AN INVESTIGATION INTO THE EXPERIENTIAL LEARNING EXPERIENCE OF SOUTH AFRICAN CONSTRUCTION MANAGEMENT STUDENTS AT UNIVERSITIES OF TECHNOLOGY

By

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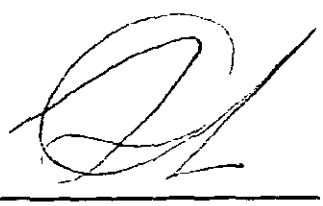
DECLARATION

With this statement I, Ferdinand Cedric Fester, affirm that the research work upon which this dissertation is supported is my own (except where acknowledgements indicate otherwise), and that the entire research endeavour nor any part of it has been, is being or is to be submitted for another degree in this or and other education institution.



Ferdinand Fester November 2005

By

FERDINAND FESTER

This dissertation is dedicated to my wife Renate, my children Storm-Fauve, Jade, Chandler and Ferdinand, my grandson Tyler and the memory of my Parents Derrick and Barbara Fester and my Brother Colin.

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To the Lord Jesus Christ for all the Blessings that I have received. For the ability to complete this work. For the support of my family and colleagues.

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Chair: Dr Theodore Conrad Haupt
Major Department: Built Environment

Cooperative education is practiced in many fields of industry. The South African construction industry has shown a preference for cooperative construction management education. Cooperative construction management education is practiced worldwide, but the majority of these programmes do not have compulsory credit bearing experiential learning as part of its programmes. This study examined the experiential learning experience as well as the relevance and adequacy of preparation of subject areas taught in UT construction management programmes from the perspective of all the stakeholders. The study had four main objectives namely (1) To measure the extent of the perceived relevance by industry stakeholders, students and academics of the topics and content of construction management programmes at UT; (2) To establish the level of inadequacy, as perceived by industry stakeholders and academic staff of the preparation of UT construction management graduates to perform construction management functions: (3) To determine the level of dissatisfaction, if it existed with the experiential learning of construction management students; and (4) To establish the preparedness of construction industry stakeholders

to mentor construction management experiential learning students; and to use the findings of the study to inform development of construction management programmes.

Literature was reviewed relative to experiential learning and its general and specific application to construction management education. Self- administered questionnaires were completed by 1st year as well as senior students registered for the National Diploma: Building as well as the B. Tech. degrees in Construction Management and Quantity Surveying.

The study suggests that although the experiential learning experience is relevant and generally well accepted by all role-players, there is a mismatch between the needs of industry and what is being produced by the UT. The topics that form the programme are relevant, but a level of dissatisfaction exists with the preparation of construction management graduates to perform construction management functions do exist.

CHAPTER 1
INTRODUCTION

1.1 General background

Construction education at Universities of Technology (UT) in South Africa is based on the cooperative education model. This cooperative education model, pioneered at the University of Cincinnati in 1906 by Professor Herman Schneider (Collins, 1986), embodies the notion that both education and training are equally essential. Education refers to all the ways in which students train and develop to fulfil their potential realized as a result of acquiring skills, attitudes and values which not only reflect the need of the industry, but also the social, cultural and physical environment in which students live (Guillaud and Garnier, 2001). Training on the other hand is the systematic development of attitudes, knowledge and skill patterns required by persons to adequately perform given tasks or jobs (Haupt, 2003).

Cooperative education thus needs to bridge the gap between education and training to produce a graduate or diplomate that is both educated and trained and able to add value to the construction industry. According to Ryder, Wilson and Associates, (1987) and Schaafsma (1996) cooperative education is an educational approach that links classroom instruction and work for the purpose of enhancing the total educational experience of students. Cooperative education therefore involves training and systematically developing students through the acquisition of the requisite skills, attitudes, values and knowledge required to adequately perform in their chosen careers.

Many argue that the practical experience gained from a structured internship is an important step in laying the groundwork to prepare students for careers in their chosen field (Hauck, Allen and Rondinelli, 2000; Miller, 1998).

Cooperative education thus incorporates productive work into the curriculum as a regular and integral element of a higher education course (Haupt, 2003; Miller, 1998). Experiential learning has long been recognized as among the most effective means of acquiring professional education and training (Tinker and Tramel, 2002; Beliveau and Peter, 2002; Davies, 2000; Hicks 1996). The present model involves three cooperative partners, namely the academic institution, employer and student (Haupt, 2003; Smith, 2000; and Rainsbury, Hodges, Sutherland and Barrow, 1998).

The Chartered Institute of Building (CIOB), which is arguably the leading internationally recognised construction management professional body, reports that despite the demand for graduates with industrial experience, only 30% of graduates are taught using the sandwich mode of delivery (CIOB, 2004). This sandwich mode of delivery is made up of experiential learning periods that are placed (sandwiched) in between periods of academic learning at an educational institution. This concern by the CIOB further stresses the importance of experiential learning in cooperative education.

It should therefore be evident that cooperative education has two main components, namely an academic component and an experiential learning component, both of which are integral to its success (Haupt, 2003). A pilot study recently completed in South Africa suggested that construction management education programmes that include a period of experiential learning are preferred by South African construction employers (Haupt, Smallwood and Miller, 2004). The precise timing of periods of

experiential learning within these programmes as well as their duration are both issues upon which there is no consensus at present. Internationally, internships or periods of service learning form an integral part of construction education although not always compulsory in every case. Several authors have argued that experiential learning should form an integral part of any Construction Management education programme (Kramer, 2004; Siddiqi and Ozcan, 2004; Hager, Pryor and Bryant, 2003; Miller, 1998)

The assessment strategy used to evaluate the academic component involves various assessment tools such as tests, examinations, assignments and projects. The assessment of the experiential learning component on the other hand may be via student self evaluation, keeping of logbooks, assignments and also by reports written or assessed by the employer representative to whom the student reports (Haupt et al., 2004; Fester and Haupt, 2003; Greenbank, 2002; Miller, 1998). Against a backdrop of needs which include developing into a knowledge society as well as providing education and training to develop skills and innovations necessary for national development and successful participation in the global economy (Department of Education (DoE), 1997) the UT are in a unique situation to provide students and industry with graduates and diplomats who have not only been educated, but also properly trained in order to participate fully in a society in transition or in need of transformation.

For some time, construction industry employer representatives have suggested that education and training programmes offered at UT do not always address the needs of the industry. They argue that UT graduates lack the necessary theoretical skills, training and managerial understanding to ensure immediate meaningful employment. Fester and Haupt (2003) found dissatisfaction among employers of the former Technikon

Witwatersrand construction management graduates, relative to the academic preparation of these graduates across a range of construction management topics.

This study thus critically evaluates:

- Whether the experiential learning undertaken by construction management students at South African UT equipped them with the requisite experience and practical skills to perform various construction management functions once employed;
- Whether the outcomes required by employers of UT graduates are realized; and
- Whether the topics covered by the UT in their construction management programmes are relevant.

1.2 Guiding questions

Are the topics covered by construction education programmes at UT relevant to the outcomes sought? Shirazi and Hampson (1998) identified the following attributes as being outcomes that construction management education programmes should develop in students, relative to the practice and discipline of construction management. These include, but are not restricted to:

- The demonstrated commitment from students to their chosen career in construction;
- Being trustworthy, having motivation and empowering others to succeed in construction;
- The ability to communicate, listen and articulate objectives and problems clearly;
- Being able to use technological tools and techniques;
- Being able to tolerate stress, uncertainty and risk; and
- Understanding and communicating technical aspects of the construction process (Shirazi and Hampson ,1998).

The construction management programme should not only produce a person who is qualified, but develop a person holistically as well. Another question to be asked is whether construction management programmes lead to high levels of sustainable

employment for diplomates and graduates in the discipline and practice of construction management?

Pilot studies as well as extensive literature confirm that experiential learning forms a much desired part of the construction management education experience. This finding leads to more questions that need to be answered concerning experiential learning:

- Is the nature (what is learnt during the experiential learning period) of such experiential learning suitable for achieving the intended outcomes?
- Is the duration of the experiential learning period adequate?
- Which methods of assessment should be used to evaluate experiential learning to ensure appropriate levels of competency have been reached?
- When should the experiential learning period take place within the cooperative education programme?

1.3 Significance of the study

The government of the Republic of South Africa has clearly defined goals and objectives that Higher Education (HE) must satisfy and achieve relative to the reconstruction and redevelopment of the country. This policy requires the higher education system and its institutions to meet the needs of an increasingly technologically-oriented economy (DoE, 1997). The Higher Education Qualifications Framework draft document (2004) also puts certain challenges forward that HE must achieve (DoE 2004a). These demands on educational institutions are not unique to South Africa. For example, Miller (1998) cites the New South Wales (Australia) Government Green Paper as strongly advocating co-operative education strategies as a means of raising standards in the construction industry in Australia, particularly in the areas of management and technical competence.

Co-operative education is classified as Mode 2 knowledge in that it is characterized by the proliferation of knowledge production in the context of application. This knowledge production is mostly problem specific and guided by the requirements of practical relevance to a particular industrial sector, in this case the construction sector (Haupt, 2003). Workplace learning therefore provides the underpinning knowledge and attributes of competence needed for the job as a whole such as, for example, aspects of work-place culture, work norms and values (Schaafsma, 1996 citing Gillen, 1993).

UT plays an important role in the higher education sector of South Africa in that they are the primary vehicle for co-operative education in the country. The quality of this education however, has to be such that it contributes positively to the development and growth of the South African economy in general and the South African Construction Industry (SACI) in particular. This study investigates the quality of experiential learning in co-operative construction management education offered by UT relative to this contention.

An essential element of construction industry service-learning is the creation of a body of literature specific to the discipline of construction management (Senior, 1999). This study contributes to the development of such a body of knowledge

Problem Statement:

The problem to be investigated may be stated as:

Construction Management programmes currently offered at South African Universities of Technology are perceived by industry employers to be inadequately preparing diplomates and graduates academically, and failing to equip them with the requisite experience and practical skills to perform various construction management

functions in the construction industry resulting in general dissatisfaction with these programmes.

1.4 Hypothesis

H 1:

The topics and content of construction management courses offered at South African Universities of Technology are not relevant to the practice of construction management

H 2:

The South African Universities of Technology inadequately prepare graduates for the functions of construction management

H 3:

South African construction industry stakeholders consider experiential learning undertaken during construction management programmes at South African Universities of Technology unnecessary.

H 4:

South African construction industry stakeholders are not "geared up" to manage experiential training.

1.5 Objectives

The objectives of the study are:

- To measure the extent of the perceived relevance by industry stakeholders, students and academic institutions of the topics and content of the construction management courses covered in South African Universities of Technology construction management programmes;

- To establish the level of inadequacy, as perceived by industry stakeholders and academic staff, of the preparation by South African Universities of Technology of graduates and diplomates to perform construction management functions;

- To determine the levels of dissatisfaction, if they exist, with the experiential learning of construction management students, relative to its timing in their programmes, length of the period spent in industry, structure and method of assessment; and

- To use the findings of the study to inform the development of construction management programmes.

1.6 Methodology

To test the hypotheses and achieve the objective of the study the research methodology will include both qualitative and quantitative methods. The study will include a comprehensive literature review of the cooperative education approach, the discipline and practice of construction management, and construction management cooperative education. Various research instruments and approaches will be developed to test the hypotheses of the study and achieve its stated objectives. Collected data will be statistically analysed using a statistical software package namely the Statistical Package for Social Sciences (SPSS). Conclusions will be drawn from the analysis and recommendations will be made for further study and curriculum revision if necessary.

1.7 Limitations of the research

This research project is subject to the following limitations:

1. The student sample will only include students who are full time first and final year National Diploma: Building and Bachelor of Technology: Quantity Surveying and Construction Management students registered at the University of Johannesburg and the Cape Peninsula University of Technology.
2. The industry sample will only include construction management, project management or quantity surveying employers.
3. The academic staff sample will be restricted to academic staff at UT throughout the country where the National Diploma: Building and the Bachelor of Technology Construction Management and Quantity Surveying programmes are offered.

1.8 Assumptions

It is assumed that all participants in this study will provide accurate responses to the questions asked of them.

1.9 Sample region

The Republic of South Africa will constitute the sample region as UT graduates and diplomates are employed throughout the country and across all sectors and disciplines of the construction industry.

1.10 Ethical statement

To comply with internationally accepted ethical standards, no names of individuals will be recorded on research instruments. In this way, no individual can be linked to particular completed research instruments, thus assuring anonymity. Respondents will receive no compensation in any manner or form for participation in this study. Quality assurance will focus on the following aspects:

- Correctness and completeness of questionnaires, when used, with particular regard to open ended questions;
- Quality and accuracy of data capturing; and
- Frequency distributions run to check that all variables contain only values in the accepted range.

1.11 Definitions of key terms and concepts

University of Technology

> A Higher Education Institution, which concentrates on application of scientific principles to practical problems and to technology, thus preparing learners for the practice, promotion and transfer of technology within a particular vocation or industry (CHE, 2002).

Experiential Learning/Internship/Service Learning

> A period of work-based learning undertaken by a student in an employment situation to gain work experience that may be used to link theory and practice and develop transferable skills and enhance the teaching-learning process. This period may be either for academic credit or not. (Greenbank, 2002; Hickox, 2002; Schneider, 1910 in Barbeau and Stull, 1990).

Co-operative Education

> Working together of industry and the co-operative education institution, in a process in which academic study is integrated with work experience in order to benefit both the students and industry. This term is used by the TUT sector to describe the integration of productive work into the career-focused curriculum (CHE, 2002).

Construction Management

> The application of advanced expertise in the theory and practice of management relating to the construction procurement process and the construction organization as a business enterprise (cited in Haupt, et al., 2004).

Construction Manager

> A person employed by either a client or contractor to manage the physical construction process relative to a single or multiple projects (SACPCMP, 2002)

1.12 *Structure of Study*

Chapter 1: Introduction to study

The chapter will focus on the background of the experiential learning undertaken by Construction Management students at Universities of Technology, including an overview of cooperative education and its value in construction management education. The problem statement and hypothesis are presented as well as the significance, purpose and value of the study.

Chapter 2: Review of Literature

Past and current literature is reviewed with regard to four aspects of the study, namely experiential learning, co-operative education, construction management education and co-operative construction management education will be discussed in detail.

Chapter 3: Research Methodology

The research design and methodology will form the basis of this chapter. The method in which the research will be undertaken will be discussed fully.

Chapter 4: Data Analysis

The analysis of the data (using the SPSS application) will be presented in this chapter.

Chapter 5: Discussion of Findings

The results and findings of the research are discussed in this chapter.

Chapter 6: Summary, Conclusions and Recommendations

In this chapter, the study will be summarised, with conclusions being drawn from the research and findings and recommendations for further study and improvements of current construction management programmes.

1.13 Abbreviations and Acronyms

B.Tech.: Bachelor of Technology
CHE: Council for Higher Education
CIOB: Chartered Institute of Building
CPD: Continuous Professional Development
HEQC: Higher Education Quality Council
N.Dip.: National Diploma
NQF: National Qualifications Framework
SACI: South African Construction industry
SACPCMP: South African Council for the Project and Construction Management Professions
SAIB: South African Institute of Building

SAQA: South African Qualifications Authority
SPSS: Statistical Package for Social Sciences
WBL: Work-based learning
UT: University of Technology

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to review the literature relative to construction management education and the importance of work-based learning within construction management education. Further the chapter develops an understanding of the links between the commonalities within the different terms used by construction management academia and the construction industry internationally and locally in order to use one term throughout this dissertation.

2.2 Historical Background

The Institute of Building (IOB) received Royal Charter in 1980, and was henceforth known as the Chartered Institute of Building (CIOB) with this recognition construction management emerged as a profession. In South Africa, the South African Institute of Building (SAIB) was formed in 1969 with the hope that construction managers would be accorded their rightful place among the other construction professionals such as architects, engineers and quantity surveyors. This was however not to be. The promulgation of the South African Council for the Project and Construction Management Professions (SACPCMP) Act 48 of 2000, sought to change the status quo and the construction manager is now recognised as a professional with a specific body of knowledge. The SACPCMP accredits courses and programmes at universities that offer construction management and which are accredited against criteria developed by the

SACPCMP. The CIOB merged with the SAIB in 2002 and formed the CIOB-Africa. Internationally, the CIOB plays an accrediting role and accredits construction management programmes around the world. In South Africa, the CIOB has only accredited five of the six traditional universities. None of the Universities of Technology (UT) has been accredited to date. A problem however exists in that UT has to measure their construction management programme against set criteria, and the current programme does not satisfy the criteria. Love, Haynes and Irani (2001) cite Murdoch and Hughes (1996) who suggests that construction management professionals should:

- possess a distinct body of knowledge or identifiable corpus of expertise;
- hold the appropriate qualifications required by the appropriate professional body, such as the CIOB and in South Africa the SACPCMP;
- provide a service to the public by considering their needs before the needs of their own; and
- hold mutual recognition of other professions.

Love et al., (2001) have found that generally construction organisations in Australia are satisfied with the construction management graduates that graduate from universities. However, they found that these managers still lacked skills. They raise the debate with regard to whether or not construction managers should be educated or trained, considering the different outcomes of education and training.

2.3 The Role of Higher Education

Higher education in the Republic of South Africa has undergone and still is undergoing radical transformation and change. The Ministry of Education of the Republic has identified purposes for Higher Education (DoE, 1997). One purpose is to address the re-developmental needs of society, and provision of that society with high-level

competencies that will keep pace with needs that are constantly changing. Higher education also needs to make valid contributions to the creation of knowledge. The mismatch between the needs of a modern economy and higher education is a challenge that has to be met. The need for human resource development and levels of training in skills that will strengthen the country's business enterprises is of importance is this regard. Graduates with skills and competencies that build lifelong learning, are one of the goals which higher education needs to meet (DoE, 1997). Partnerships between higher education and other sectors of society, in particular, the business sector, needs to be encouraged. (Fairclough, 2002; Chang, 1998; Shirazi and Hampson, 1998; Davies and Csete, 1998; Kumaraswamy, 1998; Cheung Lo, 1998; Wilkinson, 1998; Miller, 1998; Kestle, 1998; DoE, 1997; Frain, 1992).

In South Africa the Higher Education Institutions (HEI) that dominate the sector are the traditional Universities, the UT and the Comprehensive Universities. Private and International universities and colleges do exist, but none of these offer undergraduate construction management qualifications.

2.4 Entrance Criteria

UT, namely the former technikons, had their foundations in the polytechnics that existed in the UK in the early 1990's. Typically the qualifications they offer are National Diplomas and Bachelor of Technology degrees. Historically, the target student population of these institutions differs from the traditional university in that the student does not require a university exemption in order to be admitted to courses of study. These admission criteria differ from one UT to another, but generally a pass in mathematics and physical science at grade 12 level is acceptable. Individual institutions, however, may have higher entry requirements such as Mathematics and Physical Science Higher Grade

D and Standard Grade B and English first language higher grade D, second language higher grade C, first language standard grade C and second language standard grade B (University of Johannesburg, 2005).

2.5 Teaching Methodology

The majority of UT programmes at diploma level are based on the cooperative education model that comprises experiential learning forming a compulsory part of the programme. In the National Diploma: Building the experiential learning component comprises one sixth of the programme and the student is expected to complete this experiential learning period failing which the diploma may not be issued (DoE, 2004).
The construction management education programmes at UT in South Africa are based on the cooperative education model. This model comprises three partners, the student, the education institution and the employer. The consequence of government restructuring of the academic landscape of South Africa and the mergers that ensued has resulted in the historical gap between traditional universities and the UT narrowing. The cooperative education model makes use of work-based learning in order to achieve the link between the classroom and the industry.

2.6 Cooperative education

Chapin, Roudebush and Krone (2003), quotes Collins, 1986 as crediting Professor Herman Schneider of University of Cincinnati of innovating formal cooperative education in 1906. Cooperative education embodies the notion that both education and training are equally essential (Haupt, 2003). It may also be explained as combining classroom learning with job training (Siddiqi and Ozacan, 2004 citing Taylor, 2002). This connects both education and training (Tennessee Department of Education, 2004). Education refers to all the ways in which students train and develop to fulfill their

potential realized as a result of acquiring skills, attitudes and values which not only reflect the need of the industry, but also the social, cultural and physical environment in which students live (Guillaud and Garnier, 2001; Love et al., 2001 citing Farrel and Gale, 2000). Training on the other hand is the systematic development of attitudes, knowledge and skill patterns required by persons to adequately perform given tasks or jobs (Haupt, 2003; Love et al., 2001, citing Hammer and Champy (1993). Cooperative education thus needs to bridge the gap between education and training to produce a graduate or diplomate that is both educated and trained and able to add value to the construction industry. Cooperative education is an educational approach that links classroom instruction and work for the purpose of enhancing the total educational experience of students (Ryder et al., 1987 and Schaafsma, 1996) Cooperative education therefore involves training and systematically developing students through the acquisition of the requisite skills, attitudes, values and knowledge required to adequately perform in their chosen careers (Kivinen and Ritela, 2002).

