

**GUIDELINES FOR THE INTEGRATION OF EDUCATION AND TRAINING
IN THE ELECTRICAL CONSTRUCTION INDUSTRY**

by

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SHORT DISSERTATION

Submitted as partial fulfilment of the requirements for the degree

MAGISTER IN EDUCATION

in



in the

FACULTY OF EDUCATION AND NURSING

at the

RAND AFRIKAANS UNIVERSITY

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May 1999

ACKNOWLEDGEMENTS

On completion of this short dissertation, I wish to express my appreciation and sincere thanks to the following:

- The Almighty God for giving me the courage and the necessary insight without which this study would have been a failure.
- Prof. G Jacobs, for his inspiring guidance, experience and insight as a supervisor who has made the course and this study in particular, challenging and meaningful. This study would have sacrificed its in-depth context without his encouragement, motivation and positive criticism.
- Prof. WA Cronje, for his guidance, helpfulness and expertise in the electrical construction aspects of this dissertation.
- Dr. ESG Greyling for her assistance in editing the dissertation.
- Members of the ECA (SA), the Electrical Contracting Industries Training Board and employers for their assistance and participation in the interviews.
- Heléne and Nicole, my wife and daughter, for their patience, insight and sacrifice over my study period.
- My family, colleagues and friends for their encouragement and supportive discussions.

OPSOMMING

Die integrasie van onderwys en opleiding is tans 'n belangrike aangeleentheid in Suid-Afrika met die totstandkoming van die Nasionale Kwalifikasie Raamwerk. Verskeie ander lande het alreeds soortgelyke stelsels geïmplementeer wat veral beroepsonderwys en opleiding integreer.

Die Elektrotegniese Aannemersvereniging van Suid-Afrika bied verskeie opleidings en persoonlike ontwikkelings kursusse vir hul lede aan. Die kursusse strek vanaf bestuurkursusse vir bestuurders van sake-ondernemings tot opleiding vir ongeskoolde operateurs. Vakleerlinge ontvang teoretiese opleiding by onderwysinstellings (tegniese kolleges) wat op 'n formele grondslag aangebied word, terwyl die operateurs teoretiese en praktiese opleiding ontvang, wat deur die nywerheid se eie opleidingspersoneel aangebied word. Die probleem is dat die inhoud van die kursusse vir operateurs gerig is op die aanleer van vaardighede tesame met relevante vakteorie. Basiese onderwys vorm egter nie deel van die bestaande kursusse nie.

Die doel van die studie is om 'n geïntegreerde onderwys en opleidingsraamwerk daar te stel vir die ontwikkeling van kennis, vaardighede, houdings en waardes vir die operateurs betrokke by die elektriese kontrakteursbedryf. Die navorsingstrategie wat toegepas is, is beskrywend, verklarend en verkennend.

'n Kort oorsig van die Elektrotegniese Aannemersvereniging en Opleidings Raad word weergegee en 'n literatuurstudie onderneem oor die bestaande stelsel wat plaaslik en internasionaal toegepas word, met verwysing na die integrering van onderwys en opleiding, is onderneem.

Die navorsingsontwerp wat beskrywend, kontekstueel en kwalitatief van aard is en die navorsingsinstrument vir die empiriese ondersoek ('n gestruktureerde vraelys) word bespreek. Die empiriese ondersoek geskied

deur middel van onderhoude met die Opleidingsraad, werkgewers in die nywerheid en die vereniging onderskeidelik. Onderhoude fokus op die opleiding en evalueringsmeganismes wat tans in die bedryf aangewend word. Bevindinge van die literatuurstudie het aangedui dat verskeie lande alreeds soortgelyke strukture het om onderwys en opleiding te integreer. Die empiriese ondersoek het gevind dat die bestaande vaardigheid kursusse voldoen aan die industriële behoeftes maar dat die kursusse geen onderwys komponent bevat. Die bevindinge was ontleed en aanbevelings vir 'n raamwerk om 'n geïntegreerde onderwys en opleidingsprogram te ontwikkel, was voorgestel.

Die raamwerk sluit onder andere 'n situasie-analise in om die aard en omvang, van onderwys en opleiding in die bedryf sowel as die vaardighede benodig vir die integrasie van onderwys en opleiding te analiseer. 'n Behoeftebepaling om die inhoud en balans van die kennis en vaardighede te bepaal, asook om die metodologie van aanbieding vas te stel, word gedoen. Riglyne vir die evaluering van die program met behulp van die studente en werkgewers asook die vlakke en metodes vir evaluering word bespreek.

Daar word tot die gevolgtrekking gekom dat 'n geïntegreerde benadering vir die elektriese kontrakteursbedryf noodsaaklik is, as gevolg van die verandering in die huidige mannekrag opleidings wetgewing is dit 'n geldige geleentheid om bestaande opleidingstelsels te wysig. Die feit dat alle toekomstige onderwys en opleiding asook evaluering aan die hand van eenheid-standaarde gedoen word gaan bepaalde implikasies vir die bedryf hê. Die grootste uitdaging vir die bedryf is om ooreenstemming met betrekking tot die integrasie van onderwys en opleiding te bereik. Laastens word daar 'n aantal aanbevelings vir verdere navorsing in die elektriese kontrakteursbedryf gemaak.

