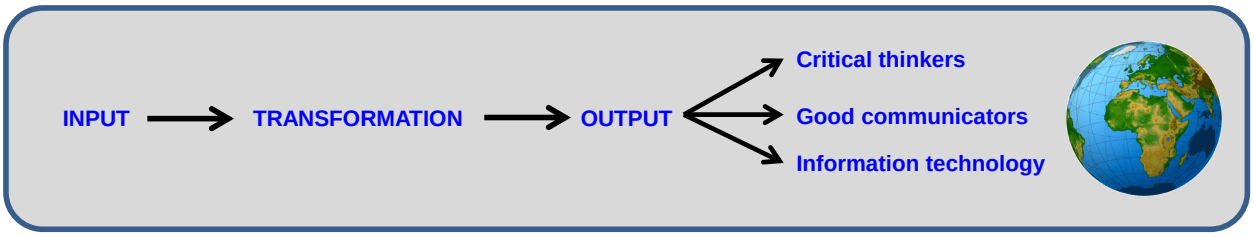

Figure 18: Transformation through education

Moore (2005) identifies two other forms of learning that are similar to transformative learning, co-operative learning and collaborative learning. Co-operative learning requires learners to work as a team on a task and share information. The teacher leads the activity and is responsible for designing the task. Collaborative learning also involves working in groups but each member of the group has something to contribute to the process. Moore (2005: 81) describes collaborative learning as a *"shift from knowledge transfer (transmission learning) or discussion (co-operative learning) toward all participants sharing the construction of their knowledge"*. The role of the teacher is that of a participant or co-learner.

Transformative learning however, has a more effective way of bringing about change in the learner's frame of reference. This is done through critical reflection and self-reflection and a conscious altering of the frame of reference (Moore, 2005).

Moore (2005) however questions whether transformative learning is effective in higher education as her research has led to the discovery that students are more comfortable with "subject-orientated" learning and do not have the skill or maturity to think critically. Many professors (lecturers) also do not necessarily have training in the complex teaching methodology which is required in transformative learning.

To sum up the teaching and learning models discussed above, Figure 19 is an illustration by Dayna Watland (and published in *Critical pedagogy: Notes from the real world* by Joan Wink in 2005) that best describes not only how teaching and learning styles have changed over time, but also how the needs of society have driven a change in teaching styles to accommodate the economic and social needs of society.

A closer look at Figure 19 will reveal a plant to the right. The transmission model is at the bottom of the illustration. Wink (2005) refers to this model of teaching as the “bank model”, as the teacher is often talking in front of the class and the students are listening. Words often bounce off students as they have very little relevance to them. The roots of the plant are next to this model of teaching. The misconception with this teaching model was that “planting” of knowledge by the teacher led to the generation of knowledge by the learner.

In the Generative model in Figure 19, the teacher has moved closer to the learners and communication now flows freely between teacher and learner. There are still however some areas of confusion for the learner as the learners are able to visualize concepts but are not able to relate it to the real world. The stem and leaves of the plant are next to this model as it is believed in this teaching model that the learner must show growth.

At the top of Figure 19 is the Transformative model. The learner has the opportunity to experience the real world in his or her learning. To the right of this model are a flower and a butterfly. This represents the fact that “growth” is not where the learning experience ends but that learning extends to blossoming and inviting the world (represented by the butterfly) into one’s world.

Figure 19: Three Perspectives on Pedagogy by Dayna L Watland (Wink, 2005: 178-180)

3.7 REALISTIC FACTORS THAT INFLUENCE TEACHING AND LEARNING

All teaching and learning models are based on ideal situations with sufficient professional teachers and resources in hand. The reality is that nowhere in the world will one find an ideal teaching situation, but rather one that requires some adaptations. One of those adaptations is a change in mindset. Below is a discussion of some factors that could influence teaching and learning in the South African context and how these need to be addressed.

3.7.1 Class Size

After the democratic elections of 1994, access to all meant an increase in enrolment at higher education institutions but not necessarily a proportional increase in teaching staff. Solidarity Research Institute (2010) lists the enrolment rate at higher education institutions in 1994 as 528 135 and in 2007 as 759 093. This is a 43,7% increase in enrolment 1994-2007.

With the natural increase in class size, lecturers have adapted their teaching style as a coping mechanism. Opportunity for question time at the end of the lecture is limited as only a certain number of questions can be entertained, time for discussion and group work is limited and one-on-one attention is virtually non-existent.

Morrow (2007), however disagrees that teaching a large class has to mean compromising the quality of the teaching that takes place. Morrow (2007) further explains that an increase in class size is inevitable in the South African higher education context as greater access to higher education is part of redressing the inequalities of the past. Access to higher education is instrumental in developing an educated population and will so provide for the economic, political and social success of the country. Larger classes however do not have to mean a decline in the quality of teaching. If this is the case, then the two forms of access, formal access and epistemological access, *"are in direct conflict with each other"* (Morrow, 2007: 19).

3.7.2 Professional Teachers

Morrow (2007: 29) states: *"Key agents in the success of any schooling system are the professional teachers who work in it"*. Morrow (2007) further explains that in the past teachers used to be seen as instruments to transmit information. But with all forms of mass media available, students have easy access to information and thus the teacher's job is to organize the manner in which the student will process all the information.

In his book "Learning to Teach in South Africa", Morrow (2007) states that given the South African education situation (i.e. one that has moved from a divided system in Apartheid to one that strives for a democratic system that allows access to all today), the best way to approach teaching and learning is through systematic learning. Systematic learning will lead to epistemological access.

Systematic learning is defined as having a desire to learn, knowing how to access information, application of information and being able to relate what is learnt to reality (Summum, 2013).

Morrow (2007) says that professional teachers need to understand the current ills of the education system and move towards being the organisers of systematic learning so that its cultural and political significance can be understood by all.

3.8 ACADEMIC DEVELOPMENT PROGRAMMES IN HIGHER EDUCATION

Academic development programmes were introduced by the Department of Higher Education and Training in 2004. At the time the Department of Higher Education and Training saw the need to introduce these programmes to assist first time higher education students who came from a disadvantaged secondary education background, by giving them the necessary academic and social support to cope with higher education. Academic development programmes at higher education institutions in South Africa can take the form of a foundation course that offers a complete course that prepares a student for the mainstream course, an extended course where the mainstream course is combined with foundational material and is offered over an extended period, an augmented course where the course offered is the same length of time as the mainstream course but additional foundational classes are offered and the augmenting course where the mainstream and foundational course are offered at the same time but foundational support is a separate module in the course.

A closer look at the term "academic development programmes" could reveal that this is an opportunity for epistemological access. There is sufficient time for curriculum innovations to allow for, as Morrow (2007:39) states, "access to the goods" of a higher education institution. Several higher education institutions have been looking at and documenting interventions that allow for epistemological access in the academic development programmes offered. Some of these will be discussed below.

3.8.1 Case studies from higher education extended programmes

The analyses of the case studies below look at specific extended curriculum courses and how the interventions practiced have allowed for epistemological access to students. The case studies are part of a compilation of various case studies put together by Bozalek, Garraway and McKenna (2011) to demonstrate how epistemological access can be put

into practice in the classroom. The compilation is called "Case Studies of Epistemological Access in Foundation/Extended Curriculum Programme Studies in South Africa".

Case Study 1: Herbert, Conana, Volkwyn and Marshall, in their contribution to "Case Studies of Epistemological Access in Foundation/Extended Curriculum Programme Studies in South Africa" by Bozalek, Garraway and McKenna (2011), describe their interventions in the Physics course offered by the Physics Department at the University of the Western Cape (UWC), as *"learning for professional development"* and allow for students to understand the links between concepts in Physics and so understand the structures of their knowledge as it progresses from basic to more advanced topics. They believe that these interventions have helped to avoid the negative attitude towards Physics as a result of not understanding the links between concepts and how they develop in complexity.

The Extended Curriculum Programme (ECP) Physics course is centered around not only the content of Physics (solving equations, formulae, etcetera) but also on the social practices within the world of Physics. Students are required to use the correct vocabularies when talking about solving a problem, look at ways of reading and talking and writing and thinking like physicists. Students would now be engaged in the discourse of Physics. This allows students to see the relevance of Physics in their daily lives.

The curriculum and classroom activities are centered on investigating and solving problems more so than identifying an equation that will only give one an answer. The classroom itself is considered key to teaching Physics and large lecture type venues were substituted with smaller flat spaced venues that allowed for peer engagement, group discussion, presentations, practice and experimentation.

One positive result of this intervention is an increasing number of third year students who started their first year in ECP. Another is the feedback from second year and third

year lecturers who report that students who are second and third year and who come from the ECP course show a deeper understanding of the work.

Case Study 2: This case study by St Clair Henning in “Case Studies of Epistemological Access in Foundation/Extended Curriculum Programme Studies in South Africa” by Bozalek, Garraway and McKenna (2011) describes the practice of service learning as a tool to allow for epistemological access. Service learning is practiced where students participate in a community service project. This requires students to integrate theory and practical application to, in most cases, provide solutions to problems faced in the community.

The service learning project in the Department of Food and Technology at Cape Peninsula University of Technology (CPUT) required second year students to train informal small scale trout farmers in basic food hygiene, personal hygiene, food safety and post-harvest processing technologies. Students had to use the theory learned in the different subjects to assist them. This provided a real-life opportunity to practice working in the field of Food Technology and so could be seen as a tool to allowing epistemological access. Through presenting the courses to the trout farmers, the students themselves improved their communication skills and learning skills and experienced personal growth in their chosen field of study.

To facilitate the learning from the service learning project, students did not only have to prepare the one day workshop for the trout farmers, but they were also required to reflect on their learning in the project in the form of written reports and presentations. The reflection activities were important tools to consolidate what they had learned and so allowed for epistemological access to the field. Self-reflection was emphasized as it was believed that this helped with personal growth and allowed students to connect the theory learned in the class to the practical application.

Case Study 3: This case study by Carelse in “Case Studies of Epistemological Access in Foundation/Extended Curriculum Programme Studies in South Africa” by Bozalek, Garraway and McKenna (2011) is a reflection of the teaching and learning strategies

used in the ECP in the Bachelor of Social Work degree offered at UWC. These strategies were implemented with the intention of facilitating epistemological access. The dominant strategy was that of self-reflection as a tool for learning.

The intervention used to practice self-reflection was in experiential learning. Experiential learning was chosen because it is an ideal means to reflect on one's experiences and apply knowledge to real-world situations. The theoretical base for this case study was based on Kolb (1984), cited in Atherton (2005), where Kolb describes experiential learning as a four-stage process. Figure 20 below is a representation of Kolb's learning cycle. Stage 1 is the Concrete Experience, where the student experiences the environment. Stage 2 is Reflective Observation, where the student tries to make sense of the experience. Stage 3 is Abstract Conceptualisation where the student formulates ideas on how to change (improve) the experience and stage 4 is Active Experimentation where the ideas are changed into actions and put into practice.

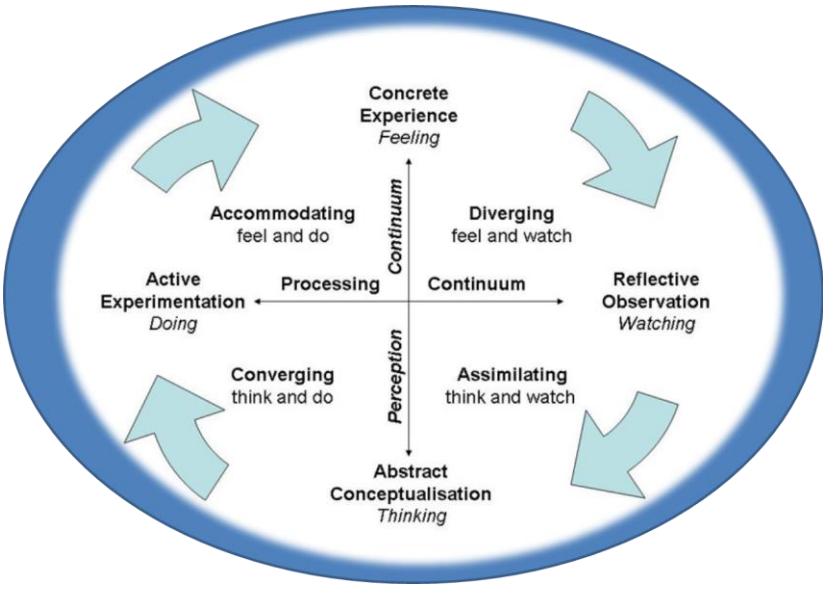

Figure 20: Kolb's Learning Cycle (McLeod:1)

Students were divided into groups in the first semester, and throughout the semester the groups had to deliver on either group or individual tasks in the form of presentations, debates, case studies, essay writing and concept mapping. At all stages during the learning the group had to reflect on individual contribution and the effort of the group as a whole.

The conclusion that was drawn in this case study is that this intervention was suited for the development of critical thinking. It was aimed at the construction of knowledge and aided students to apply knowledge to the real world, an important facet in epistemological access.

To sum up the achievements of these case studies, epistemological access is vital in drawing a student into his or her chosen course of study. Epistemological access has to be driven by the lecturer in the interventions put in place during the course of study. The three case studies demonstrated three effective ways of allowing for epistemological access, namely, multi-modal learning, service learning projects and self-reflection in experiential learning.

3.9 QUALITY MANGEMENT IN THE SOUTH AFRICAN CONTEXT

The question remains whether the developments in South Africa's higher education system has taken into account not only accessibility to higher education, but also a sufficiently adapted teaching and learning methodology that can address and accommodate the needs of all its students. Scott, Yeld and Hendry (2007) argue that academics are not sufficiently involved in the quality assurance system at higher education, a quality assurance system that extends beyond the administrative aspects of a higher education institution and its programmes. There is a need for institutions to continually evaluate the teaching and learning processes and so highlight problems and limitations that could hinder South Africa's strive to develop a new generation of students. But the need is also there to identify teaching and learning processes that have yielded good results in terms of not only producing graduates, but also graduates who are able to take on the global socio-economic challenges.

Tinto (2005) states that higher education institutions are not taking student success seriously. Institutions recognise the problem with high attrition rates, put programmes and many other interventions in place but do not necessarily take the problem seriously.

Tinto (2005) identifies six conditions that need to be in place at higher education institutions that support student success. The first is commitment. Commitment must not only come in the form of programmes, mission statements, etcetera, but institutions need to provide resources and incentives and rewards to enhance student success. The second is expectations. Institutions need to raise their expectations of students in order to force students to perform. Higher expectations result in greater effort, low expectations result in less effort. The third is support in the form of academic, social and financial support. Academic support is needed to support students who enter the higher education system unprepared for the academic demands placed on them. Social support is needed to assist students to adjust to the change from secondary education to higher education and help them find their way around. Financial support is a reality that exists for many students. Ease of financial difficulties can result in less distraction from their studies.

The fourth condition is feedback. Students will succeed if there is regular feedback on their performance from faculty and staff. Feedback from students to staff is also useful in assisting in areas of difficulty. The fifth condition is involvement. Students need to be drawn in to become involved in their studies both academically and socially. Involvement happens in the classrooms and laboratories. In most cases, students do not have the time to get to know their classmates outside of class, so interaction through classroom activities and group activities allows for social adhesion, which makes academic involvement and support from each other possible. Tinto (1993) refers to this as *"building educational communities"*.

The sixth and final condition is learning. Students are more likely to succeed in settings that foster learning. Learning is linked to involvement (mentioned above) in that getting students involved in their learning leads to better learning.

Tinto's six conditions tie in with Scott, Yeld and Hendry (2007) in that all six conditions can only be met by staff who are committed and involved. No amount of funding or programmes can make student success work unless the staff who teach on these programmes through continual evaluation of their teaching and learning practices, identify the problems students are experiencing and address them. There is a need for quality management practices with teaching and learning at higher education institutions.

