CHAPTER ONE: INTRODUCTION

1.1 Overview

Bizzel (2002) estimated that the building profession began in South Africa in 1783 when Louis Thibault was assigned the entire surveying and town planning functions in the Cape Colony. Manthe and Smallwood (2003) stated that formal professional education only began with the School of Mines in 1896 presenting classes in history, construction and design to a small group of students. The School progressed through different stages until it became part of a formal academic programme at the University of the Witwatersrand in 1922.

In South Africa, the group of professional consultants brought together to plan, implement, operate, and manage physical infrastructure are generally referred to as the built environment professionals. Depending on the nature of the project, the professional team would comprise one or more of the following parties (Hauptfleish and Sigle, 2001):

a. Project and Construction Manager,
b. Architect,
c. Quantity Surveyor,
d. Engineers [Structural, Civil, Electrical, Mechanical],
e. Landscape Architect,
f. Land Surveyor,
g. Urban and Regional Planner,
h. Property Valuer,
i. Property Manager
j. Other experts such as Acoustic Consultant, Lighting Consultant, Interior Decorator, Office Planner, etc.

Other members of the above group of built environment professionals include Builders and Facility Managers. The exclusion of the engineers will make the team to be regarded as 'Non-Engineering Built Environment' (NEBE) professionals.

Figure 1 shows the graphical representation of the NEBE structure:

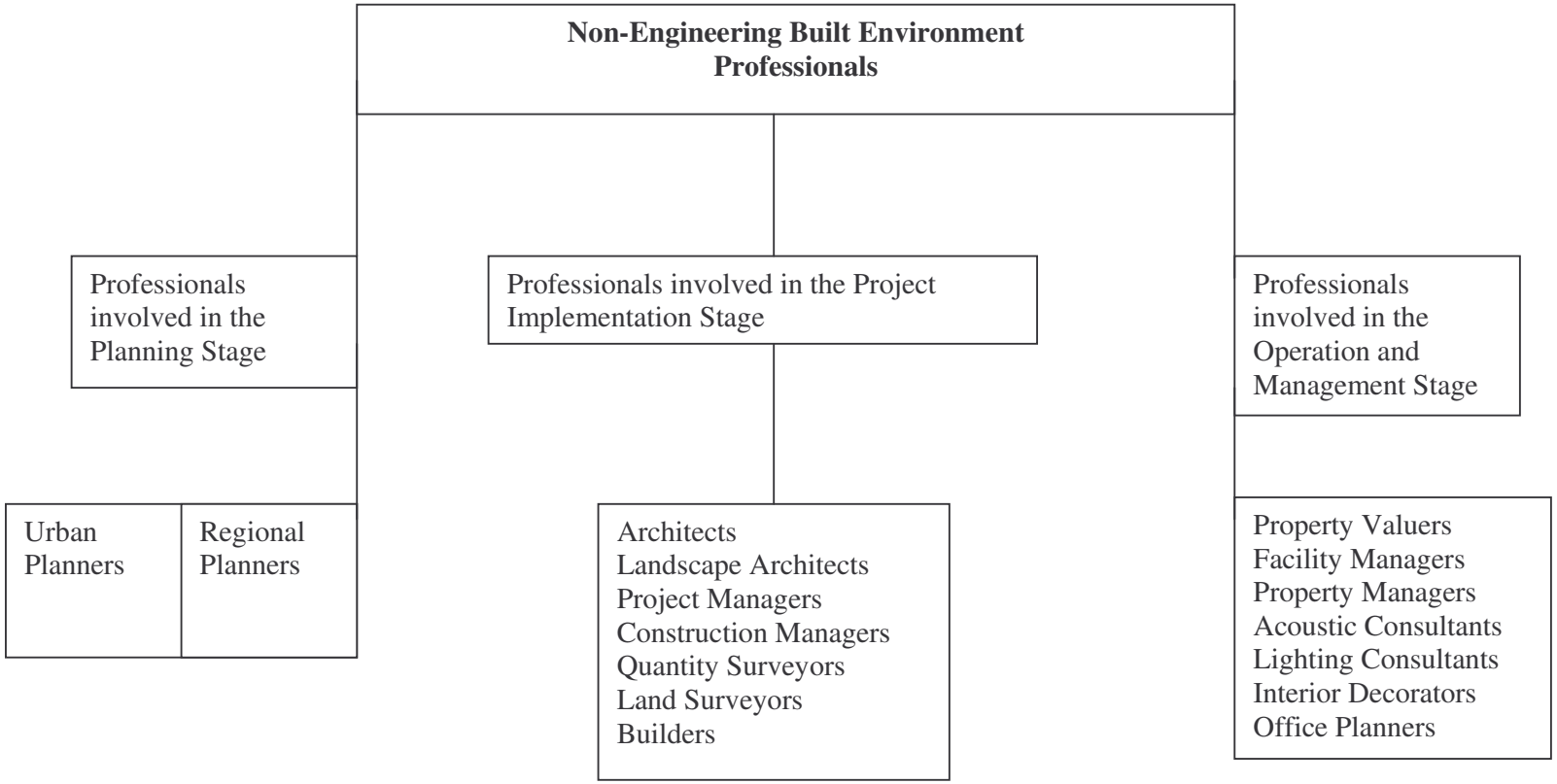

Figure 1: A graphical representation of the NEBE structure

1.2 The Non-Engineering Built Environment

Figure 1 show the major phases involved in construction project lifecycles and the professionals that are actively involved in each phase of the construction project lifecycle. Below are brief descriptions of the activities carried out in each major phase by the non-engineering built environment professionals.

(a) Planning Stage

Urban and Regional Planners (through the Town and Regional Authority) play a vital role at the inception stage, in that they supply useful information on land-use (e.g. the provision of master plans showing water supply networks, power cable networks, gas networks, road networks etc.) and legislation relating to the existing and projected infrastructure in the neighbourhood, city, region, or nation. They also issue the necessary approvals, permits and licenses (Akindele, 2005). These planning practitioners also sometimes work together with the Landscape Architects. Landscape Architects specifically focus on the design of optimum utilization of open spaces such as in public places for sport activities, golf courses, beach and recreational facilities, tourist developments, community parks, and general land use planning for residential and commercial estates.

(b) Implementation Stage

At this second stage, the Architect designs the building (if it is a building project) with respect to its use and beauty. Based on the Architect designs, Project or Construction Managers plan, direct and oversee the entire project or just part of the project. They typically schedule and coordinate all design and construction processes, including the selection, hiring, and oversight of specialty trade contractors (Kerzner, 2003).

Project or Construction Managers coordinate and supervise the construction process from the conceptual development stage through to final construction, making sure that the project gets done on time and within budget. Project or Construction Managers
work closely with other professional members of the construction industry - including Quantity Surveyors, Builders and Land Surveyors. Each of these professionals plays a vital role in the implementation of the project.

(c) Operation and Management Stage

Operation and management of a finished project is basically handled by professional Valuers and Facility Managers, who are able to provide a comprehensive range of services to a comprehensive range of clients.

1.3 The Research Problem

Nkado's (1999) previous study on skills and competency development reveals that acute shortage of skilled and competent professionals in the South African construction industry has resulted in the inequitable delivery of infrastructure, amongst all South African communities, especially those that have been historically disadvantaged. Hence, in 2003 an estimate of South Africa's infrastructure backlog amounted to R170 billion. As a result, the South African government is dissatisfied with its infrastructure delivery (Manthe and Smallwood, 2003). Concerted efforts, therefore, have been focused on skills and competency development in the construction industry in order to improve the standard of living of citizens through infrastructure provision.

However, in the light of major on-going national, provincial, and local projects (Mfenyana, 2006) involving the construction of five new stadiums, upgrading of five existing stadiums and the South Africa Gautrain Project (Benjamin, 2006), in preparation for the hosting of South Africa 2010 FIFA World Cup, the South African government is confronted with the challenge of developing more competent and skilful built environment professionals, to effectively and efficiently plan, implement, operate and manage South Africa's infrastructure provision (Altman and Mayer, 2003). This study is therefore focused on investigating the skills and competencies required of NEBE professionals, also, to determine the disparities that exist between the theoretical competencies and practical competencies currently evident in South African NEBE professionals.

1.4 Significance of the Study

According to Gallon et al (1995), a competitive society is one that has found a dynamic equilibrium between wealth creation and social cohesion. Therefore, to remain a competitive society, the South African government is required to embark on programmes that involve development of competencies that is crucial to the creation of competitiveness in the individual, the organization and the nation.

Furthermore, to implement the Reconstruction and Development Programmme on the scale proposed by the South African government, it will require the availability of skilled and competent NEBE professionals, in order to meet socio-economic objectives and ensure sustainability of infrastructure projects (McCrudden 2004).

Therefore, the present challenge for the South African government is to ensure that appropriate competencies are available or developed in NEBE professionals to meet its socio-economic demands. This research is therefore important to the South African government, employers of labour, NEBE professionals, higher education providers, and NEBE undergraduates in the following ways:

a. Competitiveness in the global construction industry: the appropriation of the skills and competencies matrix identified in this research in South Africa by NEBE professionals, will enhance the construction industry to compete favourably amongst contemporaries internationally (Gann, 2002).
b. Global acceptance and recognition: skilled and competent NEBE professionals will gain international credence and support.
c. Societal impact: skilled and competent NEBE professionals will positively influence the society by creating a better environment for a nation's citizenry (SA Builder/Bouer, 2002).
d. Political significance: skilled and competent NEBE professionals will confidently demonstrate an ability to comfortably engage in the political arena (Ilemobade, 2006).
e. Economic influence: skilled and competent NEBE professionals will positively contribute to the growth and development of the nation through meaningful and useful decisions (Nkado, 1999).

f. Benchmark for employment: the identified skills and competencies will serve as a benchmark to assist the employer of labour in the recruitment of appropriate skilled and competent NEBE professionals.
g. Empowerment: higher education providers will be able to include in their curriculum, any deficient skills and competencies identified in this research, in order to equip postgraduates and undergraduates with the appropriate skills and competencies needed to perform successfully in the construction industry (Flood, 2002). Skills and competencies imparted to young graduates and undergraduates will enhance a smooth succession and continuity in the construction industry.

1.5 Research Question

The research work seeks to provide solutions to the following question:
What are the generic competencies required in non-engineering built environment professionals in order to efficiently and sustainably plan, implement, operate and manage South Africa's physical infrastructure?

1.6 Objectives of the Study

a. To understand non-engineering built environment disciplines and the systems put in place to develop these disciplines.
b. To identify the challenges currently facing non-engineering built environment professionals in South Africa.
c. To investigate the competencies required of NEBE professionals in South Africa today in order that they may promote effective and efficient planning, implementation, operation, and management of South Africa's physical infrastructure.
d. To investigate the perceived disparity that exists between the level of importance given to each of the competencies required of NEBE professionals in South Africa today and the level of importance given to each of the competencies that have been published in literature as ideal for each profession. By identifying this disparity, if it does exist, educational and related institutions and employers may be better equipped to empower NEBE professionals that are in training and in practice.
e. To evaluate a course identified in the competency matrix in relation to its contribution to developing one or more of the generic competencies identified in (3) above.

1.7 Limitations of the Study

a. In the light of the scope of the study being confined only to the views of Practicing NEBE professionals located in Gauteng province, this implies that the reliability and validity of the research findings could be undermined if an attempt is made to generalize the results at a nationwide level.
b. The research entails interviews with key decision makers within the targeted NEBE group and many of these participants have limited time to engage in lengthy discussion outside their scope of work, thus interviews have to be arranged around their free work schedules, thus prolonging the time initially earmarked for the interviews.
c. Questionnaires were used, and some of these were not answered at all, hence limiting the respondent sample size for this study.

1.8 Structure of the Research Report

(a) Chapter One

Chapter one comprises the introduction that explains the background of the study. It also highlights the NEBE structure, statement of the research problem, significance of the study, research questions, objectives of the study, limitations of the study, and the structure of the research report.

(b) Chapter Two

Chapter two identifies and explains the various NEBE disciplines existing in South Africa. It discusses the various training programmes put in place to develop these NEBE disciplines. A literature survey of existing works on skills and competencies, particularly as they relate to NEBE professions in South Africa are discussed.

(c) Chapter Three

Chapter three presents the establishment of research propositions arising from the review of literature.

(d) Chapter Four

This chapter discusses the research methods adopted in this study in order to find solutions to the research questions and objectives. Finally, the mode of data collection is discussed.

(e) Chapter Five

This chapter is an assessment and analysis of the data collected in chapter four. The research findings are compared to the findings in literature detailed in chapter two and some suggestions are proffered.

(f) Chapter Six

This chapter summaries the results and discussions of the previous chapter and presents recommendations and conclusions of the study. Areas uncovered in the study, are highlighted and proposed for further study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Definition and Role of the Built Environment

The built environment can be described as a complex, techno-socio-economic system comprising physical components (e.g. bridges, roads, ports, rail, schools, healthcare facilities), and the institutional, management and operational relationships among these components and the society they serve (Gueli and Liebenberg, 2006). As a catalyst for sustained economic growth and social development, the built environment addresses a number of key national objectives, including provision of housing and improved human habitats; increased access and mobility; rural development of infrastructure (with a specific focus on poverty reduction and job creation); human resource development of professionals in the built environment; safety and personal security; environmental sustainability; better public buildings (including health facilities and schools); and improved service delivery in the public sector.

In South Africa, the built environment is coordinated by a regulatory body called the 'Council for the Built Environment' CBE (Policy document, 1999). This organ was established in 1999 and charged with the following responsibilities:

a. To advise government on matters of national importance, such as resource utilization, socio-economic development, public health and safety and the environment;
b. To promote appropriate standards of health, safety and environmental protection within the built environment;
c. To provide advice and consultation on national policy that could impact on the built environment, human resources development in relation to the professions and the recognition of new professions;
d. To evaluate and comment on all proposed legislation impacting on health and safety in the built environment;
e. To investigate and initiate investigations into matters pertaining to its functions and policy with regard to the built environment, and recommend legislation in this regard;
f. To ensure the consistent application of policy by the councils for the professionals in the following areas, taking due cognizance of the characteristics of each built environment profession -

i. the accreditation of education providers and education programmes;
ii. principles for the registration of different classes of professionals, candidates and specified categories;
iii. key elements of competence testing of applicants for registration;
iv. codes of conduct to be prescribed by the councils for the professions;
v. disciplinary procedures to be followed by the councils for the professions; and
vi. the determination of fee structures for the councils for the professions;

g. To facilitate interministerial co-operation concerning issues relating to the built environment;
h. To consider proposals from the different councils for the professions with regard to the determination of the policy framework referred to in item No. 5;
i. To direct communication from the Minister to the councils for the professions;
j. To act as an appeal body with regard to disciplinary hearings conducted by the councils for the professions in cases where conviction upon the charge may lead to cancellation of registration and other decisions of a particular council for a profession;
k. To obtain recognition for the respective councils for the professions as the bodies responsible for the establishment of education and training standards in terms of the South African Qualification Authority Act, 1995 (Act No. 58 of 1995);
l. To assimilate the annual reports of the councils for the professions and submit one report to the Minister;
m. To review fees published by the councils for the professions to ensure the consistent application of the framework for fees determined by it; and
n. To institute legal proceedings to recover all membership fees payable in terms of this Act if such fees are in arrears.