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CHAPTER 1

INTRODUCTION, AIMS AND RESEARCH STRATEGY

1.1 INTRODUCTION

Education has become so academic that students are no longer adequately prepared for the world in which they have to exist meaningfully (Dekker & Lemmer, 1993:251). Education and training are key activities in our society and are of vital interest to every family as well as to the health and prosperity of our national economy. The Department of Education (1995:32) indicates that education and training in South Africa has tended to operate separately for many years in terms of provision, curricula, examination and qualification structures.

There is a limited integrated approach to the structures for education and training, and limited provision for linkages between education, training, business and labour although when suitably modified certain elements of the structure could be used to develop an integrated approach. Education curricula are devised at a central level and bear no relation to the requirements for vocational training (National Training Board, 1994:59). The only formal link occurs within technical colleges and technikons where academic education is strongly associated with vocational training requirements.

Education is seen to provide the entry-level qualifications, which in turn allow for on-the-job experience or training to take place. Schools provide entry into the training system but are not in any way integrated to it. The education and training system plays no meaningful role in integrating the school-leaver into the world of work (National Training Board, 1994:69).

A vast majority of the adult population of many countries still has no qualifications at all. Even today, one in three of the working population in the United Kingdom has no qualifications of any kind (Inter-Ministerial Working Group, 1996:22). In South Africa a breakdown in terms of the level of education of the population

aged 20 years and older reveals that 13% hold no educational qualifications; 24% of the population have only completed primary education; 52% have completed secondary education (up to grade 12 or National Technical Certificate 3), while the remainder holds one or other post-school qualification. According to the Department of Manpower (1994), South Africa's lowest-level human resources appeared to be in the order of 52% of the total labour force, while the high-level human resources are in the order of 15%. Over the last thirty years progress has been made to improve the skills level of the labour force (Gerber, Nel & Van Dyk, 1998:411).

Table 1.1 indicates in 1994 that only 8,7% of the economically active population of South Africa had no education. Almost a quarter of the potentially economically active population had only primary education, while 35,3% are regarded as functionally illiterate, that is having an education level of less than grade seven.

Table 1.1: Percentage distribution of potential labour force by level of education, 1994

No Schooling %	Gr. 1 – 7 %	Gr. 8 –10 %	Gr. 11 – 12 %	Diploma/ Certificate %	Degree %	Other %	Total %
8,7	26,6	32,5	24,4	5,0	2,4	0,4	100,0

Source: Bureau of Market Research (1995)

According to the Ministry of Education (Department of Education, 1995:15), education and training are closely related and should be viewed as parallel activities essential for human resource development. However, in order to maximise the benefits, one needs to apply an integrated approach to education and training.

A range of policy proposals regarding integration have been put forward by various national and regional sector groupings which includes work done by the National Union of Metalworkers of South Africa (NUMSA) and Congress of South

African Trade Unions (COSATU) in 1989, National Education Policy Investigations (NEPI) in 1992, the National Training Board (NTB) in 1993, the African National Congress (ANC) Draft policy for Education and Training (1994) and many more.

In spite of all this, no long-term consensus on policy development has been reached, although attempts have been made to develop concepts and structures that will lead to policy development of an "*integrated approach*". The Ministry of Education and the Ministry of Labour have a joint responsibility for providing education and training. Despite the existence of excellent institutions and innovative programmes, further education and training is characterised by fragmentation, poor co-ordination with reference to apprenticeships, inefficiency and inequality (Department of Education, 1998:7). For example, the Education Department designed a theory component independently of practical training designed, by the Department of Manpower. These two departments are often united in their desire to resist integration (Human Sciences Research Council, 1995:37).

There is concern among the Electrical Contracting Industries Training Board (responsible for curricula and education and training standards for the electrical construction industry) about the fragmented system of education and training which prevents the possibility of continued learning in the electrical construction industry. It is a well known and documented fact that South African education and training is fragmented, compartmentalised, poorly co-ordinated, not in tune with the requirements of the modern work place, and not equally accessible to all (Inter-Ministerial Working Group, 1996:41).

Accredited training providers in the electrical construction industry provide the practical component (skills training), while the theoretical component is provided at technical colleges. This system creates compartmentalised thinking, as trainees are not able to integrate their knowledge and skills. According to Mehl (1997:36), the apprenticeship programme has suffered from a lack of articulation and often very little relevance from theoretical to practical training.

The electrical construction industry is associated with the training of apprentices and in-service training. The conditions of an apprenticeship are drawn up by industry and are published in a Government Gazette while the in-service training is excluded from the Manpower Training Act. Conditions of employment and development for in-service training are negotiated through a Bargaining Council for the electrical construction industry.