3.9.1 The HEQC and Quality Management in South African Higher Education

As described in Chapter 2, the CHE is an independent body established to advise the Minister of Higher Education on matters relating to higher education. The HEQC is a subsidiary of the CHE, with the specific purpose of focusing on quality assurance in higher education. Further described in Chapter 2 is the mechanism put in place by the HEQC to address quality assurance in higher education in South Africa. The process involved two cycles the first of which ran from 2004 to 2011.

> *The HEQC system utilized four well-known elements of quality assurance:* ***programme accreditation*** *assured provider compliance with minimum standards,* ***national reviews*** *focused on existing programmes to reinforce accountability of providers, the* ***institutional audit*** *process looked at the effectiveness of an institution's internal quality assurance mechanisms in the three core functions (teaching and learning, research and community engagement and* ***quality promotion*** *focused on training in quality assurance methods* (CHE, 2011:4).

During this time much came to light regarding Higher Education Institutions in South Africa and the higher education system as a whole. Gaps were identified in terms of policies, processes and structures.

The first cycle focused on institutional audits, with particular focus on fitness for purpose and on *"the effectiveness of internal systems for quality management"* (CHE, 2011:5).

Programme accreditation allowed for an awareness of meeting minimum standards. As a result, institutions that received provisional accreditation were given *"a time-frame to meet the required minimum standards, and these must be met before the programme can be offered"* (CHE, 2011: 5).

National reviews allowed for benchmarking with a close analysis of national programmes in relation to international good practice. This practice was considered to be most effective on the part of the HEQC to promote quality (CHE, 2011).

3.10 QUALITY MANAGEMENT IN HIGHER EDUCATION ACROSS THE GLOBE

Quality management in higher education is very difficult to define as there are various stakeholders in higher education and various role players in higher education, and each of these, in order to operate optimally, need to have a quality management system in place. But this is not an easy process, as trying to find a quality management system used in industry that is well-suited for higher education has proven to be difficult for various reasons.

The first of these reasons is the fact that there are internal and external stakeholders in higher education who have different views and different expectations of quality. External stakeholders in education have concerned themselves mainly with quality assurance in the processes implemented to provide an adequate service. Examples of external stakeholders in higher education would be the Department of Higher Education and Training, professional bodies, for example, the Engineering Council of South Africa (ECSA), industry and external funders. According to Brookes and Becket (2008), external stakeholders are *"concerned with the measurement and evaluation of institutional quality assurance procedures"* and *"the effectiveness and reliability of the quality assurance systems and processes in managing quality and academic*

standards". Quality assurance mechanisms are usually used by management to focus on course or programme accreditation.

Brookes and Becket (2008) cite Elton (1992) in his reference to external stakeholder quality assurance as referring to the quality A's – accountability, audit and assessment, which refers to the control of quality and the people who control quality.

Internal stakeholders are the providers of the education and the receivers of the education. According to McKay and Kember (1999), internal stakeholders should be focused on quality enhancement rather than quality assurance. Quality enhancement is the practice of focusing on quality teaching and learning through innovative practices, and addresses issues such as empowerment, enthusiasm, expertise and excellence (E's) (Elton (1992) cited by Brookes and Becket (2008)). Examples of quality mechanisms used by internal stakeholders are self-evaluation and student feedback.

A second reason for the difficulty in defining quality management in higher education is the fact that the educational product is a complicated one. Various researchers have attempted to define a good output of higher education. Is it one that has learned well, one that has fitted well into the needs of society or one that earns well? It all comes down to a matter of the quality of teaching and learning. Harvey (1995) however argues that there is no end product in higher education, as learning is seen as a lifelong process and higher education is merely a transformation that a student goes through as part of his or her learning.

3.11 DRIVING FORCES BEHIND QUALITY MANAGEMENT IN HIGHER EDUCATION

In a comprehensive study of quality management in higher education, Brookes and Becket (2008) state that there were no global initiatives for quality in higher education but that quality management practices were undertaken at national and sometimes even individual institutional level. In a comparison of these higher education quality management practices, Brookes and Becket (2008) listed three broad environmental forces that drive change in higher education. These are political forces, economic forces

and socio-cultural forces. These environmental forces have a direct impact on quality management in higher education.

Political forces would include either government initiative to widen access, government development of more higher education institutions or stricter government control of higher education curriculum and management.

Economic forces are reduced or limited funding per student, rising costs per student, greater emphasis on internationalisation and a dependence on international student fees.

Socio-cultural forces include a greater demand for a place to study, a greater diversity of student population, a greater diversity of provision and the consumer's need for greater accountability or value for money.

From these environmental forces it was found that in South Africa the force was mainly that of government's drive to increase access to higher education and a diverse student market as a result of this. This results in concerns regarding the quality of the provision of higher education (Brookes and Becket, 2008).

Increased access to higher education leads to student demand for higher education and subsequent expectations from students about the quality of education received. OECD (2006) estimates that earning power for graduates is 8-20% higher than for non-graduates. Employers who recruit graduates expect graduates to make a significant contribution to their businesses and ultimately to national economic growth. As such, students expect that higher education will lead to good employment and a good return on their investment (tuition fees). Students and employers are therefore demanding more from higher education. The quality of the education provided impacts directly on all of this and places the emphasis on effective quality management in higher education. To be accountable to both student and industry, higher education has borrowed quality management and efficiency models from industry.

The review panel of the HEQC's quality assurance first cycle came to the conclusion that although the South African higher education system is growing, the system does not produce sufficient graduates and *"of those who graduate few do so within the stipulated minimum time"* (CHE, 2011: 7).

A clear outcome for the review panel of the HEQC's quality assurance programme was the need to focus on teaching and learning in the second cycle, as quality in teaching and learning had a direct impact on not only the number of graduates produced, but also the quality of graduates produced.

According to CHE (2011: 9), some of the points highlighted through the institutional audits with regard to teaching and learning are:

- *The increase in formal access to higher education has not been accompanied by a proportional increase in epistemological access.*
- *Teaching philosophies, when articulated or documented, suggest that at many institutions students are seen as a-social, a-cultural, autonomous beings whose ability to succeed in higher education depends on factors inherent in the individual, such as 'motivation' and 'potential'.*
- *The notion of 'disadvantage' is understood as expressing the relationship between socio-economic context and lack of preparedness for the demands of higher education. This has not resulted in the development of approaches to curriculum and overall educational process or in the professional development of academics to be able to deal appropriately with the needs of a new and different generation of students.*
- *At the majority of higher education institutions there are examples of excellence in teaching and learning. However, these occur as a result of the dedication of individuals rather than as a result of an institutionally-driven strategy.*

These highlighted factors once again reinforce the need for quality management practices in teaching and learning and a teaching strategy, such as the extended

curriculum programme, that places specific emphasis on teaching methodology that can assist in the low throughput and low graduation rates in higher education.

3.12 QUALITY MANAGEMENT IN HIGHER EDUCATION AND QUALITY MANAGEMENT IN INDUSTRY

Harvey and Knight (1996) have placed views of quality in higher education into five interrelated industry approaches to quality. The first is quality as exceptional. In this approach, quality is seen as something that is measured against a set of standards. A product or service is seen as excellent if it exceeds high standards. In the traditional notion of quality as exceptional in higher education, exceptional quality was based on the name and reputation of an institution.

The second is quality as perfection or consistency. In this case, quality is seen as getting it right the first time or in getting it right all the time. This approach is distinguished by its aim for zero defects, and a culture of quality is cultivated amongst employees.

The third is quality as fitness for purpose. This approach sees quality in relation to the purpose of the product or service. The thinking is that a product may have zero defects, but if it is not fit for purpose it is useless. This approach is difficult to define in higher education as the notion of who the customer is, is one for debate. Is the customer in higher education the student who receives the service or is the customer those who fund the provision of the service (e.g. Department of Higher Education and Training)? An alternative view could be that of the institution defining quality in terms of its mission.

The fourth approach is quality as value for money. In recent years there has been great pressure on institutions to be efficient and effective while dealing with expansion without a comparable increase in resources. Institutions would then be seen as being judged of good quality if they can do much with so little.

The fifth and final approach is quality as transformation. The operative word in this approach is *"qualitative change"* (Harvey and Knight, 1996: 18). It is the change of form. Students are seen as going through transformation if they enter higher education

in a particular "form" and through education at the higher education institution are transformed into seeing life and the world differently. This approach seems to be more applicable to higher education, as many of the other processes focus on a product or service and there could be problems in attempting to equate education to a product. Education is more of a process than a product or a service.

3.13 QUALITY MANAGEMENT MODELS APPLIED TO HIGHER EDUCATION

Brookes and Becket (2008) identified several quality management models that were originally developed for industry, and have been applied to higher education. Table 11 lists the industry quality management models and a brief definition of each that is applicable to higher education. Total Quality management (TQM) is the model most frequently drawn upon as it prescribes to take the perspectives of all stakeholders into consideration.

Table 11: Industry Quality Management Models (Brookes and Becket, 2008: 18)

Model	Definition
TQM	Based on the participation of all its members. Success is measured through customer satisfaction and the benefits to all members and society.
EFQM Excellence Model	Non-prescriptive framework that establishes 9 criteria (divided between enablers and results), suitable for any organisation to use to assess progress towards excellence.
Balanced Scorecard	Performance/strategic management system which utilises 4 measurement perspectives: financial, customer, internal process, and learning and growth.
Malcolm Baldridge Award	Based on a framework of performance excellence which can be used by organisations to improve performance. 7 categories of criteria: leadership; strategic planning; customer and market focus; measurement, analysis and knowledge management; human resource focus; process management; and results.
ISO 9000 Series	International standard for generic quality assurance systems. Concerned with continuous improvement through preventative action. Elements are customer quality and regulatory requirement, and efforts made to enhance customer satisfaction and achieve continuous improvement.
Business Process	System to enable redesign of business processes, systems and structures to achieve improved performance. It is concerned with change in five

Reengineering	components: strategy, processes, technology, organisation and culture.
SERVQUAL	Instrument designed to measure consumer perceptions and expectations regarding quality of service in 5 dimensions: reliability, tangibles, responsiveness, assurance and empathy and to identify where gaps exist.

Brookes and Becket (2008) state that all of the above models have a common requirement of self- assessment against defined criteria.

What follows in Table 12 is a summary of the application of the above quality management models to higher education, with a look at the benefits and limitations of the application of the models to higher education. This summary was the result of a review of quality management practices in higher education over a ten year period by Brookes and Becket and published in 2008.

Brookes and Becket (2008) point out that particular models benefited different higher education stakeholders. As benefits of the application of these models, for example, TQM models were geared at improvements in customer service and faculty morale, whereas the balanced scorecard seemed to benefit budgeting, resource allocation and reward systems. ISO9000 on the other hand benefited inter-departmental working conditions and student enrolment. A common thread in all the models was that students were seen as customers.

As for limitations, the most prevalent limitation was bureaucratic structures within higher education. Another limitation was the lack of effective leadership to see quality management happening. A final distinctive limitation was that it was difficult to quantify the outputs for higher education in teaching and learning and research (Brookes and Becket, 2008).

At this point in the South African higher education environment, the HEQC is closely overseeing quality management in higher education. And with the second cycle of quality assurance placing emphasis on teaching and learning, the need is to be able to

gauge the effectiveness of teaching interventions, such as the extended curriculum programme by looking at how these interventions assist in contributing to an increased throughput rate and an increased graduation rate. Different quality measurements (quantitative and qualitative) need to be applied to achieve a result.

Table 12: Quality Management Models Applied in Higher Education (Brookes and Becket, 2008)

Model Tested	Author (year), Country	Benefits/Limitations
TQM models include: **5-step Programming** **Service guarantees** **HoshinKanri** **CQI** **QFD** **CRM**	• Seeman& O'Hara (2006) USA • Thakkar et al (2006), India • Popli (2005), India • Sahney et al (2004), India • Roberts & Tennant (2003), UK • Cruickshank (2003), USA, Australia and UK • Wildrick et al (2002), USA • Aly&Akpovi (2001), USA • Hwarng&Teo (2001), UK and Singapore • Lawrence and McCollough (2001) USA • Pounder (1999), Hong Kong • Roffe (1998), UK • Motwani& Kumar (1997), USA • Colling and Harvey (1995), UK	Benefits: • Integrates TQM with the strategy and links goals with processes through self assessment • Encourages disciplined thinking about tangible and intangible aspects of academic activities • Identifies key processes and operational aspects required in design and delivery of courses in line with customer voice • Demonstrated improvements include customer service, university processes, staff and faculty morale, course quality and personal hiring Limitations: • Difficulty in transferring TQM principles developed for industry to HE environments including defining outputs; autonomy of academic staff; bureaucratic and fragmented structures; application to complex course structures; definition of student roles within HE (customer or co-producer0 • More relevance to academic service functions than teaching quality • Challenges regarding leadership skills and institution-wide strategic planning • Lack of acceptance and application of TQM in HE
EFQM	• Calvo-Mora et al (2006), Spain • Tari (2006), Spain • Hides et al (2004), UK • Osseo-Asare&Longbottom (2002), UK • McAdam&Welsh (2000), UK	Benefits: • Integrated map of management issues valued an useful to secure confidence of stakeholders • Useful as a basis of self-assessment • Tests relationship between enablers/results Limitations: • More relevant to service functions • Dilemma of applying business language to public sector • It can be 3 to 5 years before benefits are evident • Challenges regarding managerial skills and top level commitment in HE • Lack of integration between EFQM and national HE quality control mechanisms

Balanced Scorecard	• Chen &Shiau (2006), Taiwan • Cullen et al (2003), UK	Benefits: • Scorecard used to manage rather than just monitor performance • Focus on performance management and evaluation • Staff understand performance targets • Improved budgeting, resource allocation and reward systems • System can increase educational quality • Limitations: • Performance indicators require careful identification specific c to situation and can be dysfunctional unless grounded in strategy
Malcolm Baldridge Award	• Arif& Smiley (2004), USA	Benefits: • Evident in operational elements; strategic and budget planning, careers, outreach and information services • May be immediate and long standing
ISO9000 Series	• Sohail et al (2003), Malaysia • Shutler& Crawford (1998), Singapore	Benefits: • Quality certification can improve inter-departmental working conditional, student enrolment, and staff/supplier satisfaction • Continuous improvement achieved preventative action Limitations: • Scientific control less achievable in higher education than manufacturing
Business Process Reengineering	• Sohail et al (2006), Malaysia • Welsh &Dey (2002), USA	Benefits: • Cost effective method for accountability • Enables organisation to become improvement driven through re-focusing core processes to improve both productivity and service levels • Takes a broad number of stakeholder views into account • QMS 2000 at the University of Louisville has significantly enhanced the use of data for quality

		assurance purposes
Modified (SERVQUAL)	• Abdullah (2006), Malaysia • Markovic (2006), Croatia • Ford et al (1999), New Zealand and USA • Kwan & Ng (1999), China and Hong Kong	Benefits: • Enables assessment of internal and external customer views which is important in a competitive environment Limitations: • Student culture impacts upon perceived importance of different elements of HE and thus on perceptions of quality • Performance indicators related to management processes but do not address education quality

With these limitations, in mind, especially that of effective quality management in teaching and learning, several academics have made attempts to develop models that are more applicable to encompass all spheres of higher education. Table 13 on the next page is a compilation by Brookes and Becket (2008) that provide an overview of quality management models developed and tested at specific institutions over the ten year period of their research.

The models in Table 13 still rely heavily on industry models but some distinctively place emphasis on the student learning experience. Brookes and Becket (2008) however conclude that many authors, in their review state, that the emphasis on quality management in higher education is still too heavily weighted on non-academic matters, and fails to focus on *"the learning experience of an increasingly diversified student body"* (Brookes and Becket (2008: 26).

Table 13 shows several models that place the emphasis on student learning and the student experience. The "Model for Quality Management in Higher Education" places emphasis on teaching and learning by applying the transformative model of teaching and learning, where the students are equal participants in the learning process and control the learning taking place in the classroom. The "Model to Assess Quality of Student Experience and Learning Outcomes" places emphasis on the student experience and gauges this by looking at growth in student numbers and the opinion of the students on their university experience.