Many argue that the practical experience gained from a structured internship is an important step in laying the groundwork to prepare students for careers in their chosen field (Hauck et al., 2000; Miller, 1998). Students also believe that the experience gained will give them an added advantage when they return to the industry on completion of the academic programme (Fester and Haupt, 2005; Kramer, 2004 and Barclay 1996). Cooperative education thus incorporates productive work into the curriculum as a regular and integral element of a higher education course (Haupt, 2003; Miller, 1998). Experiential learning has long been recognized as among the most effective means of acquiring professional education and training (Tinker and Tramel, 2002; Beliveau and

Peter, 2002; Davies, 2000; Hicks 1996). The present model involves three cooperative partners, namely the academic institution, employer and student (Haupt, 2003; Smith, 2000; and Rainsbury et al., 1998). Not only does cooperative education contribute to more effective learning (Schaafsma, 1996) it has the potential to be beneficial to not only the students, but employers as well (Frain, 1992).

In addition, students are introduced to work ethic and learn those interpersonal skills that are needed to survive in the work place (Schaafsma, 1996). Employers benefit by being able to serve on advisory committees of the academic departments, and thus are able to significantly influence course design and content, by ensuring that industry-specific knowledge, awareness and values form part of the higher education process. Chapin, et al., (2003), found that the majority of respondents in their 1996 survey done with members of the Associate Schools of Construction in the United States of America supported cooperative education construction management programmes, and believed benefits such as ease of finding permanent employment and higher starting salaries outweighed the disadvantages which some schools believed existed. Respondents identified these as being, inter alia, time, financial support, personnel and lack of commitment from the University. The collaboration between the HEI and the employer further emphasises the connection between academic preparation and the job requirements. Thus such a cooperative approach offers greater opportunities to blend the academic and the practical skills. Against a backdrop of needs the UT are in a unique situation. These needs include developing into a knowledge society as well as providing education and training to develop skills and innovations necessary for national development and successful participation in the global economy (DoE, 1997). The UT

should provide industry with graduates and diplomats who have not only been educated, but also properly trained in order to participate fully in a society in transition or in need of transformation.

2.7 Work-based learning

It should therefore be evident that cooperative education has two main components, namely an academic component and an experiential learning component, both of which are integral to its success (Haupt, 2003). A pilot study recently completed in South Africa suggested that South African construction employers prefer construction management education programmes that include a period of experiential learning (Haupt et al., 2004). Work-based learning is an experience that involves activities that connect actual work with the classroom (Asher, 2005; WBLRC, 2005; PALATINE, 2005; Tennessee Department of Education, 2004).

The assessment strategy used to evaluate the academic component involves various assessment tools such as tests, examinations, assignments and projects. The assessment of the WBL component on the other hand may be via student self evaluation, keeping of logbooks, assignments and also by reports written or assessed by the employer representative to whom the student reports (Haupt et al. 2004; Fester and Haupt, 2003; Greenbank, 2002; Miller 1998). The value of work based learning may thus be summarised as follows:

- enhances employment prospects of graduates;
- gives students insight into the world of work and career prospects;
- develops job skills and on the job performance;
- develops interpersonal and social skills;

- increases industrial contact for lecturers;
- improves students self confidence, job knowledge, job seeking skills, practical reasoning and attitudes towards supervision;
- helps students to integrate well into the work environment;
- develops greater maturity in students;
- enables students to make positive contributions and demonstrate more positive attitudes in class;
- develops professional skill; and
- links theory to practice (Miller, 1998).

Numerous terms are used to denote work based learning. These terms include service learning, action learning, sandwich programmes, experiential learning, experiential training and internships. Action learning and experiential training do not satisfy the criteria to be work-based learning. Action learning may be carried out without a theoretical and academic component. (Dick, 1997) and experiential training is the realm within which experiential learning takes place (Itin, 1999).

The commonalities between the other concepts, service learning, experiential learning, the sandwich programme and internships may be stated as follows:

- All form part of a cooperative education programme;
- All have a theoretical basis to which the practical must be connected;
- All take place in the workplace; and
- All need to be done under the guidance of an instructor, employer or mentor.

Not all these concepts however require that work-based learning be credit bearing. As stated previously in South Africa the UT work-based learning is however credit bearing and compulsory.

2.8 Work-based learning in construction education

As stated previously many authors have argued that work-based learning is not only important but also relevant to the construction industry. These concepts are discussed in the section below. The thread that runs through all four concepts are also discussed.

2.8.1 Service Learning

Tinker and Tramel (2002) argue for an incorporation of service learning courses into construction management programmes at American Universities and cite the University of Arkansas at Little Rock (UALR) as a success in this regard. Chapin et al., (2003) also found that more than three-quarters of 88 ASC members surveyed in 1996 felt that a formal cooperative education experience was necessary. The UALR structured programme differs from others, insofar as it is spread over 3 years and students have to work in three various stages of construction, from labour, through clerical into management. This system requires 800 hours of work which translates to 20 hours of work based learning through the 3 year period which equates to between 6 and 7 weeks of work based learning per year. Service learning in various shapes and sizes exist in many HEI. Employers also support the concept that service learning should form part of a construction management programme (Senior 1999).

2.8.2 Internships

(Siddiqi and Ozcan 2004) found that the majority of employers surveyed in the USA preferred to hire graduates with practical experience through internships or cooperative education. This further supports Frain's 1992 findings. Internships are an important aspect of construction management students' professional preparation. (Hauck, et al., 2000; Adcox, 2000). Adcox further argues that the internships may also be used by

the student as a method of self-assessment, in order for them to assess themselves against set criteria and determine whether or not that they have reached competency in each of these. Hauck et al., (2000) also states that students received the benefit of these internships as they were able to perform at a higher level in subsequent academic years as a result of this experience. Siddiqi and Ozcan (2004) have also shown that through internships, employers are able to add value through comment as to the quality of construction management programmes.

2.8.3 Sandwich Programmes

The Chartered Institute of Building (CIOB) reported that despite the demand for graduates with industrial experience, only 30% of British construction management graduates are taught using the sandwich mode of delivery. (CIOB, 2004). UT in South Africa all utilise the sandwich programme delivery system for their construction management students. The student attends a period of one year to eighteen months at the university, after which they spend twelve or six months in an industrial placement. After the industrial placement period, they return to the university to complete the final year of the National Diploma: Building, after which they may continue with the Bachelor Technology: Construction Management or Quantity Surveying degree. This system employed for the National Diploma: Building was developed in 1990 when the current course came into being. This programme has the work-based learning period as a credit bearing course which carries a value of 0.5 credits out of a total of 3.00 credits for the National Diploma: Building (DoE, 2004). This current course also followed on a previous course that was first offered in 1981 where the National Diploma: Building Surveying and the National Diploma: Construction Supervision, were three year sandwich programmes. They comprised three six month academic periods which were each

followed by a six month industrial placement over the three year period. The National Higher Diploma: Building Surveying and Construction Supervision were also offered. This was an additional six month period at the academic institutions, followed by another six month period in industry.

2.8.4 Experiential Learning

Davies (2000) highlights the fact that employers require newly graduated employees to contribute significantly to the organisation. He also contends that generally graduates are not able to do this, as they do not posses the necessary skills that employers require. He thus argues that experiential learning be used in this regard to grow the skills that employers have identified as lacking in graduates. The precise timing of periods of experiential learning within these programmes as well as their duration are both issues upon which there is no consensus at present. Internationally, internships or periods of service learning form an integral part of construction education although not always compulsory in every case. Several authors have argued that experiential learning should form an integral part of any Construction Management education programme (Kramer, 2004; Siddiqi and Ozcan, 2004; Hager et al. 2003; Miller, 1998). Through this experiential learning, students are prepared for their future careers. The skills and knowledge acquired through learning from doing, and the reflection on that experience all takes place while they become acquainted with the workplace (Ross and Elechi, 2002; Rainsbury et al, 1998; Hicks, 1996). They thus are in better position to make knowledgeable decisions about their chosen career (Fester and Haupt, 2005). They are also able to better appreciate classroom concepts after applying them in a work situation (Gordon, Hage and McBride, 2001). This is normally also the first opportunity for them to do so and thus gain a more realistic view of how the world of work operates (Fester

and Haupt 2005). This form of experiential learning may be expressed as the combination of three elements, programmed learning in structure settings, questioning learning via investigation and research, and through own experiences (Hicks, 1996).

2.9 Perceived dissatisfaction with construction management graduates

The perception of dissatisfaction by the construction industry of construction management programmes exists. This perception is discussed exploring the various reasons highlighted by the construction industry for this perception and the perceived shortcomings of construction management graduates.

Although the majority of employers prefer cooperative education programmes (Haupt, et al., 2004), dissatisfaction exists among employers of some construction management graduates (Fester and Haupt, 2003) relative to the academic preparation of these graduates, across a range of construction management topics. Employers contend that many UT programmes are irrelevant and outdated (Fester and Haupt 2003; Haupt 2003). The equipment used at these institutions does not compare favourably with that used in industry, and thus retraining is required on the work site on items that students should have been conversant with. This training or re-training is unacceptable to both the student (Cheung Lo, 1998) and to the employers (Davies and Csete, 1998). The South African government has stated as policy, that cooperative education should bridge the minds of students at HEI such as UT and CU and the industry in which the wish to pursue their careers. To achieve this national objective, universities have to pursue strong relationships with and input from stakeholders and industry that employ their students.

The programmes should be sensitive to the needs of the industry that they serve, and they must be designed to help the student in their transition from the classroom to the work place. Employer representative suggest that the education offered at the UT and CU

are inadequate for the needs of their industry. They contend that the graduates lack the necessary theoretical skills and training and managerial understanding to ensure immediate meaningful employment and this creates a mismatch between the employers need and what higher education provides (Davies and Csete, 1998; Cheung Lo, 1998; Graham and McKenzie, 1995). This perception of a mismatch contributes to the unemployment of graduates and diplomates, and also the lack of advancement opportunities for these graduates (Davies and Csete, 1998). One of the purposes of higher education is to prepare students to address the needs of society (DoE, 1997; Kim, Williams, Dattilo, 2002; Sanyal, 1991). There are real concerns in the construction industry about whether construction-related curricula adequately prepare students for their future careers in the industry (Fester and Haupt 2005; Davies and Csete, 1998). For some time academics and practitioners have recognized the need to balance the relationship between theory as taught in the classroom and practice in the field or industry (Ross and Elechi, 2002). Several authors have highlighted that apart from course content relevant to job-related situations, there is the need for an appropriate teaching approach that bridges the perceived gap between formal academic instruction and on the job training (Kim, Williams and Dattilo, 2002; Sanyal, 1991; Ellington, Gordon and Fowlie, 1998; Schaafsma, 1996). South Africa Construction Industry needs skilled technicians and according to Chileshe, Fester and Haupt (2005) it is possible that these skills may be learnt at the higher education institution as well as the workplace. This gap between what is taught in classrooms and what is needed in the workplace is well illustrated in Table 2.1 adapted from Cook and Cook (1998).

Table 2.1: Traditional education vs. Workplace needs

Traditional Education	Workplace needs
Facts	Problem solving
Individual effort	Team skills
Passing a test	Learning how to learn
Achieving a grade	Continuous improvement
Individual courses	Interdisciplinary knowledge
Receive information	Interact and process information
Teaching separate from learning	Technology

(Source: Cook and Cook, 1998)

In the light of the statements made above it may thus be stated that construction graduates are not well prepared to contribute to the economic growth of the country from date of employment. They do adapt well to new skills but respond at a lesser speed to technological advancement. HEI and UT in particular are thus faced with both challenges and opportunities to contribute to the achievement of the national economic priorities through cooperative education programmes that are relevant to the industries that they wish to serve.

Shirazi and Hampson (1998) and Choudhury (2005) identified outcomes that should be developed during construction management education and competencies that construction managers should possess. Table 2.2 compares the education that a student should receive with the competencies required by construction managers. The table is however not exhaustive. From the table it is most notable that the competencies that a construction manger needs to possess, are the same as those that they found should be developed at the HEI (Shirazi and Hampson, 1998).

Therefore they contend that graduates should obtain all the competencies at the HEI so that they are able to be productive employees as soon as they have completed the formal qualification. Many other authors have found this not to be the case. In fact it is argued that the converse is true.

Table 2.2: Competencies required by construction managers.

Educational outcomes.	Construction management requirements
The demonstrated commitment from the student to their chosen career in construction	Obtain commitment from sub-contractors and employees with regard to the objectives of the project
Being trustworthy, having motivation and empowering others to succeed in construction	Trusting, motivating and empowering and giving meaning to employees work
The ability to communicate, listen and articulate objectives and problems clearly	Being an effective communicator and being able to listen, and being able to articulate objectives and problems clearly
Being able to use technological tools and techniques	Ability to understand and use technological tools and techniques
Understanding and communicating technical aspects of the construction process	Ability to understand and communicate technical aspects of the building process
The programme should not only produce a person who is qualified, but develop a person holistically as well. A person who is able to tolerate stress, uncertainty and risk	The ability to work and make decisions effectively in change situations, this requires the ability to tolerate stress, uncertainty and risk

(Source: Shirazi and Hampson, 1998)

The graduate has to undergo further training in order to be productive (Cheung Lo, 1998) and be able to earn fees for their employer (Davies and Csete, 1998). According to Davies and Csete (1998) one of the important aspects of any qualification is to prepare the student for the work situation. They cite Eraut, (1994); Ashworth and Bridge (1996); Mole (1997) and Li, Gao and Chen (1994) and conclude that the HEI are not producing the graduates needed by the construction industry to fulfill their requirements. These graduates should also be good advance planners who possess advanced management skills as well (Li and Yang, 1998). Employers also state that students need to develop skills needed for employment, before leaving university. Ross and Elechi, (2002) and Zhang and Yang, (1998) have argued that students support work-based learning and these students have stated that the benefit greatly from the experience.

The students have however also stated there are mismatches between the classroom and the workplace which are already visible during work-based learning, and the concern is that these mismatches may increase during full-time employment.

Cheung Lo (1998) and Ngowi (1997) argue that the partnership between universities and the construction industry is the bridge for professional development in construction education. He further argues that the bridge may be clearly seen from the viewpoints of the HEI which sees the degree as part of the learning process, which leads to further learning, and the employer who requires a degree that allows the graduate to be productive and earn his salary. Frain (1992); Cheung (1998); Davies and Csete(1998); Wilkinson (1998) among others all call for collaboration between HEI and the construction industry, inclusive of curriculum development in order to bridge this gap and alleviate the perceived mismatch between industry and the HEI. Cheng, Kingsland and Ilett, (1998) further argue for a paradigm shift in construction management higher education. They argue that for "transformational education", which they define as education for change. They define this as an educational system that concentrates the students' energies on learning that enables them to not only do their job, but also do it properly. Thus the learning content is not the only the focus, but also the methodology under which the learning takes place, and places the learning in context as well. It is argued that this type of learning empowers students. These empowered students have characteristics that include, but are not restricted to creativity, originality, and have the ability to undertake autonomous learning and are motivated to undertake continuous further development (Cheng et al., 1998).

2.10 Assessment

Assessment forms an important part of any learning experience. The reasons for assessment, the agency of assessment, the timing of assessment, the method of assessment, the location of assessment and the content to be assessed must all be considered.

- Who should assess the work-based learning?
- Why should work-based learning be assessed?
- When should it be assessed?
- How should it be assessed?
- Where should it be assessed?
- What should be assessed?

2.10.1 Who should assess

Although traditionally the university assesses both the academic and the work-based learning, Hicks (1996) and Rainsbury et al. (1998) argue for a more inclusive and participatory approach to assessment that includes all three cooperative education partners. Fester and Haupt (2005) found that South African construction employers felt that they should be involved in the assessment process as well. The Royal Melbourne Institute of Technology (RMIT) also requires that the employer and the academic mentor assess the students work based learning (RMIT, 2005). The student and their peers may also be involved in the assessments, as self (Gray, 2001; Lester, 2001) and peer assessors, although special considerations need to be made in these circumstances (Gray, 2001).

2.10.2 Why assess

Gray, (2001) and Field, (2003) argue that assessment is able to show a student what their strengths and weaknesses are. It also provides students with feedback on progress and achievements. They further state that it provides lecturers, mentors, instructors with feedback on their abilities to lecture, mentor or instruct. According to Field, (2003) it may be used to motivate students. Assessment may also be used to guide students as to their suitability for their chosen programmes (Field, 2003; Green, 2003).

2.10.3 When should the assessment take place

By virtue of what is being assessed, the general consensus is that the assessment takes place at the end of the work-based learning period (RMIT, 2005; Field, 2003; Gray, 2001; Lester 2001). Continuous assessment is undertaken at RMIT and students, who are placed within Australia, are visited three times by an academic mentor during the work-based learning period (RMIT, 2005).

2.10.4 How is the assessment done

When considering how assessment should be done, the first statement to make, is that the assessment must be consistent and reliable, and secondly, valid. Assessments must be coherent, comprehensive, sequenced, equitable, inclusive and authentic (Field, 2003; Gray, 2001). Assessments should be inclusive and take into account the specialised and personal knowledge of the person being assessed that has developed during the training period and should not be restricted to a syllabus or set course content. (Lester, 1995).

The methods of assessment vary and include, but are not restricted to the following:

- Assignments and Projects that were done in the workplace (RMIT, 2005; Gray, 2001);

- Portfolios (Gray, 2001);
- Presentations (RMIT, 2005; Gray, 2001);
- Full day on the job assessment of work performance (Lester, 2001); and
- Log books (Gray, 2001)

2.10.5 Where does the assessment take place

Although the assessment is of the students' work-based learning, not all authors agree that the assessment should take place at the work place. Lester, (2001) proposes that the work-based learning assessment takes place at the work place. Others speak about portfolios, presentations, assignments and projects being handed in to be marked by academics (RMIT, 2005; Gray, 2003 and Field, 2001). The role of the employer in the assessment phase is however discarded.

Lester (2001) calls for external professional assessors to undertake the assessment at the work-place. Other authors (Fester and Haupt, 2005; Rainsbury et al., 1998 and Hicks, 1996) found that all three parties to the cooperative education experience should be involved in the assessment and include the employers.

2.10.6 What is assessed

It is generally accepted that performance in relation to outcomes are to be assessed. It also should be able to show the abilities of the student to do the job (Field, 2003; Gray, 2001; Lester, 1995). These outcomes are what the students are able do in the work place. The ability to perform tasks in the work place using both the academic training and the practical experience gained during work-based learning.

2.11 Role of the employers in cooperative education

As stated previously, the cooperative education process involves three partners. The role of the employers with regard to their preparedness to act as the third party in the cooperative education process is considered here. Many industries where work-based learning takes place have training manuals for implementation of such work-based learning. Within the built environment in South Africa, the Quantity Surveying professions is one such case in point (SACQSP, 2005). This guide provides both the candidate quantity surveyor and the mentor with direction with regard to the knowledge areas that they should be competent in, in order to be registered. Many other professions, both internationally and locally provide such guidelines to graduates who need to obtain professional registration in order to practice.

With the promulgation of the SACPCMP Act 48 of 2000, and the appointment of the council (SACPCMP) the construction managers now also have to develop a body of knowledge that graduates have to be competent in, in order to obtain registration and practice in their chosen field. In order to be able to register, a newly qualified graduate will have to register as a candidate construction manager. This candidate construction manager will have to be mentored by a registered professional for a period of at least three years after graduating before they will be able to sit for the assessment of professional competence (APC). The system being followed is very similar to the system developed by the CIOB. The engineering, architectural and quantity surveying disciplines, both internationally and locally, have used such a system of mentoring for years. Love, et al. (2001) calls for construction organisations to also follow such a system in order to train newly graduated construction managers properly. The construction industry however is reluctant to do this, and seem to want construction management

graduates to perform productively from the date of employment (Fester and Haupt 2003; Haupt 2003; Cheung Lo, 1998 and Davies and Csete, 1998). Whether this is fair to the graduates or not, is debatable. With the construction industry not having such a system in place for graduates, it is obvious that not having such a system in place for students who should undergo work-based learning is even more problematic. One way of solving this problem is to have a mentoring system in place in construction organisation, similar to the other professions. Taylor (2001) recognises these as a general problem and calls for the involvement of the employers in work-based learning and raises many advantages in this regard:

- The link between theory and practice;
- Reinforcement of theory through practical experience;
- Increasing of students motivation and commitment;
- Increasing student employability once complete with academic study; and
- Employers being able to recruit staff familiar with the organisations culture

She goes further however to raise the reasons that employers feel reluctant to implement such strategies, namely:

- The belief that they do not have the time to plan and review training;
- Uncertainty with regard to responsibility to support students;
- Not understanding the link between academic and work-based learning;
- Tight budgets;
- Lack of understanding of the commercial reward of education and training; and

- Belief that students demands may conflict with those of other employees (Taylor, 2001)

In order for any construction organisation to be truly able to participate in the assessment of work-based learning students, the argument may be made that such entity have in their employ persons suitably qualified and experienced to carry out such assessments. The argument that may also be made conversely is that employers are best suited to assess the abilities of work-based learning as they are in the business of employing personnel. They would argue that they will assess the abilities of a student as an employee and not academically. They could base this argument on the fact that they require persons who are productive. They will thus look for traits that lead to such conclusions of productivity. In contrast to this, the academics may be inclined to assess academic abilities rather than the ability to perform in the work place. The possibility exists that these abilities may not be equal.