An accredited career path for skills training in the electrical construction industry does exist, but as stated above, problems are experienced with the fragmentation of the system. Employers are responsible for the education and training of their employees at certain levels. This results in a variation of standards, due to the fact that the Electrical Contracting Industries Training Board's (ECITB) training prospectus can only be a guide of what skills level the trainee should achieve (Electrical Contractors' Association, 1996:8).

It is essential for the Electrical Construction Industry to build a system of education and training with which all employers and employees can identify, as this will serve the needs and interests of the industry. The system should be non-discriminatory, founded on equity, and should honour prior learning and experience, while striving for excellence. According to the Department of Labour (1997:27), learning needs to be articulated in a continuum of opportunities to ensure that the relevant education and training are combined with appropriate learning and assessment.

According to the Inter-ministerial Working Group (1996:42), the following problems are experienced with reference to competence in general:

- Competence is a contested area in education circles and, if for example the Electrical Construction Industry is to have an integrated outcomes-based approach to education and training, a widely accepted understanding of competence will be essential.

- The construction industry should not simply accept the narrow minded of being competency-based on directly observable or measured actions, usually restricted to practical demonstrations.

Education and training in the electrical construction industry are fragmented. This has resulted in theoretical curricula lagging behind the needs of the industry. Dekker and Lemmer (1993:251), state that there is a lack of basic skills training that results in learners being unprepared for working life. A more vocational-directed curriculum is required to foster a better knowledge and appreciation of the working world. Education and training are separated, both by the way they are organised and by the way society thinks about them. For example, academic study is generally perceived to be more valuable than training for occupations (Human Sciences Research Council, 1995:6).

Department of Labour (1996:8), state that employees are used to perform tasks in the industry, having had no formal education or training for specific skills. Employers rely on employees' experience acquired over the years.

The electrical construction industry needs to reassess the way in which learning is organised and certified. It needs to develop the employees' abilities, enrich their knowledge, improve their qualifications or point them in a new direction to bring about change in their attitudes and/or behaviour. A culture of lifelong learning and the ability to adapt to constant technological change, in order to maintain high working standards, needs to be created.

1.2 PROBLEM STATEMENT

1.2.1 Background to the problem

A deeply fractured skills profile exists in the electrical construction industry as a high proportion of on-the-job training takes place in isolation, and as general education does not form part of the Electrical Contracting Industries Training Board's career path. Furthermore, it is the employer responsibility to determine

the knowledge and skills proficiency of the semi-skilled employee (Bargaining Council for the Electrical Contracting Industry, 1997:9).

According to the Department of Labour (1996:8), the Department of Education's Adult Basic Education (ABET) programmes are taking place without any link to the skills context within which adults are learning. South Africa ranked last out of 46 developing countries in terms of its human resources development performance and other labour market indicators (Department of Labour, 1997:7). According to Gerber *et al.* (1998:5), the general competitiveness factors are: national economic strength, internationalisation, government, finances, infrastructure, management, science and technology and human resources. Examples of criteria for assessing human resources are:

- skills of the labour force;
- attitudes of the labour force; and
- competitiveness, that tends to increase the expectations of employees with regard to the quality of life.

The country's poor record in the field of education and training has been an important determinant of the above mentioned criteria.

It is further stated by the Department of Labour (1997:7), that complex education institutions and industry-based training sites and programmes, with limited linkages to each other or to commerce and industry resulted in limited:

- access to specialised learning;
- recognition of skills;
- portability of qualifications across different areas of learning; and
- formal learning progression abilities.

The current environment is one of considerable uncertainty, especially as the process of review and transformation of government structures are still under way at all levels of the system. For example, according to the Bargaining Council for the electrical contracting industry (1997:7), in order for an electrical construction operator, level 1 (Elconop 1) to progress along the career path, she/he should be in possession of proof of proficiency as an Elconop 1, issued by the employer.

The employer is thus responsible for determining the proficiency of the Elconop 1. Although limited guidelines to be utilised during the development of the electrical construction operator are provided for in the main agreement and the Training Prospectus, different standards are applied throughout the industry as no structured training or assessment is done by the employers.

Furthermore, the problem is aggravated due to the lack of provision and implementation of formalised ABET programmes by the Industry Training Board. Basic literacy and numeracy are not addressed, as it does not form part of the career path. For example, an Elconop 1 receives on-the-job training and needs no formal entry qualifications (Electrical Contractors' Association, 1996:10).

1.2.2 Problem formulation

The problem that will be researched can be stated in the form of the following question: **In what way can an integrated approach to education and training in the electrical construction industry in South Africa be enhanced?**

1.3 THE AIMS OF THE STUDY



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1.3.1 Overarching objective

The objective of this study is to develop an integrated education and training framework for the development of knowledge, skills, attitudes and values for electrical construction operators within the electrical construction industry.

1.3.2 Research Goals

The following research goals are formulated in order to achieve the overarching objective.