The "ISO-Based TQM Model" looks at an inclusive approach to quality management by including, amongst other things, programme management and operations, curriculum design, assessment and student support.

Table 13: Quality Management Models Developed for Higher Education (Brookes and Becket, 2008)

HE Specific Models Developed		
Model for Quality Management in Higher Education	Srikanthan&Dalrymple (2004, 2003, 2002), Australia	• Approach is based on evidence from educational literature • 4 methodologies; transformative; engagement theory of programme quality; methods to develop a university of learning; strategies for achieving a responsive university • In teaching and research students are participants and the focus is on their learning • Implements of 2002 model focusing on philosophies and approaches to student learning and methods of engendering a dynamic collaboration around student learning • Recommends a move from the ritual of teaching to focus on student learning, academic productivity and organisation performance • Radical change using student learning as the central criterion
Excellence Model	Pires da Rosa et al (2001, 2003), Portugal	• Based on empirical research, 9 criteria supporting self analysis and acting as a source for quality improvement and leading strategic development • Quality management associated with evaluation activities covering teaching and research and regarded by participants as positive
Academic Award Model	Badr& Abdulla (2004), UAE	• Concerned with teaching, research and services to develop a more explicit approach to faculty rewards/awards • Model includes criteria for diversification, course development, material production, student evaluation, course files, teaching portfolio and contributions to conferences and workshops
Model to Assess Quality of Student Experience and Learning Outcomes	Tam (2006, 2002), Hong Kong	• Assessment of quality in HE should be measured in terms of student growth, this calls for attention on student outcomes, including cognitive and non cognitive aspects of learning, skills and satisfaction with university environment • Investigates relationship between university experience and student outcomes as a means of determining a university's success in meeting its educational goals and proposes approach orientated to this • Instrument designed to help understand the student experience
Multi-models of Quality in Education	Cheng and Tam (1997), Hing Kong	• Identifies 7 models of quality in education and emphasis the complexity of pursing educational quality • Effectiveness and quality are concepts used to understand performance, so approach needs to be comprehensive and take account of longer term goals • Cross cultural issues require further investigation
Performance Measures for Academic Departments	Al-turki&Duffaa (2003), Saudi Arabia	• Adopts a systems approach and identifies performance measures to evaluate productivity, efficiency, effectiveness, internal structure, growth and development

		• Hierarchical performance measurement model is based on outcome measures for each category- input, process and outputs
Internal Audit	Reid &Ashelby (2002), UK	• Identifies tangible benefits from internal audits, such as: significant cultural changes which can re-enforce quality enhancement, create greater staff involvement, as well as benefits to this institutions • Considers programme management, development, qualities/quantitative information, snapshot/longitudinal time span, quality dimension assessed and system elements
Internal Audit	Becket & Brookes (2006), UK	• Model to evaluate quality management approaches in departments • 6 dimensions identified: internal/external perspective, qualitative/quantitative information, snapshot/longitudinal time spam, quality dimension assessed, and system elements
Quality Dimensions Framework	Owalia&Aspinwall (1996), UK	• 30 different quality characteristics identified for HE using generalised dimensions defining quality drawn from manufacturing/software and service methods
Programme Evaluation Model	Mizikaci (2006), Romania	• Considers HE as a system (input, process and outputs) for programme evaluation and identifies social, technical and management systems within these
Quality Management Framework	Grant et al (2004, 2002) Widrick et al (2002), USA	• Identify dimensions of quality in HE – quality of design, conformance and performance • Quality of performances least likely to be considered
Subject Quality Assurance System	Martens & Prosser (1998), Australia	• University-wide system assurance to enable systematic review and enhancement if individual subjects, allowing for discipline-specific requirements • The focus is on the improvement of student learning
ISO – Based TQM Model	Borahan&Ziarati (2002), Turkey	• Combine TQM, Malcolm Baldridge and ISO 9000 principles drawing on USA and UK practices to identify quality criteria • Building blocks for quality assurance and control include: programme management and operations, curriculum design content and organisation, teaching learning and assessment, student support and guidance, and quality assurance and enhancement
5 Phase TQM Implementation Model	Motwani& Kumar (1997), USA	• Identifies the issues which institutions need to consider when implementing TQM in 4 phases: deciding, preparing, starting, expanding or integrating and evaluating

To conclude, this chapter has placed quality management in higher education into perspective by first looking at the meaning of quality and describing quality management models applied in industry. Then a closer look at teaching and learning was taken, with a view of improving teaching and learning at higher education institutions and working towards producing graduates fit for the 21st century. The two spheres (Quality and Teaching and Learning) were then married by looking at Quality Management in Higher Education. The challenges faced with quality management in higher education were highlighted and then the application of industry quality models in higher education was evaluated. Finally, a discussion around the development of quality management models in higher education looked at actual examples of the application of some of these models.

From the literature citied in this chapter it is clear that there is still a large amount of research to be done in quality management in higher education, as a review of systems at higher education institutions has revealed that when it comes to quality management in higher education, more emphasis has been placed on quality management systems in the administration sector of higher education than the teaching and learning sector. Teaching and learning is most certainly an area that has a need for a quality management system as pointed out in the literature because of the growing demand from the business world for graduates who can meet the demands of a growing and competitive economy.

Higher education institutions produce graduates who have a qualification in a field. The American Heritage Dictionary (2000) and Compact Oxford Dictionary and Thesaurus (2006) define a qualification as "*a quality or ability that makes someone capable of doing a task*". The emphasis is on quality, and programmes within a higher education institution have to ensure that what they are producing are graduates who possess the quality or qualities as required by industry. A simple quality management process as described in this chapter is applicable to qualification programmes in higher education. This is illustrated Figure 21 where, just as in industry, a product or service is first designed and carefully thought through, then executed where areas for improvement

can be identified and finally the product or service goes through continual improvement to keep all customers happy.

Figure 21: Quality Management Simplified

Chapter 4 is a description of the methodology applied to gathering data on a specific programme in a department in the Faculty of Engineering. The purpose in gathering information is to gauge the success of the programme in meeting its objectives and the quality management practices in place to ensure the success of the programme.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

The logical process to follow to reach answers and conclusions to the question of "What quality management practices are in place in the Extended Curriculum Programme at a University of Technology?", is to look at the current results of the ECP and work back to practices in the programme that have led to the results, and so determine if those practices are effective and whether the ECP was successful in meeting its objectives. Shortcomings within the programme can then be identified. The analysis of data in this thesis started off by identifying a cohort of ECP and Mainstream students from a particular department within the University of Technology. An analysis and comparison of student performance (throughput rate, graduation output, and further studies) was then done.

The next step towards looking at quality management practices in the ECP was to look at graduates of ECP (of the above-mentioned cohort) in the workplace and focus on aspects like employability, earning power and adaptability in the world of work (21st century skills) as indicators of the success of the ECP.

Finally, interviews with lecturers teaching on the ECP determined the interventions implemented in the classroom and the programme as a whole, and the monitoring of the success of such interventions.

The three focus areas (student success, graduates in the workplace and classroom practices) are interlinked and cyclic in looking at the success and continual improvement of the ECP at the University of Technology.

Figure 22 below shows the relationship and cyclic nature of these three focus areas.

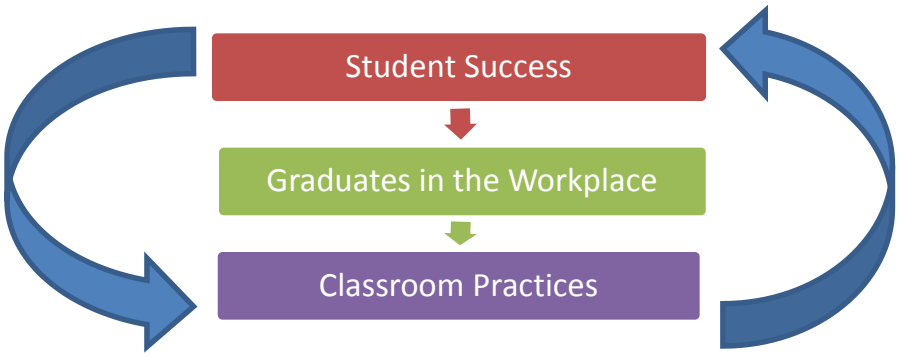

Figure 22: Focus areas for success and continual improvement

Primary information for this research was gathered using mixed methods, which are both quantitative and qualitative methods. It was decided to focus the research on the Department of Mechanical Engineering at the University of Technology. The motivation for choosing the Department of Mechanical Engineering was the fact that statistics on student success indicate a definite shortage of skills in the Science, Engineering and Technology field (SET), as pointed out by the Council on Higher Education (2000) in its recommendation to the Minister of Education in 2000. SET is one of the categories in which subject matter is classified according to the Higher Education Management System (HEMIS). These categories are called Classification of Educational Subject Matter (CESM). The Department of Mechanical Engineering would therefore be used as a sample of a course that would contribute to addressing some of the skills shortages in the SET field.

Scott, Yeld and Hendry (2007) showed that graduation for National Diplomas in Engineering in regulation time sat at between 5-11% for the 2000 cohort. The statistics are detailed in Table 14 below.

Table 14: National Diplomas, by selected CESM: All first-time entering students, 2000 cohort (Scott, Yeld and Hendry, 2007: 26)

CESM	Grad in 3 years	Grad in 4 years (cumulative)
04: Business/Management	18%	28%
06: Computer Science	14%	27%
08: Engineering	5%	11%
21: Social Services/Public Administration	13%	25%

This figure had not changed significantly by 2007 when the Advice and Monitoring Directorate of the Council on Higher Education (2009) reported that the graduation rate for SET had only reached 17% for all public higher education institutions and only 17% of the 2000 cohort for National Diploma students had graduated after five years. Table 15 below illustrates the graduation of the 2000 cohort after five years.

Table 15: National Diploma graduation rate for first-time entering students of the 2000 cohort (Advice and Monitoring Directorate of the Council on Higher Education, 2009: 36 from CHE 2007)

Subject area	Graduated within 5 years	Still registered after 5 years
Business / management	33%	8%
Computer science	34%	11%
Engineering	17%	14%
Social services / public admin.	29%	6%

A further motivation for using the ECP in the Department of Mechanical Engineering is that the ECP had been running in the Department of Mechanical Engineering since 2007. Prior to the ECP, the Department of Mechanical Engineering had a Foundation

Programme running. The Foundation Programme was a bridging course that assisted students to move on to the Mainstream programme after completion of it. The ECP however, runs concurrently with the Mainstream Programme and follows the same curriculum but is offered over a longer period of time. This is discussed in more detail further in the chapter. It is for this reason that the sample for the primary information was chosen from the ECP.

Finally, the ECP is an initiative to address student throughput, graduation output and student success at higher education and fits perfectly within the ambit of the Quality Enhancement Project as a measure to gauge the efficacy and efficiency of teaching and learning at a higher education institution.

4.1 QUANTITATIVE METHOD

The quantitative research component in this study was conducted by collecting and analyzing historical data on the 2007 intake of first-time students (both in ECP and mainstream studies) in the Department of Mechanical Engineering at a University of Technology. The 2007 cohort was specifically chosen for several reasons.

The first reason is that students in both ECP and mainstream would by the end of 2013 have had 1½ times the regulation time to complete their National Diploma. Regulation time refers to the minimum required time to complete the qualification. In the case of the Extended Curriculum Programme, regulation time for the National Diploma is four years and regulation time for the mainstream is three years.

The Extended Curriculum Programme offers semester 1 over one year and semester 2 over one year. Semester 3 and semester 4 are six months each (as in the mainstream). Experiential learning is 1 year in length for both ECP and mainstream. Regulation time for ECP is therefore 4 years and mainstream is 3 years. Figure 23 on page 107 illustrates the time frames for the two programme offerings.

EXTENDED

S1	S2	S3	S4	In-service training
1 year	1 year	6 months	6 months	1 year

MAINSTREAM

S1	S2	S3	S4	In-service training
6 months	6 months	6 months	6 months	1 year

Figure 23: National Diploma in Mechanical Engineering programme duration

The second reason is that the data would reflect how many students have gone on to further studies i.e. B-tech or Masters. The final reason is the fact that students who have entered the workplace would have had some time to establish themselves in their chosen field.

Even though the merger of higher education institutions took place in 2005, for logistical reasons (physical space being one), the physical merger of some departments at the University of Technology had not happened in 2007 yet. This was the case with the Department of Mechanical Engineering at the University of Technology in the study. In 2007 the Department of Mechanical Engineering was still operating from two campuses, Bellville and Cape Town. The sample of this study is based on student enrolments at the Bellville campus.

Forty four students had enrolled for the ECP in 2007 and 77 first-time entering students had enrolled for the Mainstream in the Department of Mechanical Engineering. Historical data was gathered from the University of Technology's database (Mass Information System). The raw data was tabularized and levels of study within the qualification were colour-coded for easy tracking of student progress. This was done over a period of one month. The final spreadsheets of the organized data are attached as Appendix A (ECP) and Appendix B (mainstream).

The organized data was then used to determine the throughput rate from S1 to S2, S2 to S3 and S3 to S4 for this cohort. The attrition rate was calculated. The graduation rate in regulation time and beyond (till 2013) was then calculated. Finally, the number of students who went onto post-graduate studies was calculated from the data.

The quantitative method attempted to answer the following investigative sub-questions:

- What percentage of students succeeds from S1 to S2, S2 to S3 and S3 to S4 in the minimum required time in the Department of Mechanical Engineering?

  Figure 24 below shows what information will be derived from the data in order to address the question.

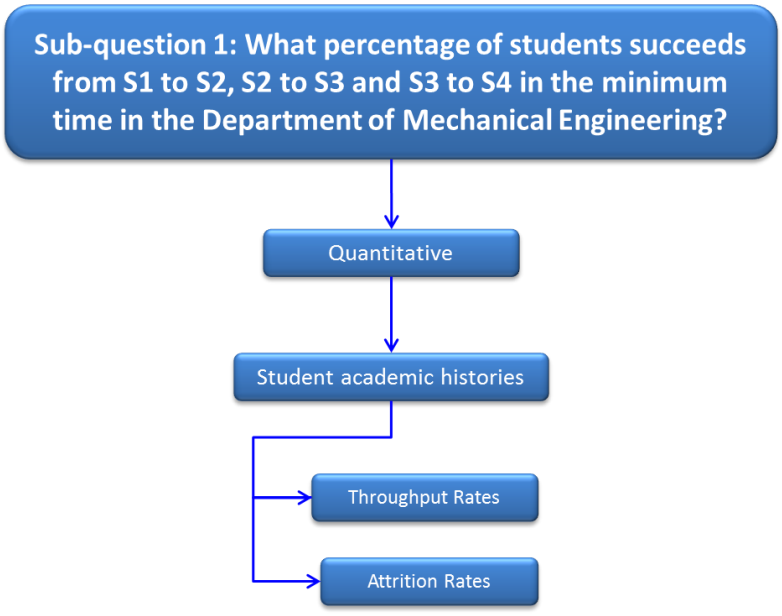

Figure 24: Methodology for addressing Investigative sub-question 1

- What percentage of first time students graduate in minimum time at the Department of Mechanical Engineering?

  Figure 25 below shows what information will be derived from the data in order to address the question.