Chapter Summary:

Experiential learning plays a vital role in the education and training of construction management graduates. The construction industry internationally supports programmes that have experiential learning as part of their programme. Experiential learning is not as wide spread throughout construction management programmes as it could be. It is not a compulsory component of the majority of construction management programmes. The methods of assessment of the experiential learning phase of the construction management programmes are varied. The content of what is being assessed depends on the skill and experience of the assessor.

Currently the majority of construction industry employers do not possess the skills and resources to carry out assessments in a manner that is fair and equitable to both

students and the academic institution. For the experiential learning component to be a viable part of the construction management programme, this status quo will need to change. There is a distinct body of knowledge that construction industry employers believe construction management graduates should possess. These competencies are vital for the production of competent construction management graduates. These competencies should form the backbone of any construction management programme. The subject areas of a construction management programme and the skills which make up these subject areas need to develop the competencies required by construction management graduates. The education and training of construction management graduates does not end at the awarding of the qualification, rather the awarding of the qualification must be seen as the beginning of journey towards professionalism, and not the culmination of it.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

3.1.1 Defining the research questions

The research involves the following aspects of construction management education:

- The relevance of the topics and content of UT construction management course to the construction industry;
- Whether or not the UTs adequately prepare construction management students for functions of construction management the;
- The need for an experiential learning component during the construction management programmes at UTs; and
- The preparedness of construction industry stakeholders to carry out their duties during the experiential learning period.

Pilot studies and literature confirm that experiential learning forms a much desired part of the construction management education experience (Fester and Haupt 2004; Siddiqi and Ozcan 2004; Chapin et al 2003; Fester and Haupt 2003; Tinker and Tramel, 2002; Adcox, 2000; Hauck et. al, 2000; Senior, 1999).

The guiding questions of experiential learning research are:

- Is the nature (what is learnt during the experiential learning period) of such experiential learning suitable for achieving the intended outcomes?
- Is the duration of the experiential learning period adequate?
- Which methods of assessment should be used to evaluate experiential learning to ensure competency has been reached?

- When should the experiential learning period take place within the cooperative education programme?

The nature of experiential learning, the achievement of the intended outcomes, the determination of whether the experiential learning has academic value and whether or not it should be assessed are issues of concern.

3.2 Literature Review

The aims and objectives of the research have been done and this was followed by an extensive literature review. The literature review has been set out as follows:

- an overview of the historical background;
- *the role of higher education in cooperative education;*
- a review of the entrance criteria as it differs from traditional universities;
- the teaching methodology of cooperative education programme as it differs from traditional universities;
- cooperative education and it's different forms;
- work-based learning within the construction sector;
- the perception of dissatisfaction; and
- the assessment of work-based learning, what should be assessed and by whom.

The literature expresses the views of others pertaining to the research topic. The broad body of literature provided the interrelation between what is supposed to be and what the prevailing situation is. It has established what research has been conducted previously and led to refined, insightful questions about the problem. The literature also assisted in targeting and formulating the questions about the study topic. Using this information it was possible to determine which method of analysis would be suitable for

the study. Neuman (2000) states that a literature review is conducted on the assumption that knowledge accumulates, that we learn from and build on what others have done. The reasons for conducting a literature review in this research have been adopted from Neuman (2000).

- To demonstrate familiarity with the research area that one is studying;
- To show the path of prior research and how the current project is linked to it;
- To integrate and summarize what is known in sustainable construction;
- To stimulate new research ideas through understanding others work; and
- The first stage was one of information seeking which was done scanning the literature efficiently, using any available means to identify relevant information. The literature was also critically appraised identify studies that were unbiased and valid.

The sources of literature included:

- Textbooks;
- databases, peer-reviewed articles, journals and conference papers;
- government documents, policy reports;
- Professional bodies and publications such as the Chartered Institute of Building (CIOB) and the South African Council for the Project and Construction Management Professions (SACPCMP); and
- Internet sources – web pages

In order to conduct a literature review the literature should:

- Be organized around and related directly to the research question being developed ;
- synthesize results into a summary of what is and is not known;

- identify areas of controversy in the literature ; and
- formulate questions that need further research

3.3 Research Design

3.3.1 Quantitative Research

A quantitative research methodology will be used in this study. Quantitative research uses the approach of testing of a hypothesis (Naoum, 1998; Fellows and Liu, 1997). Quantitative research may also be considered cold insofar as it does not take cognisance of human nature, but merely considers the facts (Leedy, 1997).

The sole method of collecting data will be by means of a number of self-administered structured questionnaires. The value of the questionnaire is that since it contains mostly close-ended questions, it will be reasonably easy to complete. The questionnaire does not entail much data collection from respondents (Fellows and Liu, 1997). A major drawback of the questionnaire is industry fatigue. It may thus be difficult to obtain wide responses as typically responding to student questionnaires do not rate highly on the list of priorities of many a business organisation (Naoum, 1998). Quantitative research reports data numerically (Leedy, 1997). The data is represented through statistical analysis. By employing the quantitative techniques, data is analysed statistically enabling inferences to be drawn from the data (Leedy, 1997). The role of statistical analysis is to give meaning to the data that has been collected (Leedy, 1997; Fellows and Liu, 1997; Naoum, 1998)

3.3.2 Qualitative Research

In comparison to quantitative research, which endeavours to establish the facts, qualitative research aims to establish the reason for those facts. Qualitative research is a more suitable approach when the aim of a study is to establish why people, organisations

or employers think in a certain way. If the objective of a study is to establish the underlying reasons for the thinking of respondents, then qualitative research would be the procedure best suited for the study. When the purpose however is to establish how many respondents feel that topic or subject area is relevant or irrelevant, and inferences are to be drawn from the percentage that fell one way or the other, then quantitative research is more appropriate. Qualitative methods do however allow for a depth of understanding of responses that is not possible in purely quantitative research (Henning, Van Rensburg and Smit, 2004; Patton, 2002; Neuman, 2000; Merriam, 1998). Qualitative research is used when the researcher needs "rich, thick" data that will contribute to establishing why respondents believe one way or another. (Henning, et al., 2004; Patton, 2002; Neuman, 2000).

Interviews may often be an important source of information as they afford the researcher the opportunity to establish the viewpoints of other persons'. (Henning, et al.,. 2004; Patton, 2002 & Neuman, 2000). During an interview, matters are reported and interpreted by participants and can provide important insights into a situation under investigation. The open-ended interview provides an opportunity for participants to converse comfortably in a conversational manner. In this way the researcher is granted the opportunity to explore in depth the views of the participants (Patton, 2002 & Neuman, 2000). Open-ended questions allow responses that the interviewer may not have considered, adding value to a study (Bailey, 1982). In this regard, participants are asked probing and clarification questions.

Data is condensed through the use of thematic analysis, which initially looks for patterns in the data (Henning, et al., 2004; Patton, 2002; Neuman, 2000). Coding all raw

data is recommended (Henning, et al. 2004; Patton, 2002 & Neuman, 2000). A step known as open coding is used where codes are assigned to the raw data. The next step in the analysis process is axial coding, where categories and themes are assigned to the data. Finally all major themes are identified. Selective coding then takes place where the data is clustered. It is at this stage that interpretations will be made (Patton, 2002; Neuman, 2000). The literal statements and quotations of the participants are used from the verbatim accounts to increase the reliability of a study.

Qualitative research is threatened by lack of validity (McMillan and Schumacher 1993). If high internal validity is claimed for a study, there is a need to ensure that the method used to collect and analyse data are appropriate, namely interviews and thematic analysis. In addition, to contribute to an increased internal validity of a study, the data collection period needs to be lengthy to provide for continual data analysis (McMillan and Schumacher 1993). Through this constant comparison and corroboration it is possible to refine ideas and to ensure a match is reached between the researcher's based categories and participants' reality.

3.3.3 Triangulation in research

Many authors regard triangulation in research as being a mixture of qualitative and quantitative research in order to fill the gaps that may have occurred, when using only one method (Leedy, 1997; Naoum, 1998; Fellows and Liu, 1997). However, Chileshe and Watson (2005), contend that triangulation in research may also include the use of the literature review.

Love, Holt and Li (2002) argue that in order for construction management researchers to effectively solve problems, they need to take both the philosophies of being and knowledge into account.

In this study the "Chileshe and Watson (2005)" approach will be used and this study will rely on the literature review to strengthen the arguments made in the method of triangulation used. In conducting the literature review, cognisance was taken of what other authors have written about the research questions and hypothesis.

3.4 Methodology used

Four self-administered questionnaires were developed in order to gather the opinions of various role players within the co-operative construction education process. These role players were:

- The students who were registered for the National Diploma Building;
- The employers who employed these students during and after their experiential learning periods, and
- The academic staff who taught the theoretical part of the programme.

Separate questionnaires were designed for first year students, who had not as yet experienced experiential training but had registered at UT, and third year students who had completed their experiential training component during their second year of the National Diploma: Building.

Once the questionnaires were returned the responses were electronically captured using the Software Package for Social Sciences (SPSS). The mean values and the valid percentages were used to present the analysed data.

3.5 The Employers Sample

The employer sample was selected by sending a pilot questionnaire to employers of UT students by the various UTs in the country. Questionnaires were then only sent to those employers who responded that they would be prepared to partake in the study. The

sample may be called a convenience sample. Of the 75 questionnaires distributed 58 completed questionnaires were returned representing a response rate of 77.3 %.

3.6 The Academic Sample

The academic staff sample was drawn from UT. Heads of construction management and quantity surveying departments at the UTs in South Africa were sent a copy of the questionnaire. They were requested to have their academic staff complete them. Of the 48 questionnaires distributed 30 completed questionnaires were returned representing a response rate of 62.5%.

3.7 The Student Sample

The student questionnaires were administered during their class sessions by an academic staff member. Only Vaal University of Technology (VUT), Cape Peninsula University of Technology (CPUT) and University of Johannesburg (UJ) participated in the survey. At both CPUT and UJ the student questionnaire was administered 1st year and senior students in the National Diploma: Building and Bachelor of Technology: Construction Management and Bachelor of Technology: Quantity Surveying programmes. At VUT the questionnaire was completed by 3rd year National Diploma: Building students. From the students requested to partake in the study, 161 1st year students and 186 3rd year student returned completed questionnaires all the questionnaires distributed were returned as the questionnaires were distributed during a class session were distributed.

3.8 Questionnaire Design

The questionnaires were designed to test the issues raised in the hypotheses and the research objectives. With regard to the content of the construction management

courses and the adequacy of preparation of these by UT a set of questions were designed to test these particular hypotheses.

The questionnaire was designed after a review of the literature pertaining to the areas in which construction management graduates were expected to be conversant, resulting in 37 skills being identified the survey. The subject areas surveyed were drawn from the construction management curriculum at UT. The Table below shows both the UT and the subject area or skill that is tested in this survey. Table 3 provides the list of construction management with the skill or attribute it falls within.

All respondents' were requested to express their opinion of the subject areas and course content and the relevance of this to the both the industry and the country

The literature and anecdotal evidence formed the basis of the questions pertaining to experiential learning. All respondents' were asked to rate their perception of the importance of experiential learning. The basis and structure of experiential learning were issues measured as well. The method of assessment and the agency of assessment were all questions asked. These are all issues that have been highlighted in the literature. The timing of the experiential learning and the adequacy of mentoring as well and as preparation for further academic study was also measured. The literature review formed the basis of this section of the questionnaire.

The ability of a graduate to function as a construction manager is founded upon that graduates ability to continuingly learn and think on his feet. Questions dealing with continuing professional development and professional registration are thus all issues that measure the graduate ability to perform construction management functions with continuing professional development and registration of construction managers.South

Africa has a unique situation that construction managers need to register as professionals with the SACPCMP in order to practice.

Table 3: UT subjects and comparable subject areas, skills and attributes

University of Technology Construction Management Subject	Subject area, skill or attribute
First Year:	
Communications	Verbal communication skills; Interpersonal skills; Active listening skills
Computer Skills	Computer literacy
Applied Building Science	Construction Science
Construction Technology	Construction Technology
Construction Management	Management principles theories and practice
Quantity Surveying	Measurement, costing and estimating
Site Surveying	Ability to use surveying and leveling equipment
Second Year	
Construction Technology	Construction Technology
Construction Management	Management principles theories and practice
Quantity Surveying	Measurement, costing and estimating
	Practical building knowledge; Time Management; Quality Management
University of Technology Construction Management Subject	Subject area, skill or attribute
Third Year	
Construction Technology	Construction Technology
Construction Management	Management principles theories and practice
Quantity Surveying	Measurement, costing and estimating
Price Analysis and Estimating	Measurement, costing and estimating
Structures and Concrete	Construction Technology
Construction Accounting	Construction Business Environment
Fourth Year	
Construction Management	Project Management
Development Management	Project Management; Environmental Awareness; Negotiating Skills
Building Entrepreneurship	Construction Business Environment
Construction Economics	Construction Economics
Contract Law and Procedures	Construction Law
Research Methodology	Research Methodology
Maintenance Management	Construction Management
Appropriate Construction	Construction Technology

(Source: M. Tech fieldwork)

Many authors have questioned the ability of construction graduates internationally to act as construction managers. This section sought to establish the respondents' opinion with regard to the issue. *Continuing professional development* is established both nationally and internationally as a requirement to continue to practice as a professional in most fields.

Questions were also asked with regard to the satisfaction of placement monitoring and supervision during experiential learning as well as the experience gained. Academics were requested to rate the ability of employers to mentor experiential learning students.

Chapter Summary:

In this chapter the design of the research was discussed and the reasons for using a questionnaire were given. The method of collecting the data and analysing the data were presented. The various samples and the sample selection techniques were also discussed. The link between the literature review and the methodology was also shown.

CHAPTER 4
DATA ANALYSIS: VIEWS OF EMPLOYERS

4.1 Profile of employer respondents

The employer sample included general contractors (48.9%), project management practices (17.8%), quantity surveying practices (15.6%), consulting engineers (4.4%) and co-contractors (2.2%). These employers operated largely in the Gauteng (30.0%) and Western Cape provinces (24.0%). More than half (51.1%) had annual turnovers exceeding R20 million with 20.7% having turnovers between R1 million and R5 million. The average reported size of their labour force was as follows:

- Less than 10 employees (22.4%);
- Between 11 and 50 employees, (20.4%); and
- Greater than 250 employees (24.5%).

4.2 Experiential Learning

The views of employer respondents' on aspects of experiential learning were examined based on questions that referred to the following aspects of experiential learning:

- The necessity of experiential learning;
- The basis of experiential learning;
- The preferred nature of experiential learning;
- Whether or not experiential learning should be assessed;
- The preferred agency of assessment of experiential learning;
- The preferred method of assessment of experiential learning;

- Whether or not experiential learning should be undertaken in stages;
- The timing of experiential learning; and
- Whether or not experiential learning should be remunerated.

The majority of employers considered experiential learning to be either necessary (24.1%) or totally necessary (72.4%). A combination of both function based experience, which experience is gained by working in each of the different departments of a business, and project- based experience, which is experience gained on a specific project was preferred by 70.7% of the employers. Of these employers (82.5%) preferred a structured experiential learning period. This experiential component was one jointly developed by the institution and employer together with guidelines on what the student was expected to do during the period spent in industry. On the other hand, an unstructured programme left the onus upon the employer to train the experiential learning student in general construction matters. Further, 89.7% of employers reported that experiential learning should be assessed. With regard to the preferred agency to assess the experiential learning component, the responses are reflected in Table 4.1.

Table 4.1: Preferred assessment agency.

Employer respondents	UT	Employer	Independent Assessor
Yes	69.6%	74.5%	21.4%
No	30.4%	25.5%	78.6%

Most employers (74.5%) preferred to be involved in assessments themselves, while 69.6% expected the academic staff to also be involved. The overwhelming majority of employers (78.6%) did not support the assessments being carried out by an independent assessor.

4.3 Description of the different assessment methods:

- Continuous Assessment Method:

  Is a method used when a student is assessed on a piece of work and has to prove they are competent before being allowed to continue. The major benefit is that the work component is normally small and as the method is formative it is possible to correct mistakes. A draw-back of this method is that without a cap-stone project, while a student may be competent in the parts, there is no way of knowing if they will be competent in the whole. The method is primarily formative, although a summative assessment is normally needed to determine competency.

- Project Based assessment method:

  In this method, a student may be given a project to undertake, which may then be assessed by a range of strategies. The benefit is that through a project integration of the work should be possible. The draw-back may be the project may not be all encompassing and also it may be difficult to pinpoint the arrears where short-comings exist. The method is primarily summative.

- Competency Based Assessment Method:

  The student will be given a specific task to undertake and will have to achieve a set level of success in the task before being allowed to continue. Similar to continuous assessment, a benefit above continuous assessment may be that a capstone may be set as a competency that a student has to succeed in before being rated as competent. The method may be a combination of formative and concluded by a summative assessment.

- Rating Sheet:

  A number of tasks may be set out on a sheet, and the student would be rated as to the competency in completion in each task. This may be used as a part of competency based as well as continuous assessment. The assessment may be based on observation, examination presentation etc. A draw-back may be when a student does not succeed and feedback may not be possible if the rating sheet is not adequately formulated. The method tends to be summative.

- Term Report:

  A report stating what work has been done and the quality of such work may be contained in this report. The major problem here is that it is and after the fact event, possibilities to correct mistakes may be minimal. The assessments may once again be done through examinations, presentation, assignments etc. The method tends to be summative.

- Observation Method:

  The student is observed at the work-place. This system in time consuming and if the assessor/s do not have a definite system to rate work being done problems may occur. If it is combined with continuous and or competency based assessment as well, this may be most beneficial as the student may be stopped when doing the wrong thing, and shown the correct way before proceeding. It is continuous and if only used as a summative assessment rate a student without feedback, is quite useless. If used correctly, then the method is formative.

- Self-Assessment Method:

  The student assesses his/her performance. Unless this is based on a rating sheet, or term report, the system serves no purpose. If a student assesses themselves, they will need guidance as to what is being assessed and what the standard of expected performance is. This system is quite useful when the proper systems are in place as it may be continuously and improvement in performance is possible. If used correctly the method is formative.

- Portfolio Assessment Method:

  The student compiles a portfolio of all the work undertaken during the experiential learning period. Without set guidelines as to what goes into the portfolio and the depth of information, this system produces very little quality. If the necessary information is included, then the standard of work may be quite high. The draw back is that the method does not allow for continuous feedback and is summative rather than formative.

- Job Sponsor Assessment Method:

  The job sponsor may use a variety of methods to do the assessment. It is useful if the job sponsor also acts as the mentor of the student and the assessments are formative. If not and the assessments are summative and after the fact, not much may be derived from it.

- Peer Assessment Method:

  The peers of the student are required to assess the work of their colleague. When used in the proper atmosphere, this is a very good method to use. It may be formative and used to give constant feedback on performance. The other benefit is that the student is constantly being observed and the assessment is ongoing. Problems may occur when personalities clash. A mature method of assessment which should be used wisely! If used as a summative method without proper guidance, it will serve very little purpose.

- Panel Assessment Method:

  A panel assessment method may be useful when used formatively and feedback given after observations has been done. If used as an interview or interrogation, it will be summative and not add any value.

The preferred method of assessment of experiential learning is shown in Table 4.2.

Table 4.2: Preferred method of assessment.

Assessment method	Yes	No	Ranking
Continuous Assessment Method	56.6%	43.4%	1
Project Based assessment method	53.7%	46.3%	2
Competency Based Assessment Method	51.9%	48.1%	3
Rating Sheet	48.1%	51.9%	4
Term Report	48.1%	51.9%	4
Observation Method	44.4%	55.6%	6
Self-Assessment Method	35.2%	64.8%	7
Portfolio Assessment Method	33.3%	66.7%	8
Job Sponsor Assessment Method	33.3%	66.7%	8
Peer Assessment Method	24.1%	75.9%	10
Panel Assessment Method	16.7%	83.3%	11

The most preferred form of assessment was the continuous assessment method (56.6%), followed by project-based assessment (53.7%) and competency based assessment (51.9%). Only these three assessment methods received more than 50% approval. The Panel assessment method proved most unpopular, (83.3%), the peer assessment method (75.9%) and both the portfolio and job sponsor method with a disapproval rating of 66.7%. Most employers (78.9%) preferred experiential learning to be undertaken in stages. A one year period of industrial experience was the most popular option with employers (63.6%). With regard to the location of the experiential learning in the academic programme, the responses are shown in Table 4.3.

Most employers (80.0%) regarded experiential learning after the second year of the academic programme as the most desirable option. Other popular options were the present arrangement, namely after the 1st year (71.4%), after the 3rd year (66.7%) and

during the 2nd year (60.9%) and anytime before the issue of the National Diploma (60.0%).