- to scientifically highlight the currently perceived problem in the Electrical Construction Industry, regarding the lack of integration of education and training, by means of a case study;

- to explore and describe the concept of an integrated approach to education and training which will be crucial to this study;
- to empirically research meaningful links between education, training and the world of work, as well as possible methods of how integration could be initiated in the electrical construction industry in South Africa;
- to present literature on all the view points and implementation notions in a consolidated response, and to deduce guidelines for an integrated education and training framework; and finally
- to summarise, draw conclusions and make recommendations, as well as identify areas that could be researched further.

The next section will deal with the concepts relevant to this study in order to clarify the researcher's meaning of these concepts.

1.4 CLARIFICATION OF CONCEPTS

1.4.1 Education

According to Van Dyk, Nel and Loedolff (1992:147), education may be defined as activities which aim at developing the knowledge, moral values and understanding required in all walks of life rather than knowledge and skills relating only to a limited field of activity. Education is however, a comprehensive concept and may also include the concepts of training and development.

Education is an act or process of systematic instruction in a field of study dealing with problems, methods, and theories of teaching and learning. Education suggests both the process and result of developing the mind's capacity and scope (Halsey, 1992:324).

The working definition of education that will be used in this study refers to education as activities, which aim at developing the knowledge, moral values and understanding required by employees' in their work environment, as well as, in their life-experiences.

1.4.2 Training

Training is a process to change employees' work behaviour through the application of learning principles. This behavioural change usually focuses on knowledge or information, skills or activities, attitudes or beliefs and value systems (Anderson, 1993:9). Training focuses on equipping recipients with the competence needed to perform in their current jobs (Fredric & Bell, 1989:2).

Training can be defined as any attempt to improve employee performance on a currently held job or one related to it. This implies changes in specific knowledge, skills, attitudes or behaviour. Bernardin and Russell (1998:172), state that to be effective, training should involve a learning experience, be a planned organisational activity and be designed in response to identified needs.

For the purposes of this study, training will be defined as the systematic process of changing and directing the behaviour and attitudes of the electrical construction operator, level 1 to achieve the objectives of the employers in the electrical construction industry. Training will therefore be a deliberate effort to teach specific skills, knowledge and attitudes to serve a specific purpose.

1.4.3 Competence

Competence involves the capacity for continuing performance within specified ranges and contexts resulting from the integration of a number of capabilities and is the expression of a qualification (National Training Board, 1997:9).

According to Bellis (1997:8), competence is a skill or integrated cluster of skills executed within an indicated range or context to specific standards of:

- performance;
- integrated understanding of the performance and its knowledge base;
- understanding of the system in which the performance is carried out;
- the ability to transfer to other related contexts; and
- the ability to innovate, when appropriate.

Competence is the ability to repeatably perform activities within an occupational area to the set standards and levels required in the work place and incorporates understanding, insight and innovation. This definition will be applicable throughout the study.

1.4.4 Learning Outcome

A learning outcome is that segment of a unit standard which is a statement of the required learner capabilities that should be demonstrated. Outcomes are specified by stated performances and assessment criteria, and range statements (Human Sciences Research Council, 1995:2).

Bellis (1997:6) defines outcomes as the result of learning processes and refers to knowledge, skills, attitudes and values within a particular context. Learning outcomes describe the result of training and explain what the participant will be able to demonstrate at the end of training. There are critical and specific outcomes (South African Qualifications Authority, 1997: 6):

- **Critical cross-field outcomes** focus on the capacity of an individual to demonstrate knowledge, skills and attitudes in an integrated way in his/her learning, work situations as well as in life. Examples of critical outcomes could include problem solving skills and the ability to communicate effectively.
- **Specific learning outcomes** are essentially contextually demonstrated knowledge, skills and attitudes reflecting one or more of the critical outcomes. These are the building blocks, that enable learners to achieve overall competence in a field, at a given level.

For the purpose of this study learning outcomes will be defined as elements of a unit standard, that describe the assessable performances. Outcomes are statements that describe observable, demonstrable and assessable performance and refer to values and dispositions, practical skills, content knowledge and understanding.

1.4.5 Electrical Construction Industry

The Electrical Construction Industry is the industry in which employers and their employees are associated with the design, preparation, erection, installation, repair and maintenance of all the electrical equipment forming an integral and permanent part of buildings and/or structures. This includes the wiring, cable jointing and laying, electrical overhead line construction, and all other operations incidental thereto (Bargaining Council for the Electrical Construction Industry, 1997:9).

1.4.6 National Qualifications Framework (NQF)

The NQF is a framework created and managed by the South African Qualifications Authority (SAQA) for providing lifelong learning opportunities while utilising nationally recognised levels (National Qualifications Framework, 1996:15).

According to the South African Qualifications Authority (SAQA) bulletin (1997:5) the objective of the National Qualifications Framework (NQF) will be to create an integrated national framework for learning. Access, mobility and progression are the key objectives, as represent the need for enhancing quality in education and training.