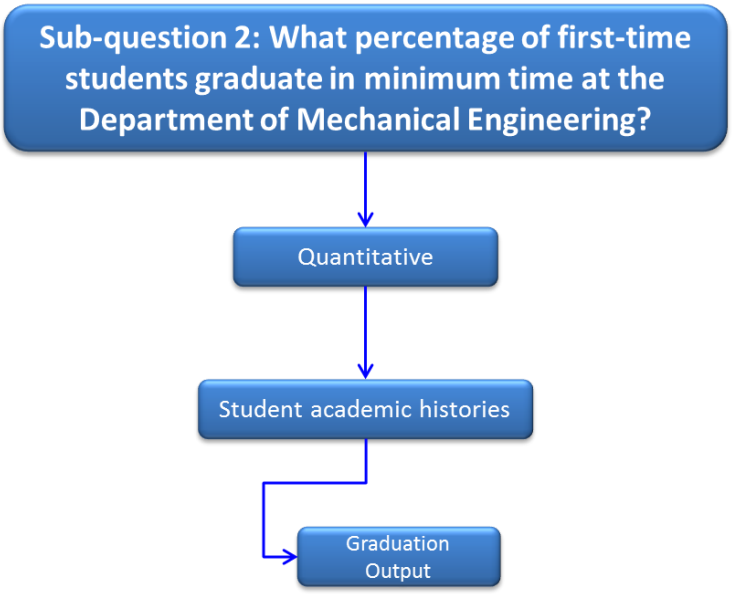

Figure 25: Methodology for addressing Investigative sub-question 2

- What percentage of ECP students go onto postgraduate studies?

  Figure 26 on page 110 shows what information will be derived from the data in order to address the question.

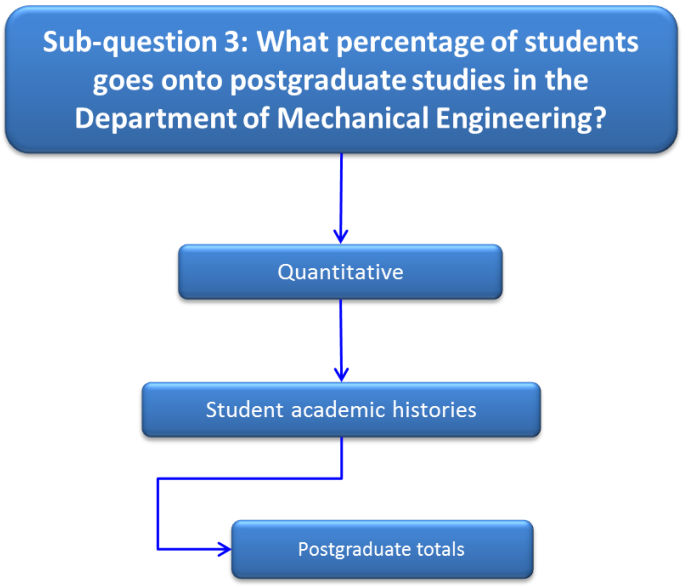

Figure 26: Methodology for addressing Investigative sub-question 3

4.2 COMBINATION OF QUANTITATIVE AND QUALITATIVE METHOD

A combination of some quantitative and qualitative research in this study was conducted by doing a survey with a sample of the 2007 ECP cohort who had graduated with a National Diploma in Mechanical Engineering from the University of Technology who had now entered the world of work. The survey was aimed at determining the employment prospects for students who had graduated by doing the ECP course in Mechanical Engineering and the kinds of positions they hold in industry.

The focus of the questionnaire was to gather information on the environment graduates were employed in and how relevant their working environment was to their field of study, as well as the opportunity for growth presented to them by their current employer, based on their abilities. Another focus of the questionnaire was to look at how some of the skills transferred to the graduates during their studies had benefited them in their workplace.

Twenty students in the 2007 ECP cohort had graduated to date. Contact had been established with fifteen graduates and the questionnaire was e-mailed to them. Within a three week period, twelve recipients of the questionnaire had responded.

A copy of the questionnaire is attached as Appendix C.

This component of the study attempted to answer the following investigative sub-question:

- What employment prospects are available for students who graduate from ECP in the Department of Mechanical Engineering?

Figure 27 below shows what information will be derived from the data in order to address the question.

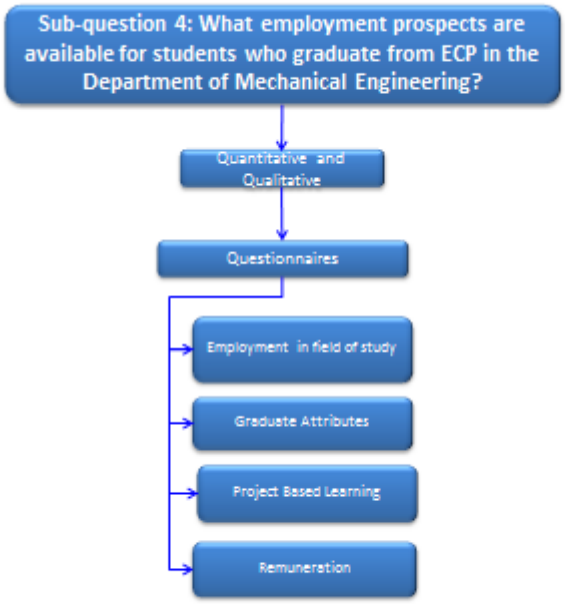

Figure 27: Methodology for addressing investigative sub-question 4

4.3 QUALITATIVE METHOD

Another qualitative component of the research was interviews conducted with staff members who teach on the ECP at the Department of Mechanical Engineering at the University of Technology. The aim of the interviews was to gauge the extent to which quality management practices are in place in the Department of Mechanical Engineering and to determine how this is related to success in the ECP.

Interviews were conducted on a one-on-one basis and the length of the interview was approximately 30 minutes. A copy of the guide questions for the interview is attached as Appendix D.

This qualitative method attempted to answer the following investigative sub-question:

- What Quality Management Practices are in place in ECP in the Department of Mechanical Engineering to gauge the success of teaching and learning interventions?

Figure 28 on page 113 shows what information will be derived from the data in order to address the question.

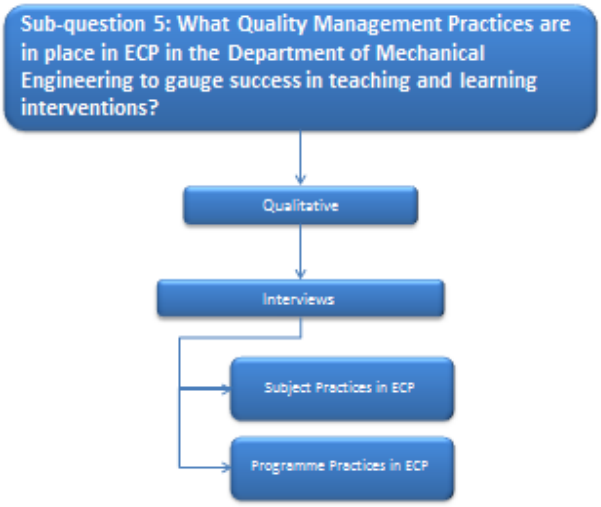

Figure 28: Methodology for addressing Investigative sub-question 5

The following chapter details the findings of the research and discusses its significance to the primary research question and investigative sub-questions.

CHAPTER 5: FINDINGS

How is the quality of an academic qualification measured? What is considered a quality programme in higher education? Who are the stakeholders in higher education? Whose voice is important in determining the quality of an academic programme?

Answers to these questions were attempted through the point of view of literature in Chapter 3. This Chapter took some of the theory and applied it to a sample. The sample was the 2007 cohort of the Extended Curriculum Programme in the Department of Mechanical Engineering at a university of technology. The ultimate goal of the research was to determine if quality management practices were in place in the ECP. In order to do this, the ECP had to be looked at from different angles and then collectively put the findings together to determine the quality management practices in place.

Firstly, in order to gauge if the ECP in the Department of Mechanical Engineering was succeeding in its objective of increasing throughput and graduate output and further studies, the 2007 ECP cohort in the Department of Mechanical Engineering was compared to the equivalent mainstream course cohort in the department. The academic histories of the students of these two programmes were compared and the answers to three investigative questions could be derived from the data. These investigative questions and the results are discussed as investigative questions 1 to 3 below.

Secondly, investigative question 4 looked at the graduates produced by the 2007 ECP cohort and their current employment. It was important to get the thoughts from the students, as they are considered to be one of the stakeholders in higher education.

Finally, investigative question 5 looked at the point of view of the lecturers who taught on the ECP in the Department of Mechanical Engineering and specifically focused on quality management practices in the classroom and for the programme as a whole.

What follows is a detailed description and analysis of the findings for the five investigative questions.

5.1 INVESTIGATIVE QUESTION 1: WHAT PERCENTAGE OF STUDENTS SUCCEEDS FROM S1 TO S2, S2 TO S3 AND S3 TO S4 IN THE MINIMUM TIME IN THE DEPARTMENT OF MECHANICAL ENGINEERING?

One hundred percent (100%) student progression is the ideal situation in a higher education environment. The percentage of students who move from one level of study to another is referred to as the throughput rate. However, many systematic faults hinder a large percentage of students from moving through their different levels of study. Scott, Yeld and Hendry (2007) point out that a possible reason for high dropout rate (attrition) at first year level is a "lack of educational continuity". This essentially is a lack of articulation between consecutive educational levels. In this case, articulation refers to the alignment of secondary school outcomes with the requirements for higher education.

Scott, Yeld and Hendry (2007) clarified the articulation problem further:

> *The problem is two-fold: the schools are not producing more well-prepared candidates and the higher education sector is not geared to successfully accommodate more than a very small proportion of the potential candidate pool in key subject areas.*

Table 16 below shows the number of students enrolled in ECP and mainstream respectively, and the throughput in numbers (headcount) for each level of study. The throughput was calculated on a student spending the regulation time (minimum time with no repeats) in a specific level.

Table 16: Throughput expressed in numbers (headcount)

	No. Registered	Semester 1 to Semester 2	Semester 2 to Semester 3	Semester 3 to Semester 4
ECP	44	18	15	6
Mainstream	77	32	16	16

Table 17 below shows the above numbers expressed as a percentage of the registered intake.

Table 17: Throughput expressed as a percentage

	No. Registered	Semester 1 to Semester 2	Semester 2 to Semester 3	Semester 3 to Semester 4
ECP	44	41%	34%	14%
Mainstream	77	42%	20%	20%

The bar graph in Figure 29 displays a comparison of throughput rates for ECP and mainstream students in the Department of Mechanical Engineering at a University of Technology per level of study in the course.

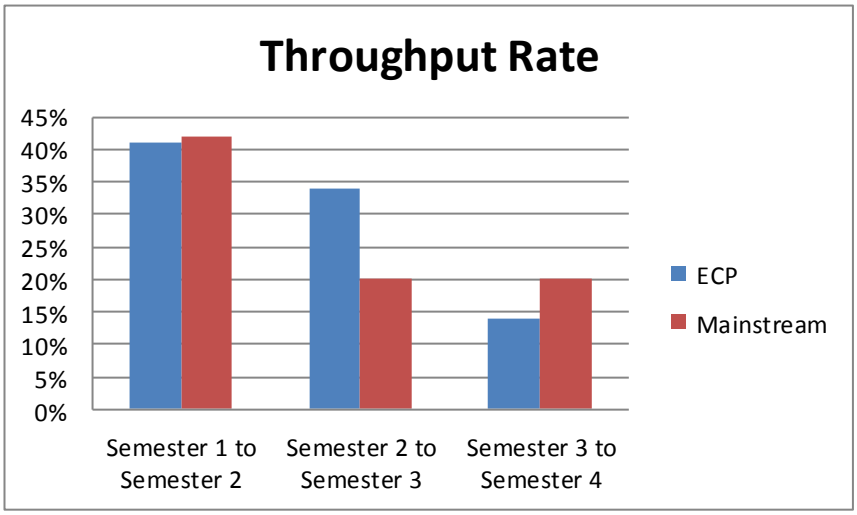

Figure 29: Throughput Rate for ECP and Mainstream 2007 cohort

From the above data it can be seen that the throughput rate from Semester 1 (S1) to Semester 2 (S2) is very close for ECP and mainstream. There is a drop in the number of ECP students who move from S2 to S3. ECP students then seem to remain longer in S3 before passing to S4. A possible reason for this is that ECP students join the mainstream in S3 and the pace is faster. ECP students in S3 may be having problems coping with the different teaching methodology.

Mainstream students seem to pass S3 and S4 easily once they get through S2. At this point in time (one year, and in some cases longer, since entering higher education) the students may have had time to adjust from secondary education to higher education.

It was discovered that determining the throughput rate for semester 2 and upward was difficult as students did not progress evenly through the levels as a result of having to repeat certain lower level subjects. Throughput rate at these levels can only be estimated as accurately as possible.

Attrition as discussed above is another problem at higher education institutions, especially at first year level.

Table 18 below details the attrition rate of the 2007 cohort in the Department of Mechanical Engineering and a breakdown of the number of students who left the system (i.e. left the institution at specific points in their studies) as well as students who left the course but registered for another course at the institution.

Table 18: Attrition Numbers for ECP and Mainstream 2007 cohort

	No. Registered	After S1	Post S2	Another course	Total headcount	Percentage
ECP	44	10	7	4	21	47,72727
Mainstream	77	19	17	4	40	51,94805

The total attrition rate for ECP and mainstream is close to 50% with ECP at 48% and mainstream 52%. This is very high as it implies that many students do not go on to complete their chosen course of study.

There is not a significant difference between ECP and mainstream attrition rates which could mean that irrespective of the type of teaching provision, students are still struggling to complete their studies.

The bar graph in Figure 30 illustrates the comparison of attrition rates between ECP and Mainstream at certain levels of study.

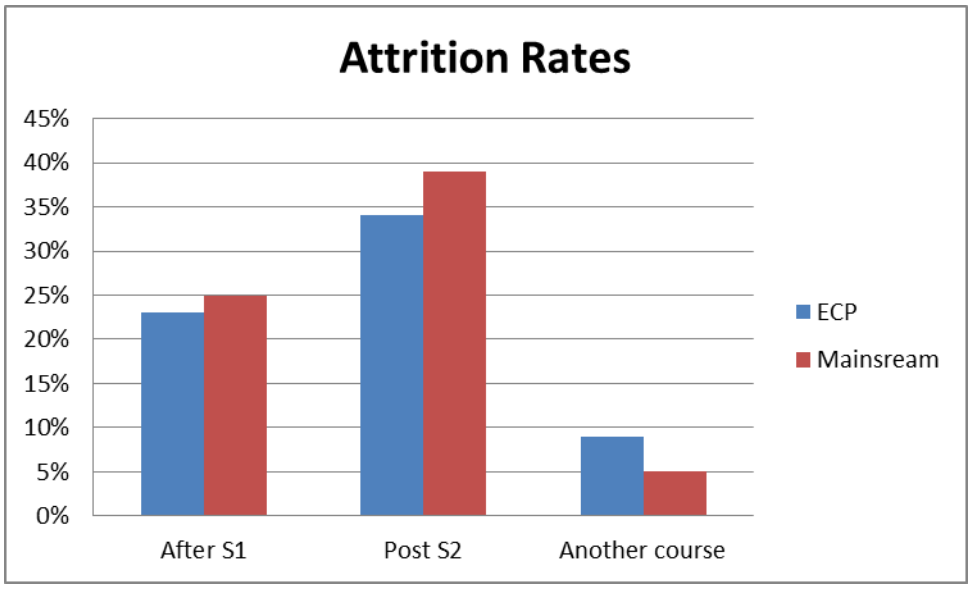

Figure 30: Attrition Rate for ECP and Mainstream 2007 cohort

From Table 18 it can be seen that more mainstream students leave the system after S1 (25%) than ECP students (23%). Various studies have attributed the reasons for leaving to the difficulty in adjusting to higher education, lack of time management, ineffective study skills and in some cases financial and accommodation constraints.

However, Tinto (2005) states that the above reasons are not the only reasons that students exit the system but that a closer look at the teaching and learning methodologies within a course is required.

Another significant statistic to consider is the percentage of students who leave the system after they had attempted S2, S3 or even S4. Refer to Appendix A and Appendix B for a detailed analysis of such cases. An in-depth analysis of the reasons for leaving at this stage in their studies is not available.

Finally, the debate around success rate of a qualification based on attrition rates is that if a student leaves a course but registers for another course at the institution, it may be a loss for the affected department but it cannot be seen as a loss for the institution since the student is still in the system.