The CBE recognises and approves of the following professional councils shown in figure 2:

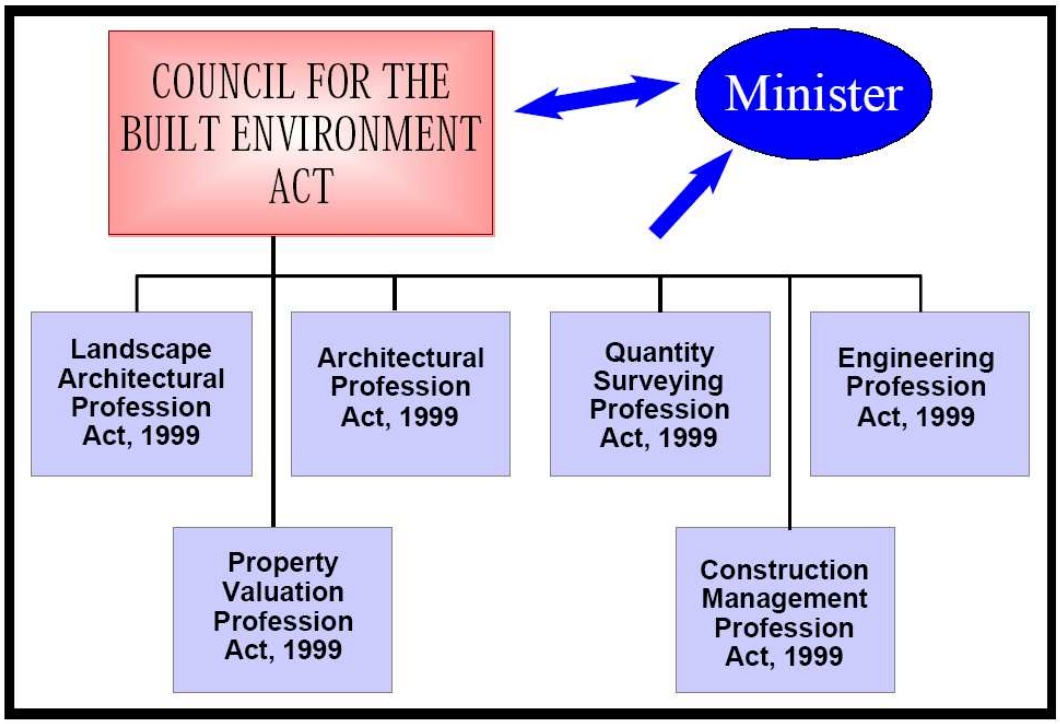

Fig. 2: Council for the Built Environment professions (BE Policy document, 1999)

However, the council for the urban and regional planning profession and council for the professional land surveyors, gained recognition under the S.A. Act No. 36 of 2002. The exclusion of the council for engineering profession will make the above professional team to be regarded as 'non-engineering built environment' (NEBE) professionals.

2.2 Non- Engineering Built Environment Disciplines

2.2.1 The Architectural Profession

Architects create architecture, and their responsibilities encompass all that is involved in doing so (Bredemeyer and Malan, 1999). This would include articulating the architectural vision, conceptualizing and experimenting with alternative architectural approaches, creating models and components, interfacing with specification documents, and validating the architecture against requirements and assumptions. The Royal Institute of British Architects (RIBA, 1999) believes that Architects are at the forefront of architectural designing in the built environment. As experts in the field of architectural building design and construction, Architects use their creative skills to advise individuals, property owners and developers, community groups, local authorities and commercial organizations on the design and

construction of new buildings, the reuse of existing buildings and the spaces which surround them in the towns and cities.

It is also an obvious fact that the work of Architects influences every aspect of our built environment, from the design of energy efficient buildings to the integration of new buildings in sensitive contexts. Because of their ability to design and their extensive knowledge of construction, Architects' skills are in demand in all areas of property, construction and design.

Architects' expertise is invaluable when there is need to conserve old buildings, redevelop parts of towns and cities, understand the impact of a development on a local community, manage a construction programme or advise on the use and maintenance of an existing building (Bollay, 2006).

Architects work closely with other professional members of the construction industry including engineers, builders, surveyors, local authority planners and building control officers. Much of their time is spent visiting sites, assessing the feasibility of a project, inspecting building work or managing the construction process. They also spend time researching old drawings, and testing new ideas and construction techniques.

Society looks to architects to define new ways of living and working, to develop innovative ways of using existing buildings and creating new ones. An Architect's understanding of the complex process of design and construction is needed in order to build socially and ecologically sustainable cities and communities (Bollay, 2006). Architects can be extremely influential as well as being admired for their imagination and creative skills.

2.2.2 The Project and Construction Management Profession

(a) Project management

The project management role can be better described by first establishing what a project is. Atkins and Gilbert (2003) define a project as a one-off, temporary activity with a clear start and a clear end; having full or part-time resources clearly assigned to it by resource-owning managers. They further state that projects are a way of bringing about predictable change. That is, at the beginning of a project one should be able to predict cost, end date, deliverables and quality. Further, that a project is made predictable by assigning a clear scope, clear roles, clear plans, and clear control mechanisms.

(b) Role of project managers

The project manager is basically charged with the responsibility of developing and undertaking a feasibility study, establishing the terms of reference, appointing the project team, setting up the project office, performing a phase review, creating a project plan, a resource plan, a financial plan, a quality plan, a risk plan, an acceptance plan, a communications plan, and a procurement plan. S/he is responsible for contracting the suppliers, defining the tender process, issuing a statement of work, a request for information, a request for proposal, building deliverables, monitoring and controlling time, cost, quality, change, risk, issues, procurements, acceptance and communications, performing project closure, and reviewing project completion (Hallinan, 2003).

Project success is dependent upon the leadership qualities of project managers and their ability to bring the best out in their team. Construction project managers have to combine technical knowledge and expertise with behaviour that engender effective multi-organizational teamwork and communication if successful outcomes are to be achieved. These areas of expertise are known collectively as core competencies (Construction Industry Institute, 1997). The identification, assessment, and maintenance of such competencies are fundamental to the optimization of the productivity and performance of contemporary engineering organizations (Trejo, 2002).

Projects managers also undertake a range of work activities for a finite period with one or more defined objectives (Turner and Muller, 2003). This short-term interaction presents one of the greatest challenges to the individuals managing performance within it (Turner and Muller, 2003). Notably, it places demands upon managers to respond flexibly to rapidly changing circumstances in order to replan and refocus their strategies for meeting competing project objectives. Indeed, construction project managers rarely undertake methodical and repetitive activities, their role being characterized by brevity, variety, and fragmentation with a need to refocus their attention at regular intervals (Partridge, 1989).

Meredith and Mantell, (1995) have categorized the skills required of project managers into six key areas, namely: communication, organizational, team building, leadership, coping, and technological skills. These categories embody a broad range of abilities linked to the inherent characteristics of the project management role, such as achieving outcomes and working

under defined time and resource constraints. El- Sabaa (2001) has found that, of these competency areas, technical skills have the least influence on project managers' performance. In contrast, he found that the role of the project manager demands a basic understanding of a broad range of functional roles and extensive cross-functional experience, layered over in-depth technical expertise. If the construction project manager is viewed as an overseer and coordinator of activities rather than as a functional specialist, this can be seen as a creative activity, within which softer qualities such as sensitivity and flexibility enhance an organization's competitiveness (Jacobs, 1989). The behavioural characteristics of construction project managers are therefore likely to be more complex and diverse than most in other industry professions.

(c) Role of construction managers

Construction managers plan, direct, and coordinate a wide variety of construction projects, which include the building of all types of residential, commercial, and industrial structures, roads, bridges, wastewater treatment plants, and schools and hospitals. Construction managers may oversee an entire project or just part of a project, and they typically schedule and coordinate all design and construction processes, including the selection, hiring, and oversight of specialty trade contractors (Barrie and Paulson, 1976).

Construction managers are salaried or self-employed managers who oversee construction supervisors and workers. They often go by the job titles: programme manager; construction superintendent; project engineer; project manager; construction supervisor; contractor, or similar designations. Construction managers may be owners or salaried employees of a construction management or contracting firm, or may work under contract or as a salaried employee of the property owner, developer, or contracting firm overseeing the construction project.

Construction managers coordinate and supervise the construction process from the conceptual development stage through to the final construction, making sure that the project gets done on time and within budget (Akindele, 2006). They often work with Owners, Engineers, Architects, and others who are involved in the construction process. Given the designs for buildings, roads, bridges, or other projects, construction managers oversee the planning, scheduling, and implementation of the project to execute those designs.

Some projects are divided into many segments if found too complicated for one person to manage. These are large construction projects, such as an office building or industrial complex. These are divided into many segments such as: site preparation, which includes land clearing and earth moving; sewage systems; landscaping and road construction; building construction, which includes excavation and laying of foundations and erection of the structural framework, floors, walls, and roofs; and building systems, which includes fire-protection, electrical, plumbing, air-conditioning, and heating. Construction managers may be in charge of one or more of these activities (Barrie and Paulson, 1976).

Construction managers evaluate and help determine appropriate construction delivery systems and the most cost-effective plan and schedule for completing the project. They divide all required construction site activities into logical steps, and budget the time required to meet established deadlines. This may require sophisticated estimating and scheduling techniques and the use of computers with specialized software.

Barrie and Paulson (1976) further stated that Construction managers oversee the selection of general contractors and trade contractors hired to complete specific parts of a project, which could include everything from structural metalworking and plumbing to painting and carpet installation. Moreover, they determine the labour requirements and, in some cases, supervise or monitor the hiring and dismissal of workers. They oversee the performance of all trade contractors and are responsible for ensuring that all work is completed on schedule.

Construction managers direct and monitor the progress of construction activities, sometimes through construction supervisors or other construction managers. They oversee the delivery and use of materials, tools, and equipment; and the quality of construction, worker productivity, and safety. They are responsible for obtaining all necessary permits and licenses and, depending upon the contractual arrangements, direct or monitor compliance with building and safety codes and other regulations. In agreement with the Quantity Surveyor, they continually track and control construction costs to avoid cost overruns. They may direct the work of several subordinates, such as assistant managers or superintendents, field engineers, or crew supervisors.

2.2.3 The Landscape Architectural Profession

Landscape Architects undertake studies such as environmental impact assessments, visual impact assessments and surveys of environmental aspects such as vegetation, topography, soils, climate, views, circulation patterns, existing structures, services and cultural landscapes (ILASA, 2003). These assessments assist in the planning process to determine the feasibility of the site for certain activities.

Landscape Architects are responsible for the design and planning of internal and external open spaces such as streets, squares, public parks and outdoor and indoor landscaped gardens. Based on the information received from the urban and regional planners, they design for both private and public clients and work in both natural and urban environments.

The Landscape Architect produces design proposals in a variety of ways, including master plans, sketch plans, reports, guidelines and perspective drawings. This is presented to the client for approval and is usually accompanied by an initial cost estimate prepared by the quantity surveyors.

Landscape Architects are trained to evaluate the natural characteristics of a site. This environmental expertise is unique among design consultants. It enables them to plan a site to make the most of its natural resources. Training in urban design enables them to undertake open space and land use planning projects.

On approval of the design, the Landscape Architect produces contract documentation to direct the installation of the proposed works. This includes working drawings such as layout, grading and planting plans as well as details, specifications, bills of quantities and a tender document.

On receipt of the completed tenders, the Landscape Architect evaluates the tenders and makes a recommendation to the client in terms of appointing a contractor to undertake the landscape implementation. Finally, the Landscape Architect monitors the implementation of the works by carrying out site inspections and instructs the contractor on behalf of the client as required. The certification of payments to the contractor forms part of the work.

Landscape Architects develop design solutions in accordance with the budget of their clients. They prepare estimates of what proposals will cost and ensure that they are cost-effective by calling for competitive tenders from reputable contractors. The preparation of detailed documentation helps to avoid unforeseen expenses during installation. (ILASA, 2003).

2.2.4 The Property Valuation Profession

Valuers are skilled professionals who are able to provide a comprehensive range of services to a comprehensive range of clients. Valuers assess the value of land, buildings and improvements, together with plant and machinery. They provide expert independent advice on matters under litigation, and are recognized by courts of law as expert interpreters of the market. Some of the typical functions of property valuation include (Property institute, 2006):

a. Act as adviser to clients on issues relating to mortgage and re-financing.
b. Monitor and report on the tread of market value of properties.
c. Investigate and advise clients on mortgages in possession.
d. Liaise with the client to supply the bank with security over loans.
e. Supply the client with relevant information from the receiver of revenue office, and the latest Capital Gains tax.
f. Acquaint the client with information about various options of insurance available and the risks involved.
g. Advise the client of the implication of life interests in property holdings based on information received from the insurance.
h. Assist the client to evaluate their assets (e.g. property) for financial reporting.
i. Assist the client to develop portfolio valuation based on their academic knowledge of property finance.
j. Assist the client to settle their rating and tax disputes, with the involvement of the rate and tax inspectors.
k. Advice on development controls and environmental planning.
l. Give expert advice on property sales and purchases.
m. Act as intermediaries to resolve matrimonial and family property disputes.
n. Involve themselves in rental assessments and reviews.
o. Act on behalf of the client for lease negotiations.
p. Act as an intermediary, reporting all arbitral issues for arbitration.

q. Advise and act on behalf of the client to request for compensation on matters relating to forceful or compulsory acquisition.
r. Assist clients to arrange for procurements of estate, probate and stamp duty.

2.2.5 The Quantity Surveying Profession

A Quantity Surveyor (QS) is described as a professional person working within the construction industry. The role of the QS is, in general terms, to manage and control costs within construction projects and may involve the use of a range of management procedure and technical tools to achieve this goal (Collier, 1987).

The profession developed during the 19th century from the earlier "Measurer", a specialist tradesman (often a guild member), who prepared standardized schedules for a building project in which all of the construction materials, labour activities and the like were quantified and against which competing builders could submit priced tenders. Because the tenders were each based on the same schedule of information, they would be easily compared to find the most suitable candidate (Collier, 1987).

Although all QSs will have followed a similar course of education and training (for those entering the profession today, this is usually to degree level), there are many areas of specialization in which a QS may concentrate. The main distinction amongst QSs is between: i) those who carry out work on behalf of a client organization often known as a "Professional Quantity Surveyor", "Professional QS" or "PQS", and ii) those who work for construction companies often known as a "Contractor's Quantity Surveyor".

(a) The Professional Quantity Surveyor

The functions of the Professional Quantity Surveyor are broadly concerned with the control of the cost on construction projects. The methods employed, however, cover a range of activities which may include cost planning, value engineering, feasibility studies, cost benefit analyses, lifecycle costing, valuation, and cost estimation. Some senior quantity surveyors are known as construction economists, cost engineers or construction managers (Collier, 2001).

Quantity surveyors control construction costs through accurate measurement of the work required; by the application of expert knowledge of costs and prices of work, labour, materials and plant required; and through an understanding of the implications of design

decisions at an early stage to ensure that good value is obtained for the money to be expended.

The technique of measuring quantities from drawings and specifications prepared by designers, principally Architects and Engineers, in order to prepare Tender/Contract Documents, is known in the industry as taking off. The quantities of work taken off typically are used to prepare bills of quantities, which usually are prepared in accordance with a published standard method of measurement as agreed to by the QS profession and representatives of the construction industry.

(b) The Contractor's Quantity Surveyor

The Contractor's QS is responsible for all legal and commercial matters within the contracting organization - in fact their commercial leaning has meant that in many organizations they are now termed commercial managers rather than QS's.

2.2.6 The Planning profession

The planning profession is an area of expertise which involves the initiation and management of change in the built and natural environment across a spectrum of areas, ranging from urban to rural and delineated at different geographic scales (region, sub region, city, town, village, neighbourhoods), in order to further human development and environmental sustainability (S.A. Planning Professions Act no. 36 of 2002), specifically in the fields of:

a. the delimitation, regulation and management of land uses;
b. the organization of service infrastructure, utilities, facilities and housing;
c. the co-ordination and integration of social, economic and physical infrastructure through the synthesis and integration of information for the preparation of strategy policy, statutory and other development plans within the development context.

2.2.7 The Land Surveying Profession (PSLS, 1998)

In the manual of Practice for Professional Land Surveyors (PSLS, 1998), the "Practice of Land Surveying" involves the location, relocation, establishment, reestablishment or retracement of any property line or boundary of any parcel of land or any road right-of-way, easement or alignment; the use of principles of land surveying, determination of the position of any monument or reference point which marks a property line boundary, or corner setting, resetting or replacing any such monument or individual point including the writing of deed

descriptions; managing or conducting as managers, proprietors or agent any place of business from which land surveying work is solicited, performed or practised.