1.4.7 Electrical Construction Operator, Level 1

Electrical Construction Operator describes an employee whose formal training will be provided by the employer, who undertakes any of the following tasks and may use the tools necessary to perform such tasks as set out in the main agreement (Bargaining Council for the electrical contracting industry, 1997:6): Bending, cutting, threading and reaming of conduit, attachment of conduit accessories and trays, installation of wireways (excluding of surface installations), installation of cables, fitting of glands, operating a trenching machine, laying of cables, work of

a labourer, and assisting all other levels of skilled categories in the electrical construction industry.

1.5 RESEARCH STRATEGY

The research strategy is descriptive, declarative and explorative. According to Gay (1981:12), descriptive research involves the collecting of data in order to test hypotheses or answer questions concerning the current status of the subject being studied. It will this be qualitative research by nature and will include the gathering of information through a relevant literature and empirical study. The declarative research component will analyse the existing information and evaluate the current education and training system in the electrical construction industry in order to make an affirmation in terms of the current situation. The explorative research component will gain insight and clarify concepts with reference to the integration of education and training (Mouton & Marais, 1992:45). Exploratory interviews will be conducted to elicit ideas, thoughts and feelings to lay the foundation for the proposed framework.

1.6 CHAPTER OUTLINE

In emulation of the objectives in paragraph 1.3.2 the following research procedure will be followed. The chapter outline is illustrated by figure 1.2.

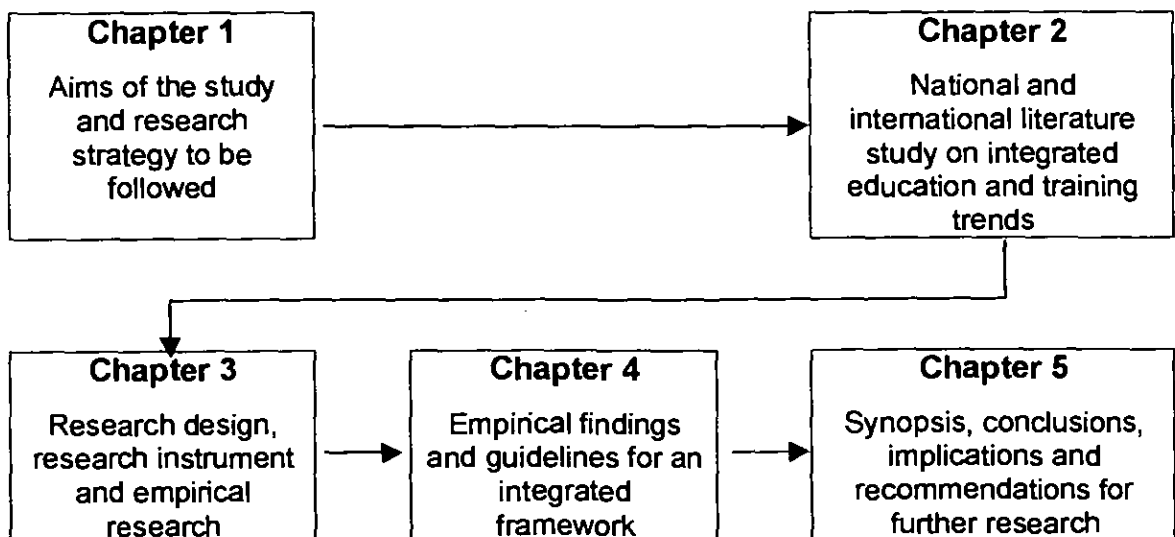


Figure 1.1: A summary of the procedure to be followed in the study.

Chapter 2

In this chapter, the electrical construction industry's mission, functions, training and education strategies will be described. A literature study, will be conducted that will focus on national and international perspectives relating to the implications of the integrated approach for education and training, will be undertaken as well.

Chapter 3

Chapter 3 is empirical by nature and will include information on the qualitative research design and research instrument. Structured interviews from the Electrical Contractors' Association, Electrical Contracting Industries Training Board and employers in the industry will be used to collect data on opinions/proposals regarding an integrated approach to education and training. The perceived "gap" between education and training in the electrical construction industry, with reference to the electrical construction operator, level 1 will also be researched.

Chapter 4

In this chapter, the empirical findings and guidelines for an integrated education and training framework for the electrical construction industry will be discussed. The proposed framework and a breakdown of the components of the framework will be dealt with.

Chapter 5

The final chapter will contain a synopsis of the research, together with conclusions and possible priorities for further research.