Tinto (2005) clarifies student success further by stating that students may be considered successful even if they do not finish their studies at a particular institution because even if they had gone through several courses before graduating, they will have gathered valuable knowledge and skills in each course.

5.2 INVESTIGATIVE QUESTION 2: WHAT PERCENTAGE OF FIRST-TIME STUDENTS GRADUATE IN MINIMUM TIME AT THE DEPARTMENT OF MECHANICAL ENGINEERING?

Scott, Yeld and Hendry (2007) report that of all the first-time entering students of the 2000 intake cohort at higher education institutions in South Africa only 30% graduated within five years (i.e. 2005), 14% are still registered after five years and 56% leave without graduating.

With specific reference to technikons (now universities of technology), 32% graduates within five years, 10% are still registered after five years and 58% leave the system (Scott, Yeld and Hendry, 2007).

With an even more narrowed down look at the specific Classification of Education Subject Matter (CESM) categories i.e. Business/Management, Computer Science, Engineering, and Social Services/Public Administration at technikons, Scott, Yeld and Hendry (2007) report that only 17% of first time entering students in Engineering graduate within five years and 14% are still registered after five years.

At this point in their statistics, Scott, Yeld and Hendry (2007) reported that the merger of institutions which happened between 1 January 2004 and 1 January 2005 may change the situation. However, in 2007 the graduation rate in Engineering at higher education institutions was still at 17%

Table 19 below shows the graduation rate for the 2007 ECP and Mainstream cohort for the Department of Mechanical Engineering at the university of technology in this study within regulation time and the graduations after adding a semester at a time. The statistics were calculated till the September 2013 graduation. Regulation time for ECP is four years and for Mainstream is three years.

Table 19 shows that the total percentage that has graduated to date is the same at 45% for ECP and Mainstream. With consideration for the reasons for the implementation of the ECP as detailed in Chapter 2 and Chapter 3, students in ECP have done better under the circumstances under which they were recruited into the programme. Students in ECP in 2007 were recruited with less than the minimum entrance requirements for a National Diploma in Mechanical Engineering. But with effective interventions to bridge the gap, students were able to bring their academic performance to the same level as mainstream.

Table 19: Graduations expressed in numbers (headcount) for 2007 cohort

	No. Registered	Regulation time	Regulation time + 6mnths	Regulation time + 1yr	Regulation time + 1yr 6mnths	Regulation time + 2yrs	Beyond	TOTAL	% graduated
ECP	44	6	3	4	1	5	1	20	45,45455
Mainstream	77	9	6	5	7	3	5	35	45,45455

Table 20 below shows the graduation percentages in regulation time and the graduation percentages after adding a semester at a time.

Table 20: Graduation rate (percentage) for 2007 cohort

	No. Registered	Regulation time	Regulation time + 6mnths	Regulation time + 1yr	Regulation time + 1yr 6mnths	Regulation time + 2yrs	Beyond
ECP	44	14%	7%	9%	2%	11%	2%
Mainstream	77	12%	8%	6%	9%	4%	6%

Figure 31 below represents the above table's statistics graphically.

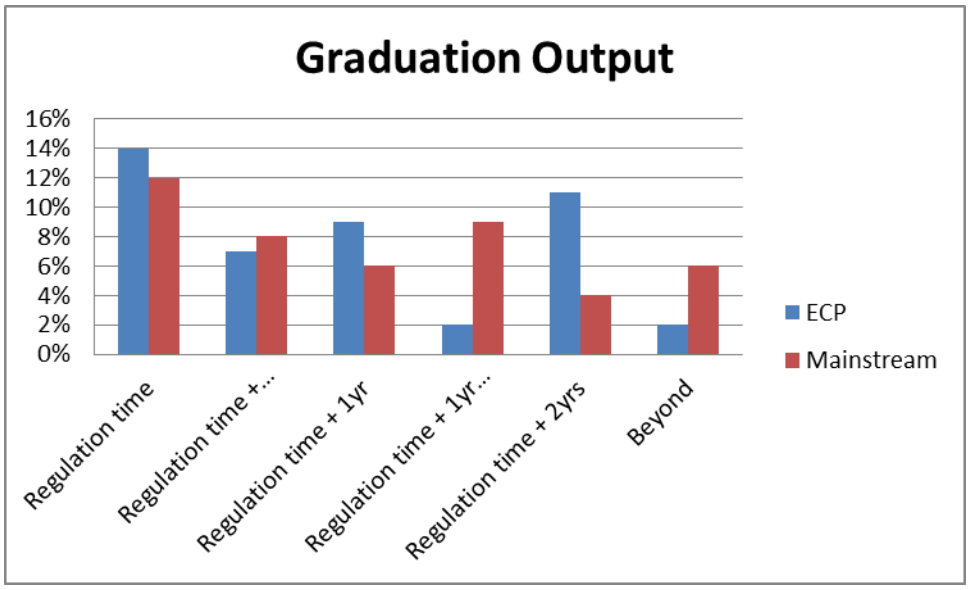

Figure 31: Graduation output for 2007 cohort

From the above statistics it can be noted that besides graduating in regulation time, the greatest percentage of graduations in ECP is after six years in the system (11%) and the greatest percentage of graduations in Mainstream is after four years and six months (9%). Both are one and a half times the regulation time. This means that a great percentage of students take a lot longer to complete their course of study.

5.3 INVESTIGATIVE QUESTION 3: WHAT PERECENTAGE OF STUDENTS GOES ONTO POSTGRADUATE STUDIES IN THE DEPARTMENT OF MECHANICAL ENGINEERING?

Eight students of the 2007 ECP cohort has to date registered for B-tech in Mechanical Engineering studies. This could be represented as 18% of the cohort or more significantly it represents 40% of those who have graduated thus far.

There is a significant difference in the Mainstream cohort as demonstrated in Figure 32 below. Twenty one students of the 2007 mainstream cohort has to date registered for B-tech in Mechanical Engineering studies. This is 27% of the registered students or 60% of those graduated thus far.

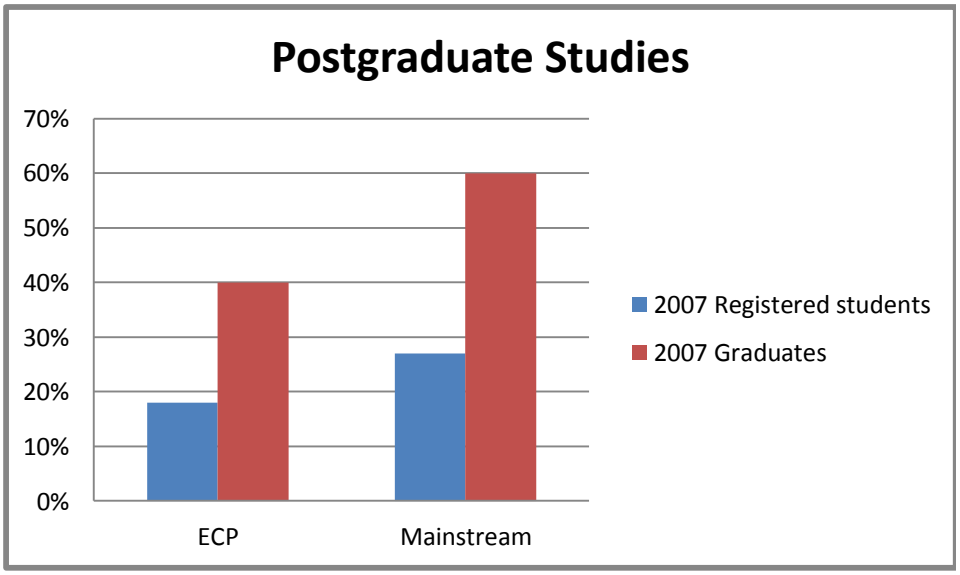

Figure 32: Students embarking on Postgraduate Studies

5.4 INVESTIGATIVE QUESTION 4: WHAT EMPLOYMENT PROSPECTS ARE AVAILABLE FOR STUDENTS WHO GRADUATE FROM ECP IN THE DEPARTMENT OF MECHANICAL ENGINEERING?

Thirteen graduates from the ECP cohort in the Department of Mechanical Engineering responded to the questionnaire based on their current employment and their experience in the ECP. All respondents were from the 2007 ECP cohort in the Department of Mechanical Engineering. The responses to the questions are looked at individually below.

5.4.1 Employment details

Respondents were asked several questions about their current employer. These questions were asked to assist in getting an idea of the type and size of the organisation they work for and also to determine how marketable they were when they completed their studies in Mechanical Engineering.

All respondents are currently employed in a range of industries, not all of them related to engineering or specifically engineering. Table 21 below is a list of the types of organisations graduates are employed in. It is significant to note that none of the respondents are self-employed. Further research in this area could possibly reveal the reasons for graduates not owning their own businesses.

Table 21: Organisations of Employment

Organisation	No. of respondents
Self-employed	0
SSME	0
Private Company	7
Public Company	4
Government	2
NGO	0

For the sake of respect and anonymity of the respondents, the names of the organisations they are employed with cannot be revealed, but the above table indicates that the majority (54%) are employed with private companies, 31% is employed by public companies and the minority (15%) is employed by government.

Graduates who enter employment expect to be employed at the level of their qualification or to be employed at a junior level and then with time, prove their abilities and move upward in the organisation. Table 22 below displays the length of time they have been employed with their current employers. This question was specifically asked to set the background for the questions to follow about remuneration and training opportunities with their current employers.

Table 22: Duration of employment with current employer

Length of employment	No. of respondents
6 to 11 months	1
12 to 17 months	4
18 to 23 months	2
24 to 29 months	4
30 to 35 months	0
3 years and longer	2

City Press (2012) published: *"University degrees or diplomas no longer hold the promise of jobs for young South Africans as hundreds of thousands of them battle to find work"*. The motivation for this was based on labour market analyst, Loane Sharp's comment that employers are not only using university qualifications as criteria for a position, but that employers are looking for more. Engineers were reported to have the lowest employment rate of 0.4%. City Press (2012) further went on to say that the South African Qualifications Authority (SAQA) found that a huge gap existed between what universities were producing and what employers were expecting when they hired graduates. Employers were looking for "proficiency in English, ICT skills and an understanding of the world of work" (City Press, 2012).

City Press (2012) stated that a study by Dr Haroon Bhorat from the Development Policy Research Unit indicates that those with diplomas and not degrees have a 50% chance of finding employment compared to 17% for those with degrees.

The Centre for Development and Enterprise (2013) however reported that research done by Professor Servaas van der Berg and Hendrik van Broekhuizen does not agree with the City Press. It was found that the unemployment rate for degree holders was just under 5%. They do, however, distinguish between degree holders and other non-degree tertiary qualifications, and state that the unemployment rate for non-degree tertiary qualification holders was 16%. The low unemployment rate is attributed to the need for skilled labour in the country and the demand for universities to produce such graduates.

With these contrasting points of view in mind, respondents were asked to indicate how long it took them to find employment from the time they graduated. The majority of the students (62%) were able to secure employment immediately after graduating but 30% however were unemployed for six months or more. The pie chart in Figure 33 below illustrates the unemployment statistics for the 2007 ECP cohort in the Department of Mechanical Engineering.

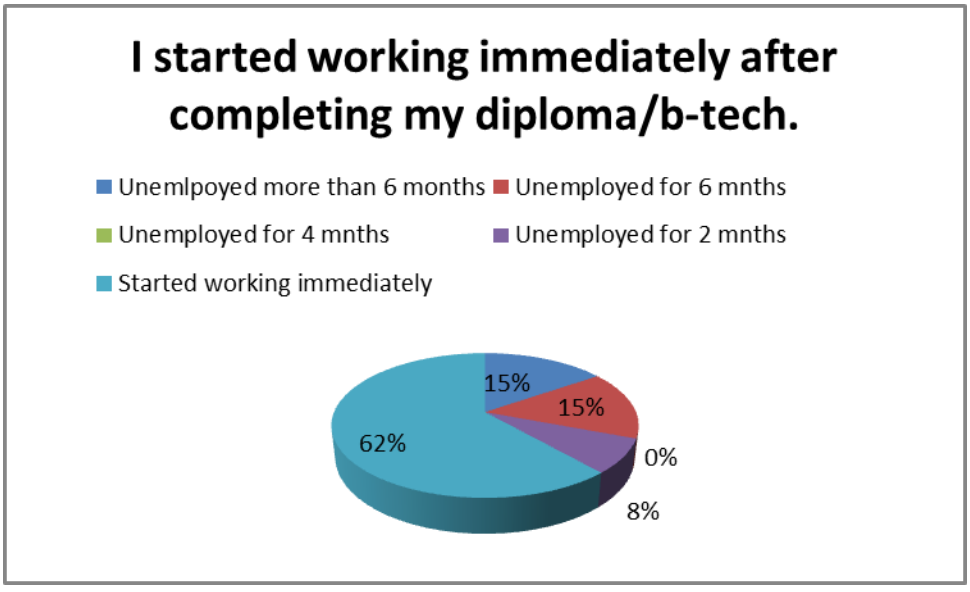

Figure 33: Employment after graduating

The high rate of students who are employed straight after graduating is a positive indication that graduates are seen to have the necessary skill for the job and/or show potential.

Respondents were then asked whether they were employed in the field that they were trained in. The pie chart in Figure 34 below shows the findings. The majority seemed to be satisfied that they were doing what they were trained to do, with 31% feeling that they were to a great extent in the right position and 38% feeling that they were sufficiently in the right position. This makes up 69% of the respondents with the other 31% not convinced that they were doing what they were trained to do. Of the 31%, 23% felt that they were somewhat exposed to what they were trained to do and 8% felt that they got very little exposure.

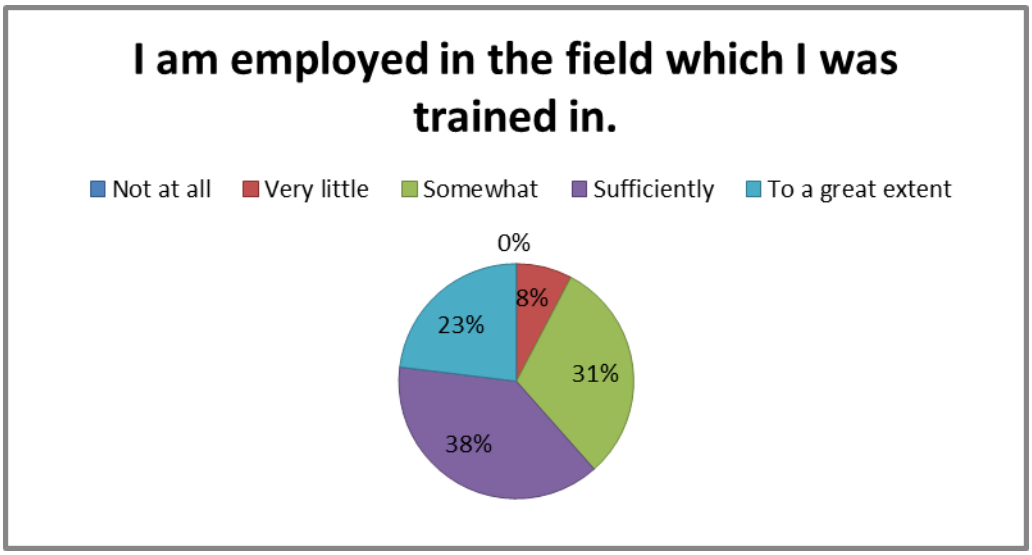

Figure 34: Working within the field of training

Figure 35 indicates the prospect for skills improvement and promotion. Once again the majority (77%) responded positively, saying that they were given training and there was opportunity for promotion.