A Professional Land Surveyor is an individual licensed and registered under the law to engage in the practice of land surveying. A professional land surveyor may perform engineering land surveys but may not practise any other branch of engineering.

Engineering Land Surveys means surveys for: (i) the development of any tract of land including the incidental design of related improvements, such as line and grade extension of roads, sewers and grading but not requiring independent engineering judgment. Provided, however, that tract perimeter surveys shall be the function of the Professional Land Surveyor; (ii) the determination of the configuration or contour of the earth's surface, or the position of fixed objects thereon or related thereto by means of measuring lines and angles and applying the principles of mathematics, photogrammetry or other measurement method; (iii) geodetic survey, underground survey and hydrographic survey; (iv) storm water management surveys and sedimentation and erosion control surveys; (v) the determination of the quantities of materials; (vi) tests for water percolation in soils; and (vii) the preparation of plans and specifications and estimates of proposed work and attendant costs.

(a) The Role of Land Surveyor in the Government (HKIS, 2006)

i. To define land parcel boundaries for the alienation of government land to private owners and non-government bodies,
ii. To define land boundaries allocated to various government departments,
iii. To delineate special areas such as country parks, road and lane limits,
iv. To determine the limits of land resumption and area of private land to be resumed,
v. To set out land boundaries on ground for every new land grant as stipulated in the terms and conditions of sale or grant,
vi. To maintain a detailed land boundary record for all land parcels in the country, and
vii. To re-establish boundaries of "old" lots on the request from private landowners for redevelopment purposes

(b) The Role of Land Surveyor in the Private Sector (HKIS, 2006)

A professional land surveyor practicing in the private sector provides the following land boundary services to landowners and developers upon the handover of the land parcel to the grantee:

i. the re-establishment of land boundaries of land properties;
ii. setting out of the land boundary; re-definition of land boundary; and
iii. defining a section boundary upon subdivision of land parcel.

2.3 The Built Environment Training Programmes

The South African government has put in place various initiatives in the form of institutional arrangements to develop the identified NEBE disciplines (Herman, 1990). Such arrangements include the establishment of:

a. Tertiary institutions- these are institutions that embark on the provision of training programmes and courses leading mostly to the award of degrees, diplomas and various categories of certificates, and
b. Vocational institution – these are institutions that embark on the provision of various skills development projects and learnerships aimed at developing skilled technical construction workers. Vocational institutions are required to be registered with the South African Qualifications Authority (SAQA). SAQA administers the National Qualification Framework (NQF) and Construction Education and Training Authority (CETA).

The above stated NEBE disciplines (2.2.1-2.2.7) are offered in various tertiary institutions. Table 1 shows minimum admission requirements for NEBE disciplines at the University of Witwatersrand, Johannesburg.

Table 1 – Wits Faculty of Engineering and the Built Environment Syllabus 2007

Degree (Programme)	**Minimum admission requirements** **HG=Higher grade** **SG=Standard grade**	**Likely acceptance level** **These are guidelines only. They dont guarantee admission. Places are limited.**	**Selection procedures**
Bachelor of Architectural Studies - BAS	Mathematics (Pass HG or minimum 60% at SG) English (Pass HG)	**No automatic acceptance level.** Acceptance dependent on departmental selection procedures. Applicants require to complete a written and graphic exercise and may required to attend an interview. Applicants with a points rating of **23** and above may be accepted on this basis. Applicants with between **18** and **22** points may be accepted on the basis of the exercise and an interview for either the ordinary degree or an extended curriculum programme.	Applicants with a points rating of **20** to **23**; may be accepted for either the ordinary degree or an extended curriculum programme subject to further selection procedures. The University may decide that all applicants complete an admission exercise and/or selection tests.
Bachelor of Science in Quantity Surveying - BSc(QS)	Mathematics (Pass HG or minimum 60% at SG) English -as above	All degrees **24 points** and above.	
Bachelor of Science in Construction Management - BSc(Construction Mgmt)			
Bachelor of Science in Property studies-BSc (Prop. Studies)			
Bachelor of Science in Urban and Regional Planning - BSc(URP)			

The present curricula identified and outlined by Benning (1990) for the built environment includes: Mathematics; English and public speaking; Social Studies and the Humanities which reinforce human relationships and communication skills; Construction Design, which enable an understanding of the parameters governing sound construction; Business and Management, which enables an understanding of the economic system and the principles of sound Business Management and Construction Methods to give graduates a rudimentary knowledge of the skills required at entry level positions .

Hannah and Barlow (1995) also recommend that a course in Value Engineering be included in built environment tertiary education to provide some of the basic tools of creativity and team building so that a graduate enters the workforce with these skills and a strong desire to use them.

In view of the current changes experienced in the building industry, Runeson (1993) notes with concern that a survey has revealed that Schools of Building still lag behind in the provision of relevant training in Industrial Relations and Procurement methods. As a follow up to this observation, it was suggested that tertiary institutions should endeavour to identify the essential changes taking place in the built environment and adjust to accommodate them (Architect & Specificator, 2001).

Due to global technological challenges, the South African educational system has changed in accordance with government's commitment to transformation and increased access to higher education for all its citizens. Consequently, institutions previously known as Technikons have now being transformed into Universities of Technology, which are responsible for providing courses that are both relevant and responsive to the needs and priorities of the national economy (Haupt and Smallwood, 2003). These institutions are expected to offer career-oriented educational programmes designed to meet the needs of industry and commerce in a hi-tech global economic environment. Their approach to education is practical and outcomes-based, with the intent that their graduates are immediately employable and productive. A key component that ensures this productivity is the inclusion into Universities of Technology periodic programmes of experiential learning spent in industry (Haupt and Smallwood, 2003). This collaborative approach to education, also known as cooperative education, has three stakeholders namely: the institution, industry and students. Co-operative education includes periods of academic study alternating with a period of related work experience and prepares the student well for the class-to-work transition.

2.3.1 The Modus Operandi of Cooperative Education

Cooperative education is classified as Mode 2 knowledge which is characterized by the proliferation of knowledge production in the context of application, and which is mostly problem-specific and guided by the requirements of practical relevance such as a specific industrial sector (Haupt and Smallwood, 2003). This particular educational approach provides opportunities for students to have hands-on experience as part of their course of study.

In this way students are prepared for their future careers. They acquire valuable and specialized knowledge and skills by learning from experience and reflecting on that experience while becoming acquainted with the work processes (Hicks, 1996; Rainsbury et al., 1998). Workplace learning, therefore, underpins knowledge learned, and competences needed for the job as a whole, such as aspects of work-place culture, work norms and values (Gillen, 1993). This form of experiential learning may be expressed as the combination of three elements, namely programmed learning in structured settings, questioning learning gained via investigation and research, and own experience (Hicks, 1996).

Apart from co-operative education contributing to more effective learning (Schaafsma, 1996) it also has the potential to be mutually beneficial to both students and employers (Frain, 1992). Employer's benefit from having a significant influence on course design and content by ensuring that industry-specific knowledge, awareness and values are integrated into the higher education process. Students benefit from working as they experience firsthand and come to understand the requirements of their chosen career. As they engage in the actual activities in the workplace they gain appreciation for the challenges of their particular job (Ross and Elechi, 2002). Consequently, they are better able to make informed decisions on their career choices. They also develop enhanced appreciation of concepts learnt in the classroom after applying knowledge in a professional setting (Gordon et al, 2001).

This work experience or in-service period is often the students' first opportunity to apply theoretical, classroom-based knowledge in a practical work situation. They gain a more realistic view of how the world of work operates. Work experience is often a strong determining factor in whether or not students find employment. Co-operative education provides the opportunity for students to enhance their prospects of employment once they graduate (Frain, 1992). They are given the opportunity to demonstrate their abilities to prospective employers. Through this approach, they already have work experience at the moment of academic graduation. Students are introduced to the work ethic, and gain insight into the interpersonal skills needed to survive in the working world (Schaafsma, 1996). They see the opportunities for career development and personal growth that are open to them in their field of study.

In several studies, employers noted that more opportunities for work placement during the students' courses would be beneficial and ease their transition into the workplace upon completion of their formal academic programmes at higher educational institutions. Spencer (1992) and Lakey (2000) cite the value of work experience for building students, and the Standing Committee: Co-operative Education (2000) maintains that there are advantages of co-operative education for all the role players involved in experiential training. Although literature amplifies the importance of optimum experiential training, students in co-operative education do not gain meaningful practical experience, nor sufficient opportunity to apply their acquired knowledge during their experiential training year in industry while at the former technikons (Manthe and Smallwood, 2003). Over the last decade, it seems that ways of learning in higher education are gradually getting closer to the needs and methods of the real world.

However, studies have shown that there is still a mismatch between what employers appear to want and what higher education provides. (Fester and Haupt, 2003). To resolve this mismatch, Universities of Technology are currently offering relevant training to prepare their graduates adequately for the world of work.

2.4 Challenges facing Non-Engineering Built Environment professionals in South Africa

In view of the pro-democracy programme of reconstruction, the South African government's strategy is focused on the investment of its physical and social infrastructure. This approach has resulted in the South African construction industry being faced with great challenges, such as increasing its capacity to deliver, attaining higher order efficiency and addressing the skewed ownership pattern within the building industry (Gounden, 1997).

Responding to these challenges, statistical data (Ros, 2001) has revealed that the South African government spent an approximate sum of R1.2billion on construction projects in 1996. And in 1997, construction contributed about 35% to Gross Domestic Fixed Investment, a contribution that could double by 2009 if the projections made in 1999 are realized (Nkado, 1999).

In 2003, an estimate of South Africa's infrastructure backlog amounted to R170 billion. As a result, the government is dissatisfied with its infrastructure delivery (Haupt and Smallwood, 2003), and is thus making concerted efforts to focus on the construction industry in order to improve the standard of living of its citizens through infrastructure provision.

To further intensify its efforts, the South African government has committed itself to a massive expansion in its capital budget, from about R58 billion in 2002/3 to R74 billion in 2003/4, and has maintained that level in real terms. In 2004/5 - 2005/6, approximately R28 billion or more was spent in real terms over the 3-year period than was spent in 2000/1 - 2002/3. That represents an increase of about 30%. A large portion of this increase has been allocated to civil construction (i.e. general construction, rehabilitation and maintenance), which is typically capital intensive (Altman and Mayer 2003). Altman and Mayer (2004) highlighted in table 2 the quantity of civil construction work projected as a 5 year rolling plan by the South African government in furtherance of infrastructure provision.

Table 2: Infrastructure to be constructed by 2009 (Altman and Mayer, 2004)

Targeted categories of infrastructure (output kms)	2004/5	2005/6	2006/7	2007/8	2008/9	Total
Provincial Roads (km) Regravelling, Light Seals	4300	4800	5300	6000	6400	**26800**
Municipal Roads (km) Regravelling, light	1600	1900	2100	2300	2500	**10400**
Water Reticulation (Pipelines) (Km)	4100	4800	5400	5800	6300	**26400**
Sanitation (pipelines)	850	990	1000	1000	1100	**5240**
Storm water (km)	230	270	300	320	350	**1470**
Pavements (km)	20	25	30	30	35	**140**

Gounden (1997) establishes that the developed agenda enunciated in the South African Reconstruction and Development Programme (RDP) and its redistribution strategy necessitates that the construction industry be appropriately geared to promptly respond to some identified imperatives, such as:

a. The rapid and efficient delivery of quality assets to the public.
b. Sustainable employment creation.
c. The active promotion of small medium and micro enterprises, especially enterprises originating from historically disadvantaged communities.
d. Improve competitiveness of the South African construction sector and gear for global markets.
e. A human resource development strategy for the sector, which is holistic, sustainable and accessible.
f. Sustainable economic growth and productivity of the sector.

In response to these identified imperatives, the South African government has introduced some appropriate measures, such as: the use of extensive unregulated labour-only subcontractors; introduction of the equal opportunity Black Economic Empowerment programme (BEE) which encourages mentorship and joint ownership within the sector; the introduction of the Affirmative Action (AA) policy to ease employing skilled and competent professionals originating from historically disadvantaged communities (Altman and Mayer 2003), hence increasing the supervisory and management capacity within the construction sector across different races; and other productive innovations geared towards placing the South African construction industry on the path of irreversible change.

About two decades ago, the construction companies in South Africa researched and adopted new managerial innovative methods of procurement and construction process that has improved its productivity and increased its efficiency (Talukhaba, 2006).

These methods seen in *Rethinking Construction* (Egan, 1988), are seen as key factors that have driven change in the past decade. In the future, the *Sustainable Communities* programme - with its emphasis on creating integrated built environment solutions focused on meeting social needs - will be the political agenda most likely to drive industry change.

Sustainability and the need for the industry to create perceptible social, environmental and economic value will be the most influential factors affecting the industry's future (RIBA, 1999). The impact of accelerating climatic change and the depletion of natural resources are of particular significance.

Technological innovations have enabled substantial industry change in the last two-decades. In addition to IT developments in the future (particularly in the area of Building Information (object) Modelling), technological factors impacting the industry relates to greater industrialization and standardization of buildings (Talukhaba, 2006). Increasingly, demanding and powerful consumers will also form a significant driver for future change. The growth of global competition will drive industry consolidation and increase the need for the industry to deliver higher quality buildings more efficiently.

According to RIBA (1999) a key supply side factor that will influence the construction industry's ability to meet these changing market demands relates to the skills, education and continuing training of the construction workforce. Equally, the fragmented economic structure of the industry - with a large number of small practices and a small number of large firms that dominate industry turnover - may restrict its ability to respond.

Further analysis by RIBA (1999) expressed the following past and future drivers for change:

a. New methods of procurement – PFI, Design and Build Sustainability / Social responsibility – social, environmental, economic.
b. Rethinking Construction Agenda – collaborative working, supply chain integration, Partnering Future skill needs and training.
c. Recognition of need to change, industry increased standardization and industrialization.
d. IT – in its widest sense (Globalization).
e. Increased scrutiny and managerialism. Rise of consumer power and expectations.

In my opinion, there was, however, little convergence in the views and experiences expressed by individuals from the construction industry and those from the built environment professions. The only shared view between the two groups is that sustainability will be the most influential driver of change in the future.

2.5 Previous Studies on Skills and Competencies

Skills and Competency-based studies have been conducted on specific professions such as the clergy (Barker, 1992), attorneys (Cresswell, 1995), and internal auditors (Hassal, Dunlop and Lewis, 1996), quantity surveying (Nkado, 1999), project managers (Fry, 1997, Birkhead, 1999), and home management (Legae, 2003). Below are closely-related studies that have been perused and included in this study:

2.5.1 A SCANS (2000) Report for America

The Secretary's Commission on Achieving Necessary Skills (SCANS, 2000), an adhoc committee of the US department of labour was established in February 1990 to examine the demands of the work place and to determine whether the current and future workforce is capable of meeting those demands. Commission members included 31 representatives from the nation's schools, businesses, unions and government. The Commission issued its first report, "What Work Requires of Schools," in June 1991. This report informs educators and employers what students and workers need to know and be able to do in order to succeed in the work place. This kind of information is especially vital today, when more than half of our young people leave school without the basic skills required to find and hold a good job.
Specifically, the Commission was directed to advise the Secretary of Labour on the type and level of skills required to enter employment. In carrying out this charge, the
Commission was asked to:

a. Define the skills needed for employment;
b. Propose acceptable levels in those skills;
c. Suggest effective ways to assess proficiency; and
d. Develop a strategy to disseminate the findings to the nation's schools, businesses and homes.