Table 4.3: *Timing of experiential learning.*

Employer responses	Yes	No	Don't Know	Ranking
After 2nd year	80.0%	20.0%		1
After 1st year	71.4%	28.6%		2
After 3rd year	66.7%	33.3%		3
During 2nd year	60.9%	39.1%		4
Anytime before the issue of the National Diploma	60.0%	32.0%	8.0%	5
Anytime before the issue of the B. Tech.	50.0%	40.9%	9.1%	6
During 1st year	47.4%	52.6%		7
During 3rd year	47.1%	52.9%		8

Most employers (72.2%) were prepared to offer experiential learning opportunities to students with remuneration. Almost two-thirds of employers (62.8%) were not prepared to offer employment if they were not able to pay students during the experiential learning period.

4.4 Strategies to influence construction management programmes

While large proportions of employers reported neutral feelings with regard to the effectiveness of strategies that may be able to influence construction management programmes at UT, the Construction Education and Training Authority (CETA), the CIOB and the regional Master Builders Associations were reportedly the most influential agencies of influence (45.1%). The CETA has a number of responsibilities in terms of the Sectoral Education and Training Authorities Act (DoL, 2001). It has to accredit providers of education and training within the sector, in this case the construction sector. It must monitor this provision of education and training. It must register assessors, moderators and verifiers of this training and education. It must also monitor the progress of learning and learners and the quality of the provision of education and training that

have been registered on the National Qualification framework (NQF). It thus has a role to play in construction management education. The CIOB as stated previously is arguably the leading construction management professional body in the world. It has more than 42000 members in 90 countries and accredits construction management programmes worldwide (CIOB 2004). The Master Builders Associations are regional organisations that have become the home of contractors who regard themselves as Master Builders throughout the country. They play an important role in so far as they are a voice for the formal contracting sector to negotiate with and represent their membership on forums through which they are able to influence amongst other issues education and training. They are represented on the CETA. All these organisations therefore have a direct and indirect influence in education and training. The results are therefore of concern as the ideal must be that employers' get involved in organisations in order to influence the development of the programmes.

While the lobbying of CETA and others was regarded as most effective (45.1%) in comparison to the others, the CETA currently does not recognise construction management as a profession. Consequently construction managers are not represented on the CETA.

Table 4.4: Strategies to influence construction management programmes at UT

Employers	Ineffective	Neutral	Effective	Ranking
Influencing bodies such as CETA, CIOB, regional MBA and others	11.8%	43.1%	45.1%	1
Serving on UT advisory committees	18.8%	43.8%	37.5%	2
Lobbying of appropriate education authorities	24.5%	63.3%	12.2%	3

4.5 Professional registration and adequacy of preparation of UT construction management graduates

The employers' responses with regard to the suitability of the UT graduate to register as a professional in terms of national legislation are shown in Table 4.5 below.

Table 4.5: Suitability to register as professional

Extremely Unsuitable	Slightly Unsuitable	Neutral	Slightly Suitable	Slightly Suitable	Mean	Std. Dev.
8.6%	24.1%	34.5%	31.0%	1.7%	2.93	0.99

Of the employers, (34.5%) were neutral with regard to the suitability of UT graduates for professional registration. The mean (2.93) is also below the midpoint value of 3.00. The employers thus regarded the UT construction management graduate as unsuitable for professional registration. Professional registration as a Construction Manager is compulsory in order to practice as a construction manager in South Africa. Therefore if a graduate is unsuitable for professional registration, that graduate is unsuitable to practice as a construction manager.

Table 4.6: Adequacy of preparation in management of UT graduates

Management Issue	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
Manage a specific project	1.9%	9.3%	31.5%	46.3%	11.1%	3.56	0.88
Manage the business of construction	7.3%	23.6%	38.2%	27.3%	3.6%	2.96	0.98
Manage a number of projects	7.4%	25.9%	37%	27.8%	1.9%	2.91	0.96

This concept is further amplified when Table 4.6 is considered. With regard to the preparation of UT graduates to manage within the construction industry, most employers regarded the UT graduate as being suitably prepared to manage a specific project (mean = 3.56). The employers regarded as unsuitable the preparation of UT graduates to manage

the business of construction (mean = 2.96), or manage a number of projects (mean = 2.91). When requested to give reasons for their answers, 25.9% of the employers expressed the view that more on site training was still required, and 37% expressed the opinion that experience takes time, and that hand-on experience was required in order to complete the training of UT graduates. Respondents were further asked about the relevance of eight subject areas in construction management programmes, as well as to the adequacy of preparation of these subject areas by UT. Their responses in Table 4.7 and 4.8 are shown ranked by their mean scores.

Table 4.7: Employers' views on relevance of the subject areas.

Subject Area	Extremely Irrelevant	Irrelevant	Neutral	Relevant	Extremely Relevant	Mean	Std. Dev	Ranking
Project management	-	5.6%	9.3%	29.6%	55.6%	4.35	0.87	1
Construction Technology	1.9%	5.6%	9.3%	31.5%	51.9%	4.26	0.98	2
Management Principles	-	5.3%	15.8%	47.4%	31.6%	4.05	0.83	3
Construction Law	-	9.1%	20.0%	36.4%	34.5%	3.96	0.96	4
Construction Business Environment	1.8%	5.5%	12.7%	60.0%	20.0%	3.91	0.85	5
Construction Economics	1.9%	5.6%	24.1%	38.9%	29.6%	3.89	0.97	6
Construction Science	-	9.3%	22.2%	42.6%	25.9%	3.85	0.92	7
Research Methodology	11.1%	11.1%	38.9%	27.8%	11.1%	3.17	1.13	8

Employers regarded all the subject areas as relevant with mean scores above the midpoint value of 3.00. Project management, construction technology and management principles theories and practice predominated (means > 4.00). Construction law (mean = 3.96), construction business environment (mean = 3.91) construction economics (mean = 3.85) and construction science (mean = 3.85) were regarded as next relevant. Considering that industry does not regard research as important, the mean (3.17) for research

methodology was not surprising. Anecdotal evidence confirms the difficulty that researchers have in getting the construction industry to participate in research initiatives. The employers, through the mean values for 7 of the subject areas, reported that, according to them, the UT did not prepare their graduates adequately.

The employers felt that UT graduates were inadequately prepared to undertake research in the industry (mean = 2.85). With not a single subject area being adequately prepared according to the employers, it may be interpreted that the UT were not achieving their mandated goal.

Table 4.8:Adequacy of preparation in the subject areas. Employers' views.

Subject area	Extremely inadequately	Somewhat inadequately	Neutral	Somewhat adequately	Extremely adequately	Mean	Std. Dev.	Ranking
Construction technology	2.0%	16.3%	26.5%	32.7%	22.4%	3.57	1.08	1
Management principles theories and practice	2.0%	14%	38%	30%	16%	3.44	0.99	2
Project management	2.0%	18.4%	32.7%	34.7%	12.2%	3.37	0.99	3
Construction business environment	4.2%	14.6%	41.7%	31.3%	8.3%	3.25	0.96	4
Construction law	2.0%	22.4%	36.7%	28.6%	4.1%	3.22	0.99	5
Construction economics	4.2%	16.7%	41.7%	29.2%	8.3%	3.21	0.97	6
Construction science	4.1%	20.4%	34.7%	36.7%	4.1%	3.16	0.94	7
Research methodology	8.3%	20.8%	54.2%	10.4%	6.3%	2.85	0.95	8

Respondents were requested to rate the importance of 37 skills and attributes that a construction manager should possess. Of the 37 skills and attributes, 25 of these were rated as important (mean > 4.00). The most important were trust and honesty (mean = 4.56), acceptance of responsibility (mean = 4.48) and problem solving skills (mean = 4.42). Three skills and attributes, namely worker safety and health awareness, decision making and time management (mean = 4.39) were rated equally important. Five skills and attributes had means < 3.50 namely, marketing skills (mean = 3.35), work study

(mean = 3.31), ability to conduct statistical analysis (mean = 3.23), systems development ability (mean = 3.23) and the ability to conduct research (mean = 3.14). The results are shown in Table 4.9.

Table 4.9: Importance of skills and attributes to the practice of construction management

Skills/attribute	Extremely Unimportant	Unimportant	Neutral	Important	Extremely important	Mean	Std. Dev	Ranking
Trust and honesty	-	-	5.3%	33.3%	61.4%	4.56	0.60	1
Acceptance of responsibility	-	-	1.8%	48.2%	50%	4.48	0.54	2
Problem solving skills	-	-	8.8%	40.4%	50.9%	4.42	0.65	3
Worker safety and health awareness	-	-	10.5%	40.4%	49.1%	4.39	0.68	4
Decision making	-	-	3.6%	53.6%	42.9%	4.39	0.56	4
Time management	-	-	10.5%	40.4%	49.1%	4.39	0.68	4
Verbal communication skills	-	-	8.8%	49.1%	42.1%	4.33	0.64	7
Planning, scheduling and controlling construction operations and activities	-	1.8%	8.8%	45.6%	43.9%	4.32	0.71	8
Practical building knowledge	-	1.8%	8.8%	47.4%	42.1%	4.30	0.71	9
Interpersonal skills	-	-	10.5%	49.1%	40.4%	4.30	0.65	9
Measurement, costing and estimating	-	1.8%	8.9%	48.2%	41.1%	4.29	0.71	11
Familiarity with construction quality management	-	-	12.3%	57.9%	29.8%	4.18	0.63	12
Team building capability	-	1.8%	14%	50.9%	33.3%	4.16	0.73	13
Ability to work autonomously	-	3.5%	10.5%	52.6%	33.3%	4.16	0.75	13
Adaptability to changing work environment	-	3.5%	14%	49.1%	33.3%	4.12	0.78	15
Leadership capability	-	1.8%	19.3%	45.6%	33.3%	4.11	0.77	16

Table 4.9 Cont.: Importance of skills and attributes to the practice of construction management

Skills/attribute	Extremely Unimportant	Unimportant	Neutral	Important	Extremely important	Mean	Std. Dev.	Ranking
Active listening skills	1.8%	1.8%	15.8%	47.4%	33.3%	4.09	0.85	17
Ability to resolve conflicts and disputes	-	1.8%	17.5%	50.9%	29.8%	4.09	0.74	17
Supervisory skills and ability to train others	-	1.8%	19.6%	48.2%	30.4%	4.07	0.76	19
Numeracy	-	1.8%	17.5%	52.6%	28.1%	4.07	0.73	19
Ability to exercise professional judgement	1.8%	1.8%	14%	52.6%	29.8%	4.07	0.82	19
Creativity and innovation	-	1.8%	21.4%	44.6%	32.1%	4.07	0.78	19
Computer literacy	-	1.8%	14%	63.2%	21.1%	4.04	0.65	23
Ability to use surveying and levelling equipment	-	5.4%	23.2%	35.7%	35.7%	4.02	0.90	24
Up-to-date professional knowledge	1.8%	3.5%	15.8%	50.9%	28.1%	4.00	0.87	25
Managerial knowledge	-	3.5%	24.6%	43.9%	28.1%	3.97	0.82	26
Financial management	1.8%	5.4%	12.5%	57.1%	23.2%	3.95	0.86	27
Negotiating skills	-	5.3%	22.8%	54.4%	17.5%	3.84	0.74	28
Familiarity with workings and intricacies of industry	-	5.3%	26.3%	47.4%	21.1%	3.84	0.82	28
Environmental awareness	-	7%	24.6%	50.9%	17.5%	3.79	0.82	30
Academic achievement	-	1.7%	35.1%	49.1%	14%	3.75	0.71	31
Entrepreneurship	3.5%	8.8%	31.6%	43.9%	12.3%	3.53	0.95	32
Marketing skills	3.5%	12.3%	40.4%	33.3%	10.5%	3.35	0.95	33
Work study	5.5%	5.5%	49.1%	32.7%	7.3%	3.31	0.90	34
Ability to conduct statistical analysis	7.1%	8.9%	44.6%	32.1%	7.1%	3.23	0.97	35
Systems development ability	7.1%	10.7%	42.9%	30.4%	8.9%	3.23	1.01	36
Ability to conduct research	5.3%	15.8%	45.6%	26.3%	7%	3.14	0.95	37

Table 4.10 reports the employers' views on the adequacy of development of these skills and attributes by UT. Academic achievement (mean = 3.64), planning scheduling and controlling construction operations and activities (mean = 3.52), numeracy (mean = 3.52), and computer literacy (mean = 3.50), were the only skills and attributes with means > 3.50. The overwhelming majority of the mean scores fell in the band between 3.00 and 3.50 which reflected neutrality according to the employers. The adequacy of development of seven skills and attributes fell below the midpoint value of 3.00. These were supervisory skills and the ability to train others (mean = 2.98), negotiation skills (mean = 2.92), entrepreneurship (mean = 2.91), systems development ability (mean = 2.87), ability to conduct statistical analysis (mean = 2.85), creativity and innovation (mean = 2.83), and marketing skills (mean = 2.83). It is important to note that there is no correlation between the rankings of the importance of the skills and attributes, and the adequacy of development of these by the UT.

4.6 Discussion of findings:

4.6.1 Computation of indices

4.6.1.1 Computation of Relative Adequacy Subject Indices

The *relative adequacy subject index* (RASUI) derived to summarize the adequacy of graduate preparation in each academic subject area and was computed as

$$\textbf{RASUI} = \frac{\sum w}{AxN} \quad \textbf{.....Equation 1.0}$$

Pheng and Gracia (2002) (Cited in Chileshe, Fester and Haupt, 2005)

Where:

w = weighting as assigned by each respondent in a range 1 to 5, where 1 implies 'extremely inadequate' and 5 implies 'extremely adequate';
A = the highest weight (5);
N= the total number in the sample.

Table 4.10: Adequacy of development of skills and attributes

Skill	Extremely inadequately	Inadequately	Neutral	Adequately	Extremely Adequately	Mean	Std. Dev	Ranking
Academic achievement	-	4.3%	38.3%	46.8%	10.6%	3.64	0.74	1
Planning, scheduling and controlling construction operations and activities	2.1%	12.5%	29.2%	43.8%	12.5%	3.52	0.95	2
Numeracy	2.1%	4.2%	39.6%	47.9%	6.3%	3.52	0.77	3
Computer literacy	-	8.3%	39.6%	45.8%	6.3%	3.5	0.74	4
Ability to use surveying and levelling equipment	-	14.9%	31.9%	42.6%	10.6%	3.49	0.88	5
Practical building knowledge	2.1%	14.6%	29.2%	43.8%	10.4%	3.46	0.94	6
Measurement , costing and estimating	4.2%	12.5%	29.2%	41.7%	12.5%	3.46	1.01	6
Active listening skills	2.1%	8.3%	45.8%	33.3%	10.4%	3.42	0.87	8
Trust and honesty	2.1%	8.3%	47.9%	33.3%	8.3%	3.38	0.84	9
Time management	-	14.6%	41.7%	37.5%	6.3%	3.35	0.81	9
Up-to-date professional knowledge	4.2%	8.3%	43.8%	35.4%	8.3%	3.35	0.91	11
Acceptance of responsibility	-	14.6%	41.7%	41.7%	2.1%	3.31	0.75	12
Ability to work autonomously	4.2%	12.5%	37.5%	39.6%	6.3%	3.31	0.93	12
Familiarity with construction quality management	2.1%	12.8%	42.6%	38.3%	4.3%	3.30	0.83	14
Verbal communication skills	2.1%	12.5%	43.8%	37.5%	4.2%	3.29	0.82	15
Managerial knowledge	2.1%	20.8%	31.3%	39.6%	6.3%	3.27	0.94	16
Familiarity with workings and intricacies of industry	2.1%	18.8%	41.7%	31.3%	6.3%	3.21	0.90	17
Interpersonal skills	2.1%	20.8%	33.3%	41.7%	2.1%	3.21	0.87	17

Table 4.10 Cont.: Adequacy of development of skills and attributes

Skill	Extremely inadequately	Inadequately	Neutral	Adequately	Extremely Adequately	Mean	Std. Dev	Ranking
Ability to exercise professional judgement	-	14.9%	57.4%	21.3%	6.4%	3.19	0.77	19
Problem solving skills	-	25%	35.4%	35.4%	4.2%	3.19	0.87	19
Financial management	2.1%	20.8%	37.5%	35.4%	4.2%	3.19	0.89	19
Worker safety and health awareness	4.2%	18.8%	35.4%	39.6%	2.1%	3.17	0.91	22
Decision making	2.1%	22.9%	39.6%	27.1%	8.3%	3.17	0.95	22
Leadership capability	-	31.3%	31.3%	31.3%	6.3%	3.13	0.94	25
Team building capability	2.1%	14.6%	54.2%	27.1%	2.1%	3.13	0.76	25
Work study	4.3%	19.6%	45.7%	28.3%	2.2%	3.04	0.87	27
Ability to resolve conflicts and disputes	4.2%	18.8%	47.9%	29.2%	-	3.02	0.81	28
Environmental awareness	8.3%	16.7%	43.8%	29.2%	2.1%	3.00	0.95	29
Ability to conduct research	8.3%	16.7%	45.8%	25%	4.2%	3.00	0.97	29
Supervisory skills and ability to train others	4.2%	27.1%	37.5%	29.2%	2.1%	2.98	0.91	31
Entrepreneurship	2.1%	31.9%	40.4%	23.4%	2.1%	2.92	0.86	32
Negotiating skills	2.1%	27.1%	50%	18.8%	2.1%	2.92	0.80	32
Systems development ability	4.3%	31.9%	40.4%	19.1%	4.3%	2.87	0.92	34
Ability to conduct statistical analysis	8.7%	28.3%	37%	21.7%	4.3%	2.85	1.01	35
Marketing skills	2.1%	27.1%	58.3%	10.4%	2.1%	2.83	0.73	36
Creativity and innovation	6.3%	29.2%	41.7%	20.8%	2.1%	2.83	0.91	36

A low relative adequacy index indicates that the graduates are least adequately prepared in an academic subject as perceived by the employers, whereas a high index

indicates that the preparation in the academic subject is high (Chileshe, Fester and Haupt, 2005).

Where the RAIs were the same for two or more academic subjects (variables), rank differentiations are achieved by examining the distribution of the rating against such variables. Kumaraswamy and Chan (1998) to compute a mean score used a similar formula

4.6.1.2 Computation of Relative Relevancy Subject Indices

The *relative relevancy subject index* (RRSI) derived to summarize the relevancy of each academic subject area and was computed as

$$\mathbf{RRSI} = \frac{\sum w}{AxN} \quad \textbf{.....Equation 2.0}$$

Pheng and Gracia (2002) (Cited in Chileshe, Fester and Haupt, 2005)

Where:

w = weighting as assigned by each respondent in a range 1 to 5, where 1 implies 'extremely irrelevant' and 5 implies 'extremely relevant';
A = the highest weight (5);
N= the total number in the sample.

A low relative relevancy index indicates that the academic subject is perceived to be least relevantly the employers, whereas a high index indicates that the relevancy of the academic subject is high. Where the RRIs were the same for two or more academic subjects (variables), rank differentiations are achieved by examining the distribution of the rating against such variables (Chileshe, Fester and Haupt, 2005).

4.6.1.3 Computation of Relative Adequacy Skills Index (RASI)

The *relative adequacy skill index* (RASI) derived to summarize the adequacy of preparation in each of the 37 skills and attributes and was computed as

$$\textbf{RASI} = \frac{\sum w}{AxN} \quad \textbf{.....Equation 3.0}$$

Pheng and Gracia (2002) (Cited in Chileshe, Fester and Haupt, 2005)

Where:

w = weighting as assigned by each respondent in a range 1 to 5, where 1 implies 'extremely inadequate' and 5 implies 'extremely adequate';
A = the highest weight (5);
N= the total number in the sample.

A low relative skills adequacy index indicates that the graduate is least adequately prepared by UT in the skill and attribute as perceived employers, whereas a high index indicates that the adequacy of preparation in the skill is high (Chileshe, Fester and Haupt, 2005).

Where the RASIs were the same for two or more construction management skills (variables), rank differentiations are achieved by examining the distribution of the rating against such variables. Kumaraswamy and Chan (1998) to compute a mean score used a similar formula.

4.6.1.4 Computation of Relative Importance Skills Index (RISI)

The *relative importance skills index* (RISI) derived to summarize the importance of each of the 37 construction management skills and was computed as

$$\textbf{RISI} = \frac{\sum w}{AxN} \quad \textbf{.....Equation 4.0}$$

Pheng and Gracia (2002) (Cited in Chileshe, Fester and Haupt, 2005)

Where:

w = weighting as assigned by each respondent in a range 1 to 5, where 1 implies 'extremely unimportant' and 5 implies 'extremely important';
A = the highest weight (5);
N= the total number in the sample.

A low relative importance index indicates that the construction management skill is perceived to be least important by employers, whereas a high index indicates that the

importance of the construction management skill is high (Chileshe, Fester and Haupt, 2005).