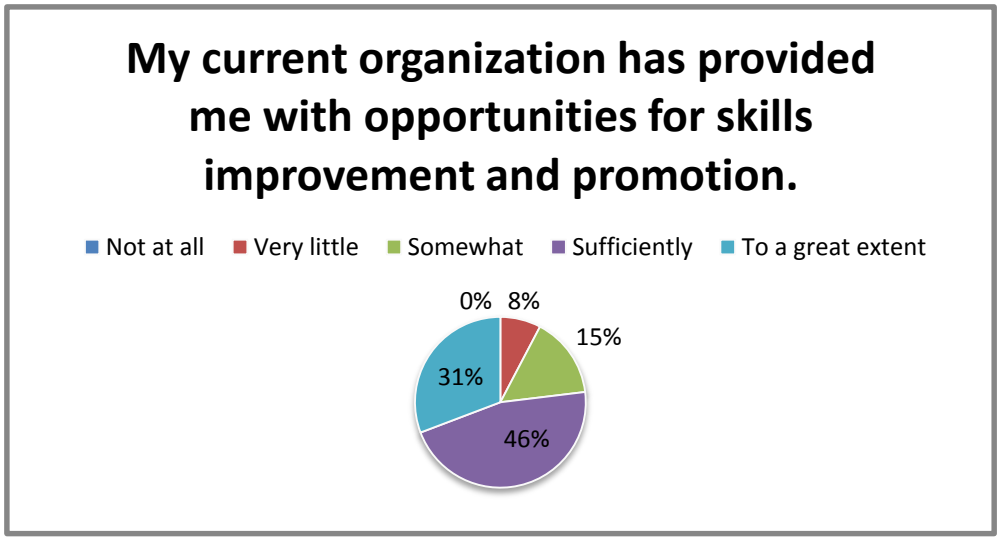

Figure 35: Skills improvement and promotion opportunities

Remuneration is a huge indicator of job satisfaction and a competitive salary could be seen as firstly, an indicator of the appreciation of one's skill and secondly, as an indicator of the need or scarcity of the skill. Respondents were asked to rate their current remuneration in comparison to remuneration in their field of work elsewhere. The pie chart in Figure 36 on page 128 shows the results. Sixty two percent (62%) were not completely satisfied but were sufficiently satisfied that they were earning a competitive salary. Eight percent (8%) was very satisfied with their salaries. Eight percent (8%), however, indicated that the salary was not competitive at all.

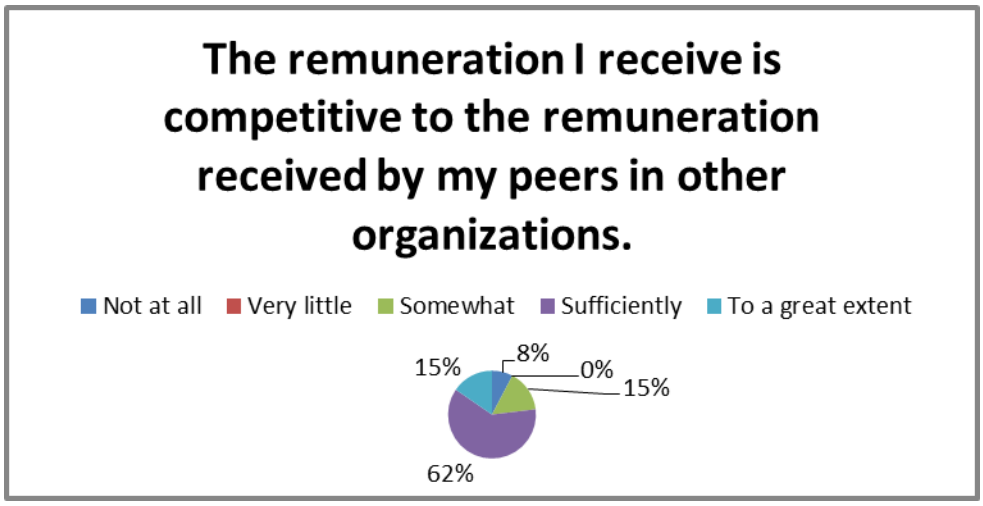

Figure 36: Remuneration

Adams (2013), a Forbes staff reporter, says that a poll conducted by Accenture ACN indicates one third of recent graduates reported that they were earning what they were expecting. Seventy seven percent (77%) of new graduates were optimistic about getting on the job training where in reality, less than half (48%) did accomplish this. This is an indication that new graduates are not in touch with the world of work.

5.4.2 Relevance of skills acquired

As mentioned in Chapter 3, Saavedra and Opvra (2012) stated the need for graduates of higher education institutions to be properly equipped with skills that will stand them in good stead to be effective participants in the world of work, and make substantial contributions to solving economic, civil and global challenges.

City Press (2012) also emphasised the fact that employers are looking for graduates who not only have a qualification in their field of study, but who display competencies in communication, ICT and a general understanding of the world of work. These are generic skills that can be learned through formal classes in the course but they can be applied generally to all jobs.

Bennet (2002) calls these generic skills "transferable skills" and go on to describe them as the skills,

> *which enable people to participate in a flexible and adaptive workforce. They include personal skills such as the ability to work well with others, the ability to organise, self-motivation, communication skills, initiative, creativity, the capacity to solve problems and leadership* (Bennet, 2002: 457).

Respondents were asked three questions regarding these generic skills. The three questions looked at the skill of critical analysis and solving problems, interpersonal skills and communication skills. Table 23 below and Figure 37 on page 130 show the results as elicited by the thirteen graduates. The aim was to assess whether the ECP course in Mechanical Engineering had equipped them with these important generic skills.

No respondents strongly disagreed, disagreed or were undecided on this matter. All the respondents gave a positive response with regard to the generic skills gained. When it came to critical analysis and problem solving, only 23% strongly agreed but when it came to interpersonal relationships and communication, 77% of the respondents strongly agreed.

Table 23: Generic Skills acquired

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	TOTAL
I am able to critically analyse and solve problems in the workplace.	0	0	0	10	3	13
I am able to communicate with my colleagues and employer/s.	0	0	0	3	10	13
I am able to complete all written communication with ease.	0	0	0	3	10	13

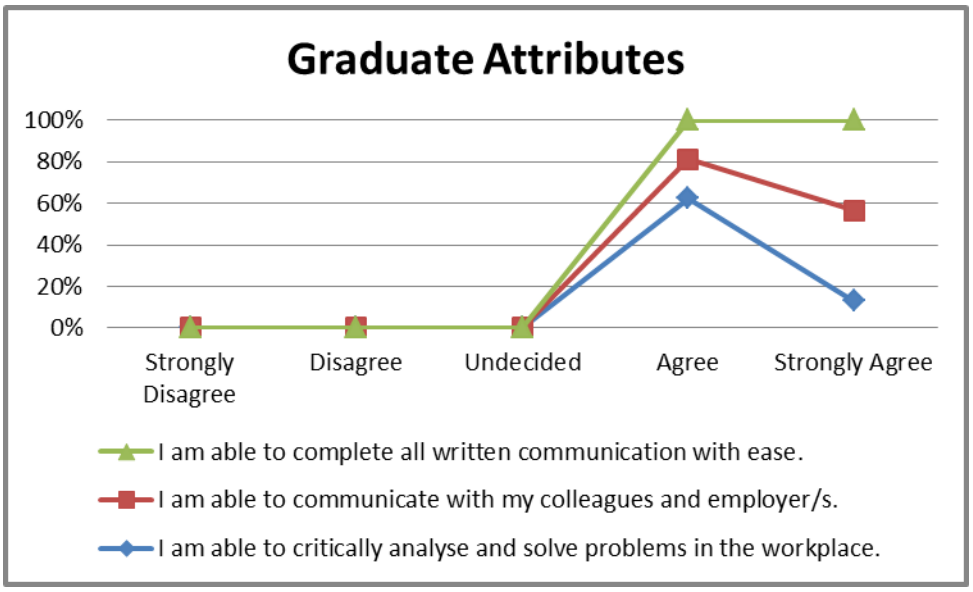

Figure 37: Generic Skills acquired

Tying in with generic skills, projects are an effective teaching method to integrate generic skills with professional skills. The two kinds of skills are sometimes referred to as context dependent skills (professional skills) and context independent skills (generic skills).

The ECP in the Department of Mechanical Engineering at the university of technology run two integrated projects during the first year of ECP and one integrated project in the second year of ECP. The integrated project is a task that requires students to work in groups to solve an engineering related problem. Students are required to go through the whole process from conceptualisation to drawing to manufacturing, testing and communicating both orally and in written form. It is seen as an ideal opportunity to combine the skills learnt in all the subjects and see the relevance of what they learn in each subject. At the same time generic skills like project management, group dynamics, interpersonal relationships, ICT and communication are learnt throughout the duration of the project.

The integrated project aligns itself with the Critical Cross-field Outcomes (CCFO's) as prescribed by the South African Qualifications Authority (SAQA) to be included as the outcomes in all recognised subjects for qualifications. The CCFO's are:

- Identify and solve problems in which responses demonstrate 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.

Respondents were asked whether the integrated projects done at university assisted them in coping with projects or tasks at work. Fifteen percent (15%) of the respondents were undecided on whether integrated projects helped. One of these respondents has been with his or her current organisation for ten months and another respondent with their current organisation for 23 months. An explanation for their answers had not been requested and it needs to be determined if the position held and the type of organisation they work for, played a role in their responses. The length of time at the organisation and the position held at the organisation, can also play a role in the kind of relevant exposure the respondent will get to his or her chosen career, and thus an opportunity on the side of the respondent, to demonstrate his or her skills learnt.

The other 85% of respondents responded positively with 54% agreeing that integrated projects helped and 31% strongly agreeing.

The pie chart Figure 38 demonstrates the distribution of responses.

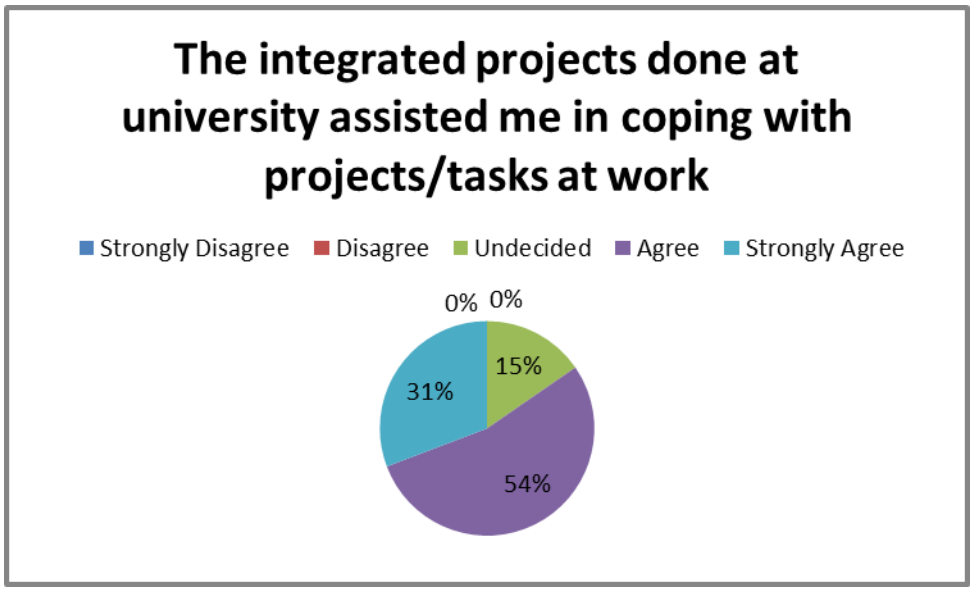

Figure 38: University projects and how they impact on real world projects

5.5 INVESTIGATIVE QUESTION 5: WHAT QUALITY MANAGEMENT PRACTICES ARE IN PLACE IN ECP IN THE DEPARTMENT OF MECAHNICAL ENGINEERING TO GUAGE SUCCESS IN TEACHING AND LEARNING INTERVENTIONS?

Four lecturers who teach on the Extended Curriculum Programme in the Department of Mechanical Engineering at the university of technology were interviewed. The interviews were structured interviews with all interviewees asked the same questions. A full list of the questions asked is attached as Appendix D.

The number of years of employment as lecturer on ECP for the four lecturers ranged from two years to ten years. This is significant as the responses from the lecturers to the other questions will range from tried and tested methods of teaching, to newly implemented methods of teaching. The length of service is also significant in lecturers' views of interventions in ECP to assist students outside of their subject area.

5.5.1 Mainstream versus ECP

All of the lecturers interviewed have taught on the mainstream programme in Mechanical Engineering. Two of the four lecturers still teach on the mainstream and extended programme simultaneously. The fact that lecturers have taught or still teach on the mainstream while teaching on the ECP had an influence on how they responded to some of the questions asked later in the interview.

When interviewees were asked about the differences in teaching styles on the mainstream and the ECP, the factor of time was mentioned by all the interviewees. All the interviewees were of the opinion that because of the shorter period of time for completing the syllabus on mainstream, there was no time for any additional interventions to assist students with understanding basic concepts and ensuring that basic concepts were well-embedded. Mainstream students were expected to work through a great portion of the work on their own and there is no time for revision. One lecturer mentioned the fact that the mainstream course is very “exam-driven”.

Interviewees felt that the teaching styles on the ECP were vastly different as there was more time to cement concepts and establish the principles of the subject solidly. Two interviewees mentioned the fact that there was time to run tutorial sessions which were very helpful in practising the skill learnt and an opportunity for one-on-one discussion.

When asked about the profile of the students who enter mainstream in comparison to those who enter ECP, the lecturers were in consensus that generally there was no difference between mainstream students who enter the Mechanical Engineering course and first time entering ECP students. One lecturer pointed out that in the past ECP students entered the course having not met all the entrance requirements and the distinction between mainstream students and ECP was evident, but now that everyone admitted to the programme meets the minimum requirements there is no distinct difference in the ability of the students. Only a small portion of the mainstream students are quite capable of coping with the mainstream pressures.

Interviewees were asked about the most evident shortcomings that students have that hamper them from succeeding at higher education. Three of the four lecturers pointed out that students enter higher education not prepared for what they are about to encounter. One of the three lecturers went on to say that the students lacked an overall strategy to cope. Another one of the three lecturers pointed out the fact that there was a lack of commitment to succeeding and this affected their performance in all subjects. One lecturer mentioned that mainstream students were more disadvantaged, as given the short period of time to complete the syllabi, students fail to see the relevance of what they are doing and how everything fits together and there is not enough time to appreciate what is being taught in all subjects.

Still on the topic of shortcomings that students display, one lecturer said that a lack of language ability placed students at a disadvantage as they (students) struggle to understand concepts and instructions and this ultimately affected their results.

Two of the four lecturers mentioned social issues as a major shortcoming that disadvantages students and hampered their success. Some of the social issues mentioned were financial instability, no secure or proper arranged housing and the fact that many students were new to the city. These issues occupied students' minds and distracted them from their studies. One of the two lecturers also mentioned a lack of basic life skills and technological skills as social shortcomings. A lack of these basic skills left students feeling intimidated and overwhelmed and this distracted them from their studies.

5.5.2 ECP Subject Practices in Mechanical Engineering

Interviewees were asked what intervention they had put in place in their subject to assist students in understanding concepts and succeeding in their subject. All lecturers interviewed taught different subjects and the interventions mentioned were relevant to success in their specific subjects. In Drawings the lecturer felt that using physical 3-d models helped students to visualise. Another technique was simplifying concepts and then building on it in terms of complexity. In Manufacturing, the lecturer emphasised

the need to do a practical soon after the theory was taught, as this was a great help in seeing the equipment in reality as many students did not have any frame of reference when it came to the equipment and techniques.

In Computer Skills the lecturer saw projects as a useful way to allow for practise in the subject. In Communication Studies one-on-one consultations were seen as important to assist students with specific and varying problems. The lecturer also felt that group discussions helped the shy and struggling students to be more confident in speaking in smaller groups rather than in front of the whole class.

In Mechanics, tutorials were effective and a structured tutorial programme was run. Tutors were employed to work closely with students and give them the individual and personal attention needed. The lecturer pointed out that it is imperative that the tutorial programme is run under the guidance of the lecturer. In that way the lecturer is always on top of the needs of the students.