1.7 CONCLUSION

In this chapter, it was highlighted that education and training are key activities, but operate separately, with no real integration of activities in the electrical construction industry. In this country, two official state departments represent Education and Training and have resisted integration of activities in the past (Human Sciences Research Council, 1995:36). In the field of education and skills, the Ministry of Labour operates mainly in a demand capacity, while the Ministry of Education operates in a supply capacity (Department of Education, 1998:6). The Departments of Education and Labour are mainly responsible for human resources development, playing two distinct but overlapping roles. Three distinct, although completely separate/discernable segments of education and training systems can be identified, as depicted in figure 1.2

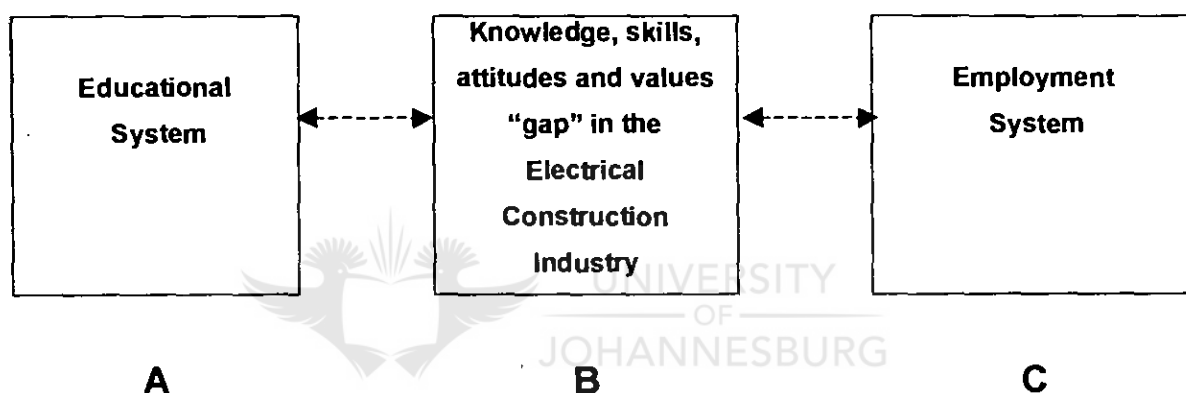


Figure 1.2: A graphic representation of the knowledge gap between education and training systems

Segment A represents the education system, which could be regarded as the supplier side of the education and training system. Segment C represents the employment system or demander side of the education and training system. Employers are primarily responsible for the development of employees in this segment. Education and training are mostly work-based. Segment B depicts the mismatch between the education and employment system. A number of prospective employees end up in the gap between the education system and the employment system (Gerber, *et al.* 1998:440).

The Electrical Construction Industry needs to re-assess the way in which learning is organised and certified. It needs to develop its employees' abilities, enrich their knowledge, improve their qualifications or point them in a new direction to bring

about change in their attitudes and/or behaviour. Furthermore, it needs to create a culture of lifelong learning and the ability to adapt to constant technological change, in order to maintain high working standards.

The objective of this study is to develop an integrated education and training framework for the development of knowledge, skills, attitudes and values for electrical construction operators within the electrical construction industry.

The following chapter will be dealing with the mission, function, education and training strategies in the electrical construction industry, as well as a review on national and international perspectives on an integrated approach to education and training.



CHAPTER 2

INTEGRATION OF EDUCATION AND TRAINING IN THE ELECTRICAL CONSTRUCTION INDUSTRY

2.1 BACKGROUND TO THE ELECTRICAL CONTRACTORS' ASSOCIATION OF SOUTH AFRICA

The Electrical Contractors' Association (ECA) of South Africa is an employer organisation within the Construction Industry that strives for the well being and development of its members and employers in the Construction Industry as a whole. The Association can be referred to as the administrative arm of the electrical contractor.

At the end of 1997 the Association had 2500 members. The members employ a current work force of 11000 employees, ranging from skilled to semi-skilled throughout South Africa. The scope and application of the Electrical Construction Industry are determined by the main agreement of the Bargaining Council for the Electrical Contracting Industry. The contents of this agreement are negotiated annually.

Parties to the main agreement are the Electrical Contractors' Association of South Africa (ECA), South African Electrical Workers' Association (SAEWA) and the Metal and Electrical Workers' Union of South Africa (MEWUSA) (Bargaining Council for the Electrical Contracting Industry, 1997:2). The Electrical Industries Training Board is accredited as a Training Board in terms of the Manpower Training Act 1981 (Department of Manpower, 1981). The following are some of the objectives of the Board:

- to assume responsibility for the education and training needs of the industry with a view of improving the quality, efficiency and productivity of the work force to;
- to identify training needs;

- to establish education and training criteria and competency standards;
- to develop a system of assessment and quality management for the industry (Electrical Contractors' Association, 1996:12).

The scope of the electrical construction industry refers to the joint enterprise in which employers and employees are associated for the purpose of design, preparation (other than manufacturing for sale) and the erection of electrical installations. Such installations form an integral and permanent part of buildings, as well as the repair and/or maintenance of the installations, including the cable jointing or electrical wiring associated therewith. It however, excludes the repair and/or maintenance and or installation of lifts and escalators in buildings (Bargaining Council for the Electrical Contracting Industry, 1997:12).