In its first report, the Commission identified two types of skills: competencies and
foundations. Competencies are the skills necessary for success in the work place and are organized into five areas. Foundations are skills and qualities that underlie the competencies. The competencies and foundations are generic - most of them are required for most jobs. The identified SCANS skills and competencies are listed below:

(a) SCANS Foundations (Skills and Personal Qualities)

***Basic Skills*:** Reads, writes, performs arithmetic and mathematical operations, listens, and speaks:

i. *Reading* - locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
ii. *Writing* - communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
iii. *Arithmetic/mathematics* - performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
iv. *Listening* - receives, attends to, interprets, and responds to verbal messages and other cues.
v. *Speaking* - organizes ideas and communicates orally.

***Thinking Skills*:** Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons:

i. *Creative thinking* - generates new ideas.
ii. *Decision-making* - specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternatives.
iii. *Problem solving* - recognizes problems and devises and implements plan of action.
iv. *Visualizing* - organizes and processes symbols.
v. *Knowing how to learn* - uses efficient learning techniques to acquire and apply new knowledge and skills.
vi. *Reasoning* - discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

***Personal Qualities*:** Responsibility, self-esteem, sociability, self-management, integrity, and honesty:

i. *Responsibility* - exerts a high level of effort and perseveres towards goal attainment.
ii. *Self-esteem* - believes in own self-worth and maintains a positive view of self.
iii. *Sociability* - demonstrates understanding, friendliness, adaptability, empathy, and politeness in-group settings.

iv. *Self-management* - assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.

v. *Integrity/honesty* - chooses ethical courses of action.

(b) SCANS Five Competencies

Resources: Identifies, organizes, plans, and allocates resources:

i. *Time* - selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.

ii. *Money* - uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.

iii. *Material and facilities* - acquires, stores, allocates, and uses materials or space efficiently.

iv. *Human resources* - assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Interpersonal: Works with others:

i. *Participates as member of a team* - contributes to group effort.

ii. *Teaches others new skills.*

iii. *Services clients/customers* - works to satisfy customers' expectations.

iv. *Exercises leadership* - communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.

v. *Negotiates* - works toward agreements involving exchange of resources, resolves divergent interests.

vi. *Works with diversity* - works well with men and women from diverse backgrounds.

Information: Acquires and evaluates information:

i. *Acquires and evaluates information.*

ii. *Organizes and maintains information.*

iii. *Interprets and communicates information.*

iv. *Uses computers to process information.*

Systems: Understands complex interrelationships:

i. *Understands systems* - knows how social, organizational, and technological systems work and operates effectively with them.
ii. *Monitors and corrects performance* - distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems performance and corrects malfunctions.
iii. *Improves or designs systems* - suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology: Works with a variety of technologies:

i. *Selects technology* - chooses procedures, tools, or equipment including computers and related technologies.
ii. *Applies technology to task* - understands intent and proper procedures for setup and operation of equipment.
iii. *Maintains and troubleshoots equipment* - prevents, identifies, or solves problems with equipment, including computers and other technologies.

2.5.2 The General Perspective on Skill

(a) Proposed Skills requirement of built environment practitioners

In the built environment, the diversity of skills required is seen from Weidman's (1993) contention that, "technical and production skills are only two of the many components necessary to survive in contracting. Now, knowledge and expertise in business finance, bonding, taxes, insurance, law, marketing, training, contract administration, labour relations, legislation and regulations, amongst others, are required."

The skills necessary for a specific discipline are listed as people's skills, decisiveness, creativity, business and management skills and computer skills (S A Builder/Bouer, 2000). Skills and a knowledge inventory, which details what is required of a Construction Management practitioner is provided by Young and Duff (1990). Forty-eight skills are listed in descending order of use. Tables 3 and 4 show the listed skills:

Table 3: Core Skills and Knowledge for Construction Management Practitioners

Junior and Mid-level Management (Core skills and knowledge)	**Senior Management (Core skills and knowledge)**
Leadership	Leadership
Supervision of others	Supervision of others
Organization at site level	Competitive tendering
Programme stocks/material distribution	Costing and estimating
Programme maintenance	Budgetary control
Negotiating/suppliers	Sources of finance
Negotiating/plant hire	Analysis of project risks

Table 4: Subsidiary Skills and Knowledge for Construction Management Practitioners in descending order of use

Junior Management	**Mid-Level Management**	**Senior Management**
Communication	Communication	Communication
Motivation of others	Motivation of others	Motivation of others
Health and safety	Programme construction	Health and safety
Programme construction	Budgetary control	Programme construction
Management of Quality Assurance	Management of Quality Assurance	Company (strategic) Planning
Budgetary control	Negotiate/Sub-contractor	Public Relations
Organization of communication systems	Health and safety	Recruit/select: Management/Professional
Termination/Dismissal: Manual labour	Programme Design	Company Account
Recruit/Select: Manual labour	Recruit/Select: Sub-contractor	Negotiate/Sub-contractor
Codes of Practice	Analysis/Project risks	Programme Design
Recruit/Select: Sub-contractor	Costing and estimating	Employee Training: Mgt./Professional
Costing and Estimating	Employment Legislation	Contract Drafting
Public Relations	Organization of communication systems	Manpower Planning
Employment Legislation	Recruit/Select: Man Labour	Appraisal/Career Development
Negotiate/Sub-contractor	Competitive Tendering	Recruit/Select: Sub-contractor
Analysis of Project Risks	Use of Computer Techno	Programme Maintenance
Programme Design	Codes of Practice	Advertising/Promotion
Termination/Dismissal: Sub-contractor	Termination/Dismissal: Su-contractor	Promotion and Transfer
Negotiate/Trade Union	Appraisal/Career Dev.	Codes of Practice

Junior Management	Mid-Level Management	Senior Management
Appraisal/Career- Development	Recruit/Select: Supervisor/Foreman	Employment Legislation
Employee: Training Manual	Termination/Dismissal: Manual Labour	Company Law
Employee Welfare	Negotiate/Plant Purchasing and Leasing	Negotiate/Government
Employee Training: Supervisor/Foreman	Negotiate/Trade Union	Management of Quality Assurance
Promotion and Transfer	Promotion and Transfer	Recruit/Select: Sup. /Foreman
Recruit/Select: Sup. /Foreman	Public Relations	Job Analysis/Specification
Negotiate/Client	Job Analysis/Specification	Consumer/Client Protective Law
Consumer/Client Protective Law	Termination/Dismissal: Supervisor/foreman	Organization Structure
Job Analysis/Specification	Recruit Select: Management/Professional	Programme Stocks/Material-Distribution
Company Law	Company Account	Termination/Dismissal: Sub-contractor.
Negotiate/Government	Employee Training: Supervisor/Foreman	Employee Welfare
Company Accounting	Company Law	Termination/Dismissal: Management/Professional
Negotiate/Plant Purchasing and Leasing	Employee Welfare	Termination/Dismissal: Supervisor/foreman
Termination/Dismissal: Supervisor/foreman	Employee Training: Management/Professional	Market Research
Competitive Tendering	Negotiate Client	Use of Computer Technology
Advertising Promotion	Termination/Dismissal: Management/Professional	Employee Training: Supervisor/Foreman
Contract Drafting	Contract Drafting	Organization/Site
Use of Computer Technology	Consumer /Client Protective Law	Demotion and Retirement
Company(Strategic) Planning	Company(Strategic)Planning	Negotiate/Plant Hire
Planning Law	Planning Law	Negotiate/Suppliers
Organizational Structure	Negotiate/Government	Planning Law
Employee Training: Management/Professional	Negotiate/Main Contractor	Negotiate/Main Contractor
Sources of Finance	Organizational Structure	Negotiate/Trade Union
Negotiate/Main Contractor	Employee Training: Manual	Organization of comm. System
Property Legislation	Advertising Promotion	Termination/Dismissal: Man Labour

Junior Management	Mid-Level Management	Senior Management
Termination/Dismissal: Management/Professional	Demotion and Retirement	Employee Training: Manual
Recruit Select: Management/Professional	Sources of Finance	Recruit/Select: Manual labour
Demotion and Retirement	Market Research	Negotiate/Plant Purchasing and Leasing
Market Research	Property Legislation	Property Legislation

(b) Skills Management (Wikipedia, 2007)

Skills Management is the practice of understanding, developing and deploying people and their skills. Well-implemented skills management should identify the skills that job roles require, the skills of individual employees, and any disparities between the two.

The skills involved can be defined by the organization concerned, or by third party institutions. They are usually defined in terms of a skills framework, also known as a competency framework or skills matrix. This consists of a list of skills, and a grading system, with a definition of what it means to be at a particular level for a given skill.
To be most useful, skills management needs to be conducted as an ongoing process, with individuals assessing and updating their recorded skill sets regularly. These updates should occur at least as frequently as employees' regular line manager reviews, and certainly when their skill sets have changed.

Skills management *systems* record the results of this process in a database, and allow analysis of the data. Skills management provides a structured approach to developing individual and collective skills, and gives a common vocabulary for discussing skills.

As well as this general benefit, three groups of employees receive specific benefits from skills management:

Individual Employees: As a result of skills management, employees should be aware of the skills their job requires, and any skills disparities that they have. Depending on their employer, it may also result in a personal development plan (PDP) of training to bridge some or all of those skills disparities over a given period.

Line Managers: Skills management enables managers to know the skill strengths and weaknesses of employees reporting to them. It can also enable them to search for employees with particular skill sets (e.g. to fill a role on a particular project).

Organization Executives: A rolled-up view of skills and skills disparities across an organization can enable its executives to see areas of skill strength and weakness. This enables them to plan for the future against the current and future abilities of staff, as well as to prioritize areas for skills development.

2.5.3 The Concept of Core Competency

(a) Core Competency

A core competency is something that a firm can do well and that meets the following three conditions specified by Hamel and Prahalad (1990):

i. It provides customer benefits
ii. It is hard for competitors to imitate
iii. It can be leveraged widely to many products and markets.

A core competency can take various forms, including technical/subject matter know how, a reliable process, and/or close relationships with customers and suppliers (Mascarenhas et al. 1998). It may also include product development or culture such as employee dedication. Modern business theories suggest that most activities which are not part of a company's core competency should be outsourced. If a core competency yields a long-term advantage to the company, it is said to be a sustainable competitive advantage.

The concept of core competencies was developed in the management field. Prahalad and Hamel introduced the concept in a 1990 *Harvard Business Review* article. They wrote that a core competency is "an area of specialized expertise that is the result of harmonizing complex streams of technology and work activity." As an example they gave Honda's expertise in engines. Honda was able to exploit this core competency to develop a variety of quality products from lawn mowers and snow blowers to trucks and automobiles. To take an example from the automotive industry, it has been claimed that Volvo’s core competence is safety.

Ever since Prahalad and Hamel introduced the term in the 1990's many researchers have tried to highlight and further illuminate the meaning of core competence. According to D. Leonard-Barton (Prahalad and Hamel, 1990), "Capabilities are considered core if they differentiate a company strategically." On the other hand Galunic and Rodan (1998) argue, "A core competence differentiates not only between firms but also inside a firm it differentiates amongst several competencies. In other words, a core competency guides a firm recombining its competencies in response to demands from the environment."

(b) Individual versus Core Competencies

It is important to distinguish between individual competencies or capabilities and core competencies. Individual capabilities stand alone and are generally considered in isolation. Gallon et al. (1995) made it explicit that core competencies are more than the traits of individuals. They defined core competencies as "aggregates of capabilities, where synergy is created that has sustainable value and broad applicability." That synergy needs to be sustained in the face of potential competition and, as in the case of engines, must not be specific to one product or market. So according to this definition, core competencies are harmonized, intentional constructions.

Coyne et al. (1997) proposed: "a core competence is a combination of complementary skills and knowledge bases embedded in a group or team that results in the ability to execute one or more critical processes to a world class standard." Two ideas are especially important here. The skills or knowledge must be complementary, and taken together they should make it possible to provide a superior product. For example, core technological competencies pertain to 200 to 600 W electric motors, and this motor is their core product. All of their end products are modifications of this basic technology (with the exception of their work benches, flash lights, battery charging systems, toaster ovens, and coffee percolators).

They produce products for three markets:

i. The home workshop market: small electric motors are used to produce drills, circular saws, sanders, routers, rotary tools, polishers, and drivers.
ii. The home cleaning and maintenance market: In the home cleaning and maintenance market, small electric motors are used to produce dust busters, etc.

iii. The kitchen appliance market: small electric motors are used to produce can openers, food processors, blenders, bread makers, and fans.

(c) Characteristics of Core Competencies

There are three tests for Core Competencies:

i. Potential access to a wide variety of markets - the core competence must be capable of developing new products and services.
ii. A core competence must make a significant contribution to the perceived benefits of the end product.
iii. Core competencies should be difficult for competitors to imitate. In many industries, such competences are likely to be unique.

(d) Performance-based Competency

A performed-based competency consists of a set of observable performance dimensions, including individual knowledge, skills, attitudes, and behaviours, as well as a collective team, process, and organizational capabilities, that is linked to high performance, and provides the organization with sustainable competitive advantage (Athey and Orth, 1999).

(e) Occupation-based Competency

In terms of the required competencies Stewart and Hamlin (1992b) define competency as something, which a person who works in a given occupational area should be able to do. It is a description of an action, behaviour or outcome which a person should be able to demonstrate, or the ability to transfer skills and knowledge to new situations within the occupational area (Homes and Joyce, 1993).

(f) Knowledge-based Competency

Competencies are the manifestation of knowledge acquired through education, training, and self-learning. Wisher (1994) insists that competencies provide a common cultural thread, a language for success, a framework for thinking about excellence and a way of communicating the future.

Meyer and Semark's (1996) citing from D.S. Karpin argue that "competencies can be useful to a profession when they are:

i. Determined by current and emerging business requirements,
ii. Based on successful management performance,
iii. Designed to be easily identified and applied,
iv. Associated with key technical skills, and
v. Developmentally oriented".

In the technical professionals' research report, van Ryneveld and Sproule (2005) proposed a table consisting of a brief summary of required competencies for technical professionals and decision-makers. The proposed competencies are highlighted in table 5.

Table 5: A summary of competencies required for technical professionals and decision-makers (van Ryneveld and Sproule, 2005)

Methodical competencies		**Social competencies and competency of personage**		
Academics	**Practical**	**Administrative**	**Intrapersonal**	**Interpersonal**
Active live-long learning • Accessing information • Livelong professional development • Initiative	Numeracy • Ability to interpret engineering information • Ability to read and interpret graphs • Ability to perform basic mathematical calculations • Ability to interpret diagrammatic information • Ability to visualize plans and product	Business sense • Being able to estimate economic costs • Understand business processes • Knowledge of legislation and public policy	Active listening • Synthesizes different perspectives • Observes interaction	People management and leadership • Initiative • Risk • Respect of colleagues
Application of knowledge • Relevance of information • Interpret and analyze data • Assemble and integrate diverse strand of knowledge • Evaluate viability • Comparing situation	Technical knowledge and skills • Experimentation • Scientific method • Instrumentation • Knowledge of contemporary issues • Materials and design knowledge	Judgment • Evaluating information • Isolate central issues • Decision making • Checking viability of decisions	Creativity / innovation • Think laterally • Original and alternative solutions • Models solutions	Teamwork • Respect for others • Productive working relationships • Add value to a team • Functions on multi-disciplinary teams
Problem solving and posing • Apply knowledge	Information and communication technology (ICT) Skills	Ethical • Shows integrity	Adaptable • Anticipates and	Working with stakeholders • Client focus

Methodical competencies		Social competencies and competency of personage		
Academics	**Practical**	**Administrative**	**Intrapersonal**	**Interpersonal**
• Analyze new situations • Overcome obstacles • Revise processes • Pose problems	• Software applications • Macro writing • Design tools • Seek, store and retrieve information as needed	• Belongs to professional societies • Responsibility to the profession • Confidentiality	predicts change • Manage change • Helps others adapt	• Understand needs • Negotiation • Works within socio-economic context
		• Time management • Establishing time frames • Maintaining timelines • Meeting deadlines	• Awareness of self in context • Motivation • Designated responsibility • Multiple demands • Monitoring progress and correcting actions • Problem sensitivity	• Communication • English proficiency • Audio Visual presentation • Comprehension and writing • Oral communication • Interpersonal communication

Finally, table 6 presents a comparative summary of extracted core competencies of recognised NEBE professions as highlighted by some professional associations and previous researchers: Architecture (SAIA, 1996); Landscape Architecture (ILASA, 2003); Construction management (Young & Duff, 1990); Project management (Birkhead, 1999); Quantity surveying (Nkado, 1999); and Property valuers (SACPVP, 2000).