4.6.2 Computation of the Level of Preparation in academic subject areas and skills by the UT

In order to assess the adequacy and relevancy levels of the necessary skills and attributes of Construction Managers, a total mean value for all the eight factors namely project management, construction technology, management principles, theories and practice, construction business environment, construction law, construction science and research methodology and construction economics was deemed to represent the levels of adequacy /relevancy of Construction Management Skills (Chileshe, Fester and Haupt, 2005). This approach of adopting the vector was used by Saraph et al (1989); Watson and Chileshe (2004).

4.6.2.1 Levels of Skills / Attributes of Construction Managers = $\frac{\sum Wi}{N}$ .....Equation 5.0

Where:

$\sum$Wi = The sum of the average of each factor (construct)
N= the total number of the academic subjects (N =8).
(Chileshe, Fester and Haupt, 2005)

4.6.2.2 Construct Centre of Gravity

The centre of gravity gives an indication of the overall weight within the Construction Management Skills and Attributes Model (CM-SAM) that can be apportioned by the construct. It can be defined as the ratio of the construct to the overall construct relative advancement indices. The construct centre of gravity or cwf may be computed as follows:

$\acute{O}_{RAI} = (\sum (Wi_{RAI} / NA)/n)$ .....Equation 6.0

Where $Ø_{RAI}$ = Centre of Gravity of the Construct or Critical Weight Factors (cwf)
(Adapted from Chileshe, Fester and Haupt, 2005)

Table 4.11 : Scoring the Levels of CM-SA Preparation

Average Score (∑Wi)	RAI/RRI	CMS Level
4.0 to 5.0	0.8 to 1.0	High (H)
3.0 to < 4.0	0.6 to < 0. 8	Medium (M)
1.0 to < 3. 0	0.2 to < 0.6	Low (L)

(Source: Chileshe, Fester and Haupt, 2005)

Table 4.12: Employers views of relevancy of subject areas with cwf

Rank	Subject area	Mean	CWF	Std. Dev.
1	Project Management	4.35	0.138	0.87
2	Construction Technology	4.25	0.135	0.97
3	Management Principles, Theories and Practices	4.05	0.129	0.83
4	Construction Law	3.96	0.126	0.96
5	Construction Business Environment	3.91	0.124	0.84
6	Construction Economics	3.89	0.124	0.96
7	Construction Science	3.85	0.122	0.92
8	Research Methodology	3.17	0.101	1.12
	Total	**31.43**	*1.000*	

(Source: Chileshe, Fester and Haupt, 2005)

The sum of the mean values for the relevance of the subject areas totals 31.43 out of a possible total of 40. The sum of the mean values of the adequacy of preparation in the subject areas totals 26.06 out of a possible total of 40. The gap therefore exists.

Table 4.13: Employers views of adequacy of preparation in subject areas with cwf

Rank	Subject area	Mean	CWF	Std. Dev.
1	Construction Technology	3.57	0.137	1.08
2	Management Principles, Theories and Practices	3.44	0.132	0.99
3	Project Management	3.37	0.129	0.99
4	Construction Business Environment	3.25	0.125	0.96
5	Construction Law	3.22	0.124	0.98
6	Construction Economics	3.20	0.123	0.97
7	*Construction Science*	*3.16*	*0.121*	*0.94*
8	Research Methodology	2.85	0.109	0.95
	Total	**26.06**	1.000	

(Source: Chileshe, Fester and Haupt, 2005)

Using a similar approach as Chileshe, Fester and Haupt (2005) the importance weights or centroid of gravity (critical weight factors) for the key skills and attributes desirable in Construction Managers and Subject Indicators taught in the UT are combined to produce a matrix. The actual level of importance and performance is obtained from the sum of the mean values for the subject areas and the skills and attributes. For a world class UT the maximum highest score expected in each subject preparation would be a perfect 5, which would equate to the importance weighting or centroid value of 0.125 as computed from equation 6.0 The matrix generated the overall maximum level of Construction Management skills development equal to 225 from the employers in the sample. The value of 225 is obtained from $\Sigma(n=8)*5 + (n=37)*5 = 40 + 185 = 225$. Therefore, the generated Total Construction Management Skills and Attributes - Subject Performance Index (CM-SASPI) for the sample is 225 as the maximum achievable score is 225. This may also be used to determine the level of importance of the skill, attributes and subject areas (CM-SASII).

Equation 7: Measurement of performance of UT in subject areas and skills

$$\textbf{CM-SASPI} = \frac{\text{Actual Level of Performance in Skills and Subjects}}{\text{Maximum Achievable Score}}$$

(Source: Chileshe, Fester and Haupt, 2005)

Equation 8: Measurement of importance of subjects areas and skills.

$$\textbf{CM-SASII} = \frac{\text{Actual Level of Importance in Skills and Subjects}}{\text{Maximum Achievable Score}}$$

(Source: Chileshe, Fester and Haupt, 2005)

The equations 7.0 and 8.0 are adapted from Arditi and Lee (2003) as cited in Chileshe, Fester and Haupt (2005) who used it as a mechanism for corporate service quality performance measurement model. The only difference is that the matrix was generated by including the strength of relationships between the vertical and horizontal

variable from the independent assessors. Specifically, the tool was developed for construction owners to rank the design and build (D/B) firms relative to corporate service quality, as well as D/B firms to benchmark themselves against their competitors. However, this method of Quality Function Deployment has been used before by other researchers. This is normally called the "house of quality" in other studies such as Shillito (1994) and Hoyle (1998) as cited in Chileshe , Fester and Haupt (2005).

The actual levels of performance and importance are generated by calculating the sum of the mean values from both the subject areas and the skills and attributes as shown in tables 4.9, 4.10, 4.12 and 4.13. Equation 9 is the sum of the mean values of tables 4.10 and table 4.13, and equation 12 is the sum of the mean values of tables 4.9 and 4.12.

Equation 9: Actual performance in subject areas and skills

$$\text{CM-SASPI} = \frac{144.67}{225} * 100 = 64.3\%$$

(Adapted from Chileshe, Fester and Haupt, 2005)

Therefore the skills and subject performance index as shown in equation 9 is 64.3%. This is substantially lower than the skills subject importance index which is 80% as shown in equation 10.

Equation 10: Actual importance of subject areas and skills

$$\text{CM-SASII} = \frac{179.76}{225} * 100 = 80\%$$

(Adapted from: Chileshe, Fester and Haupt, 2005)

Therefore a gap exists between what the employers expect of UT construction management graduates and the adequacy of preparation that these graduates receive at the UT.

Chapter Summary

The chapter focused on the views of employers of the need for experiential learning, the location of the experiential learning in the programme. It looked at the assessment of experiential learning and who should undertake this assessment. Strategies to influence construction management programmes and inadequacy of UT construction management graduates to register as professional construction managers were discussed. The employers' views of the importance and adequacy of preparation of the subject areas and skills and attributes that construction managers undertake and should possess were also ascertained. Finally the gap between the level of importance and the actual level of performance in the subject areas and skills and attributes was measured.

CHAPTER 5
DATA ANALYSIS: VIEWS OF ACADEMICS

5.1 Profile of staff respondents

The background and previous work experience of the academic staff members included: contracting (30%), private sector client (30%), manufacturer (15%), project management consulting (20%), education sector (5%), architecture (5%) and contract surveying (5%). Most academics (53.6%) were not professionally registered with any statutory registration authority. The majority (57.1%) were involved in construction related research which included construction management, project management, low cost housing, financial management in construction, rehabilitation of cities and townships, productivity and quality, safety and health in construction and community development.

5.2 Experiential Learning

The views of academics on aspects of experiential learning were examined based on questions that referred to the following aspects of experiential learning:

- The necessity of experiential learning;
- The basis of experiential learning;
- The preferred nature of experiential learning;
- Whether or not experiential learning should be assessed;
- The preferred agency of assessment of experiential learning;
- The preferred method of assessment of experiential learning;

- Whether or not experiential learning should be undertaken in stages; and
- The location of experiential learning in the programme.

The majority of academics considered experiential learning to be either necessary (30%) or totally necessary (66.7%). They preferred a combination of both function based and project based experience. Most academics (86.6%) preferred a structured experiential learning period. Almost all academics (93.3%) preferred that experiential learning should be assessed. With regard to the preferred agency to assess the experiential learning component, the responses are reflected in Table 5.1

Table 5.1: Academic views on the preferred assessment agency

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
Employers	4.0%	4.0%	16.0%	24.0%	52.0%	4.16	1.11
Institution	3.7%	7.4%	14.8%	18.5%	55.6%	4.15	1.67
Combination of all three parties	3.8%	3.8%	11.5%	38.5%	42.3%	4.12	1.03
Independent Assessor	20.8%	16.7%	20.8%	29.2%	12.5%	2.96	1.37
Student	47.8%	21.7%	30.4%	30.4%	-	1.83	0.89

The findings suggest support for employer input (mean = 4.16), academic involvement (mean = 4.15) and a combination of the employers, academics and students (mean = 4.12) in assessing experiential learning. Self assessment by the student was not popular (mean = 1.83). Views relative to the preferred methods of assessment of experiential learning are shown in Table 5.2. The most preferred forms of assessment were the term report (mean = 4.48) and the rating sheet (mean = 4.33). The most unpopular was the peer assessment method (mean = 2.70) followed by the self

assessment method (mean = 3.00). Most academics (80%) preferred experiential learning to be undertaken in stages.

Table 5.2: Preferred method of assessment.

Academic Responses	Strongly Disagree	Disagree	Neutral	A0gree	Strongly Agree	Mean	Std. Dev.	Ranking
Term Report	-	3.7%	7.4%	25.9%	63%	4.48	0.80	1
Rating Sheet	3.7%	3.7%	3.7%	33.3%	55.6%	4.33	1.00	2
Competency Based Assessment Method	-	3.7%	18.5%	44.4%	33.3%	4.07	0.83	3
Continuous Assessment Method	3.6%	-	14.3%	53.6%	28.6%	4.04	0.88	4
Project Based assessment method	-	7.4%	22.2%	37%	33.3%	3.96	0.94	5
Job Sponsor Assessment Method	3.8%	7.7%	23.1%	34.6%	30.8%	3.81	1.10	6
Portfolio Assessment Method	-	8%	32%	36%	24%	3.76	0.93	7
Observation Method	4%	20%	16%	40%	20%	3.52	1.16	8
Panel Assessment Method	1.5%	11.5%	26.9%	34.6%	15.4%	3.31	1.23	9
Self-Assessment Method	18.5%	22.2%	22.2%	14.8%	22.2%	3.00	1.44	10
Peer Assessment Method	29.6%	14.8%	25.9%	14.8%	14.8%	2.70	1.44	11

Evidently from Table 5.3 a 12 month period (mean = 4.44) was the most popular option. This is the current situation and the academics continue to support it.

Table 5.3: The views of the academic on stages of experiential training

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
12 month	-	-	22.2%	11.1%	66.7%	4.44	0.86	1
6 month	10%	-	20%	20%	50%	4.00	1.30	2
3 month	46.7%	13.3%	26.7%	6.7%	6.7%	2.13	1.03	3

With regard to the location of the experiential learning in the academic programme, the responses are shown in Table 5.4. Most academics (mean = 4.08) regarded experiential learning after the first year of the academic programme as the most desirable option. The next popular preference was during the 2nd year (mean = 3.45).

Table 5.4: Location of experiential training period

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
After 1st year	4.3%	8.7%	17.4%	13%	56.5%	4.08	1.24	1
During 2nd year	13.6%	18.2%	18.2%	9.1%	40.9%	3.45	1.53	2
During 3rd year	35.3%	5.9%	11.8%	17.6%	29.4%	3.00	1.73	3
During 1st year	30%	15%	20%	15%	20%	2.80	1.54	4
After 2nd year	20%	25%	30%	5%	20%	2.80	1.40	4
Anytime before the issue of the ND	47.4%	5.3%	10.5%	21.1%	15.8%	2.52	1.65	6
After 3rd year	35.3%	23.5%	17.6%	11.8%	11.8%	2.41	1.42	7
Anytime before the issue of the B. Tech	61.1%	16.7%	5.6%	11.1%	5.6%	1.83	1.29	8

The academics were requested to rate the extent to which UT satisfied the requirements of construction employers relative to commitment to change. The results are reflected in Table 5.5.

Table 5.5: The views of academics relative to commitment to change

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
3.8%	11.5%	53.8%	23.1%	7.7%	3.19	0.89

Most academics (53.8%) reported neutral commitment to change. This is supported by the views expressed in Table 5.3 and 5.4 where the academics supported the

maintenance of the status quo with regard to the location of and length of experiential learning.

In rating the adequacy of employers to mentor students they reported neutrality (mean = 3.17). With regard to the adequacy of the experiential learning experience satisfying educators' requirements they tended to be more positive (mean = 3.43). The results are reflected in Table 5.6.

Table 5.6: Adequacy of mentoring, and of experiential learning.

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
Adequacy of employer to mentor	3.3%	26.7%	23.3%	43.3%	3.3%	3.17	0.99
Adequacy of EL to educators requirements	3.3%	16.7%	23.3%	46.7%	10%	3.43	1.01

5.3 Strategies to influence construction management programmes

Their views on the effectiveness of strategies that may be able to influence construction management programmes at UT were neutral. The advisory boards and the CETA, CIOB and MBA's were reportedly the most influential agencies of influence (44%).

The academics were also requested to express an opinion with regard to the supplementation of academic instruction and experiential learning by CPD, academics reported that they supported CPD, namely 30% regarded it as slightly important while 56.7% regarded it as extremely important. The mean (4.33) confirms the importance of CPD.

Table 5.7: Strategies to influence construction management programmes at UT

Employers	Ineffective	Neutral	Effective	Ranking
Influencing bodies such as CETA. CIOB regional MBAs and others	8%	48%	44%	1
Serving on UT advisory committees	16%	40%	44%	2
Lobbying of appropriate education authorities	17.4%	47.8%	34.8%	3

5.4 Professional registration and adequacy of preparation of UT construction management graduates

The responses of academics with regard to the suitability of UT graduates to register as professional construction managers in terms of the SACPCMP Act 48 of 2000 are shown in Table 5.8. The academics regarded their graduates as being slightly suitable for professional registration (mean = 3.38).

Table 5.8: Suitability to register as professional

Extremely Unsuitable	Slightly Unsuitable	Neutral	Slightly Suitable	Extremely Suitable	Mean	Std. Dev
3.4%	13.8%	34.5%	37.9%	10.3%	3.38	0.98

With regard to the necessity of CPD to maintain registration, and whether or not the UT should offer programmes that would contribute to CPD and registration, academics reported as shown in Table 5.9. The academics expressed strong support that CPD was important to maintain registration and that the UT should be involved in offering CPD.

With regard to the adequacy of preparation of graduates to perform as managers in the construction industry, they tended to agree that the graduates were suitable to

manage a specific project mean (3.72) and also the business of construction (mean = 3.71). However they also tended to agree that graduates might be suitable to manage a number of projects (mean 3.52). The results are shown in Table 5.10.

Table 5.9: CPD to maintain registration and UT offering of CPD.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
CPD to maintain registration	3.3%	3.3%	16.7%	30%	46.7%	4.13	1.04
Should UT offer CPD	-	-	10%	6.7%	43.3%	4.33	0.66

When requested to give reasons for their responses, 61.3% of academics regarded the courses as adequate, but more experience was required by the graduates and that this took time.

Table 5.10: Adequacy of preparation to manage

Management Issue	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
Manage a specific project	-	8%	28%	48%	16%	3.72	0.84	1
Manage the business of construction	3.6%	-	28.6%	57.1 %	10.7%	3.71	0.81	2
Manage a number of projects	-	4%	52%	32%	12%	3.52	0.77	3

They were also asked about the relevance of the eight subject areas in construction management programmes, and the adequacy of preparation in these subject areas by UT. Their responses are shown in Tables 5.11 and 5.12 ranked by their mean values. The academics rated all the subject areas with the exception of research methodology (mean = 3.81) as relevant. They reported construction technology (mean =

4.67) management principles, theories and practice (mean = 4.50) and project management (mean = 4.48) to be extremely relevant.

Table 5.11: Relevance of the subject areas. Academic views.

Subject Area	Extremely Irrelevant	Somewhat Irrelevant	Neutral	Somewhat Relevant	Extremely Relevant	Mean	Std. Dev	Ranking
Construction technology	-	3.7%	3.7%	14.8%	77.8%	4.67	0.73	1
Management principles theories and practice	-	3.6%	10.7%	17.9%	67.9%	4.50	0.84	2
Project management	3.7%	-	7.4%	22.2%	66.7%	4.48	0.94	3
Construction economics	-	7.4%	7.4%	25.9%	59.3%	4.37	0.93	4
Construction business environment	-	-	18.5%	37%	44.5%	4.26	0.76	5
Construction law	3.7%	7.4%	11.1%	22.2%	55.6%	4.18	1.14	6
Construction science	-	7.4%	11.1%	55.6%	25.9%	4.00	0.83	7
Research methodology	7.4%	3.7%	11.1%	55.6%	22.2%	3.81	1.08	8

The academics regarded the preparation of students in construction technology (mean = 4.29) and management principles theories and practice (mean = 4.00) as somewhat adequate. This finding contrasts sharply with the level of relevance with which the academics regarded the subject areas. With the exception of construction technology and management principles theories and practice, the rankings also differed. Research methodology however was ranked last both with respect to relevance and student preparation.

Table 5.12: Adequacy of preparation in the subject areas.

Subject area	Extremely inadequately	Somewhat inadequately	Neutral	Somewhat adequately	Extremely adequately	Mean	Std Dev	Ranking
Construction technology	-	-	17.9%	35.7%	46.4%	4.29	0.76	1
Management principles theories	-	-	25%	50%	25%	4.00	0.72	2
Construction science	-	7.1%	28.6%	53.6%	10.7%	3.68	0.77	3
Construction business environment	3.6%	-	46.6%	35.7%	4.3%	3.57	0.88	4
Construction law	3.6%	3.6%	35.7%	46.4%	10.7%	3.57	0.88	4
Construction economics	3.6%	3.6%	39.3%	39.3%	14.3%	3.57	0.92	4
Project management	7.1%	7.1%	21.4%	53.6%	10.7%	3.54	1.04	7
Research methodology	7.1%	21.4%	32.1%	32.1%	7.1%	3.10	1.07	8

Respondents were requested to rate the importance of 37 skills and attributes that a construction management graduate should possess. Of the 37 skills and attributes, 32 were rated as important (above a mean = 4.00). Of these 32 skills, academics reported 9 skills as extremely important with mean (> 4.50). The most important were trust and honesty (mean = 4.63), time management, planning, scheduling and controlling construction operations and activities, numeracy all (mean = 4.59). The least important were marketing skills, (mean = 3.67), and systems development (mean = 3.78). The results are reflected in Tables 5.13 and 5.14.

Table 5.13 Academics view of the importance of skills and attributes

Skills/attribute	Extremely unimportant	Unimportant	Neutral	Important	Extremely important	Mean	Std Dev	Ranking
Trust and honesty	-	-	7.4%	22.2%	70.4%	4.63	0.63	1
Time management	-	-	11.1%	18.5%	70.4%	4.59	0.69	2
Planning, scheduling and controlling construction operations and activities	-	-	3.7%	33.3%	63.0%	4.59	0.57	2
Numeracy	-	-	11.1%	18.5%	70.4%	4.59	0.69	2
Acceptance of responsibility	-	-	3.7%	37%	59.3%	4.56	0.58	5
Practical building knowledge	-	-	7.4%	29.6%	63%	4.56	0.64	5
Measurement, costing and estimating	-	-	3.7%	37%	59.3%	4.56	0.58	5
Verbal communication skills	-	-	7.4%	33.3%	59.3%	4.52	0.64	8
Active listening skills	-	-	3.7%	40.7%	55.6%	4.52	0.58	8
Decision making	-	-	7.4%	37%	55.6%	4.48	0.64	10
Problem solving skills	-	-	14.8%	25.9%	59.3%	4.44	0.75	11
Worker safety and health awareness	-	3.7%	7.4%	29.6%	59.3%	4.44	0.80	11
Interpersonal skills	-	-	11.1%	37%	51.9%	4.41	0.69	13
Familiarity with construction quality management	-	3.7%	3.7%	40.7%	51.9%	4.41	0.75	13
Ability to use surveying and levelling equipment	-	3.7%	7.4%	33.3%	55.6%	4.41	0.80	13
Up-to-date professional knowledge	-	-	11.1%	37%	51.9%	4.41	0.69	13
Ability to resolve conflicts and disputes	-	3.7%	11.1%	29.6%	55.6%	4.37	0.84	17
Financial management	-	-	11.1%	40.7%	48.1%	4.37	0.69	17
Ability to work autonomously	-	3.7%	11.1%	33.3%	51.9%	4.33	0.83	19

Table 5.13 Cont.: Academics view of the importance of skills and attributes

Skills/attribute	Extremely unimportant	Unimportant	Neutral	Important	Extremely Important	Mean	Std Dev.	Ranking
Creativity and innovation	-	-	11.1%	44.4%	44.4%	4.33	0.68	19
Team building capability	-	-	18.5%	33.3%	48.1%	4.30	0.78	21
Supervisory skills and ability to train others	-	-	18.5%	33.3%	48.1%	4.30	0.78	21
Ability to exercise professional *judgement*	-	-	14.8%	40.7%	44.4%	4.30	0.72	21
Computer literacy	-	-	11.1%	48.1%	40.7%	4.30	0.67	21
Negotiating skills	-	-	18.5%	33.3%	48.1%	4.30	0.78	21
Leadership capability	-	-	18.5%	37%	44.4%	4.26	0.76	26
Familiarity with workings and intricacies of industry	-	-	18.5%	37%	44.4%	4.26	0.76	26
Adaptability to changing work environment	-	-	14.8%	48.1%	37%	4.22	0.7	28
Managerial knowledge	-	3.7%	18.5%	33.3%	44.4%	4.19	0.73	29
Entrepreneurship	-	3.7%	22.2%	29.6%	44.4%	4.15	0.91	30
Academic achievement	-	-	14.8%	55.6%	29.6%	4.14	0.66	31
Environmental awareness	-	3.7%	18.5%	40.7%	37%	4.11	0.85	32
Work study	-	11.1%	18.5%	33.3%	37%	3.96	1.02	33
Ability to conduct statistical analysis	-	14.8%	18.5%	33.3%	33.3%	3.85	1.06	34
Ability to conduct research	3.7%	11.1%	14.8%	37%	33.3%	3.85	1.13	34
Systems development ability	3.7%	11.1%	14.8%	44.4%	25.9%	3.78	1.09	36
Marketing skills	3.7%	7.4%	29.6%	37%	22.2%	3.67	1.04	37

Of the 37 skills, only 3 had mean values >4.00 , namely ability to use surveying and levelling equipment (mean = 4.07), measurement and costing (mean = 4.07) and academic achievement mean (4.00). Marketing skills and systems development ability

were rated last (mean = 2.85). The rankings of the adequacy of preparation were vastly different from the importance of the skills, and were rated well below the level of importance.