All the lecturers interviewed mentioned the fact that the ECP allowed for different classroom practices than mainstream in that lecturers had more time to give the students examples to work through and then be able to move around the class. This was viewed as really valuable because lecturers then had the opportunity to see which students were struggling and assist them immediately.

When interviewees were asked about the practices in place in their subjects to monitor student success, various practices were mentioned, but the most common one was that of in-class monitoring. Lecturers saw this as invaluable as it gave them an opportunity to draw out students who were struggling and work with them individually or design an activity or another lecture if most of the class was struggling.

Other practices involved extensive monitoring of attendance, punctuality and progress marks. Two lecturers mentioned that this was effective if students were given regular feedback on their progress, attendance and punctuality and the matter was dealt with before it became too difficult to repair.

5.5.3 Programme Practices in ECP in Mechanical Engineering

Interviewees were asked whether they were aware of any interventions that are in place, other than in their classrooms, which assisted ECP students in their development and success. It is clear that many interventions had been put in place over the years and some were still in place. Below is a list of these interventions:

- Regular progress reports and marks discussions
- Student Counselling
- Orientation Programme
- Site Visits
- Integrated Project
- Movement from mainstream to ECP
- Step-up Programme
- Goal setting and monitoring

Regular progress reports are distributed to students so that they can be aware of their progress at all times. Lecturers also have regular marks discussions to look at students who are at-risk of failing some subjects and discuss ways of dealing with this.

The Student Counselling facility on campus has been roped in to present life skills courses to students during the scheduled time table. The courses are presented to students as a whole group and some of the courses are presented in smaller groups with a mentor. The courses amongst others address issues like Adjustment and Transition to Tertiary Education; Self-esteem; Study Habits and Learning Skills; Critical Thinking; Stress Management and Exam Anxiety; and Time Management and Goal Setting. Students are required to complete tasks that are assessed by Student Counselling. An at-risk assessment is done and is linked with the ECP at-risk interventions. Certificates are presented at the end of the course.

The Department of Mechanical Engineering usually runs a three-day orientation programme with new students where students are shown around campus and made aware of the facilities available to them. Over and above this, the ECP continue to draw students' attention to what is on offer at the institution by taking them on a more detailed tour of the library and regular talks on empowerment to give the students a sense of belonging.

Site visits are organised either in the programme or in specific subjects. This allows students to see qualified mechanical engineers at work and brings what happens in the classroom, a lot closer to home.

Two integrated projects are run during the first year of ECP (one per semester) and one integrated project during the second year of ECP. This is an opportunity for students to apply what they have learnt in all their subjects to solve a problem. It is the application of knowledge in a more focussed way. The mark obtained in the integrated project is used as part of the final mark for all subjects. Integrated projects are also done in groups and this encourages teamwork and enforces an awareness of group dynamics.

One lecturer mentioned the window period at the start of the year to allow for mainstream students to move to ECP after their first assessment, as an intervention because it allows for mainstream students who are serious about succeeding, but who are struggling academically, to change to ECP for the necessary support.

For the past three years the Department of Mechanical Engineering has been part of the Step-Up programme run by the Faculty of Engineering. This is a two-day course that students attend where they are taken through the understanding of why and how one learns and then are required to set goals for their performance in that year. These goals are then closely monitored by the students and their lecturers to determine if they are on track.

Interviewees were then asked what suggestions for interventions they have for the ECP. In response lecturers listed the following as suggestions:

- A system for detecting non-attendance should be introduced and should be monitored and enforced strictly.
- Students' lack of progress after the first formal assessment should be addressed immediately.
- A clear set of rules for behaviour and responsibility in the classroom should be published and given to the students.
- Quarterly meetings should be held with ECP students to motivate those doing well AND to discuss the way forward to those at risk.
- Aptitude tests should be administered in all subjects before formal lectures start at the beginning of the year, to gauge the students' ability and so adjust teaching accordingly.

Finally, interviewees were asked for suggestions on how the success of the programme can be gauged (Quality Management Practices) and these are the suggestions:

- Student tracking statistics should be compiled. This will give information about students progressing through the course and also students graduating.
- Regular comparisons with the mainstream programme should be done. This should be in the form of comparing marks attained for assessments, final pass rates and also the number of graduates in a cohort.
- The ECP should maintain contact with graduates to determine how well they are doing and how the ECP helped them.

To conclude this chapter, it can be seen that when investigating quality management practices in the ECP in the Department of Mechanical Engineering, many factors need to be taken into consideration. These factors are success rates of students, employability of graduates, classroom practices and programme practices. All these factors put together can begin to address the problem statement as laid out in Chapter One:

> Extended Curriculum Programmes are an intervention put in place to address the problem of low throughput rate and low graduate output at higher education

institutions. These problems were ascribed to students not having been fully prepared for tertiary education. Currently there are no quality management mechanisms in place to determine whether ECP's are effective.

Chapter six will draw conclusions based on the findings in this chapter and finally make recommendations for the implementation of quality management practices in the ECP of the Department of Mechanical Engineering at the university of technology.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

The year 1994 saw the birth a democratic nation in South Africa. But with the emancipation of a nation held in the grip of Apartheid for many years, and the existence of an education system that only benefited a minority, came the challenge to redress all the inequalities. Chapter 2 described the context of education in South Africa during the Apartheid era and the policies and interventions put in place by the democratic government to redress the inequalities in education.

The major challenges faced by the post-Apartheid Department of Education were:

- Access to all for higher education
- Inadequately prepared higher education students

Nineteen years into the democracy and the results of the interventions are not what was expected. Statistics of academic performance in higher education is lower than the targets set.

Various factors played a role in the low success rate at higher education institutions, the most prevalent of which were of a political and social nature. In a paper commissioned by the Development Bank of South Africa, Badat (2010) describes this dilemma as,

> *Government and universities have sought to pursue social equity and redress and quality in higher education simultaneously, difficult political and social dilemmas, especially in the context of inadequate finances and academic development initiatives to support under-prepared students* (Badat, 2010: 9).

The ECP is an academic development initiative introduced by the Department of Higher Education and Training, the context of which is discussed in detail in Chapter 2 and Chapter 3. The objective of the ECP is to allow access to students who would otherwise not have succeeded in higher education given their inadequate secondary education training.

The question remains, as stated in the problem statement of this thesis:

> Extended Curriculum Programmes are an intervention put in place to address the problem of low throughput rate and low graduate output at higher education institutions. These problems were ascribed to students not having been fully prepared for tertiary education. Currently there are no quality management mechanisms in place to determine whether ECP's are effective.

Primary research conducted in this thesis attempted to look at whether there are formalised quality management practices in place in ECP and whether the success of ECP has been established. In order to do this the 2007 ECP cohort in the Department of Mechanical Engineering at a university of technology was closely studied and five aspects of the ECP were focused on. These aspects formed the investigative questions for the research and were:

- Throughput rates
- Graduate output
- Postgraduate studies
- Graduates in the workplace
- Teaching and Learning practices

For the study of the throughput rates and graduation output, the results of these were compared to the results of the mainstream students in the same cohort. The results of the research were outlined in Chapter 5 and the conclusions that can be drawn from these findings will be discussed in this chapter. Recommendations will then be made on the implementation of quality management practices to monitor the success of the ECP in the Department of Mechanical Engineering.

6.1 THROUGHPUT RATES

Throughput rates for both ECP and Mainstream students in the Department of Mechanical Engineering are low. The throughput rate from S1 to S2 is very similar for ECP and Mainstream (41% and 42% respectively). Although there is a drop in throughput rate from S2 to S3, ECP throughput rate is still higher in comparison (ECP=34% and mainstream = 20%). There is a big difference in the throughput rate for S3 to S4 for ECP and Mainstream (14% and 21% respectively).

Coupled with the low throughput rates is also the high attrition rate. Students do not only struggle to get through to the next level of study, but many students leave the system (i.e. their course of study). ECP and Mainstream attrition rates in the Department of Mechanical Engineering are high. The 2007 cohort show both streams hovering around the 50% mark

The conclusions that can be drawn from these findings are:

- Although ECP students entered the course with lower entrance results than mainstream, with the effective interventions of the ECP, students were able to achieve a very similar throughput rate from S1 to S2. It can thus be concluded that ECP is effective in assisting academically disadvantaged students to cope with higher education during their first year of study.
- A greater percentage of ECP students move from S2 to S3 and it can be concluded that ECP interventions at S2 level are effective and necessary to assist students at this level of study.
- With the drop in throughput rate from S3 to S4 for ECP students, it can be concluded that at this point in their studies ECP students are not ready or able to cope with the mainstream pace and the reduced time to complete a level of study (six months instead of 1 year).
- Attrition rates for ECP and Mainstream are very similar (48% and 52% respectively) and it can be concluded that irrespective of the type of course offering the students undertake, many students leave the original course of study

they registered for and most particularly after S1 (1st level of study) because they cannot cope academically.

6.2 GRADUATION OUTPUT

The total graduation rate to date (2013) for ECP and Mainstream is 45%. The conclusions that can be drawn from this are:

- The ECP has done better in producing graduates than Mainstream even though the graduation percentage is the same. This is because the ECP has been able to take students who were at a disadvantage academically when they entered the course and bring them up to standard to the point where the graduate output is the same as Mainstream.
- Students on both the ECP and Mainstream courses take an average of one and a half times the regulation time to complete their studies and it can be concluded that irrespective of a student's final matric results, students struggle to cope with higher education and the demand to graduate in a specified time.

6.3 POSTGRADUATE STUDIES

The findings for ECP and Mainstream postgraduate studies indicate a significant difference in the percentage of graduates who go onto B-Tech studies after completing their diplomas. The conclusion that can be drawn from this is that ECP students do not want to or do not see the need to continue onto further studies after graduating.

6.4 GRADUATES IN THE WORKPLACE

The findings from the questionnaire administered to the ECP 2007 cohort graduates can be divided into two sections, i.e. information about their current employment and information about the relevance of the skills acquired at university.

6.4.1 Current Employment

Several conclusions regarding the success of the ECP Mechanical Engineering course at the University of Technology can be drawn from the responses to questions about their current employers.

Firstly, it can be concluded that students who graduated from the ECP Mechanical Engineering course are seen to have the necessary workplace skills as the majority of students managed to secure employment immediately after graduating.

Secondly, it can be concluded that students were competent in the skills relevant to their field of study as the majority of graduates interviewed were employed in the field that they were trained for.

Finally, it can be concluded that students who graduated from the ECP Mechanical Engineering course showed huge potential for skills improvement and were being up-skilled by their current employers.

6.4.2 Relevance of the skills acquired

Over and above the training for their field of study, the ECP students in the Department of Mechanical Engineering at the university of technology are exposed to interventions that teach them many generic (transferable skills) that assist graduates in fitting into the world of work and make graduates more marketable in industry.

The conclusions that can be drawn from the questions asked to graduates regarding the acquisition of these generic skills are:

- The ECP Mechanical Engineering course has incorporated the generic skills needed to cope in the world of work. This was indicated in the fact that 100% of the graduates who responded to the questionnaire felt that the skills of critical analysis, problem solving, interpersonal skills and communication learnt through the course assisted them in their daily activities in the workplace.
- Projects are an effective means of teaching the application and relevance of all skills necessary for the field of study as well as generic skills. The majority of students felt that the skills learnt during the integrated projects run in the ECP Mechanical Engineering course assisted them in coping with projects in the workplace.

6.5 TEACHING AND LEARNING PRACTICES

From the interviews with ECP lecturers, several conclusions can be drawn about quality management practices in the teaching and learning practices in the classroom and the interventions offered by the programme as a whole. Feedback to and feedback from all stakeholders are important in Total Quality Management. As important as it is for lecturers to gauge how effective their teaching methods are, it is also important for students and their parents/guardians to receive feedback on how well the students are performing and important for the funders of the programme to know if the programme is meeting the objectives as set out by the funders.

It can be concluded that the ECP allows for the lecturers to gauge whether students have properly understood concepts and principles taught in individual subjects. The opportunity to gauge the success of the teaching is in the form of tutorials, group discussions and one-on-one discussions. This can be seen as a quality management practice as it allows for feedback from the students regarding the efficacy of the teaching method.

Furthermore, it can be concluded that the ECP has some measure of quality management in the feedback given to the students on their academic progress, attendance and punctuality. It was however noticed that all of this is not consistently practised and endorsed by all lecturers. It was also noted that not all lecturers are aware of the interventions put in place by the programme as a whole. Lecturers practise individual quality management to some measure in their subjects, but the overall quality management of the programme is left to the co-ordinator of the programme.

This then leads to the conclusion that quality management practices in the ECP of the Department of Mechanical Engineering at the university of technology are not formalised and consistently practised, with the results recorded and reacted upon regularly.

6.6 GENERAL CONCLUSIONS

The chapter thus far has looked at conclusions drawn from specific focus areas (throughput rates; graduation output; postgraduate studies; graduates in the workplace; and teaching and learning practices). Some general conclusions that are not specific to any one of the five focus areas but are related to more than one of the focus areas, can also be drawn.

It can be concluded that the academic ability between Mainstream and ECP students is not vastly different. Irrespective of the programme students are admitted to, and the matric results, first time entering students still struggle to cope academically.

It can also be concluded that students who enter university do not have an understanding of how the university operates, what is expected of them as higher education students and they do not have a coping strategy in place.

Finally, it can be concluded that many students are hampered by social issues (financial constraints, housing/accommodation, etc.) that they have to deal with on a daily basis.

6.7 QUALITY MANAGEMENT ISSUES

Quality is defined differently by different people, based on their understanding of quality. The most common definitions of quality are as stated below:

- Getting it right the first time
- Conformance to requirements
- Meeting customer requirements
- Fit for purpose

With these definitions in mind, it can be concluded that the practices in ECP in the Department of Mechanical Engineering at the University of Technology in this study have conformed to the definitions of quality.

The ECP has contributed to increasing the graduation output of the Department of Mechanical Engineering and doing so in regulation time. This is an indication of their commitment to "getting it right the first time".

The "Guidelines for Extended Curriculum Programme" (CPUT, 2010) and the "Foundation Provision in Ministerially Approved Programmes" (South Africa. DOE, 2012) documents outline the aim of ECP's as discussed in detail in Chapter 2, and it can be concluded that based on the guidelines in these documents, the ECP at the Department of Mechanical Engineering at the University of Technology is practicing quality management by their "conformance to requirements".

ECP's have given many students from disadvantaged educational backgrounds the opportunity to have access to higher education and have resources available to them to succeed in higher education. It can therefore be concluded that ECP's are there to "meet customer requirements".

The ECP at the University of Technology has aligned itself with the institution's mission and vision and has so proved itself to be "fit for purpose".

6.8 OVERALL CONCLUSION

The overall conclusion that can be drawn is that the ECP in the Department of Mechanical Engineering at the university of technology has proven to be successful in their attempt to improve throughput rates and graduation output in the National Diploma in Mechanical Engineering. Quality Management practices are in place but are however not formalised in order to more accurately gauge the success of the programme.

6.9 RECOMMENDATIONS

Tinto (1993) identified three reasons why students do not complete their studies. These reasons were: "academic difficulties, the inability of individuals to resolve their educational and occupational goals, and their failure to become or remain incorporated in the intellectual and social life of the institution" (Tinto, 1993: 1).

Tinto's (1993) "Model of Institutional Departure" gives some advice on how to retain students in the system. In his model, Tinto refers to formal and informal systems that need to be in place at a higher education institution. He lists these systems as:

- Integration into the formal academic system. Here Tinto refers to the academic performance of the student.
- Integration into the informal academic system. Here Tinto refers to the interactions between students and the faculty/staff.
- Integration into the formal social system. Here Tinto refers to extracurricular activities offered by the institution.
- Integration into the informal social system. Here Tinto refers to peer-group interactions.