Table 6: Comparative summary of core competencies of some NEBE professions

Architecture (SAIA, 1996)	**Landscape Architecture (ILASA, 2003)**	**Construction Management (Young & Duff, 1990)**	**Project Management (Birkhead, 1999)**	**Quantity Surveying (Nkado, 1999)**	**Property Valuers (SACPVP, 2000)**
Design & planning	Site assessment & sensitivity	Leadership	Planning & controlling	Construction contract practice	Property valuation
Technical	Planning	Supervision of others	Personal influence	Construction technology & environments services	Procurement & financial management
Problem solving	Design	Competitive tendering	People management	Economics of construction	Negotiate/client
Managerial	Documentation	Costing & estimating	Problem solving	Procurement and financial management`	Client relationship management & client user satisfaction
Communication	Tender adjudication & site inspection	Budgetary control	Team Leadership		Service attitude and professionalism
Coordination & entrepreneurial		Sourcing of funds	Staff Development		
Creativity		Analysis of project risks	Project context		
		Organization at site level			
		Programme stocks/material distribution			
		Programme maintenance			
		Negotiating/suppliers			
		Negotiating/plant hire			

2.6 Summary

The review of literature clearly reveals that the acquisition of an appropriate body of skills and competencies within a career structure is fundamental in demonstrating competence and promoting a professional image in the built environment. This is increasingly so in a construction enterprise culture where successful project execution is dependent upon effective and efficient service delivery. With a more knowledgeable client demanding value for money, contractors are reliant on a team of skilled and competent NEBE professionals who will radiate confidence and commitment that ensures successful project completion.

The foregoing review vividly revealed on table 3, 4, 5 and 6 respectively shows that the success of the construction industry is mainly reliant on the NEBE professionals who possess and demonstrate readily the acquisition of the following identified core competencies:

a. Technically Oriented Competencies: Programme design, planning, construction, maintenance, health and safety, management of quality assurance etc.

b. Financial Business Management Oriented Competencies: Competitive tendering, contract drafting, costing and estimating, budgetary control, sourcing for fund, analysis of project risks, procurement and financial management, negotiation, construction contract practice, entrepreneurial ability, and etc.

c. Inter-personal Oriented Competencies: Leadership, communication, motivation of others, mentoring, supervision of others, time management, problem solving, creativity / innovation, etc.

The review of literature also establishes the fact that no previous study has been conducted to identify the present and future skills and competencies required of NEBE professionals to practice effectively in South Africa. This study thus seeks to investigate these disparities. Its contribution would be to identify and highlight those competencies which current NEBE practitioners consider of critical importance but perceive as having low levels of evidence in practice. Identified competencies that are rated as likely to be very important in the future should now be entitled to strategic focus, especially those that are rated as having below average levels of evidence in the NEBE profession.

CHAPTER THREE: RESEARCH PROPOSITIONS

3.1 Introduction

The research question and research objectives were outlined in the introduction (Chapter One) and put into perspective in the review of literature. This has led to the establishment of some propositions, which are presented below.

3.2 Identification of Competencies Required of NEBE Professionals in South Africa today

PROPOSITION1

That distinct competencies required of NEBE professionals are based on tables 3, 4 and 6. The levels of importance given to each of the competencies required of and exhibited by NEBE professionals in South Africa today can be determined using questionnaires and interviews.

3.3 Importance of Education, Training, Work Experience and Organization in Developing Competencies

PROPOSITION 2

That education, training, work experience and organization can influence the development of the different competencies highlighted in Proposition 1.

3.4 Identification of the Perceived Disparity that Exists between Theoretical and Practical Competencies

PROPOSITION 3

That the perceived disparity that exists between the level of importance given to each of the competencies required of NEBE professionals in South Africa today and the level of importance given to each of the competencies that have been published in literature as ideal for each profession, can be evaluated.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.1 Research Process

The purpose of the research methodology is to test and substantiate the propositions listed in chapter 3.

The research method was designed in the following logical sequence:

a. Review of literature
b. Formulation of propositions
c. Questionnaire design
d. Pre-test questionnaire/administration
e. Review of questionnaire
f. Questionnaire administration
g. Analysis of results

The review of literature and propositions are discussed in chapters 2 and 3 respectively.

4.2 Research Design

The research method was dictated by the nature of the data to be generated and the problem for research (Leedy, 1989). As this research was aimed at investigating the skills and competencies required in practice, a significant proportion of the data required and generated was verbal rather than numerical, and the methodology used was primarily qualitative. Thus a descriptive survey method (Leedy, 1989) was adopted for the study since achieving the research objectives demands the technique of observation (via interviews or questionnaires) to be the principal means of collecting the data, which were subsequently analysed.

4.2.1 Questionnaire Design

The questionnaire was designed to test and provide insight into the formulated propositions by comparing the respondents views on the skills and competencies required of NEBE professionals with those found in the literature survey. A copy of the questionnaire used in the research is included in Appendix B.

The questionnaire comprises three sections:

a. Personal profile of respondent and work profile;
b. Rating level of importance of competencies identified in the literature survey; and
c. Additional competencies to be suggested by respondent

The personal profile of respondent and the work profile were designed to supply information for analysis against the competencies variables. Included in this section was the demographic background of the respondent, specifically those aspects that were likely to influence their ratings of the competencies. A few close structured questions were made to ease response and to save time. The questionnaire was well designed to preserve anonymity, hence encouraging participation and quick responses.

Section B of the questionnaire contains four sub-sections with a table enumerating a list of competency outcomes from the literature. Respondents were requested to rate each competency on a likert scale of 1 to 5 namely:

i. The level of importance attached to each of the listed competencies for NEBE professions in South Africa, from 'Not Sure'(rated 1), 'Not Important'(rated 2), 'Fairly Important'(rated 3), 'Important'(rated 4), and 'Very Important'(rated 5);
ii. The current levels of each competencies exhibited by NEBE professionals in South Africa, from 'Very Low' (rated 1) to 'Very High' (rated 5);
iii. The level educational training programmes' contribute to the acquisition of the listed competencies, from 'Not Significant' (rated 1) to 'Very Significant' (rated 5); and
iv. The level work experiences and organization(s) contribute to the acquisition of the listed competencies, from 'Not Significant' (rated 1) to 'Very Significant' (rated 5).

Section C of the questionnaire sought the following additional information from respondents:

i. List of the 5 most important competencies for NEBE professionals in ascending order, from 'Least Important' (rated 1) to 'Most Important' (rated 5);
ii. Important competencies that were lacking in the formal education of respondents;
iii. Suggested competencies for post graduate specializations in NEBE professions;
iv. Suggested roles of academic institutions, professional bodies and employers to enhance or develop the competencies required of NEBE professionals.

Interestingly, **'Mentoring'** was listed as an additional competency by a female respondent. She argued that mentoring is a unique skill which is least embraced in the construction industry, and which is the most important for skills transfer in the industry. She also suggested that the enhancement of competencies development should be a collaborative effort between academics, professional bodies and employers.

4.2.2 Pre-test Questionnaire

The drafted questionnaire was pre-tested on five NEBE professionals who are colleagues of the researcher. This was done to conform to the suggestion of Babbie and Mouton (2001) that pre-testing was a sure way to guide against errors in administering questionnaires. The purpose of the pre-test, explained to the selected participants, was to obtain constructive feedback on the validity and reliability of the questionnaire before administering it to the targeted sample. These pilot tests were conducted in January 2007 in the form of standardized interviews, which took about 40 minutes each. The constructive feedback received from each of the interviewees led to the following amendments to the previously drafted questionnaire:

a. Re-wording of the personal profile questions,
b. Re-wording of the instruction for filling in Sections B and C respectively,
c. Re-designing Section C as open-ended questions, and
d. Re-designing the Likert scale range in Section B and C from 1 – 4 to 1 – 5 to accommodate 'Negligible' in the scale range.

Selected participants that were involved in the pre-test confirmed that the questionnaire was carefully drafted, legible and easily understood. Also, that the table of enumerated outcomes of the listed competencies was helpful, and that with the effecting of the corrections, the questionnaire could be filled within 25-35 uninterrupted minutes. The copy of the final drafted questionnaire administered to the targeted sample (NEBE professionals) is attached as Appendix B.

4.2.3 The Population

The survey population were 'Non-Engineering Built Environment' (NEBE) professionals employed in various sectors of the construction industry in the Gauteng province of South Africa. To provide a focused sample, these professionals were identified through their

individual professional associations. It was noted that the total population of NEBE professionals is much broader than used in this study and may not be easily covered because of the time restrictions. A representative sample was thus decided upon for the purposes of this research report.

4.2.4 Research Sample

When conducting research, it is important for the researcher to have a sample that will represent the population that is being studied, because studying the whole population is usually costly and requires much time. Therefore a sample that will be representative of the study should be selected. However, it is important to discuss what sampling is and the type of sampling that has been used in this study. Babbie and Mouton (2001) argue that sampling is the process of selecting observations.

Sampling is the use of a subset of the population to represent the whole population. Probability sampling, or random sampling, is a sampling technique in which the probability of getting any particular sample may be calculated. Non-probability sampling does not meet this criterion and is used with caution. Non-probability sampling techniques cannot be used to infer from the sample to the general population. Performing non-probability sampling is considerably less expensive than doing probability sampling.

Examples of non-probability sampling include:

a. **Convenience, Haphazard or Accidental sampling** - members of the population are chosen based on their relative ease of access.
b. **Snowball sampling** - The first respondent refers a friend. The friend also refers a friend, etc.
c. **Judgmental sampling** or **Purposive sampling** - The researcher chooses the sample based on who they think would be appropriate for the study.
d. **Case study** - The research is limited to one group, often with a similar characteristic or of small size.
e. **ad hoc quotas** - A quota is established (say 65% women) and researchers are free to choose any respondent they wish as long as the quota is met

According to Leedy (1989) the sample should be so carefully chosen that the researcher is able to see from it all the characteristics of the total population in the same relationship that would be seen if the researcher were to inspect the total population.

It is acknowledged that the above method of sampling does not constitute probability sampling, however, when there is no convenient means of estimating the total population, as is the case with the NEBE professions, non-probability sampling is recognized as a feasible way of sampling.

Levin and Rubin (1991) described a method of sampling called judgemental sampling where 'personal knowledge and opinion are used to identify those items from the population which are to be included in the sample'.

It is believed that judgemental sampling is valid for this study and that the sample of respondents would be representative of NEBE professionals in the Gauteng province.

4.2.5 Questionnaire Administration

A representative sample of 120 NEBE professionals determined by randomly choosing 15 individuals each from lists of registered members of NEBE professional associations, were chosen for the study. Therefore the following procedure was adopted for the administration of the structured questionnaire:

a. Pre-arranged telephone discussions were held with the selected individuals, stating the purpose and benefits of the study and formally seeking their consent to participate in the survey. Each discussion ended with the collection of the email address of the respondent with the purpose of sending a copy of the questionnaire electronically to the respondent. It is important to note that the majority of the responses received came through email responses. However, a handful of responses were recorded during face-to-face interviews.

b. 90 questionnaires were electronically mailed to potential respondents in the first week of February 2007 with an official covering letter prepared and signed by my supervisor. 30 questionnaires were administered face-to-face.

c. A follow-up letter was sent every week to facilitate response. Occasionally, a telephone reminder was employed.

d. Finally, a total of 58 responses were received and recorded and the analysis in the next chapter was based on 50 of those responses to enhance a round figure.

4.2.6 Bias

It is important to note that descriptive surveys are particularly susceptible to bias. Leedy (1989) has defined bias as "any influence, condition or set of conditions that singly or together distort the data from what may have been obtained under the conditions of pure chance." A potential source of bias was cited in chapter 1 under the 'limitation of the study'- that the scope of the study was confined only to the views of practising NEBE professionals located in Gauteng province. However, the impact of this source of bias was minimized by the sampling approach used.

4.3 Summary

In general, the conciseness and clarity of the questionnaire, the motivating covering letter from my supervisor, routine reminder letters and phone calls, and the electronic administration of the questionnaire including assurance of anonymity, were steps taken to maximize the success rate of responses.

CHAPTER FIVE: RESULTS AND DISCUSSION

5.1 Response to Questionnaires

The total responses recorded were 58 out of 120 questionnaires administered. Of the responses received, 46 (representing 79% of total responses) were electronically mailed back, 6 (representing 10% of total responses) were hand delivered, 4 (representing 6.9% of total responses) were rejected for incomplete and inappropriate filling, and 2 respondents (representing 3% of total responses) declined to fill the questionnaire based on an excuse that they have retired. Overall, the effective response rate was 48%. About six respondents registered interest to receive a copy of the final thesis.

5.1.1 Incomplete and Inappropriate Filling of Questionnaires

Incomplete and inappropriate filling of questionnaires are undesirable, though beyond the researcher's control, but often not completely avoidable. The appropriate reaction would have been to request the respondents to fill another unfilled questionnaire. However, it is impractical with anonymous surveys. Nevertheless, in this case the contributive effect of the data in the questionnaires was deemed to be negligible, and was the reason for rejecting the 4 uncompleted responses. Figure 3 highlights the percentage of responses (from a total of 58) received from each NEBE profession.

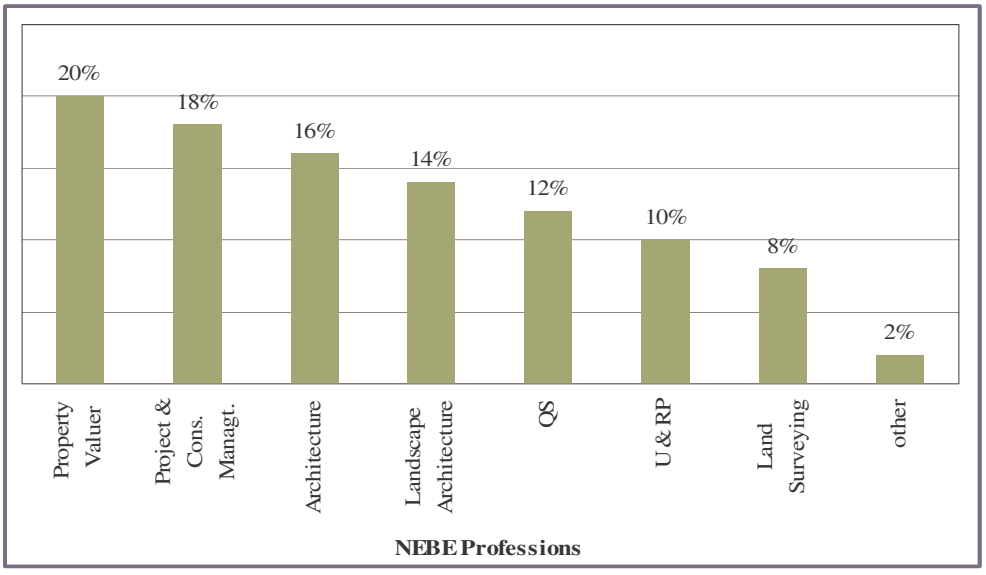

Figure 3: Responses received from NEBE professions

5.2 The Demographic Profile of Respondents

In a descriptive survey, an analysis of the demographic profiles of the respondents is an essential data analysis (Norusis, 1988). Below is a discussion of each demographic variable covered in the questionnaires, in case one or more of the demographic factors have influenced the ratings of the competencies.