The next section will deal specifically with the ECA's mission statement and the vital services it provides for its members.

2.2 THE ECA (SA): MISSION AND SERVICES

2.2.1 Mission statement

The ECA promotes and creates an environment conducive to the profitability and efficient operation of electrical construction businesses, to the benefit of both their members and their clients.

2.2.2 ECA (SA) services

The ECA (of SA) provides a wide range of essential services to association members daily, from technical advice to practical assistance. The following is a breakdown of such services (Electrical Contractor, 1996:19):

➤ Advisory services

New products and technology, interpretation of industrial legislation and regulations, application of the code of practice for the wiring of premises.

➤ **Contractual services**

Secured payment and trust fund systems, negotiations for improved contractual documentation, tendering conditions, arbitration and contractor disputes.

➤ **Labour consultancy**

Conditions of employment, arbitrates in labour disputes, advice on labour matters, labour law and regulations.

➤ **Education and training**

Apprentice training scheme, self-improvement schemes, career path development and management of education and training.

➤ **Legislative representation**

Authoritative spokesperson for the industry and is responsible for liaison and co-operation with state departments, national electricity generator, bargaining councils and large employer bodies.

➤ **Marketing and publicity**

Pro-active marketing through the association intensely promote interest of the electrical construction industry with regard to public awareness, improving the image of electrical contractors and providing an industrial communication service by means of a commercial magazine.

➤ **Special services**

The association offers special benefits to contractors, which includes guarantee of work scheme offering cover to a value of ten thousand rand, insurance, medical aid and pension fund.

The education and training mission of the ECA will be explored in the next paragraph.

2.3 ECA (SA): EDUCATION AND TRAINING MISSION

As stated in the ECA training prospectus (1996:5), the ECA shall strive to:

- make education and training accessible to all;

- create an environment conducive to the upliftment of the work force of South Africa;
- be fully aware of and accommodating towards the development needs of individuals and industry;
- enhance excellence in the quality and standard of education and training to meet national and international standards;
- create a productive work force;
- retain skills within the industry;
- ensure the portability of skills; and
- operate a labour pool system.

The ECA has had to establish infrastructure throughout the country, in order to provide a service at a national basis and across various employment categories. The training system of the ECA and features thereof will be discussed next.

2.4 TRAINING WITHIN THE ELECTRICAL CONSTRUCTION INDUSTRY

The training centres of the ECA (SA), as presently structured, came about as a result of the introduction of the Competence-Based Modular Training (CBMT) system and the advent of the Electrical Contracting Industries Training Board (Department of Labour 1994:6).

The ECA boast three established and accredited training centres in three major centres: Johannesburg, Cape Town and Port Elizabeth. In other areas, the services of various recognised accredited training institutions are utilised. All the training facilities and their training staff are fully accredited by the Electrical Contracting Industries Training Board.

In addition to the training of the required skills for the designated discipline, Electrician Construction (under the auspices of the Electrical Contracting Industries Training Board), the ECA offers courses in non-designated disciplines to support the government's Reconstruction and Development Programme, and more specifically, RDP projects. All the training is Competency-Based Modular Training (CBMT) and allows for multiple entry and exit points. This implies that a candidate can enter or leave the training programme at any stage. It should

however, be understood that in order to obtain a qualification, the full course has to be completed and all relevant tests should be passed (Electrical Contractors' Association, 1996:3).

The Electrical Contractors' Association also offers special technical courses for qualified personnel wishing to improve their technical skills or educate themselves in business management courses, culminating in a diploma in Electrical Construction Management (Dip.ECM). Further to their training commitments, the ECA is responsible for assessing candidates wishing to enter the industry and conducts competency trade tests (Electrician Construction) for the industry on behalf of the ECITB.

Due to its flexible and progressive approach to training, the Electrical Contractors' Association is able to design courses to meet any need of the industry. A career path was developed to create opportunities for employees to progress from the lowest skills level in the industry to the highest level. The career path options of the ECA will be discussed in the following paragraph.

2.5 CAREER PATH OPTIONS (CPO)

Figure 2.1 represents a flow diagram of the career path options in the Bargaining Council for the electrical contracting industry culminating, in nationally accepted electrical qualifications. The career path covers training from a labourer to a master installation electrician. All the routes are based on the CBMT system, which allows candidates to enter or exit the system at the level of their own competence.

The career path options are flexibly designed so that a candidate can achieve qualified status by following routes which best suit his/her trainee's circumstances and abilities. Notwithstanding the fact that most trainees meet certain requirements through work experience, the ECITB determines the competence and proficiency of any candidate by means of an assessment opportunity (a test), before she/he embarks on the career path.