Table 5.14: Academics view of adequacy of preparation

Skills/attribute	Extremely inadequately	Inadequately	Neutral	Adequately	Extremely adequately	Mean	Std. Dev	Ranking
Ability to use surveying and levelling equipment	-	7.4%	11.1%	48.1%	33.3%	4.07	0.87	1
Measurement, costing and estimating	-	3.7%	22.2%	37%	37%	4.07	0.87	1
Academic achievement	-	3.7%	22.2%	44.4%	29.6%	4.00	0.83	3
Planning, scheduling and controlling construction operations and activities	-	3.7%	29.6%	40.7%	26%	3.89	0.85	4
Numeracy	3.7%		29.6%	44.4%	22.2%	3.82	0.92	5
Practical building knowledge	3.7%	3.7%	33.3%	25.9%	33%	3.82	1.08	5
Familiarity with construction quality management	-	7.4%	40.7%	29.6%	22.2%	3.67	0.92	7
Managerial knowledge	-	11.1%	37%	29.6%	22.2%	3.63	0.97	8
Financial management	-	7.4%	40.7%	37%	14.8%	3.59	0.84	9
Up-to-date professional knowledge	-	11.1%	37%	33%	18.5%	3.59	0.93	9
Computer literacy	-	14.8%	29.6%	40.7%	14.8%	3.56	0.93	11
Leadership capability	-	11.1%	37%	37%	14.8%	3.56	0.89	11
Worker safety and health awareness	-	14.8%	37%	25.9%	22.2%	3.56	1.01	11
Ability to exercise professional judgement	-	7.4%	48.1%	29.6%	14.8%	3.52	0.85	15
Acceptance of responsibility	-	14.8%	33.3%	37%	14.8%	3.52	0.94	15

Table 5.14 Cont.: Academics view of adequacy of preparation

Skills/attribute	Extremely inadequately	Inadequately	Neutral	Adequately	Extremely adequately	Mean	Std. Dev	Ranking
Active listening skills	-	7.4%	48.1%	29.6%	14.8%	3.52	0.85	15
Ability to work autonomously	-	15.4%	38.5%	26.9%	19.2%	3.50	0.99	18
Familiarity with workings and intricacies of industry	-	11.1%	40.7%	37%	11.1%	3.48	0.85	19
Verbal communication skills	-	11.1%	44.4%	33.3%	11.1%	3.44	0.85	20
Problem solving skills	3.7%	18.5%	29.6%	29.6%	18.5%	3.41	1.12	21
Trust and honesty	7.4%	11.1%	33.3%	29.6%	18.5%	3.41	1.15	21
Adaptability to changing work environment	-	11.1%	44.4%	37%	7%	3.4	0.8	23
Interpersonal skills	-	18.5%	44.4%	22%	14.8%	3.33	0.96	24
Team building capability	-	30.8%	34.6%	11.5%	23.1%	3.27	1.15	25
Creativity and innovation	3.7%	18.5%	44.4%	14.8%	18.5%	3.26	1.10	26
Decision making	-	22.2%	44.4%	22%	11.1%	3.22	0.93	27
Ability to resolve conflicts and disputes	7.4%	22.2%	37%	14.8%	18.5%	3.15	1.20	28
Ability to conduct research	7.4%	22.2%	33.3%	26%	11.1%	3.11	1.12	29
Entrepreneurship	3.7%	25.9%	40.7%	14.8%	14.8%	3.11	1.09	29
Supervisory skills and ability to train others	3.7%	25.9%	33.3%	29.6%	7.4%	3.11	1.01	29
Work study	7.4%	14.8%	48.1%	18.5%	11%	3.11	1.05	29
Environmental awareness	-	25.9%	48.1%	18.5%	7%	3.07	0.83	33
Ability to conduct statistical analysis	7.4%	25.9%	37%	18.5%	11.1%	3.00	1.11	34
Negotiating skills	3.7%	25.9%	44.4%	18.5%	7.4%	3.00	0.96	34
Marketing skills	7.4%	33.3%	33.3%	18.5%	7.4%	2.85	1.06	36
Systems development ability	15.4%	23.1%	30.8%	23.1%	7.7%	2.85	1.19	36

Using the same theories as was used for the employers, the gaps between the importance and adequacy of preparation of subject areas as skills are presented from the perspective of academics.

Table 5.15: Views of academics of relevancy of subject areas.

Subject area	Mean	CWF	Std. Dev.	Rank
Construction Technology	4.67	0.136	0.73	1
Management Principles, Theories and Practices	4.50	0.131	0.84	2
Project Management	4.48	0.131	0.94	3
Construction Economics	4.37	0.128	0.93	4
Construction Business Environment	4.26	0.124	0.76	5
Construction Law	4.18	0.122	1.14	6
Construction Science	4.00	0.117	0.83	7
Research Methodology	3.81	0.111	1.08	8
Total	**34.27**	1.000		

The Table above shows the sum of the mean values for the relevance of the subject areas totals 34.27 out of a possible total of 40. The sum of the mean values of the adequacy of preparation in the subject areas totals 29.32, as shown in the table below, out of a possible total of 40. A gap therefore exists between the adequacy of preparation and the relevance of the subject areas.

Table 5.16: Views of academics of adequacy of preparation in subject areas.

Subject area	Mean	CWF	Std. Dev.	Rank
Construction Technology	4.29	0.1463	0.72	1
Management Principles, Theories and Practices	4.00	0.1364	0.72	2
Construction Business Environment	3.57	0.1218	0.88	3
Construction Law	3.57	0.1218	0.88	3
Project Management	3.54	0.1207	1.04	5
Construction Economics	3.20	0.1227	0.97	6
Construction Science	3.16	0.1212	0.94	7
Research Methodology	2.85	0.1093	0.95	8
Total	**29.32**	1.0000		

The subject performance index may thus be determined as before. However the performance of the skills and subject areas as viewed by the academics is used instead. The actual levels of performance and importance are generated by calculating the sum of the mean values from both the subject areas and the skills and attributes as shown in tables 5.13, 5.14, 5.15 and 5.16. Equation 11 is the sum of the mean values of tables 5.14 and table 5.16, and equation 12 is the sum of the mean values of tables 5.13 and 5.15.

Equation 11: Measurement of performance of UT in subject areas

$$\text{CM-SASPI} = \frac{156.35}{225} * 100 = 69.5\%$$

(Adapted from: Chileshe, Fester and Haupt, 2005)

The skills and subject performance index equates to 69.5% as shown in equation 11. This is substantially lower than the skills subject importance index as shown in equation 12 which is 85.9%.

Equation 12: Measurement of importance of subject areas

$$\text{CM-SASII} = \frac{193.73}{225} * 100 = 85.9\%$$

(Adapted from: Chileshe, Fester and Haupt, 2005)

Therefore a gap exists between what academics expect of UT construction management graduates and the adequacy of preparation that these graduates receive at the UT. This gap is a concern because the academics acknowledge that the subject areas and skills and attributes are important, (85.9%) relevance, but nonetheless the preparation according to them is inadequate.

Chapter Summary

The chapter focused on the views of academics of the need for experiential learning, the location of the experiential learning in the programme. Assessment of

experiential learning and who should undertake this assessment were considered. Strategies to influence construction management programmes and adequacy of UT construction management graduates to register as professional construction managers were discussed. The mentoring abilities of the employers' were discussed as well. The academics level of satisfaction with the learning experienced during the experiential learning period was also discussed. The academics commitment to change was also discussed. The academics views of the importance and adequacy of preparation of the subject areas and skills and attributes that construction managers undertake and should possess were also ascertained. Finally the gap between the level of importance and the actual level of performance in the subject areas and skills and attributes was measured.

CHAPTER 6
DATA ANALYSIS: STUDENT VIEWS

The views of registered students who for the National Diploma: Building and Bachelor Technology degrees in construction management and quantity surveying were canvasses through self-administered questionnaires. A questionnaire was designed for the senior students who had completed their experiential training component during their second year of the National Diploma: Building. The respondents included 186 senior students at the University of Johannesburg, the Vaal University of Technology and the Cape Peninsula University of Technology.

6.1 Profile of senior student sample

Of the 186 students, 57% were registered at the Cape Peninsula University of Technology, and 35.5% were registered at the University of Johannesburg and 7.5% at the Vaal University of Technology. Of the total number of students, 26.9% were aiming to become construction managers, 34.9% intended to become quantity surveyors, however the single majority were the undecided students (38.2%). These students were undecided even though the majority (88.7%) had received experiential training during their second year. Of the 164 students who received experiential training experience was gained in the following types of organizations:

Table 6.1: Employer organizations of 2nd year students

Type of Organization	Percent %
Contractor	64.6
Quantity Surveying Practice	15.2
Sub-Contractor	7.3
Civil Engineering Contractor	4.3
Government Department	2.4
Property Developer	2.4
Local Authority	1.8
Project Management Practice	1.2
Consulting Engineers	0.6

A large number (41.6%) of students had received more than 6 months experiential learning, with a majority (55.4%) having received 1 year experiential training. The responses to the amount of experiential learning received by the students are shown in Table 6.2 below.

Table 6.2: Employment periods for 2nd year students

Period	Percent %
Less than 6 months	3.0
6 months to less than 1 year	41.6
1 year	46.9
More than one year	8.5

6.2 Senior students views on experiential learning

The senior students also confirmed the need for experiential learning (mean = 4.18). The 12.1% of students who felt that experiential training was either unnecessary or totally unnecessary may be ascribed to those students who did not find employment during the second year.

Table 6.3: Necessity of experiential training views of senior students

Totally Unnecessary	Unnecessary	Neutral	Necessary	Totally Necessary	Mean	Std. Dev
9.8%	2.3%	10.9%	14.4%	62.6%	4.18	1.30

The students were further asked what the basis for experiential learning should be with regard to it taking place in departments, on projects, a combination of these or

neither. The senior students (mean = 4.08) reported agreement with experiential learning being undertaken in a combination of departmental and project based work. They also tended to agree (mean = 3.84) that project based work was also satisfactory. The senior students (mean = 4.19) reported that experiential learning should be structured and assessed (mean = 4.19). The results are reflected in Table 6.4.

Table 6.4: Basis of experiential training senior students

Basis	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev	Ranking
Combination	5.8%	3.3%	14.2%	30.0%	46.7%	4.08	1.13	1
Project	6.3%	3.6%	20.5%	39.3%	30.4%	3.84	1.10	2
Department	4.7%	10.5%	24.4%	41.9%	18.6%	3.59	1.06	3
Neither	77.8%	4.4%	2.2%	6.7%	8.9%	1.64	1.33	4

The senior students were also asked whether experiential learning should be structured and assessed. They reported (mean 4.19) that the experiential learning should be both structured and assessed. The results are reflected in Table 6.5 below.

Table 6.5: Senior students' view on the structure and assessment of experiential learning

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
Structured	6.6%	2.6%	14.6%	17.2%	58.9%	4.19	1.19	1
Assessed	4.8%	5.4%	12.9%	19.9%	57%	4.19	1.15	1
Unstructured	30.2%	12.8%	23.3%	14%	19.8%	2.80	1.50	3

In response to the preferred assessment agency, the senior students tended to agree that the institution (mean = 3.95) and the employer (3.98) should carry out assessments. They were neutral (mean = 3.20) on whether or not assessments should be done by independent assessors. Their responses are reflected in Table 6.6.

Table 6.6: Senior student views on the assessment agency.

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
Employers	6.4%	5.5%	17.3%	25.5%	45.5%	3.98	1.20	1
Institution	9.1%	4.2%	16.8%	22.4%	47.6%	3.95	1.28	2
Independent Assessor	29.2%	11.2%	9%	11.2%	39.3%	3.20	1.72	3

The senior students were further asked whether or not experiential learning should be undertaken in stages or not. They tended to agree that the experiential learning period should be undertaken in stages (mean = 3.48) the results are reflected in Table 6.7.

Table 6.7: Senior students' views on stages of experiential learning

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.
21.5%	5%	17.7%	16%	39.8%	3.48	1.57

When asked what the length of the stage should be the senior students tended to strongly agree (mean = 4.49) that the length of the experiential learning should be a 12 month period. They were neutral to tending to agree with a 6 month period (mean 3.52), but strongly disagreed (mean = 1.88) with a 3 month period of experiential learning. The responses are reflected in Table 6.8.

Table 6.8: Senior students' responses on the length of experiential learning

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev.	Ranking
12 month	6.3%	1.6%	4.7%	11.8%	75.6%	4.49	1.10	1
6 month	21.5%	5.1%	13.9%	19%	40.5%	3.52	1.58	2
3 month	66.7%	6.3%	10.4%	6.3%	10.4%	1.88	1.41	3

The students showed preference (mean = 3.48) for experiential learning being undertaken after the first year of academic study. They were neutral towards the experiential learning taking place before the National Diploma. They did not support any of the other suggestions.

Table 6.9: Senior student views on location of experiential learning

	Strongly disagree	disagree	Neutral	Agree	Strongly agree	Mean	Std. dev	Ranking
After 1st year	28.0%	5.6%	6.4%	9.6%	50.4%	3.48%	1.75	1
Before N.Dip	31.6%	7.9%	14.9%	9.6%	36.0%	3.11%	1.70	2
After 2nd year	31.4%	13.3%	10.5%	20.0%	24.8%	2.93%	1.61	3
During 2nd year	34.0%	10.7%	10.7%	20.4%	24.3%	2.90%	1.63	4
After 3rd year	41.8%	10.9%	4.5%	14.5%	28.2%	2.76%	1.74	5
Before B. Tech	54.5%	8.1%	8.1%	10.1%	19.2%	2.31%	1.64	6
During 1st year	67.7%	11.1%	10.1%	5.1%	6.1%	1.71%	1.21	7

The students' tended towards satisfaction with the experience gained (mean = 3.97). They were more satisfied with the employer supervision (mean = 3.55) than with the institutional monitoring (mean = 3.01). They were dissatisfied with the placement for experiential learning (mean = 2.95). Table 6.10 reflects the results.

Table 6.10: Student views on the satisfaction of experiential learning

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied	mean	Std. Dev.	Rank
Experience gained	6.5%	4.7%	20.6%	21.8%	46.5%	3.97	1.20	1
Employer Supervision	13.4%	7.9%	21.3%	25.0%	32.3%	3.55	1.37	2
Placement	24.4%	11.6%	25.0%	16.5%	22.6%	3.01	1.47	3
Institution monitoring	20.7%	13.4%	31.7%	18.3%	15.9%	2.95	1.34	4

The mean (3.49) for the 1st year preparation for 2nd year was reported by the senior students. The senior students reported that the 2nd year was better preparation for the 3rd year (mean = 3.78) than the 1st year was for the 2nd year. The results are reflected in Table 6.11 below.

Table 6.11: Senior students' views on year by year preparation

	Very poorly	Poorly	Neutral	Well	Very well	Mean	Std. Dev.
1st year preparation for 2nd year	8.3%	8.8%	34.3%	23.2%	25.4%	3.49	1.20
2nd year preparation for 3rd year	6.4%	7.5%	20.2%	33.5%	32.4%	3.78	1.17

The students were asked to express whether or not the subjects taught in 1st year were relevant to the work situation. Although the mean (3.49) showed that they did not consider themselves as being well prepared, they reported that the subjects were relevant to the work situation (mean = 4.01). The results are reflected in Table 6.12.

Table 6.12: Senior student views of relevance of subjects to work situation.

Very irrelevant	Irrelevant	Neutral	Relevant	Very Relevant	Mean	Std. Dev.
3.4%	1.1%	18.1%	36.7%	40.7%	4.10	0.97

When asked regarding the practical or academic nature of the programme, they reported that they considered the programme to be more practical (mean = 3.83) than academic (mean = 3.72). They also regarded the programme as tending towards being relevant (mean = 3.96) as well as responsive (mean = 3.78) to the needs of the country. This finding differs from the views of the 1st year students who reported that the programme was more academic than practical. The results are reflected in the Table 6.13.

Table 6.13:Senior student views on the nature of the programme.

	Not at all	Marginally	Average	Slightly	Very	Mean	Std. Dev.	Ranking
Practical	2.3%	9.3%	23.8%	32.0%	32.6%	3.83	1.06	1
Academic	3.7%	1.9%	36.4%	34.6%	23.5%	3.72	0.97	2

Table 6.14: Senior student views on the relevance of the programme to the national needs.

Very irrelevant	Irrelevant	Neutral	Relevant	Very Relevant	Mean	Std. Dev.
2.4%	5.3%	23.5%	31.8%	37.1%	3.96	1.02

Table 6.15: Senior students views of the responsiveness of the programme to the needs of the country

Not at all	Marginally	Average	Slightly	Very	Mean	Std. dev.
3.7	7.4	27.8	29.6	31.5	3.78	1.09

6.3 Profile of first year student sample

A separate questionnaire was designed for the first year students, who had not as yet experienced experiential training, but had registered at the UT because of the experiential training component. The respondents included 161 first year students at the University of Johannesburg and the Cape Peninsula University of Technology.

Of the 161 students, 44.1% were registered at the Cape Peninsula University of Technology, and 55.9% were registered at the University of Johannesburg. Of the total number of students, 32.3% came into the course to follow a career in construction management, 56.5% intended to become quantity surveyors, and the remaining 11.2% were as yet undecided as to their intended career.

6.4 Expectation of the 1st year students

The students were further requested to compare the course content of Year 1 courses with what they expected them to be when they first decided to register, 64.9% reported that the course content compared somewhat favourably with their expectations. The distribution of their responses is shown in Table 6.16.

Table 6.16: Comparison of course content with expectations

Very poorly	Poorly	Average	Well	Very well	Mean	Std. Dev.
6.2%	4.9%	24.1%	41.4%	23.5%	3.71	1.07

Table 6.17: Relevance of subjects to needs of industry

Very irrelevant	Irrelevant	Neutral	Relevant	Very relevant	Mean	Std. Dev.
0.6%	2.5%	15.5%	37.9%	43.5%	4.21	0.84

The mean (3.71) of the responses suggests that on the 5-point Likert scale, students felt that the course content compared 'average' to 'well' with their expectations of the course. Most students reported that the subjects offered in Year 1 were both relevant (86.4%) and responsive (79.5%) respectively to the needs of the construction industry. The distribution of their responses is shown in Tables 6.17 and 6.18. The correlation between the extent to which the course content compared with expectations and the extent of both the relevance and responsiveness to industry needs is statistically significant at the 0.01 level and weakly positive. This finding suggests that as the favorableness of the course content increases, the relevance and responsive also increases.

Table 6.18: Responsiveness of subjects to needs of industry

Not responsive at all	Slightly responsive	Neutral	Responsive	Very responsive	Mean	Std. Dev.
0.6%	3.8%	16.0%	41.0%	38.5%	4.13	0.86

The responses to how satisfied first year students were with the individual subjects offered during Year 1 are shown in Tables 6.4. Three of the subjects had mean values >4.00 namely construction management (mean = 4.41) was ranked highest followed by construction technology (mean = 4.32). The students tended to be satisfied with regard to all the other subjects.