5.2.1 The Highest Educational Qualifications

Figure 4 highlights the categories of the highest educational qualification achieved by respondents. The figure shows that on average, most respondents are currently holders of a masters' degree.

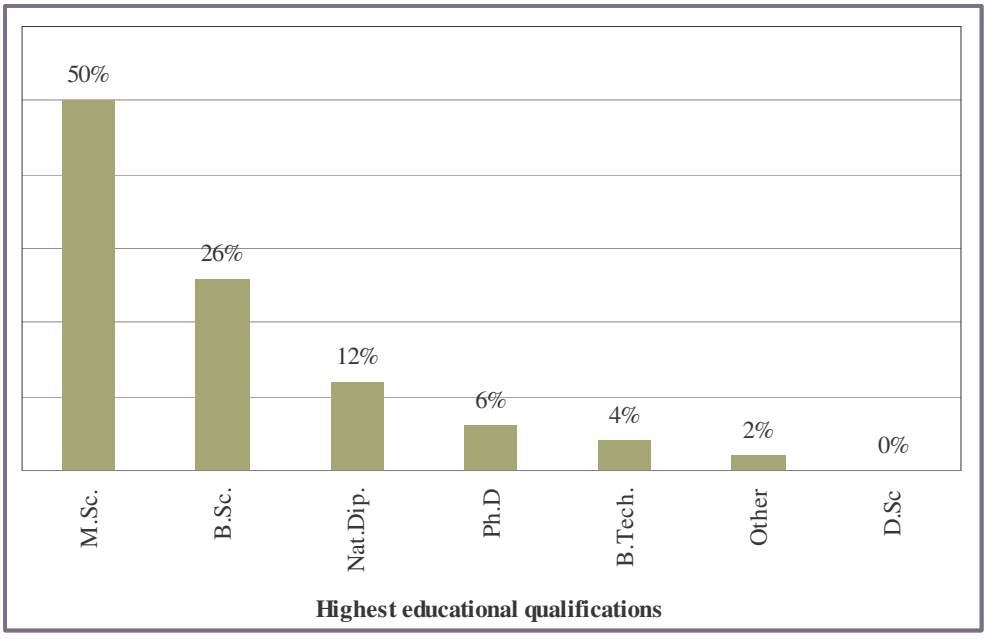

Figure 4: The Highest educational qualifications achieved by respondents

5.2.2 Age Range of Respondents

Figure 5 shows the age distribution of respondents. The results indicate a wide range of ages within the working class involved in the survey. Implicitly, it can be deduced that the current workforce in South Africa is mostly dominated by those within the 36-45 year age range. This perception may, however, be wrong and the large number of respondents aged 36-45 years could be coincidence. One positive aspect, however, is that 36/50 x 100% of the respondents are below the age of 45 years and will likely provide valuable input into the study, having a recent memory of their years of study and sufficient practical experience.

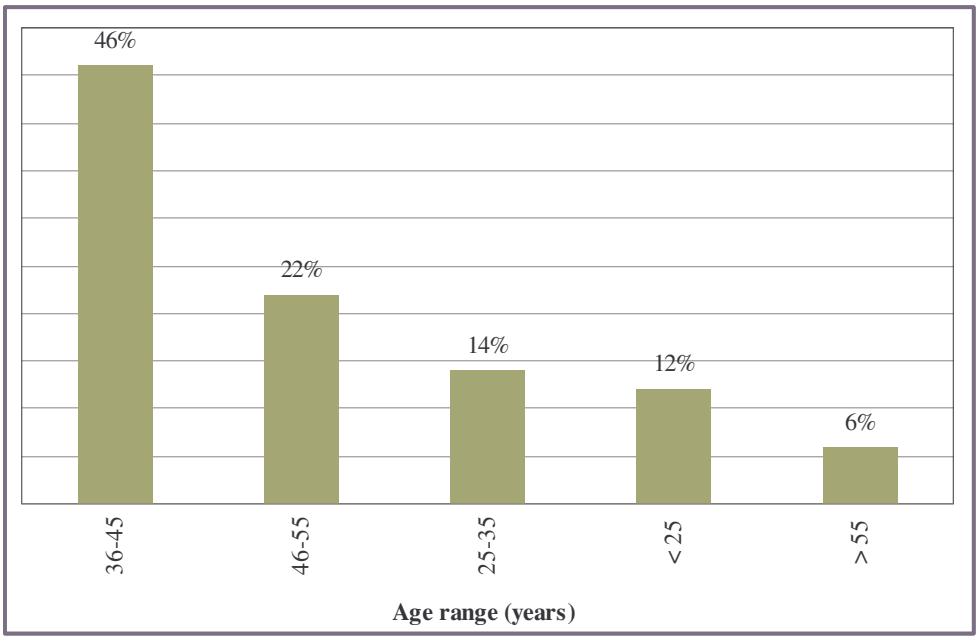

Figure 5: Age distribution of respondents

5.2.3 Length of Experience

Figure 6 shows that only 2% of respondents have been in practice for more than 20 years, while 48% of the respondents have between 11-15 years of experience in industry. This most likely indicates that the built environment profession is currently experiencing a boom. If the current statistics is maintained coupled with adequate skills development of NEBE professionals, there is high probability of the boom being sustained over time.

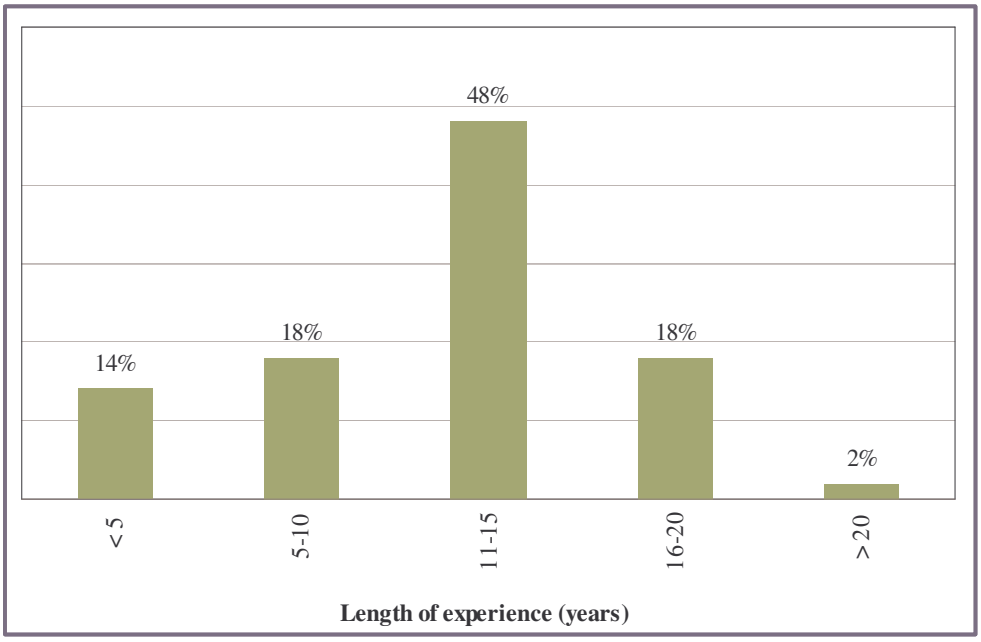

Figure 6: Respondent's length of experience

5.2.4 Gender

In relation to gender 60% of the respondents were male and 40% female. This is commendable especially considering the challenges facing women in previously male-dominated environments.

5.2.5 Professional Membership Status

The professional membership status of respondents is shown in figure 7. The distribution is a good representation of NEBE professions in South Africa. In addition to current professional membership in core institutions, some respondents are also registered in other professional associations. Of the 50 respondents, only 1 respondent was not professionally registered.

Figure 7: Professional membership status of respondents

5.2.6 Chartered Status

Table 7 reveals that 76% of the respondents are chartered professionals. Chartered status is a license to practice in the various professions. This again depicts a high sense of commitment to statutory policy for the built environment in South Africa (BE Policy document, 1999).

Table 7: Chartered Status of respondents

Response	Number of Respondents	%
Yes	38	76
No	12	24

5.3 Work Profile of Respondents

5.3.1 Present Employment

The work profile of respondents is also investigated in case the work profile of the respondents influences the ratings of the competencies. Table 8 shows the present NEBE sectors that the respondents are currently employed in. Table 8 shows that 50% of the respondents are currently employed in the consulting sector of the industry, while 6% are employed in both the private sector (e.g. financial institutions) and other organizations (e.g. equipment and material supplier).

The largest number of professionals employed in the consulting sector is directly related to the highest percentage of professionals recorded as having a Chartered status. This indicates that the construction industry is thriving, mostly in the consultancy sector, while there is a great shortfall in the contracting sector. Most responses revealed that the consultancy sector in South Africa is involved in 'Design and Build', thus discouraging or hampering emerging contractors. Secondly, there are active roles in 'Public-Private-Partnership' (3Ps), which also gives consultancies an edge in the built environment.

Table 8: Present employment sector

Type of Organization	%
Contractor	24
Consultant	50
Private Sector (e.g. financial & related)	6
Government or parastatal	14
Other (e.g. equipment & material supplier)	6

5.3.2 Level of Position in Current Organization

Figure 8 shows the level of respondents' current position in their organization. The table reveals that 72% of respondents are senior managers, while 6% are mid-level managers. This tends to corroborate the fact that many respondents are highly qualified professionals. It also serves as a seal of authentication for the data collected, since the respondents must have given their responses based on their current practical experiences.

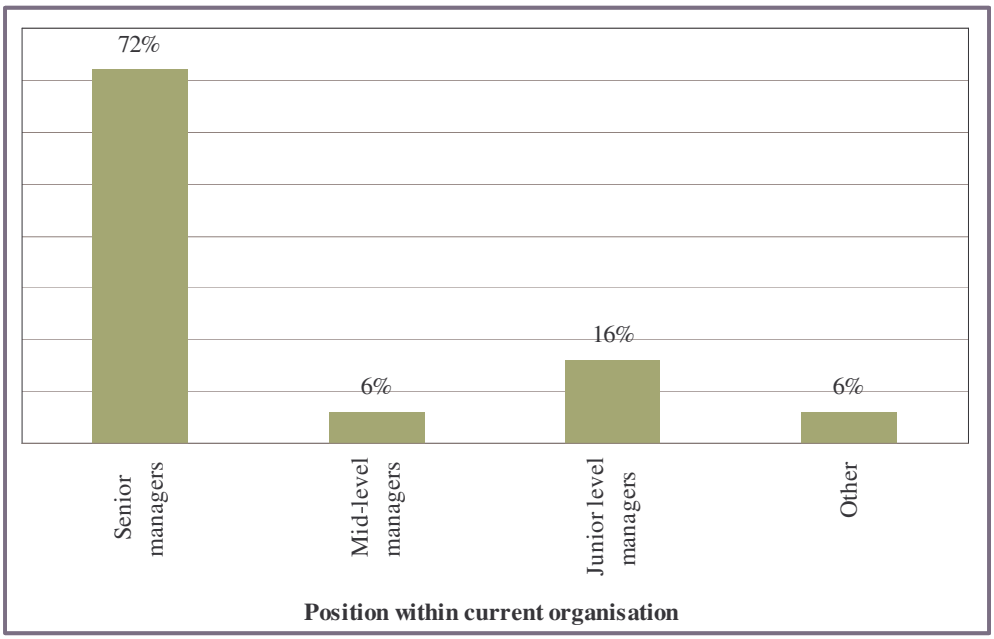

Figure 8: Level of respondents' current position in their organization

5.4 Test of Propositions and Analysis

5.4.1 Proposition 1

To evaluate Proposition 1 (chapter 3), respondents were requested to rank according to importance, the competencies identified in the literature (tables 3, 4 and 6) using 21 Likert-items.. The 21 competencies as identified in the literature were measured using a five-point scale that ranged from 1-5 namely:

1. Not sure
2. Not important
3. Fairly important
4. Important
5. Very important

Irrespective of their professional background, respondents were requested to rank the level of importance they attached to each of the 21 competencies using the five-point scale. The mean of the outcome was calculated and is shown in descending order of importance from 'the most important' to 'the least important' in table 9.

Based on the mean score, the results indicate that: professionalism; planning, design and supervision; solving problems; leadership/management and coordination were ranked the most important of the twenty-one listed competencies, while creativity/innovation; information and communication technology; and ability to source funds were rated the least important. The result is shown on table 9.

Table 9: Level of importance attached to each competency for NEBE professions in South Africa

Competencies	Rank	Mean response
Professionalism	1	4.34
Planning, design & supervision	2	4.32
Solving problems	3	4.32
Leadership/management	4	4.20
Coordination	5	3.96
Knowledge & practice of construction practice	6	3.88
Budgetary control	7	3.86
Communication	8	3.80
Costing and estimating	9	3.80
Service oriented	10	3.78
Financial management	11	3.68
Competitive tendering	12	3.62
Negotiation	13	3.58
Social skills	14	3.58
Analysis of projects risk	15	3.56
Procurements	16	3.50
Entrepreneurship	17	3.36
Executing projects	18	3.32
Creativity/innovation	19	3.28
Info.& comm. Tech. Skills	20	3.28
Sourcing for funds	21	3.02

Furthermore, respondents were requested to rank from 1 to 5 the current levels of importance exhibited by each of the 21 competencies by NEBE professionals in South Africa today. The mean of the outcome was calculated and is shown in descending order from 'the most evident' to 'least evident' on table 10.

Based on the mean score, the results indicate that executing projects; competitive tendering; costing and estimating; knowledge and practice of construction; and ability to solve problems were ranked the most evident of the 21 competencies, while information and communication technology; sourcing for funds and ability to analyse project risks were rated the least evident. The result is shown in table 10.

Table 10: Current levels of importance of competencies evidenced in NEBE professionals

Competencies	Rank	Mean response
Executing projects	1	3.66
Competitive tendering	2	3.66
Costing and estimating	3	3.66
Knowledge & practice of construction	4	3.50
Solving problems	5	3.48
Negotiation	6	3.41
Budgetary control	7	3.34
Entrepreneurship	8	3.34
leadership/management	9	3.32
Planning, design & supervision	10	3.32
Social skills	11	3.32
Financial management	12	3.30
Coordination	13	3.30
Service oriented	14	3.30
Creativity/innovation	15	3.27
Communication	16	3.22
Professionalism	17	3.22
Procurements	18	3.16
Info.& comm. Tech. Skills	19	3.14
Sourcing for funds	20	3.09
Analysis of projects risk	21	3.00

5.4.2 Proposition 2

To evaluate proposition 2 (i.e. that education, training, work experience and organisation can influence the development of the different competencies highlighted in Proposition 1), respondents were requested to evaluate the contribution tertiary, vocational and CPD training make to competency development in NEBE professionals using the five-point scale. The mean of the outcome was calculated and is tabulated in table 11 in descending order of importance from 'Very significant' to 'Not significant'.

Based on the mean score, the results indicate that: Information and communication technology; Professionalism; Executing projects; Costing and estimating; and Planning, design and supervision skills were ranked the most significant of the 21 competencies, while Coordination, Procurements and Entrepreneurship were rated the least significant.

Table 11: Contribution of Tertiary, Vocational and CPD training to Competency Development

Competencies	Rank	Mean response
Info. & communication technology	1	3.56
Professionalism	2	3.50
Executing projects	3	3.40
Costing & estimating	4	3.40
Planning, design & supervision	5	3.39
Solving problems	6	3.26
Social skills	7	3.24
Communication	8	3.24
Competitive tendering	9	3.18
Budgetary control	10	3.13
Knowledge and practice of construction	11	3.00
Financial management	12	3.00
Leadership/management	13	2.95
Analysis of projects risk	14	2.76
Sourcing for funds	15	2.74
Service oriented	16	2.74
Negotiation	17	2.74
Creativity/innovation	18	2.71
Coordination	19	2.68
Procurements	20	2.66
Entrepreneurship	21	2.42

Respondents were also requested to evaluate the contribution of work experience and organization to competency development of NEBE professionals using the five-point scale. The mean of the outcome was calculated and is shown in table 12 in descending order of importance from 'Very significant' to 'Not significant'. Based on the mean score, the results indicate that the work experience and organization contribute the most significantly to professionalism; leadership/management; knowledge and practice of construction; information and communication technology; and service oriented skills. Work experience and organization contribute the least to creativity/innovation; solving problems; and analysis of project risk. The result is shown on table 12.