In Tinto's (1993) "Dimensions of Institutional Action" he states that the higher education institution needs to play an active role in student retention. Institutions need

to be committed to retaining students by implementing retention programmes which put the students' welfare first, is addressed at all students, and supports the development of social and educational communities within the institution. The types of institutional actions highlighted by Tinto are

- Transition assistance
- Early contact and community building
- Academic involvement and support
- Monitoring and early warning
- Counselling and advising

Scott, Yeld and Hendry (2007) take a closer look at the South African higher education system and the difficulty it is having with achieving high success rates and pose the following questions:

- Could it be that the lack of sufficient participation of academics in the quality assurance system is preventing processes of change to take root at higher education institutions? (Scott, Yeld and Hendry, 2007: iv)
- What initiatives should be put in place to prevent the more mechanistic aspects of quality assurance from obliterating the investigation of the deeper challenges, problems and limitations faced by institutions in the process of educating a new generation of students? (Scott, Yeld and Hendry, 2007: iv)

With the results of the investigation into what the success rate of students on the ECP is in comparison to students on the Mainstream in the same course, the conclusions drawn and the opinions of different authors on how to address the problem of low success rates, the following recommendations are made with regard to the ECP in the Department of Mechanical Engineering at the university of technology in this study.

6.9.1 It is recommended that a plan should be in place to assist students in developing a coping strategy.

This plan should have all ECP staff play a role in actively monitoring and encouraging students to work at delivering their best. The plan should not be a once-off intervention, but should span over the first few months of all new students' time at the higher education institution.

The motivation for a plan to assist first-time students is the fact that students do not understand what higher education is about and do not know how to take on the challenge of higher education. Students do not have a frame of reference to draw from, as in most cases, their secondary education did not adequately prepare them for the challenges of higher education.

In order for this intervention to be effective, the student should be drawn in at several stages during the first few months to reflect on how he/she is coping and from that be able to work on a coping strategy. The strategy should be drawn up by the student and the student should take responsibility for monitoring his/her progress with regular feedback to one or more ECP lecturers.

6.9.2 It is further recommended that there should be active involvement from the university in assisting students to cope with some of the social pressures that they are dealing with.

It is important for students to know about the professional services available, for example Student Counselling, Financial Aid, etcetera. These services can be drawn

into presenting workshops to students on for example, budgeting, exam anxiety, adjusting to tertiary education, living away from home, peer pressure, etcetera.

6.9.3 All lecturers should be involved in the quality management of the Extended Curriculum Programme.

The Quality Department within the institution deals with the quality management aspects of the running of the programme with regards to programme accreditation, but the quality management of the teaching and learning aspect of the programme should come down to the staff who teach on the programme.

The motivation for this is the fact that lecturers have more direct contact with the students who are their first point of reference for the success of teaching interventions and the implementation of new teaching interventions. Students are a direct source of feedback regarding teaching interventions and the success of the programme as a whole.

6.9.4 The ECP should conduct regular evaluations of the programme through administering questionnaires to all students, or interviewing a sample of the students.

Programme evaluations are an effective way of getting feedback from one of the stakeholders, in this case, the students, and suggestions made by the students can be used to continually improve the programme. This kind of practice aligns itself with the TQM and Servqual quality models. Programme evaluations should be conducted at least twice a year.

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APPENDIX A: EXTENDED CURRICULUM PROGRAMME 2007 INTAKE

S1
S2
S3
S4
IN-SERVICE P1 & P2

					2007		2008		2009		2010		2011		2012		2013		
					SEM1	SEM 2	SEM1	SEM2	SEM1	SEM 2	SEM1	SEM2	SEM1	SEM 2	SEM1	SEM2	SEM1	SEM2	
							BELLVILLE				BELLVILLE				BELLVILLE				
1-ARENDSEN,WA	2.07E+08	A	NDMECX	01															Graduated April 2012
2-ATYOSI,Z	2.07E+08	A	NDMECX	01															
3-BARBIER,D	2.06E+08	A	NDMECX	01			switched to another course/campus												
4-BARTH,DD	2.07E+08	A	NDMECX	01			switched to another course												
5-BOOYSEN,EW	2.07E+08	A	NDMECX	01															
6-CAIRNS,KRC	2.07E+08	A	NDMECX	01															
7-ENGLE,L	2.07E+08	A	NDMECX	01															GRADUATED (Sept 2010)
8-GODLO,C	2.07E+08	A	NDMECX	01															
9-JANTJIES,KA	2.07E+08	A	NDMECX	01															
10-LAMANI,S	2.07E+08	A	NDMECX	01															Graduated Sept 2012 (B-tech)
11-LOTZ,CM	2.07E+08	A	NDMECX	01															GRADUATED (Sept 2010)
12-LOUW,LL	2.05E+08	A	NDMECX	01															Graduated April 2012 (B-tech)
13-MALANGABI,M	2.07E+08	A	NDMECX	01															Graduated April 2013
14-MARUPING,TA	2.06E+08	A	NDMECX	01															REGISTERED 2006
15-MASOKA,O	2.07E+08	A	NDMECX	01															Graduate April 2014
16-MASSENT,PVJ	2.07E+08	A	NDMECX	01															
17-MATOMANE,SO	2.07E+08	A	NDMECX	01															Graduated April 2012
18-MBILINI,L	2.07E+08	A	NDMECX	01															
19-MBINDA,S	2.07E+08	A	NDMECX	01															Graduated April 2013 (B-tech)
20-MDLELENI,ZO	2.05E+08	A	NDMECX	01															Graduated Sept 2011 (B-tech)
21-MFUTWANA,TA	2.07E+08	A	NDMECX	01															
22-MINTOOR,B	2.07E+08	A	NDMECX	01															
23-MJOLI,BS	2.07E+08	A	NDMECX	01															Graduated April 2013 (B-tech)
24-MNGENI,MV	2.07E+08	A	NDMECX	01															GRADUATED (April2011)
25-MOMOZA,S	2.07E+08	A	NDMECX	01															
26-MPOHLEKANA,S	2.06E+08	A	NDMECX	01															REGISTERED 2006
27-MPUTI,L	2.07E+08	A	NDMECX	01															GRADUATED (April2011)
28-NATHAN,MJH	2.07E+08	A	NDMECX	01															
29-NGQEZA,L	2.07E+08	A	NDMECX	01															Graduated April 2013
30-NKUHLU,S	2.07E+08	A	NDMECX	01															GRADUATED (Sept 2010)Btech 2011
31-NKWEBA,S	2.06E+08	A	NDMECX	01															REGISTERED 2006
32-NWANDULA,S	2.07E+08	A	NDMECX	01															
33-NXADI,MK	2.07E+08	A	NDMECX	01															Graduated Sept 2011 (B-tech)
34-NYATI,M	2.06E+08	A	NDMECX	01															
35-OLIVIER,CA	2.07E+08	A	NDMECX	01															Graduate Sept 2013
36-RAMATHAVHA,TD	2.07E+08	A	NDMECX	01															Graduated April 2012
37-RHODE,R	2.07E+08	A	NDMECX	01															
38-TINTELO,PG	2.07E+08	A	NDMECX	01															
39-TOKOZWAYO,L	2.07E+08	A	NDMECX	01			switched to another course												
40-VAN DIEMEL,JP	2.07E+08	A	NDMECX	01			switched to another course												
41-VAN NEEL,J	2.07E+08	A	NDMECX	01															GRADUATED (Sept 2010)
42-WANZA,BK	2.07E+08	A	NDMECX	01															Graduated Sept 2011
43-WILLIAMS,J	2.07E+08	A	NDMECX	01															Graduated April 2013 registered for B-tech
44-WILLIAMS,RJ	2.07E+08	A	NDMECX	01															

APPENDIX B: MAINSTREAM 2007 INTAKE

S1
S2
S3
S4
IN-SERVICE P1 & P2

					2007		2008		2009		2010		2011		2012		2013		
					SEM1	SEM 2	SEM1	SEM2	SEM1	SEM 2	SEM1	SEM2	SEM1	SEM 2	SEM1	SEM2	SEM1	SEM2	
1	ABRAHAMS, C	206143834	MDIPME	01															Graduated April 2012
2	ANTONIDES, BJ	207080992	MDIPME	01															
3	BARNARD, KW	206015240	MDIPME	01															
4	BELL, LN	207008442	MDIPME	01															Graduated April 2011. Btech 2011/12
5	BENJAMIN, R	207091528	MDIPME	01															Graduated April 2012. Btech 2012
6	BHATAYI, O	207098328	MDIPME	01															
7	BOKOLO, AM	207196990	MDIPME	01		switched to another course/campus													
8	BOTHA, LR	207152110	MDIPME	01															Graduated Sept 2010. Btech 2010
9	BRAAF, DD	207103941	MDIPME	01															
10	DLAMBULO, A	207177848	MDIPME	01															
11	GABRIELS, DH	207097321	MDIPME	01															
12	GUBHUZA, S	207158517	MDIPME	01															Graduate April 2014
13	HECTOR, GL	207092265	MDIPME	01															
14	HENKERMAN, BS	206162545	MDIPME	01															P1, P2 exempted. Graduated April 2009. Btech 2009
15	JAMA, B	207019967	MDIPME	01															Graduatd April 2010. Btech 2010
16	KANUKA, A	207109761	MDIPME	01							switched to another course/campus								
17	KGARANE, TG	207020868	MDIPME	01															Graduated Sept 2010. Btech 2010
18	KONA, LA	207177937	MDIPME	01															
19	KWAZI, GK	207154813	MDIPME	01															
20	LANGENI, Z	207072973	MDIPME	01															
21	LATEGAN, CA	207152136	MDIPME	01															Graduated April 2010
22	LEWIS, DF	207085277	MDIPME	01															
23	LONG, CR	207039690	MDIPME	01															Graduated April 2010
24	LUBISI, A	207095191	MDIPME	01															
25	MADYIBI, X	207090998	MDIPME	01															Graduated April 2010
26	MAKONGWANA, S	207192820	MDIPME	01															Graduated Sept 2010. Btech 2010
27	MANGANENG, OE	207115849	MDIPME	01															?????? Graduated
28	MARIENS, M	207092427	MDIPME	01															?????? Graduated
29	MATAME, L	207015402	MDIPME	01															Graduated Sept 2010. Btech 2010
30	MATHANZIMA, N H	207086222	MDIPME	01															Graduated Sept 2010. Btech 2010
31	MATIWANE, RM	207179913	MDIPME	01															
32	MAZOMBA, MA	207008094	MDIPME	01															
33	MBANA, N	206102984	MDIPME	01															Graduated April 2012. Btech (2013)
34	MBENENE, S	207098638	MDIPME	01															Graduated April 2011. Btech 2011
35	MBUTUMA, AB	207179778	MDIPME	01															Graduated April 2011. Btech 2011
36	MBUYANA, Z	207189366	MDIPME	01															
37	MDITSHWA, S	207179190	MDIPME	01															
38	MINNAAR, MC	206146787	MDIPME	01															Graduated April 2011. Btech 2011
39	MLAMLELI, YY	207192804	MDIPME	01															
40	MOFOKENG, A	207177899	MDIPME	01															
41	MOTHABENG, T	207034044	MDIPME	01															Graduated Sept 2010
42	MOTLALEKGOSI, MI	207192839	MDIPME	01															
43	MOTLHALE, LF	207189701	MDIPME	01															
44	MOTSOANE, W	207177902	MDIPME	01															

APPENDIX B: MAINSTREAM 2007 INTAKE CONTINUED

45	MPHE, N	207189242	MDIPME	01															Graduated April 2011. Btech 2011
46	MPOLOKENG, BJ	207174288	MDIPME	01															Graduated April 2010
47	MTSEWU, P	207091277	MDIPME	01															Graduated Sept 2013
48	NDAMASHE, A	207027293	MDIPME	01			switched to another course/campus												
49	NDLOVU, KS	207104867	MDIPME	01															
50	NGALO, S	207104301	MDIPME	01															Graduated Sept 2011. Btech 2013
51	NGQANEKA, L	207178852	MDIPME	01															
52	NGQOSHANA, A	207178127	MDIPME	01															
53	NOBULELE, AG	206024169	MDIPME	01															
54	NTIKINCA, S	207088322	MDIPME	01															
55	NTLABEZI, A	207078866	MDIPME	01															
56	NTWASA, N	207196958	MDIPME	01															
57	PATRICK, CJ	207014655	MDIPME	01															Graduated Sept 2011. Btech 2013
58	PAULSE, TC	207179670	MDIPME	01															Graduated April 2013. Btech 2013
59	QANGISO, S	207051283	MDIPME	01															
60	RAKIEP, MR	207098395	MDIPME	01															Graduated April 2010. Btech 2011
61	ROOIMES, M	207026777	MDIPME	01															Graduated Sept 2011. Btech 2011
62	RULU, PW	207105812	MDIPME	01															
63	SEBAKO, K	207007047	MDIPME	01															
64	SEHOSHE, I	207014973	MDIPME	01															
65	SELEKA, ME	207182574	MDIPME	01															Graduated April 2010
66	SIBINDLANA, SS	207189285	MDIPME	01															Graduated Sept 2012. Btech 2012
67	SISHUBA, LR	207177961	MDIPME	01															
68	SOLOMON, RS	207098859	MDIPME	01															
69	STEWART, J	207178038	MDIPME	01															Graduated April 2010. Btech 2010
70	TLADI, TN	207128219	MDIPME	01															Graduated Sept 2011
71	TSHEM, S	207189277	MDIPME	01															
72	TUKUSHE, K	207058113	MDIPME	01															Graduated Sept 2011
73	VAN ROOYEN, KC	207085552	MDIPME	01															
74	WILLIAMS, H	207109885	MDIPME	01															
75	WOLFAARDT, JM	207097887	MDIPME	01															
76	YAM, L	207028168	MDIPME	01		switched to another course/campus													
77	YAZE, M	207177872	MDIPME	01															

Name of current employer: _____

Number of years with current employer: _____

Type of organization (please mark with an X)

Self-employed	SSME	Private Company	Public Company	Government	NGO

Date National Diploma in Mechanical Engineering completed: _____

Details of further studies: _____

_____

PLEASE RATE THE FOLLOWING STATEMENTS ON A SCALE OF 1 TO 5. FURTHER EXPLANATION IS PROVIDED WITH EACH STATEMENT.

I started working immediately after completing my diploma/b-tech.	1 Unemployed for more than 6 months	2 Unemployed for 6 months	3 Unemployed for 4 months	4 Unemployed for 2 months	5 Started working immediately
I am employed in the field which I was trained in.	1 Not at all	2 Very little	3 Somewhat	4 Sufficiently	5 To a great extent
My current organization has provided me with opportunities for skills improvement and promotion.	1 Not at all	2 Very little	3 Somewhat	4 Sufficiently	5 To a great extent
The remuneration I receive is competitive to the remuneration received by my peers in other organizations.	1 Not at all	2 Very little	3 Somewhat	4 Sufficiently	5 To a great extent

PLEASE RATE THE FOLLOWING STATEMENTS FROM STRONGLY DISAGREE TO STRONGLY AGREE.

I am able to critically analyse and solve problems in the workplace.	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
I am able to communicate with my colleagues and employer/s.	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
I am able to complete all written communication with ease.	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE
The integrated projects done at university assisted me in coping with projects/tasks at work.	STRONGLY DISAGREE	DISAGREE	UNDECIDED	AGREE	STRONGLY AGREE

Thank you for completing this questionnaire. Your input is valuable in our research into the success of the Extended Curriculum Programme.

APPENDIX D: INTERVIEW QUESTIONS

1. How long have you been teaching on the Extended Curriculum Programme in the Department of Mechanical Engineering?
2. Have you taught on the mainstream programme as well?
3. What differences in the teaching styles in these programs (mainstream and extended) are evident?
4. What differences are there in the profile of student on mainstream and extended?
5. What (if any) are the most evident shortcomings that students have that are hampering them from succeeding in higher education?
6. What interventions have you put in place in your subject to ensure that students understand concepts in your subject and succeed in your subject?
7. What measures do you have in place to monitor student success in your subject?
8. What interventions are in place in the ECP (outside of individual subjects) to ensure student development and success?
9. What suggestions do you have for interventions that could help students with their overall development?
10. What measures should be in place in ECP to gauge the success of the programme?