Table 6.19: Satisfaction with Year 1 subjects (Percentages)

Subject	Extremely dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely satisfied	Mean
Construction Management	-	3.3	9.8	30.1	56.9	4.41
Construction Technology	1.9	1.9	12.8	28.8	54.5	4.32
Applied Building Science	4.5	7.0	14.0	25.5	49.0	4.08
Quantity Surveying	6.9	6.9	14.4	25.6	46.3	3.98
Computer Skills	5.2	6.5	18.2	26.6	43.5	3.97
Site Surveying	7.7	6.4	16.7	29.5	39.7	3.87
Communications	9.6	7.6	15.3	24.8	42.7	3.83

Relative to the academic and practical nature of the course students responded as shown in Table 6.20. By comparing the means of their responses, more students regarded the program as being academic rather than practical in nature.

Table 6.20: Academic and practical nature of Year 1

Aspect	Not at all	Hardly	Average	Very	Too much	Mean	Std. Dev.
Academic	2.0%	4.6%	22.4%	46.1%	25.0%	3.88	0.91
Practical	9.6%	26.0%	27.4%	21.9%	15.1%	3.07	1.21

6.5 1st year students views on experiential learning

Most of the first year students (76.1%) reported favourably relative to how well they believed the first year program was preparing them for their experiential period in industry. They tended to regard the preparation as well (mean = 3.94).

Table 6.21: First Year student perceptions of academic preparation for experiential learning

Very poorly	Poorly	Average	Well	Very well	Mean	Std. Dev.
3.8%	4.4%	15.7%	45.9%	30.2%	3.94	0.99

Chapter Summary

This chapter summarised the views of students with regard to the structure, assessment, length, necessity, basis and location of experiential learning. The relevance of the subjects being offered at first year level as well as the value that each year adds to

the succeeding years was also discussed. The students also expressed their viewpoint as to whether or not their expectations of the programme had been met. The value that the programme lends towards the needs of the country was also considered. The academic and practical nature of the programme was assessed.

CHAPTER 7
CONCLUSION

7.1 *Introduction*

The purpose of this study, as previously stated was to critically evaluate the experiential learning undertaken by construction management students at South African UT with respect to whether it equipped them with the requisite experience and practical skills to perform various construction management functions once employed, whether the outcomes required by employers of UT graduates are achieved and whether the topics covered by the UT are correct. The objectives of the study were:

- To measure the extent of the perceived relevance by industry stakeholders, students and academic institutions of the topics and content of the construction management courses covered in South African Universities of Technology *construction management programmes;*

- To establish the level of inadequacy, as perceived by industry stakeholders and academic staff, of the preparation by South African Universities of Technology of graduates and diplomats to perform construction management functions;

- To determine the levels of dissatisfaction with the experiential learning undertaken by construction management students, relative to its timing in their programmes, length of the period spent in industry, structure and method of assessment; and

- To use the findings of the study to improve the present construction management programmes.

The study was designed to test the following hypotheses:

H 1: The topics and content of South African Universities of Technology offered construction management courses are not relevant to the practice of construction management.

H 2:

The South African Universities of Technology inadequately prepare graduates for the functions of construction management

H 3:

South African construction industry stakeholders consider experiential learning undertaken during construction management programmes at South African Universities of Technology unnecessary.

H 4: South African construction industry stakeholders are not "geared up" to manage experiential learning.

The study reviewed the available literature to support the objectives. Questionnaires were designed to return primarily a quantitative response although when necessary, respondents were requested to substantiate their answers and thus some qualitative response was also obtained. The data was analysed using the SPSS software package, and the findings were recorded. This chapter reviews and summarizes the findings relative to the hypotheses to be tested and the objectives of the study. Conclusions are drawn from the findings and recommendations are made based on these conclusions.

7.2 Hypothesis testing

H 1: Relevance of construction management subject areas, skills and attributes

The relevance of the content of the programme may be measured with the CM-SASII. The academics rated this as 85.9% relevant. The relevance for the employers was 80%. The survey of 1st year students suggested that the course content of the subjects taught in 1st year compared to their original expectations (mean = 3.71). First year students found the program to be both relevant (mean = 4.21) and responsive to the needs of industry (mean = 4.13). However, considering that most of these students had not been

previously exposed to the industry itself during this year, this finding needs to be treated with caution. The senior students however supported the 1st year students and also reported that the programme was relevant (mean = 3.79) and responsive (mean = 3.96) to both the needs of the industry and the country as a whole. They also found the subjects to be relevant to the work situation (mean = 4.10). Further, the study suggests that as the level of satisfaction with course content increased the degree of relevance and responsiveness to industry needs also increased.

The hypothesis, that the content of the construction management programmes at Universities of Technology is not relevant is rejected.

H 2: Adequacy of preparation of graduates for the functions of construction management.

Using the CM-SASPI the adequacy of preparation of graduates in the subject areas and skills and attributes was not satisfactory. The CM-SASPI score for the academics (69.5%) and the employers (64.3%) was substantially lower than the CM-SASII which the academics rated as 85.9% and the employers rated as rated 80%. The employers (mean = 2.93) regarded the graduates as unsuitable to register as professionals as well as inadequately prepared to manage the business of construction (mean = 2.96) as well as manage a number of projects (mean = 2.91).

The hypothesis that Universities of Technology inadequately prepare graduates to perform construction management functions is therefore not rejected.

H 3: Necessity of the experiential learning component.

The employers (72.4%), the academics (66.7%) and the senior student (62.4%) regarded experiential learning as totally necessary.

The hypothesis that South African construction industry stakeholders consider experiential learning unnecessary is therefore rejected.

H 4: South African construction industry stakeholders are not "geared up" to manage experiential learning.

The students (mean = 3.55) were marginally satisfied with the mentoring of the employers during the experiential learning period. The academics (mean = 3.17) were non-committal with regard to the abilities of the employers to mentor the experiential learning students.

The hypothesis that South African construction industry stakeholders are not "geared up" to manage experiential learning may not be rejected.

Conclusions:

The course content and subject areas that were offered by UTs were relevant and achieved a rating of 80% relevance from employers and 85.9% relevance from academics. The subject areas offered at UT were not the cause of dissatisfaction. The adequacy of preparation in these subject areas however was dissatisfactory. A rating of 64.3% adequacy by employers and 69.5% by academics reflected that UT were not preparing construction management graduates adequately to perform construction management functions. The literature has however also shown that it is unreasonable for employers to expect graduates to perform immediately on being employed. Both employer and academic respondents have stated that experience is the key to successful construction management employees. This experience to perform construction management function is not gained during experiential learning but subsequent to graduation. The experiential learning period was however an important part of construction management programmes as it bridged the gap between the practical and

theoretical aspects of the programme. It also offered the employers an opportunity to influence the learning content through the student being exposed to actual working conditions.

7.3 Recommendations:

The following recommendations may be made:

1. The content of the construction management programme at UT is relevant and supported by South African Construction industry stakeholders. The UT however has to put processes in place to provide adequate education and training in these subject areas and this must include properly qualified lecturing staff that has adequate experience and expertise in offering the subject areas as well as the ability to undertake and teach students in research methodology.

2. The adequate teaching of research methodology as well as other cognitive reasoning skills and attributes will enable students to develop skills and abilities, albeit over time, to tackle complex on site situations and provide employers with solutions to various construction management problems.

3. Although the industry stakeholders regard experiential learning as totally necessary, the same may not be said about the levels of satisfaction of the educators of the abilities of construction industry stakeholders to provide suitable management and mentoring of the student during the experiential learning period. The students have shown higher levels of satisfaction with the monitoring by industry stakeholders than with the UT appointed monitors. However this does not negate the fact the neither the industry nor the UT were providing a satisfactory service to the student in as far as mentoring and monitoring during the experiential learning period was concerned.

4. The current length of the experiential learning period as per the Nated 151 (DoE, 2004) is 6 months. This research has shown that all stakeholders, employers, academics and students all support an experiential learning period of 12 months. The re-curriculation that is currently underway needs to look into this situation as the mismatch between the needs of the industry and what is being forced upon the industry and the HEI needs to be addressed.

5. Continuing professional development (CPD) is a vital part of any professional's life. All the professional registration legislation in South Africa requires that the registered person undertake CPD. The UT is in a position to offer CPD and thereby improve the abilities' of construction managers.

7.4 Further Study

Two points for further study are suggested:

1 Neither international nor local industry stakeholders are satisfied with the construction management graduate produced by either UT or traditional universities. Consequently all construction management programmes locally should be interrogated and the good and bad of these programmes established and a system put in place to eradicate the bad and use the good throughout all university programmes.

2 It has been established that the mentoring and management of cooperative education construction management students does not meet the demands of neither the students nor the academic staff. Research into the abilities of the industry stakeholders to undertake mentoring and management of the cooperative education construction management students should be

undertaken in order to establish the gap and put processes in place to close the gap and solve the problem.

APPENDIX A
LETTER TO ACADEMIC STAFF OF UT

Dear Member of Staff

STUDY TO EVALUATE TECHNIKON OFFERED CONSTRUCTION MANAGEMENT PROGRAMS (TECHNIKON STAFF)

The Department of the Built Environment at Peninsula Technikon in collaboration with the Department of Construction Management at the University of Port Elizabeth is conducting a series of studies designed to examine the co-operative education / work based learning / experiential learning/ school-to-work approach to construction management education in South Africa. The study will attempt to identify the strengths and weaknesses of present programs. The information gathered will be used to provide some insights into how these programs can be improved.

The survey questionnaire that is attached contains a variety of questions designed to obtain your perspectives about Technikon offered construction management programs and the caliber of Technikon construction management graduates. Many of the questions can be answered by simply marking responses with **"X"** in spaces provided. The survey can be completed in about 15 to 20 minutes. Your participation in the study is extremely important for its success. We would appreciate it if you could return the questionnaire duly completed to the address below:

Southern African Built Environment Research Centre
Peninsula Technikon
PO Box 1916
BELLVILLE
7535

or electronically to: hauptt@pentech.ac.za (if you received it electronically) by **20 September 2004**.

Should you have any questions please feel free to call the project leader, Dr Theo Haupt (021) 959 6637 or Prof John Smallwood (041) 504 2790. Responses provided will be kept strictly confidential. Research data will be summarized so that the identity of individual respondents will be concealed.

Thanking you in anticipation of your assistance.

APPENDIX B
LETTER TO EMPLOYERS

Dear Construction Industry Participant

CONSTRUCTION INDUSTRY EDUCATION STUDY

Against the background of the new higher education landscape, higher education institutions such as the new universities of technology (former technikons) have the opportunity if deemed necessary to recurriculate their construction industry related academic offerings. Further, these programs will need to be internationally accredited. Present courses will, however, continue to be offered until 2006. In the interim period a revised curriculum based on input from all stakeholders can be formulated for introduction in 2006. Considering that your input is valuable and necessary, you are again invited to participate in this process by completing the attached questionnaire.

While we are aware of the critical time pressures that you face on a daily basis, we appeal to you to take 20 minutes and give your input to ensure that in the process of recurriculation we formulate a program collaboratively that addresses industry needs and concerns and involves the broadest range of opinions and feedback.

The survey questionnaire that is attached contains a variety of questions designed to obtain your perspectives about Technikon offered construction management programs and the caliber of Technikon construction management graduates. Many of the questions can be answered by simply marking responses with **"X"** in spaces provided. The survey can be completed in about 15 to 20 minutes. Your participation in the study is extremely important for its success. We would appreciate it if you could return the questionnaire duly completed to the address below:

Southern African Built Environment Research Centre
Peninsula Technikon
PO Box 1916
BELLVILLE
7535

or electronically to: hauptt@pentech.ac.za (if you received it electronically) by **15 November 2004**.

Should you have any questions please call the project leader, Dr Theo Haupt (021) 959 6637. Responses provided will be kept strictly confidential. Research data will be summarized so that the identity of individual respondents will be concealed.

Thanking you in anticipation of your assistance.

APPENDIX C
EMPLOYER QUESTIONNAIRE TO EVALUATE CONSTRUCTION MANAGEMENT (CM) COURSES OFFERED AT TECHNIKONS

Please note that this questionnaire consists of 5 sections, namely Sections A through E

SECTION A: EXPERIENTIAL TRAINING

1. How necessary do you consider experiential training? (1= totally unnecessary; 2= unnecessary; 3=neutral; 4=necessary; 5=totally necessary)

1	2	3	4	5

2. Should experiential training be project based such that the student works on a specific project or function/department based where the student works in the various departments of the organization?

Project based	Function/department based	Both	Neither

3. Should experiential training be structured (requiring a set of predetermined tasks to be completed or skills to be gained) or unstructured (no such requirement or stipulation)?

Structured	Unstructured

4. Should experiential training be assessed?

Yes	No	Don't know

5. If **YES**, which of the following methods should be used?

Method	Yes	No	Method	Yes	No
Rating sheet			Panel assessment		
Term report			Portfolio assessment		
Observation			Competency based assessment		
Self-assessment			Job sponsor assessment		
Project-based assessment			Peer assessment		
Continuous assessment					

6 Who should carry out the assessment?

Responsible agency	Yes	No
Technikon		
Employer		
Independent assessor		

7 *Should experiential training be undertaken in stages?*

Yes	No	Don't know

8 If **YES**, over what period of time should experiential training be done?

3 months	6 months	1 year

9 When should experiential training be done?

Period in academic program	Yes	No	*Don't Know*
After year 1 at Technikon			
During year 1 at Technikon			
After year 2 at Technikon			
During year 2 at Technikon			
After year 3 at Technikon			
During year 3 at Technikon			
Any time before a National Diploma is issued			
Any time before a B.Tech is issued			

10 Is your organization prepared to provide experiential training to students? (Please note the condition of employment)

Condition of training	Yes	No	Don't know
With remuneration			
Without remuneration			

11 On a scale of 1 to 3 (where 1 = ineffective, 2 = neutral, 3 = effective) how effective are the following strategies in influencing construction management programs at Technikons?

Strategy	1	2	3
Lobbying of appropriate education authorities			
Serving on Technikon Advisory Councils or Boards			
Influencing bodies such as CETA, CIOB, regional MBAs, and others			

SECTION B: CONTINUING PROFESSIONAL DEVELOPMENT AND PROFESSIONAL REGISTRATION

12 How important is supplementation of academic instruction and experiential training by CPD? (1=not important at all; 2=slightly unimportant; 3=neutral; 4=slightly important; 5=extremely important)

1	2	3	4	5

13 Upon completion of the Technikon program how suitable in your personal opinion is the graduate for professional registration in terms of legislation? (1=extremely unsuitable; 2=slightly unsuitable; 3=neutral; 4=slightly suitable; 5=extremely suitable)

1	2	3	4	5

14 Should CPD be a requirement to maintain registration?

Yes	No	Don't know

15 Should Technikons offer programs that will contribute towards CPD and registration?

Yes	No	Don't know

SECTION C: OPINIONS ON CONSTRUCTION MANAGEMENT COURSES AT TECHNIKONS

Construction management has been defined as ***the application of advanced expertise in the theory and practice of management relating to the construction procurement process and the construction organization as a business enterprise.***

16 In terms of this definition above, do Technikons adequately prepare construction management diplomates and graduates to manage (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree):

Aspect	1	2	3	4	5
The business of construction?					
A number of projects?					
A specific project?					

17 Please provide reasons for your answer: _____

_____

18 On a scale of 1 to 5 how relevant to employment in construction are the following topics in construction management programs? (1 = extremely irrelevant, 2 = irrelevant, 3 = neutral, 4 = relevant, and 5 = extremely relevant)

Topic	1	2	3	4	5
Management principles, theories and practice					
Construction business environment					
Project management					
Construction economics					
Research methodology					
Construction law					
Construction science					
Construction technology					

19 How adequately do Technikons prepare their students in these areas? (1 = extremely inadequately, 2 = somewhat inadequately, 3 = neither adequately nor inadequately, 4 = somewhat adequately, and 5 = extremely adequately)

Topic	1	2	3	4	5
Management principles, theories and practice					
Construction business environment					
Project management					
Construction economics					
Research methodology					
Construction law					
Construction science					
Construction technology					

20 Which of the following skills and attributes should a Technikon construction management graduate **possess**?

Skill/attribute	Unnecessary	Unsure	Necessary
Academic achievement			
Acceptance of responsibility			
Computer literacy			
Adaptability to changing work environment			
Time management			
Ability to exercise professional judgement			
Managerial knowledge			
Leadership capability			
Familiarity with workings and intricacies of industry			
Planning, scheduling and controlling construction operations and activities			
Active listening skills			
Practical building knowledge			
Numeracy			
Environmental awareness			
Problem solving skills			
Worker safety and health awareness			
Verbal communication skills			
Interpersonal skills			
Team building capability			
Trust and honesty			
Up-to-date professional knowledge			
Ability to work autonomously			
Familiarity with construction quality management			
Marketing skills			
Entrepreneurship			
Ability to resolve conflicts and disputes			
Supervisory skills and ability to train others			
Negotiating skills			
Ability to conduct research			
Systems development ability			
Ability to use surveying and levelling equipment			
Financial management			

19 Cont. Which of the following skills and attributes should a Technikon construction management graduate **possess**?

Measurement, costing and estimating			
Decision making			
Creativity and innovation			
Ability to conduct statistical analysis			
Work study			

21 On a scale of 1 to 5 **how important are the following skills and attributes** in a construction management graduate? (1 = Extremely unimportant, 2 = unimportant, 3 = neutral, 4 = important, and 5 = extremely important)

Skill/attribute	1	2	3	4	5
Academic achievement					
Acceptance of responsibility					
Computer literacy					
Adaptability to changing work environment					
Time management					
Ability to exercise professional judgement					
Managerial knowledge					
Leadership capability					
Familiarity with workings and intricacies of industry					
Planning, scheduling and controlling construction operations and activities					
Active listening skills					
Practical building knowledge					
Numeracy					
Environmental awareness					
Problem solving skills					
Worker safety and health awareness					
Verbal communication skills					
Interpersonal skills					
Team building capability					
Trust and honesty					
Up-to-date professional knowledge					
Ability to work autonomously					
Familiarity with construction quality management					
Marketing skills					
Entrepreneurship					
Ability to resolve conflicts and disputes					
Supervisory skills and ability to train others					
Negotiating skills					
Ability to conduct research					
Systems development ability					
Ability to use surveying and levelling equipment					
Financial management					
Measurement, costing and estimating					
Decision making					
Creativity and innovation					
Ability to conduct statistical analysis					
Work study					

22 How adequately do Technikons develop these skills and attributes in their students? (1 = extremely inadequately, 2 = inadequately, 3 = neutral, 4 = adequately, and 5 = extremely adequately)

Skills/attribute	1	2	3	4	5
Academic achievement					
Acceptance of responsibility					
Computer literacy					
Adaptability to changing work environment					
Time management					
Ability to exercise professional judgement					
Managerial knowledge					
Leadership capability					
Familiarity with workings and intricacies of industry					
Planning, scheduling and controlling construction operations and activities					
Active listening skills					
Practical building knowledge					
Numeracy					
Environmental awareness					
Problem solving skills					
Worker safety and health awareness					
Verbal communication skills					
Interpersonal skills					
Team building capability					
Trust and honesty					
Up-to-date professional knowledge					
Ability to work autonomously					
Familiarity with construction quality management					
Marketing skills					
Entrepreneurship					
Ability to resolve conflicts and disputes					
Supervisory skills and ability to train others					
Negotiating skills					
Ability to conduct research					
Systems development ability					
Ability to use surveying and levelling equipment					
Financial management					
Measurement, costing and estimating					
Decision making					
Creativity and innovation					
Ability to conduct statistical analysis					
Work study					

SECTION D: OPINIONS ON TRAINING AND EDUCATION

It has been stated that: ***Training increases skills and competence and teaches employees the "how" of a job whereas education increases their insight and understanding and teaches them "why"***

23 What is your opinion with respect to this distinction between training and education?

Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree

24 In terms of the above statement, which should the following higher education institutions be **PRIMARILY** engaged in?