Table 12: Contribution of work experiences and organization to competency development

Competencies	Rank	Mean response
Professionalism	1	4.40
Leadership/management	2	4.34
Knowledge and practice of construction	3	4.22
Info. & communication technology	4	4.12
Service oriented	5	4.00
Budgetary control	6	3.96
Negotiation	7	3.96
Communication	8	3.94
Competitive tendering	9	3.87
Planning, design & supervision	10	3.81
Costing & estimating	11	3.78
Financial management	12	3.74
Coordination	13	3.74
Executing projects	14	3.67
Entrepreneurship	15	3.67
Social skills	16	3.67
Procurements	17	3.63
Sourcing for funds	18	3.61
Creativity/innovation	19	3.52
Solving problems	20	3.48
Analysis of projects risk	21	3.30

5.4.3 Proposition 3

To evaluate the perceived disparity that exists between the level of importance given to each of the competencies required of NEBE professionals in South Africa today and the level of importance given to each of the competencies that have been published in literature as ideal for each profession, tables **6, 9 and 10** were compared.

The principle of content analysis (Williamson et al., 1977) was applied to identify 21 separate competencies from the respondents' lists. Williamson et al. (1977) insist that 'the most common use of content analysis is to detail the frequency with which certain items, symbols or themes appear in a written document'.

Based on the mean score and the frequency of the identified competencies, the perceived disparities could be determined by identifying a competency that was listed as one of the top five (25%) by respondents and **was not** listed in the top five of the different professions published in literature. Table 13- below shows this analysis.

The results shown on table 13 indicate that '**Professionalism**' was listed as one of the top five important competencies and **was not** listed as one of the top five competencies on table 6 and 10 respectively. It could be suggested, therefore, that NEBE professions still lag behind in the development of professionalism. To corroborate this finding, it is observed on table 11 and 12 that professionalism was ranked as one of the top five competencies being developed through educational and work experiences. This indicates the prominence attached to the development of professionalism in contemporary NEBE professions.

Table 13: Evaluation of perceived disparities existing between the level of importance given to theoretical and practical competencies

Theoretical Competencies (from Literature)	**Rank**	**Practical Competencies (Currently Evident in Practice)**	**Rank**	**Important Competencies Suggested by NEBE Professionals**	**Rank**
Leadership/ Management	1	Executing projects	1	Professionalism	1
Planning, design and supervision	2	Competitive tendering	2	Planning, design & supervision	2
Coordination	3	Costing and estimating	3	Solving problems	3
Solving problems	4	Knowledge & practice of construction	4	Leadership/management	4
Costing and estimating	5	Solving problems	5	Coordination	5
Competitive tendering	6	Negotiation	6	Knowledge & practice of construction practice	6
Budgetary control	7	Budgetary control	7	Budgetary control	7
Executing projects	8	Entrepreneurship	8	Communication	8
Financial management	9	Leadership/management	9	Costing and estimating	9
Analysis of project risks	10	Planning, design & supervision	10	Service oriented	10
Procurements	11	Social skills	11	Financial management	11
Negotiation	12	Financial management	12	Competitive tendering	12
Professionalism	13	Coordination	13	Negotiation	13

Theoretical Competencies (from Literature)	Rank	Practical Competencies (Currently Evident in Practice)	Rank	Important Competencies Suggested by NEBE Professionals	Rank
Knowledge and practice of construction	14	Service oriented	14	Social skills	14
Communication	15	Creativity/innovation	15	Analysis of projects risk	15
Service oriented	16	Communication	16	Procurements	16
Entrepreneurship	17	Professionalism	17	Entrepreneurship	17
Creativity/innovation	18	Procurements	18	Executing projects	18
Sourcing for funds	19	Info.& comm. Tech. Skills	19	Creativity/innovation	19
Information and communication technology	20	Sourcing for funds	20	Info.& comm. Tech. Skills	20
Social skills	21	Analysis of projects risk	21	Sourcing for funds	21

Table 14. Professionalism

QUESTIONNAIRE RESPONSES		LITERATURE PUBLICATIONS					
Table 9.Level of importance attached to each competency for NEBE professions in South Africa	Table 10. Current level of competencies evidenced in NEBE professionals	Table 6: Comparative summary of core competencies of some NEBE professions					
		Architecture (SAIA, 1996)	Landscape Architecture (ILASA, 2003)	Construction Management (Young & Duff, 1990)	Project Management (Birkhead, 1999)	Quantity Surveying (Nkado, 1999)	Property Valuers (SACPVP, 2000)
Professionalism			Site assessment & sensitivity			Construction contract practice	Property valuation
	Competitive tendering	Technical	Tender adjudication & site inspection			Construction technology & environments services	Procurement & financial management
	Costing and estimating			Competitive tendering	People management	Economics of construction	
	Knowledge & practice of construction			Costing & estimating		Procurement and financial management	
				Budgetary control	Team Leadership		Service attitude and professionalism

From respondents' responses (column 1), Professionalism stands out as the most important competence for NEBE professionals in South Africa. Professionalism is viewed by practitioners as ''the ethic of professional service''—or, alternatively, ''the service ideal." The service ideal that obligates professionals to place their client's needs above their own and to perform well in areas where they generally are immune to their client's oversight (Bachner, 1991). Academics describe it as "the utilization of existing specialized knowledge regarding a problem domain." (MikeHalblander.com, 2007).In practice (column 2) and in published literature (columns 3-8), Professionalism is also emphasized as a core competency for each of the professions.

Table 15. Planning, Design and Supervision

QUESTIONNAIRE RESPONSES		**LITERATURE PUBLICATIONS**					
Table 9.Level of importance attached to each competency for NEBE professions in South Africa	**Table 10. Current level of competencies evidenced in NEBE professionals**	**Table 6: Comparative summary of core competencies of some NEBE professions**					
		Architecture (SAIA, 1996)	**Landscape Architecture (ILASA, 2003)**	**Construction Management (Young & Duff, 1990)**	**Project Management (Birkhead, 1999)**	**Quantity Surveying (Nkado, 1999)**	**Property Valuers (SACPVP, 2000)**
		Design & planning			Planning & controlling		
Planning, Design & Supervision			Planning	Supervision of others			
			Design				

Planning, Design and Supervision stands out as the second most important competence for NEBE professionals in South Africa. Two of the professions (Quantity Surveying and Property Valuation) do not have Planning, Design and Supervision as one of their five core competencies. Planning, Design and Supervision, is also not one of the five competencies evidenced in practising NEBE professionals.

Table 16. Solving Problems

QUESTIONNAIRE RESPONSES		LITERATURE PUBLICATIONS					
Table 9.Level of importance attached to each competency for NEBE professions in South Africa	Table 10. Current level of competencies evidenced in NEBE professionals	Table 6: Comparative summary of core competencies of some NEBE professions					
		Architecture (SAIA, 1996)	Landscape Architecture (ILASA, 2003)	Construction Management (Young & Duff, 1990)	Project Management (Birkhead, 1999)	Quantity Surveying (Nkado, 1999)	Property Valuers (SACPVP, 2000)
Solving problems		Problem solving			Problem solving		
	Solving problems						

Although considered one of the five most important competencies and competencies exhibited by practising NEBE professionals, only two of the six professions (Architecture and Project Management) emphasize the need for Problem Solving as a core competence. This may be because although Tertiary, Vocational and CPD training institutions actively develop it (Table 11), work experiences and organizations do not emphasize the need for this competence (Table 12).

Table 17. Leadership / Management and Coordination

QUESTIONNAIRE RESPONSES		LITERATURE PUBLICATIONS					
Table 9.Level of importance attached to each competency for NEBE professions in South Africa	**Table 10. Current level of competencies evidenced in NEBE professionals**	**Table 6: Comparative summary of core competencies of some NEBE professions**					
		Architecture (SAIA, 1996)	**Landscape Architecture (ILASA, 2003)**	**Construction Management (Young & Duff, 1990)**	**Project Management (Birkhead, 1999)**	**Quantity Surveying (Nkado, 1999)**	**Property Valuers (SACPVP, 2000)**
	Executing projects			Leadership			
					Personal influence		
Leadership / management		Managerial					Client relationship management & client user satisfaction
Coordination							

Leadership/Management and Coordination: Coordination is defined as "Once the group has identified a solution, actions and resources must be coordinated to ensure the objectives are reached. This is an extension of leadership with a person or persons overseeing implementation of the plan—assuring tasks are completed and the resources needed are provided." (DFI, 2007) and as such can be categorised under Leadership/Management. Landscape Architecture and Quantity Surveying stand out as two of the professions whose core competencies exclude Leadership/management. This is likely because these professions form part of a project team and rarely are involved in leadership functions.

Others: Communication/Documentation and Negotiation: Although considered a core competence for Architecture, Landscape Architecture and Property Valuers, these are reckoned much lower on the competency priority scale. Although ICT is emphasized as one of five core competencies developed in Tertiary, Vocational and CPD training institutions, it is not one of the five considered important in both practice and in the literature.

5.5 Analysis of Additional Competencies and Evaluation of a Course Identified in the Competency Matrix

5.5.1 Competencies Lacking in Formal Education

In section C of the questionnaire, respondents were requested to indicate in the open ended questions those competencies considered important but lacking in their formal education.

The results indicate that: entrepreneurship; leadership/management; negotiation; sourcing for funds; procurements; analysis of project risks; and coordination skills were considered very important but lacking in the formal education. This result is expressed in table 18.

Table 18: Competencies identified as lacking in respondents' formal education

Competency heading	Number of mentions	Rank
Entrepreneurship	26	1
Leadership/management	21	2
Negotiation	19	3
Sourcing for funds	18	4
Procurements	15	5
Analysis of project risks	12	6
Coordination	11	7

5.5.2 Recommended Postgraduate Specializations

In section C of the questionnaire, respondents were also requested to indicate in the open ended questions those competencies that could be recommended if academic institutions were to offer postgraduate specializations in any of the NEBE professions.

The results indicate that leadership/management, procurement, analysis of project risks and coordination were recommended for post-graduate specialization. The result is expressed in table 19.

Table 19: Suggested postgraduate specializations

Competency heading	Number of mentions	Rank
Leadership/management	19	1
Procurement	17	2
Analysis of project risks	12	3
Coordination	8	4

5.5.3 Roles Expected from Stake Holders

In the last part of section C of the questionnaire, respondents were requested to suggest the roles that could be played by NEBE stakeholders to enhance the development of required competencies of NEBE professions. Below is the summary of the identifiable roles:

(a) Roles suggested for academic institutions

i. Design structured programmes that ensure formal training in the identified core competencies;
ii. Design curriculum of co-operative education with experiential learning components that ensure graduates benefit from immediate employability and productivity; and
iii. Incorporate well structured information and communication technology programmes that will expose undergraduates and postgraduates students to contemporary construction software applications.

(b) Roles suggested for Professional bodies

i. Conduct workshops and offer CPD courses highlighting challenges facing the industry and potential solutions;
ii. Identify projects and mentors for potential professionals so as to enhance their interest in the profession; and
iii. Work closely with academics in finding ways of enhancing both the profession and the economy as a whole.

(c) Roles suggested for Employers

i. Provide in-house / on-the-job training with established mentorship programmes for new entrants to the organization. This is to allow for skills to be impacted by experienced professionals within the organizations;
ii. Encourage and support employees to pursue continued professional development (CPD) in competencies relevant to the construction industry; and
iii. Engage with academics and professional bodies inside and outside the country to share critical knowledge that will make the country globally competitive.

5.5.4 An Overview and Evaluation of an Undergraduate Course

Tertiary institutions today are faced with the challenge of presenting to society, graduates who have the skills to provide appropriate and sustainable solutions to society's challenges. One response to the complexity of infrastructure projects over the lifecycle from planning through detailed design to construction and operation has been to develop students who focus on one particular phase of that lifecycle rather than proficient in all phases. This has led to the emergence of differentiated undergraduate degree courses in the form of town planning, civil engineering and construction economics and management. Students obviously need to be proficient in their own phases of the project lifecycle. However, while they do not have to take primary responsibility for tasks in other phases of the project lifecycle, they do nevertheless need to know enough about other phases in order to perform their own tasks properly. Essentially, the challenge is to present an introductory course on the provision of physical infrastructure to non-engineering built environment students.

Over the last fourteen years, an introductory course entitled 'Civil Engineering in relation to Planning' (CIVN 1003) has been developed at the University of the Witwatersrand. This course is aimed at introducing to town planning, and construction economics and management students, the principles and practice of physical infrastructure provision in order to give some insight into engineering considerations during the planning of infrastructure (i.e. as an engineer would look at them) as well as to look at infrastructure from a non-engineering point of view.

Below is an overview of the contribution of the above course (CIVN 1003) currently offered to students studying Urban and Regional Planning and Property Studies.

Teaching and Learning Process

Approach: Formal lectures, tutorials, assignments and class test. Course notes and reference to textbooks/publications are provided.

Arrangements:

a. lectures per week (Wed 08h00-09h45, Thu 10h15-11h00) for 14 weeks = 42 lectures
b. 1 tutorial per week (Thu 11h15-12h00) for 14 weeks = 14 tutorials

Course Outcomes

At the end of this course, the student should:

a. be familiar with, and understand the basic definitions of infrastructure, engineering and civil engineering, the various classifications of infrastructure and the physical structures ascribed to each classification.
b. be familiar with, and understand the relationship between infrastructure growth, country income level and investment.
c. be familiar with, and understand the various components of physical infrastructure (e.g. water supply, storm water management, transportation and land use, wastewater and solid waste) and the design considerations employed in civil engineering in planning each component.
d. be familiar with, and understand the standards and guidelines employed in South Africa for each physical infrastructure component provision in both developed and developing communities.

Brief overview of annual assessments of the CIVN 1003 course

Table 20 is a brief overview of the annual assessments of the CIVN 1003 course.

Table 20: A brief overview of annual assessments of the CIVN 1003 course

Year of Registration	No. of registered students	No. of passes	No. of fails	% of Students passing	% of Students failing
2005	56	46	10	83	17
2004	23	20	3	87	13
2003	11	8	3	73	27
2002	-	-	-	-	-
2001	15	14	1	93	7
2000	17	14	3	82	18
1999	20	13	7	65	35
1998	19	13	6	68	32
1997	18	11	7	61	39
1996	24	17	7	71	29
1995	25	18	7	72	28
1994	15	8	7	53	47
1993	32	23	9	72	28
Average	23	17	6	74	26

The result revealed that a total number of 270 students registered for the course from 1993 to 2005 academic year. The percentage of students passing from the 1993 - 2005 academic periods is 74%, while 26% accounted for percentage of students failing.

The course outcomes reflect the development of more than one of the five competencies listed on tables 13. Students' perceptions of the course through their responses in structured lecturer and course evaluations, and Biggs study process questionnaires administered by the centre for Learning, Teaching and Development, University of the Witwatersrand, also reflects that some of the identified competencies, are being developed in the course. These are:

Planning and Design

a. Ability to interpret engineering information – students familiarise themselves with and understand the design considerations employed in civil engineering in planning each infrastructure component.
b. Ability to read and interpret graphical information – students read and interpret graphical information such as: intensity-Duration-Frequency graphs; flood control measures and flood mitigation structures in developed and developing catchments.

Professionalism

Aspiring practitioners (NEBE Students) internalized the attitudes and values embodied in the ethic of professional service during professional training, so that appropriate behaviour became ‘‘natural’’ (since aspirant is taught to monitor himself) and external social controls would not be required later (Daniels, 1973). In addition, students also possess the followings:

a. Ability to understand the ethic of client-relationship in business processes and project executions - students recognizes and accounts for the dependent and vulnerable position of the lay client (i.e. understand that the client interest comes first).
b. Knowledge of legislation and public policy - students familiarise themselves with and understand the standards and guidelines employed in South Africa for each physical infrastructure component provision in both developed and developing communities.

Solving Problems

While engaging the students in the application of knowledge, practical problems are presented which students are required to work through and present solutions.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study examines the core issues that are of strategic interest to the contemporary NEBE professionals in South Africa. The professionals that have responded to this current study form a broad and representative cross section of the NEBE professionals in the built environment sector. The results based on Objective 2, Objective 4, Proposition 1, 2, and 3 detail the findings from over fifty NEBE respondents. The conclusions arising from this study can be stated as follows:

The study achieved objective 2 as set out in chapter 1. It established that the major challenge confronting NEBE professionals in South Africa is ability to promptly respond to some identified imperatives, such as:

a. The rapid and efficient delivery of quality assets to the public.
b. Sustainable employment creation.
c. The active promotion of small medium and micro enterprises, especially enterprises originating from historically disadvantaged communities.
d. Improve competitiveness of the South African construction sector and gear for global markets.
e. A human resource development strategy for the sector, which is holistic, sustainable and accessible.
f. Sustainable economic growth and productivity of the sector.

In response to these identified imperatives, the study established that the South African government has introduced some appropriate measures, such as: the use of extensive unregulated labour-only subcontractors; introduction of the equal opportunity Black Economic Empowerment programme (BEE) which encourages mentorship and joint ownership within the sector; the introduction of the Affirmative Action (AA) policy to ease employing skilled and competent professionals originating from historically disadvantaged communities, hence increasing the supervisory and management capacity within the construction sector across different races; and other productive innovations geared towards placing the South African construction industry on the path of irreversible change.

To achieve objective 4, the study evaluates a course identified in the competency matrix. It establishes that the course outcomes (in section 5.5.4) reflect the development of one or more of the generic competencies identified in the review of literature as listed in table 5 (van Ryneveld and Sproule, 2005). Students' perception of the course also reflects that some of the identified competencies required of NEBE professionals in South Africa, are being developed in the course. These are:

Numeracy (i.e. Planning and Design)

a. Ability to interpret engineering information – students familiarises with and understands the design considerations employed in civil engineering in planning each infrastructure component.
b. Ability to read and interpret graphical information – students read and interpret graphical information such as: Intensity-Duration-Frequency graphs; flood control measures and flood mitigation structures in developed and developing catchments.

Business sense (i.e. Professionalism)

a. Ability to understand the ethic of client-relationship in business processes and project executions - students recognizes and accounts for the dependent and vulnerable position of the lay client (i.e. understand that the client interest comes first).
b. Knowledge of legislation and public policy - students familiarises with and understands the standards and guidelines employed in South Africa for each physical infrastructure component provision in both developed and developing communities.

Problem solving and posing

a. While engaging the students in the application of knowledge, practical problems are presented which students are required to work through and present solutions.

The study further evaluates each of the propositions stated in chapter 3.

In proposition 1

a. It established that ***professionalism; planning, design and supervision; solving problems; leadership/management and coordination*** were the most important of the

twenty-one listed competencies, while creativity/innovation; information and communication technology; and ability to Source funds were the least important. The result is shown in table 9.

b. It established that ***executing projects; competitive tendering; costing and estimating; knowledge and practice of construction; and ability to solve problems*** were the most exhibited of the 21 listed competencies, while information and communication technology; sourcing for funds and ability to analyse project risks were the least exhibited. The result is shown in table 10.

In proposition 2

a. It established that tertiary, vocational and CPD training contribute most significantly to development of information and communication technology; professionalism; executing projects; costing and estimating; and planning, design and supervision skills. Tertiary, vocational and CPD training contribute the least to development of coordination; procurements and entrepreneurship. The result is shown in table 11.

b. It established that the work experience and organization contribute most significantly to development of professionalism; leadership/management; knowledge and practice of construction; information and communication technology; and service oriented skills. Work experience and organization contribute the least to creativity/innovation; solving problems; and analysis of project risk. The result is shown on table 12.

In proposition 3

a. ***It established that NEBE professions still lag behind in the development of Professionalism***. To corroborate this finding, it is observed on table 11 and 12 that professionalism was ranked as one of the top five competencies being developed through educational and work experiences. This indicates the prominence attached to the development of professionalism in contemporary NEBE professions. It is advocated, therefore, that Professionalism should be encouraged and promoted at all levels amongst NEBE professions.

6.2 Recommendations

The concept of competency development is an exhaustive, continuous field of study that requires present and future attention. Further research is therefore suggested in the following areas:

a. Competency development with respect to issues relating to recruiting and retaining professionals with the necessary skills and experience. The suggested starting point for this is to adopt the perceived existing competencies established in this study as a benchmark.

b. The effect of workload on the existing NEBE professionals as a result of skills shortage in the construction sector. The suggested starting point for this is to adopt the skill disparity established in this study as a datum.

c. Finally, competency development through the sector's investment in training. The core of this should be to provide solutions to the question of 'what should industry's stakeholders do to support training provision and make it more accessible and more cost/time-effective.'

An overview of this competency study has no doubt supported the advocated view of Wisher (1994), that 'Competencies provide a common cultural thread, a language for success and a framework for the thinking about excellence…a way of communicating the future… and focusing on change.' It is anticipated, therefore, that this study has contributed meaningfully to a better understanding of the competencies currently required of NEBE professionals for a successful career in order to sustain the built environment in South Africa and its international counterparts.

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APPENDICES

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19 February 2007

TO WHOM IT MAY CONCERN

This is to certify that Mr. Sorinolu Adewale is a registered student of the University of the Witwatersrand, Johannesburg and currently involved in a postgraduate research project titled '*An investigation into the skills and competencies required of Non-Engineering Built Environment Professionals in South Africa*'.

This questionnaire, submitted to you, forms part of his research project. We would be happy if you would participate in this study and furnish the required information. In so doing, you will be making a valuable contribution to this subject area.

We assure you of complete confidentiality and anonymity. Should you wish to know the findings of this research, Mr. Sorinolu will be glad to send you a copy of his final M.Sc. report.

Thank you for your anticipated contribution.

Yours sincerely,

Dr. Adesola Ilemobade
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QUESTIONNAIRE

DEFINITION: For the purposes of this research, competency is defined as '*clusters of skills, knowledge and ability of an individual to perform a task*'.
For your answer, please Tick (✓) or mark (X).

SECTION A

1.0 PERSONAL PROFILE

1.1 Main Profession

( ) Project and Construction Management; ( ) Property Valuer
( ) Landscape Architecture; ( ) Architecture; ( ) Quantity Surveying;
( ) Urban & Regional Planning ( ) Land Surveying;
( ) Other _____ (Please specify)

1.2 Highest qualification

( ) D.Sc.; ( ) Ph.D.; ( ) M.Sc.; ( ) B.Sc.;
( ) B.Tech; ( ) National Diploma
( ) Other _____ (Please specify)

1.3 Length of professional work experience

( ) Less than 5years; ( ) 5 to 10 years; ( ) 11 to 15years;
( ) 16 to 20years; ( ) More than 20years

1.4 Indicate your membership of the following professional organisations?

( ) SAIA; ( ) CIOB; ( ) SAILA; ( ) SAIPV; ( ) SAIQS; ( ) SAIURP; ( ) SAILS;
( ) Not registered ( ) Other _____ (Please specify)

1.5 Are you a chartered/professional practitioner?

( ) Yes; ( ) No

1.6 Gender

( ) Male; ( ) Female

1.7 Age

( ) Less than 25years; ( ) 25 to 35years; ( ) 36 to 45years;
( ) 46 to 55years; ( ) More than 55years

2.0 <u>WORK PROFILE</u>

2.1 Present Employment

2.1.1 Type of organization
( ) Contractor; ( ) Consultant; ( ) Private sector client;
( ) Government or parastatal; ( ) Other _____ (Please specify)

2.1.2 Level of position within your current organization
( ) Senior Managers – e.g. Director, C.E.O, Regional/Divisional Manager
( ) Mid-level Managers – e.g. Contracts and Project Managers
( ) Junior Managers – e.g. Site Managers, Site Agents, Sub-Agents
( ) Other _____ (Please specify)

2.1.3 Years already spent in your current organization
( ) Less than 5years; ( ) 5 to 10 years; ( ) 11 to 15years;
( ) 16 to 20years; ( ) More than 20years

2.1.4 Your field of operation in your current organization
( ) Project and Construction Management; ( ) Property Valuer
( ) Landscape Architecture; ( ) Architecture; ( ) Quantity Surveying;
( ) Urban & Regional Planning ( ) Land Surveying;
( ) Other _____ (Please specify)
( ) All of the above;

2.1.5 Average size of your current project
( ) Less than R5 million; ( ) R5 to R10 million; ( ) R11 to R15 million;
( ) R16 to R20 million; ( ) R21 to R50 million; ( ) More than R50 million

2.1.6 Average project duration
( ) Less than 6 months; ( ) 6 to 12 months; ( ) 13 to 18 months;
( ) 19 to 24 months; ( ) More than 24 months

2.2 Immediate Past Employment history

2.2.1 Type of previous organization
( ) Contractor; ( ) Consultant; ( ) Private sector client;
( ) Government or parastatal; ( ) Other _____ (Please specify)

2.2.2 Level of position in your previous organization
( ) Senior Managers – e.g. Director, C.E.O, Regional/Divisional Manager
( ) Mid-level Managers – e.g. Contracts and Project Managers
( ) Junior Managers – e.g. Site Managers, Site Agents, Sub-Agents
( ) Other _____ (Please specify)

2.2.3 Cumulative number of years spent in all your previous organization(s)

( ) Less than 5years; ( ) 5 to 10 years; ( ) 11 to 15years;
( ) 16 to 20years; ( ) More than 20years

2.2.4 Your field of operation in your previous organization

( ) Project and Construction Management; ( ) Property Valuation
( ) Landscape Architecture; ( ) Architecture; ( ) Quantity Surveying;
( ) Urban & Regional Planning ( ) Land Surveying;
( ) Other _____ (Please specify)
( ) All of the above;

2.2.5 Average size of project in your previous organization

( ) Less than R5 million; ( ) R5 to R10 million; ( ) R11 to R15 million;
( ) R16 to R20 million; ( ) R21 to R50 million; ( ) More than R50 million

2.2.6 Average project duration in your previous organization

( ) Less than 6 months; ( ) 6 to 12 months; ( ) 13 to 18 months;
( ) 19 to 24 months; ( ) More than 24 months

SECTION B

Instruction

A table listing different competencies expected in NEBE professions is presented below. Alongside each of the competencies are five boxes, please tick (( ) or mark (X) in the most suitable box on a scale of 1 to 5.

1. **Indicate the level of importance you attach to each of the following competencies for NEBE professions in South Africa.**

Competency	Not sure (1)	Not important (2)	Fairly important (3)	Important (4)	Very important (5)
Leadership / Management					
Planning, design & supervision					
Solving problems					
Executing projects					
Knowledge & practice of construction contracts					
Communication					
Procurement					
Financial management					
Competitive tendering					
Costing and estimating					
Budgetary control					
Sourcing for funds					
Ability to analyze project risks					
Negotiation					
Coordination					
Entrepreneurship					
Creativity / innovation					
Social skills					
Service oriented					
Professionalism (ethical practices)					
Information and Communication Technology (ICT) Skills					

2. Grade the current levels each of the following competencies are exhibited by NEBE professionals in South Africa

Competency	Very low (1)	Low (2)	Moderate (3)	High (4)	Very high (5)
Leadership / Management					
Planning, design & supervision					
Solving problems					
Executing projects					
Knowledge & practice of construction contracts					
Communication					
Procurement					
Financial management					
Competitive tendering					
Costing and estimating					
Budgetary control					
Sourcing for funds					
Ability to analyze project risks					
Negotiation					
Coordination					
Entrepreneurship					
Creativity / innovation					
Social skills					
Service oriented					
Professionalism (ethical practices)					
Information and Communication Technology (ICT) Skills					

3. To what extent have Tertiary, Vocational or Continuing Professional Development (CPD) training programmes contributed to the acquisition of the following competencies?

Competency	Not significant (1)	Negligible (2)	Moderate (3)	Significant (4)	Very significant (5)
Leadership / Management					
Planning, design & supervision					
Solving problems					
Executing projects					
Knowledge & practice of construction contracts					
Communication					
Procurement					
Financial management					
Competitive tendering					
Costing and estimating					
Budgetary control					
Sourcing for funds					
Ability to analyze project risks					
Negotiation					
Coordination					
Entrepreneurship					
Creativity / innovation					
Social skills					
Service oriented					
Professionalism (ethical practices)					
Information and Communication Technology (ICT) Skills					

4. Rank how your work experiences and organization(s) have contributed to the acquisition of the following competencies

Competency	Not significant (1)	Negligible (2)	Moderate (3)	Significant (4)	Very significant (5)
Leadership / Management					
Planning, design & supervision					
Solving problems					
Executing projects					
Knowledge & practice of construction contracts					
Communication					
Procurement					
Financial management					
Competitive tendering					
Costing and estimating					
Budgetary control					
Sourcing for funds					
Ability to analyze project risks					
Negotiation					
Coordination					
Entrepreneurship					
Creativity / innovation					
Social skills					
Service oriented					
Professionalism (ethical practices)					
Information and Communication Technology (ICT) Skills					

SECTION C

Additional competencies

1. From the list below, which of the 5 competencies do you consider most important. Please rank from 1 (least important) to 5 (most important)

Competency		**Competency**		**Competency**	
Leadership / Management		Financial management		Coordination	
Planning, design & supervision		Competitive tendering		Entrepreneurship	
Solving problems		Costing and estimating		Creativity / innovation	
Executing projects		Budgetary control		Social skills	
Knowledge & practice of construction contracts		Sourcing for funds		Service oriented	
Communication		Ability to analyse project risks		Professionalism (ethical practices)	
Procurement		Negotiation		Information and Communication Technology (ICT) Skills	

2. Which competencies were lacking in your formal education?

Competency		**Competency**		**Competency**	
Leadership / Management		Financial management		Coordination	
Planning, design & supervision		Competitive tendering		Entrepreneurship	
Solving problems		Costing and estimating		Creativity / innovation	
Executing projects		Budgetary control		Social skills	
Knowledge & practice of construction contracts		Sourcing for funds		Service oriented	
Communication		Ability to analyse project risks		Professionalism (ethical practices)	
Procurement		Negotiation		Information and Communication Technology (ICT) Skills	

3. If academic institutions were to offer postgraduate specializations in any of the NEBE professions, which competencies would you recommend as outcomes of the postgraduate programme?

Competency		**Competency**		**Competency**	
Leadership / Management		Financial management		Coordination	
Planning, design & supervision		Competitive tendering		Entrepreneurship	
Solving problems		Costing and estimating		Creativity / innovation	
Executing projects		Budgetary control		Social skills	
Knowledge & practice of construction contracts		Sourcing for funds		Service oriented	
Communication		Ability to analyse project risks		Professionalism (ethical practices)	
Procurement		Negotiation		Information and Communication Technology (ICT) Skills	

4. What role should the following parties play to enhance the competencies required of NEBE professions?

a. Academic institutions (tertiary and vocational)_____
_____

b. Professional bodies_____
_____

c. Employers_____
_____

Thank you for your time and kind assistance in completing this questionnaire. Kindly save this document unto your system, and email as an MS WORD attachment to wale_sorinolu@yahoo.com. Alternatively, you may print it out and fax to 011 339 1762

Please provide your email address if you would like to receive a copy of the final report:

_____