Institution	Education	Training
University		
Technikon		

25 Please provide reasons for your answer:
Training can only happen out of the lecture hall

26 With respect to Technikon graduates (B.Tech), do you regard them as being trained or educated?

Trained	Educated	Neither	Both

27 Please provide reasons for your answer:
Still need practical training & people management skills

28 Which of the following have you employed? (Please indicate YES or NO for each category)

	ND Building Student	ND Building Diplomate	B. Tech Construction Management graduate	B. Tech Quantity Surveying graduate
Yes				
No				

29 If YES, in general how satisfied were you with their performance (Please motivate your rating in the space below)

	Most dissatisfied ..... .Most satisfied				
Category	1	2	3	4	5
ND Building Student					
ND Building Diplomate					
B. Tech Construction Management graduate					
B. Tech Quantity Surveying graduate					

30 If YES, what was the average monthly remuneration paid relative to each category of student?

Category	Monthly salary
ND Building Student	
ND Building Diplomate	
B. Tech Construction Management graduate	
B. Tech Quantity Surveying graduate	

31 Would you employ a Technikon student again?

Category	Yes	No	Unsure
ND Building Student			
ND Building Diplomate			
B. Tech Construction Management graduate			
B. Tech Quantity Surveying graduate			

32 Please provide reasons for your answer:

_____

_____

SECTION E: PARTICIPATION IN CONSTRUCTION

33 *Indicate your organization's primary participation in the construction industry (Please select only* **ONE)**

Architect		Project Manager (consultant)	
Contractor		Quantity Surveyor (consultant)	
Engineer (consultant)		Subcontractor	
Manufacturer		Supplier	
Private sector client		Other	
Public sector client			

34 If OTHER, please specify below

_____

_____

35 In which province is your business located? (Please select only **ONE**)

Eastern Cape		Kwazulu-Natal		Northern Cape	
Free State		Limpopo		North West	
Gauteng		Mpumalanga		Western Cape	

36 Average annual turnover during the past 3 years

< R1million	
≥ R1 million ≤ R5 million	
> R5 million ≤ R20 million	
> R20 million	√

37 Average size of labour force

≤ 10	> 11 ≤ 50	> 50 ≤ 100	> 100 ≤ 250	>250

THANK YOU FOR YOUR CONTRIBUTION TOWARDS IMPROVING COOPERATIVE CONSTRUCTION EDUCATION IN SOUTH AFRICA

APPENDIX D
QUESTIONNAIRE TO EVALUATE CONSTRUCTION MANAGEMENT (CM) COURSES OFFERED AT TECHNIKONS (UNIVERSITIES OF TECHNOLOGY) (STAFF)

Please note that this questionnaire consists of 5 sections, namely Sections A through E

SECTION A: EXPERIENTIAL TRAINING

1 How necessary do you consider experiential training? (1= totally unnecessary; 2= unnecessary; 3=neutral; 4=necessary; 5=totally necessary)

1	2	3	4	5

2 Should experiential training be project based such that the student works on a specific project or function/department based where the student works in the various departments of the organization?

Project based	Function/department based	Both	Neither

3 If **NEITHER**, describe your alternative

_____

_____

4 Should experiential training be structured (requiring a set of predetermined tasks to be completed or skills to be gained) or unstructured (no such requirement or stipulation)?

Structured	Unstructured

5 Should experiential training be assessed?

Yes	No	Don't know

6 If **YES**, indicate using the following scale, namely 1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree, to what extent the following methods should be used? **PLEASE RATE EACH METHOD**

Method	1	2	3	4	5
Rating sheet					
Term report					
Observation					
Self-assessment					
Project-based assessment					
Continuous assessment					
Panel assessment					
Portfolio assessment					
Competency based assessment					
Job sponsor assessment					
Peer assessment					

7 Who should carry out the assessment? (1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree) **PLEASE RATE EACH AGENCY**

Responsible agency	1	2	3	4	5
Technikon (Universities of Technology)					
Employer					
Independent assessor					
Student					
Technikon, employer and student together					

8 Should experiential training be undertaken in stages?

Yes	No	Don't know

9 If **YES**, over what period of time should experiential training be done? (1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree) **PLEASE RATE EACH OPTION**

	1	2	3	4	5
3 months					
6 months					
12 months (1 year)					

10 When should experiential training be done? (1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree) **PLEASE RATE EACH OPTION**

Period in academic program	1	2	3	4	5
After year 1 at Technikon (Universities of Technology)					
During year 1 at Technikon (Universities of Technology)					
After year 2 at Technikon (Universities of Technology)					
During year 2 at Technikon (Universities of Technology)					
After year 3 at Technikon (Universities of Technology)					
During year 3 at Technikon (Universities of Technology)					
Any time before a National Diploma is issued					
Any time before a B.Tech is issued					

11 How adequately are construction employers equipped to mentor students during their experiential leaning period in industry? (1 = extremely inadequately, 2 = inadequately, 3 = neutral, 4 = adequately, and 5 = extremely adequately)

1	2	3	4	5

12 Please provide reasons for your answer:

_____

_____

13 How adequately does the experiential learning experience of students satisfy the requirements of educators? (1 = extremely inadequately, 2 = inadequately, 3 = neutral, 4 = adequately, and 5 = extremely adequately)

1	2	3	4	5

14 Please provide reasons for your answer:

_____

_____

15 On a scale of 1 to 3 (where 1 = ineffective, 2 = neutral, 3 = effective) how effective are the following strategies in influencing construction management programs at Technikons (Universities of Technology)?

Strategy	1	2	3
Lobbying of appropriate education authorities			
Serving on Technikon Advisory Councils or Boards			
Influencing bodies such as CETA, CIOB, regional MBAs, and others			

SECTION B: CONTINUING PROFESSIONAL DEVELOPMENT AND PROFESSIONAL REGISTRATION

16 How important is supplementation of academic instruction and experiential training by CPD? (1=not important at all; 2=slightly unimportant; 3=neutral; 4=slightly important; 5=extremely important)

1	2	3	4	5

17 Upon completion of the Technikon (Universities of Technology) program how suitable in your personal opinion is the graduate for professional registration in terms of legislation? (1=extremely unsuitable; 2=slightly unsuitable; 3=neutral; 4=slightly suitable; 5=extremely suitable)

1	2	3	4	5

18 Should CPD be a requirement to maintain registration? (1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree)

1	2	3	4	5

19 Should Technikons (Universities of Technology) offer programs that will contribute towards CPD and registration? (1= Strongly disagree; 2= Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree)

1	2	3	4	5

SECTION C: OPINIONS ON CONSTRUCTION MANAGEMENT COURSES AT TECHNIKONS

Construction management has been defined as ***the application of advanced expertise in the theory and practice of management relating to the construction procurement process and the construction organization as a business enterprise.***

20 In terms of this definition above, do Technikons (Universities of Technology) adequately prepare construction management diplomates and graduates to manage (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree):

Aspect	1	2	3	4	5
The business of construction?					
A number of projects?					
A specific project?					

21 Please provide reasons for your answer:

_____

_____

22 On a scale of 1 to 5 how relevant to employment in construction are the following topics in construction management programs? (1 = extremely irrelevant, 2 = irrelevant, 3 = neutral, 4 = relevant, and 5 = extremely relevant)

Topic	1	2	3	4	5
Management principles, theories and practice					
Construction business environment					
Project management					
Construction economics					
Research methodology					
Construction law					
Construction science					
Construction technology					

23 How adequately do Technikons (Universities of Technology) prepare their students in these areas? (1 = extremely inadequately, 2 = somewhat inadequately, 3 = neither adequately nor inadequately, 4 = somewhat adequately, and 5 = extremely adequately)

Topic	1	2	3	4	5
Management principles, theories and practice					
Construction business environment					
Project management					
Construction economics					
Research methodology					
Construction law					
Construction science					
Construction technology					

24 Which of the following skills and attributes should a Technikon (University of Technology) construction management graduate **possess**?

Skill/attribute	Unnecessary	Unsure	Necessary
Academic achievement			
Acceptance of responsibility			
Computer literacy			
Adaptability to changing work environment			
Time management			
Ability to exercise professional judgement			
Managerial knowledge			
Leadership capability			
Familiarity with workings and intricacies of industry			
Planning, scheduling and controlling construction operations and activities			
Active listening skills			
Practical building knowledge			
Numeracy			
Environmental awareness			
Problem solving skills			
Worker safety and health awareness			
Verbal communication skills			
Interpersonal skills			
Team building capability			
Trust and honesty			
Up-to-date professional knowledge			
Ability to work autonomously			
Familiarity with construction quality management			
Marketing skills			
Entrepreneurship			
Ability to resolve conflicts and disputes			
Supervisory skills and ability to train others			
Negotiating skills			
Ability to conduct research			
Systems development ability			
Ability to use surveying and levelling equipment			
Financial management			
Measurement, costing and estimating			
Decision making			
Creativity and innovation			
Ability to conduct statistical analysis			
Work study			

25 On a scale of 1 to 5 **how important are the following skills and attributes** in a construction management graduate? (1 = Extremely unimportant, 2 = unimportant, 3 = neutral, 4 = important, and 5 = extremely important)

Skill/attribute	1	2	3	4	5
Academic achievement					
Acceptance of responsibility					
Computer literacy					
Adaptability to changing work environment					
Time management					
Ability to exercise professional judgement					
Managerial knowledge					
Leadership capability					
Familiarity with workings and intricacies of industry					
Planning, scheduling and controlling construction operations and activities					
Active listening skills					
Practical building knowledge					
Numeracy					
Environmental awareness					
Problem solving skills					
Worker safety and health awareness					
Verbal communication skills					
Interpersonal skills					
Team building capability					
Trust and honesty					
Up-to-date professional knowledge					
Ability to work autonomously					
Familiarity with construction quality management					
Marketing skills					
Entrepreneurship					
Ability to resolve conflicts and disputes					
Supervisory skills and ability to train others					
Negotiating skills					
Ability to conduct research					
Systems development ability					
Ability to use surveying and levelling equipment					
Financial management					
Measurement, costing and estimating					
Decision making					
Creativity and innovation					
Ability to conduct statistical analysis					
Work study					

26 How adequately do Technikons (Universities of Technology) develop these skills and attributes in their students? (1 = extremely inadequately, 2 = inadequately, 3 = neutral, 4 = adequately, and 5 = extremely adequately)

Skills/attribute	1	2	3	4	5
Academic achievement					
Acceptance of responsibility					
Computer literacy					
Adaptability to changing work environment					
Time management					
Ability to exercise professional judgement					
Managerial knowledge					
Leadership capability					
Familiarity with workings and intricacies of industry					
Planning, scheduling and controlling construction operations and activities					
Active listening skills					
Practical building knowledge					
Numeracy					
Environmental awareness					
Problem solving skills					
Worker safety and health awareness					
Verbal communication skills					
Interpersonal skills					
Team building capability					
Trust and honesty					
Up-to-date professional knowledge					
Ability to work autonomously					
Familiarity with construction quality management					
Marketing skills					
Entrepreneurship					
Ability to resolve conflicts and disputes					
Supervisory skills and ability to train others					
Negotiating skills					
Ability to conduct research					
Systems development ability					
Ability to use surveying and levelling equipment					
Financial management					
Measurement, costing and estimating					
Decision making					
Creativity and innovation					
Ability to conduct statistical analysis					
Work study					

27 To what extent do Technikons (Universities of Technology) succeed in satisfying the requirements of construction employers in the following areas? (1 = extremely inadequately, 2 = inadequately, 3 = neutral, 4 = adequately, and 5 = extremely adequately) **PLEASE RATE EACH AREA**

Area	1	2	3	4	5
Commitment to the career of construction management					
Commitment to managing change					
Ability to motivate and empower others					
Ability to tolerate work-related stress					

28 Do you consider the following qualifications to lead to sustainable employment in the discipline of construction management? (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Qualification	1	2	3	4	5
National Diploma: Building					
B. Tech (Construction Management)					
B. Tech (Quantity Surveying)					

29 Provide answers for your responses:

National Diploma: Building

_____

_____

B. Tech (Construction Management)

_____

_____

B. Tech (Quantity Surveying)

_____

_____

30 Do these qualifications contribute to the objectives that Higher Education must satisfy relative to the reconstruction, transformation and development of South Africa? (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Aspect	1	2	3	4	5
Reconstruction					
Transformation					
Development					

31 Provide answers for your responses:

Reconstruction

_____

_____

Transformation

_____

_____

Development

SECTION D: OPINIONS ON TRAINING AND EDUCATION

It has been stated that: ***Training increases skills and competence and teaches employees the "how" of a job whereas education increases their insight and understanding and teaches them "why"***

32 What is your opinion with respect to this distinction between training and education?

Totally disagree	Slightly disagree	Neutral	Slightly agree	Totally agree

33 In terms of the above statement, which should the following higher education institutions be **PRIMARILY** engaged in?

Institution type	Education	Training
University		
Technikon (University of Technology)		

34 Please provide reasons for your answer:

_____

_____

35 With respect to Technikon (University of Technology) graduates (B.Tech), do you regard them as *being trained or educated*?

Trained	Educated	Neither	Both

36 Please provide reasons for your answer:

_____

_____

37 At which level are Technikons (Universities of Technology) expected to provide employers with graduates and diplomates? (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree) **PLEASE RATE EACH LEVEL**

Level	1	2	3	4	5
Technician					
Candidate professional					
Construction manager					
Technical assistant					
Site agent					
Contracts manager					
Project manager					

38 Please provide reasons for your answers

_____

_____

39 Should the following qualifications be re-curriculated? (1= strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Qualification	1	2	3	4	5
National Diploma: Building					
B. Tech (Construction Management)					
B. Tech (Quantity Surveying)					

40 Please provide reasons for your answers

41 At which current NQF should the current qualifications be placed?

Qualification	NQF 5	NQF 6	NQF 7	NQF 8
National Diploma: Building				
B. Tech (Construction Management)				
B. Tech (Quantity Surveying)				

42 If you consider that the current qualifications need to be renamed, provide suggestions below

Qualification	New name
National Diploma: Building	
B. Tech (Construction Management)	
B. Tech (Quantity Surveying)	

SECTION E: ADDITIONAL INFORMATION

43 What is your **PRIMARY** qualification? (Please select only **ONE**)

Architect	
Construction Manager	
Engineer	
Project Manager	
Quantity Surveyor	
Public sector client	
Other	

44 If OTHER, please specify below

45 Are you professionally registered?

Yes	No

46 Are you currently involved in construction industry related research?

Yes	No

47 If **YES**, briefly describe your interest/expertise

THANK YOU FOR YOUR CONTRIBUTION TOWARDS IMPROVING COOPERATIVE CONSTRUCTION EDUCATION IN SOUTH AFRICA

APPENDIX E
SENIOR STUDENT QUESTIONAIRRE

Faculty Research Office – Engineering Faculty

P.O.Box 1906, Bellville, Cape Town, South Africa, 7535

Tel: (021) 959-6637/6666, Fax: (021) 959-6743

EXPERIENTIAL TRAINING QUESTIONNAIRE

Institution: .....

Year/ Level of Study: .....

Discipline: Architecture/ Construction Management/ Quantity Surveying (*Circle only **ONE***)

Please answer the following questions as fully as you are able. The information that you provide is extremely important for the future development and improvement of construction courses at Technikons (Universities of Technology).

1. Have you had any experiential training in Year 2?

Yes		No	

2. If Yes, with what type of company?

3. For how long were you employed? .....

Which of the following best describes the experiential training you received?

Project based	Function/department based	Both	Neither

5. How necessary do you consider experiential training?

Totally unnecessary.....totally necessary				
1	2	3	4	5

6. Provide reasons for your answer

7. To what extent should experiential training be project based such that you work *on a specific project or function/department based where you work in the various* departments of the organization? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

	Strongly disagree.....Strongly agree				
	1	2	3	4	5
Project based					
Function/department based					
Both					
Neither					

8. Provide reasons for your answer

9. To what extent should experiential training be structured (requiring a set of predetermined tasks to be completed or skills to be gained) or unstructured (no such requirement or stipulation)? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

	Strongly disagree.....Strongly agree				
	1	2	3	4	5
Structured					
Unstructured					

10. Provide reasons for your answer

11. Should experiential training be assessed?

Strongly disagree.....Strongly agree				
1	2	3	4	5

12. If **you agree**, who should carry out the assessment? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

	Strongly disagree...Strongly agree				
Responsible agency	1	2	3	4	5
Technikon (Universities of Technology					
Employer					
Independent assessor					

13. Should experiential training be undertaken in stages?

Strongly disagree.....Strongly agree				
1	2	3	4	5

14. If **you agree**, over what period of time should experiential training be done? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

	Strongly disagree.....Strongly agree				
	1	2	3	4	5
3 months					
6 months					
1 year					

15. On a scale of 1 to 5 rate when experiential training should be done? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

Period in academic program	Strongly disagree.....Strongly agree				
	1	2	3	4	5
After year 1 at Technikon (Universities of Technology)					
During year 1 at Technikon (Universities of Technology)					
After year 2 at Technikon (Universities of Technology)					
During year 2 at Technikon (Universities of Technology)					
After year 3 at Technikon (Universities of Technology)					
During year 3 at Technikon (Universities of Technology)					
Any time before a National Diploma is issued					
Any time before a B.Tech is issued					

16. On a scale of 1 to 5, rate how satisfied you were with the following? **PLEASE RESPOND TO EACH OPTION LINE BY LINE**

	Very dissatisfied.....Very satisfied				
	1	2	3	4	5
Placement					
Monitoring					
Supervision					
Experience gained					

17. How well did your academic courses in Year 1 prepare you for Year 2 (experiential year?

Very poorly .....Very well				
1	2	3	4	5

18. Provide reasons for your answer.

19. How well did the Experiential Training in Year 2 prepare you for Year 3?

Very poorly .....Very well				
1	2	3	4	5

20. Explain your answer

21. How relevant are the subjects offered in the present course to the work situation?

Very irrelevant .....Very relevant				
1	2	3	4	5

22. Provide reasons for your answer

23. How academic or practical do you rate the program on a scale of 1 to 5?
PLEASE RESPOND TO EACH OPTION

	Not at all .....Too much				
	1	2	3	4	5
Academic					
Practical					

24. Provide reasons for your answer

Academic
Practical

25. How do you rate on a scale of 1 to 5 the program with respect to its relevance to the economic, social and political needs of South Africa?

Not relevant at all .....Very relevant				
1	2	3	4	5

26. Provide reasons for your answer

27. How do you rate on a scale of 1 to 5 the program with respect to its responsiveness to the economic, social and political needs of South Africa?

Not responsive at all .....Very responsive				
1	2	3	4	5

28. Provide reasons for your answer

Thank you for your contribution to improving construction courses offered at Universities of Technology.

APPENDIX F
FIRST YEAR STUDENT QUESTIONAIRRE

Faculty Research Office – Engineering Faculty

P.O.Box 1906, Bellville, Cape Town, South Africa, 7535

Tel: (021) 959-6637/6666, Fax: (021) 959-6743

9 February, 2006

QUESTIONNAIRE TO EVALUATE BUILDING COURSE CONTENT

Year/ Level of Study: .....

Discipline: Architecture/ Construction Management/ Quantity Surveying (*Circle only **ONE***)

Please answer the following questions as fully as you are able. The information that you provide is extremely important for the future development and improvement of construction courses at Universities of Technology

1. To what extent does the course content in Year 1 compare with what you expected it to be when you decided to register for it? *(1= very poorly; 2= poorly; 3 = average; 4 = well; 5 = very well)*

1	2	3	4	5

2. Provide reasons for your answer:

3. On a scale of 1 to 5, rate how relevant you think the subjects offered in Year 1 are to the needs of the construction industry?

Very irrelevant .....Very relevant				
1	2	3	4	5

4. Provide reasons for your answer

5. On a scale of 1 to 5, rate how responsive you think the subjects offered in Year 1 are to the needs of the construction industry?

Not responsive at all .....Very responsive				
1	2	3	4	5

6. Provide reasons for your answer

7. On a scale of 1 to 5 rate how satisfied are you are the subjects you have been offered in Year 1?

	Very dissatisfied.....Very satisfied				
	1	2	3	4	5
Communications					
Site Surveying					
Computer skills					
Construction Technology					
Quantity Surveying					
Construction Management					
Applied Building Science					

8. Provide reasons for your answer.

Communications
Site Surveying
Computer skills
Construction Technology
Quantity Surveying
Construction Management
Applied Building Science

9. On a scale of 1 to 5, rate how well you think the course is preparing you sufficiently for Year 2 (experiential learning year)?

Very poorly .....Very well				
1	2	3	4	5

10. *Provide reasons for your answer*

11. On a scale of 1 to 5, rate how academic or practical the course is

	Not at all ..... Too much				
	1	2	3	4	5
Academic					
Practical					

12. Provide reasons for your answer

Academic
Practical

Thank you for your contribution to improving construction courses offered at Universities of Technology.

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BIOGRAPHICAL SKETCH

Ferdinand Cedric Fester was born on March 3, 1962 in Cape Town. He completed the National Higher Diploma in Building Surveying at Technikon Witwatersrand and the Bachelor of Technology Quantity Surveying degree at the TWR. He has completed the Higher Diploma in Technical Education at UCT.

He has served as President of the South African Institute of Building, The Chartered Institute of Building-Southern Africa, The South African Council for the Project and Construction Management Professions as well as Executive Member of the Council for the Built Environment.

He is a Fellow of the Chartered Institute of Building and Registered as a Professional Construction Manager as well as a Professional Construction Project Manager.

Ferdinand has more than twenty six years experience in the construction industry in South Africa. His primary interest however is the practice of the discipline of construction management and the education that forms the basis of this discipline and has co-authored a number of peer-reviewed conference papers on this topic.

He has been a staff member of the former Technikon Witwatersrand since 1995 and after the merger to form the University of Johannesburg is the Head of the Construction Management and Quantity Surveying Department at the UJ.

Ferdinand is married to Renate and has 4 children, Jade, Storm-Fauve, Ferdinand and Chandler and 1 grandson Tyler.