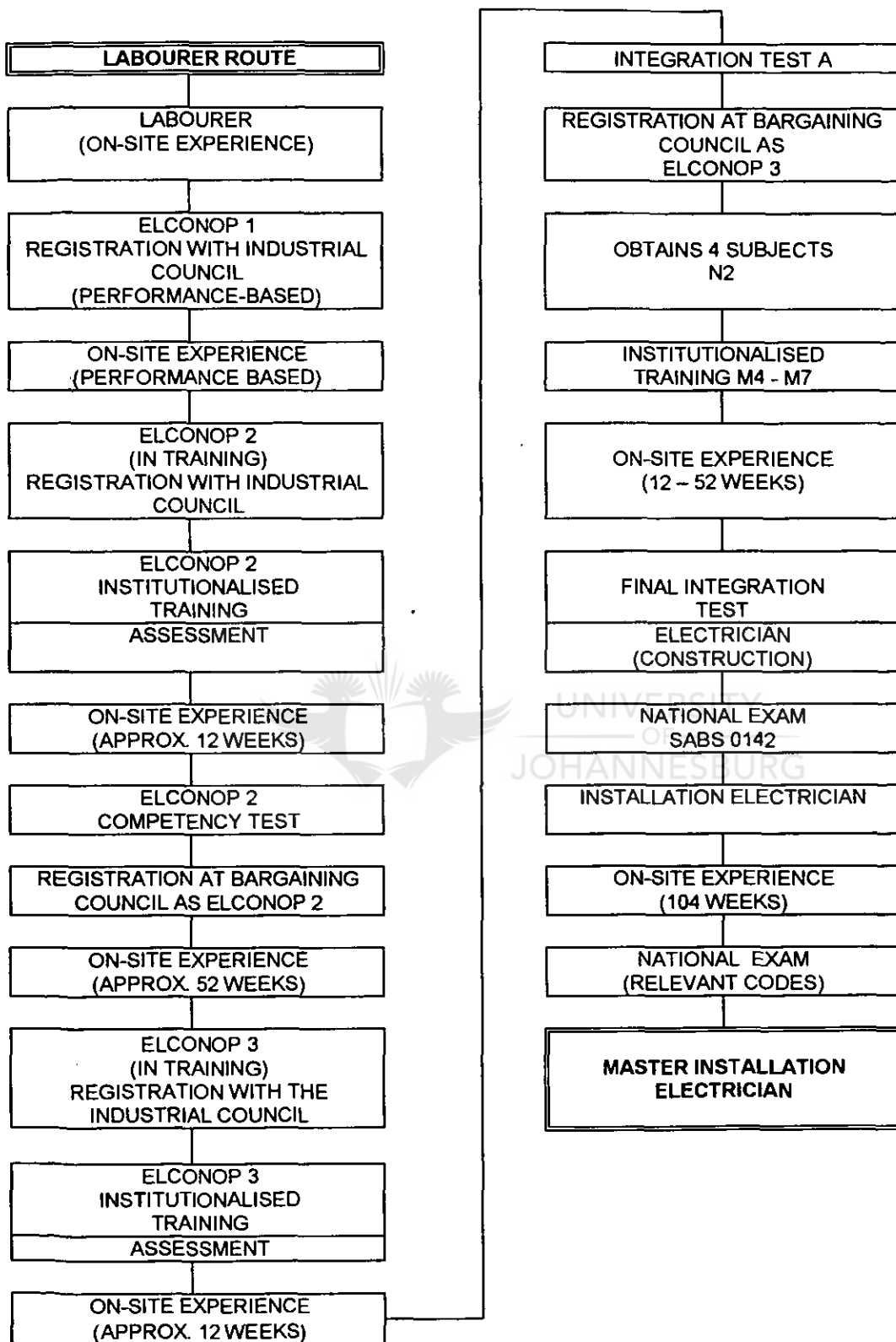


Figure 2.1: ECITB Career Path Options (Labourer to Master Installation Electrician)

2.6 WHAT CONSTITUTES AN INTEGRATED APPROACH TO EDUCATION AND TRAINING?

The Electrical Contracting Industries Training Board does not address or make provision for basic education. During institutionalised training, specific theoretical knowledge is dealt with while the emphasis of the training is on skills. Competence can be demonstrated by means of a practical assessment.

The foundation of any skills strategy is basic education. This lays the basis for all future learning, inculcated in the values and skills needed for active participation in social and political life, and enhances generic capabilities such as language, communication and problem solving skills (Department of Labour, 1996:12). Competencies to help develop electrical construction operators in a range of personal capabilities, that will equip them to fulfil a variety of life-roles in a rapidly changing world, is needed. The "gap" between fundamental (language and mathematics) and specific skills (theory and practice) needs to be addressed through the integration of education and training.

It is generally accepted that there is a close connection between education and training, as well as that education forms the basis of training (Haasbroek, 1988:18). However, all too often education and training systems map out career paths on a once-off basis. There is too much rigidity and compartmentalisation of education and training systems and not sufficient bridges or possibilities to accommodate new trends in lifelong learning (Department of Education, 1995:74).

The following observations concerning the provision of educational programmes organised by industrial employers, are made by Dekker and Lemmer (1993:291):

- Because the educational planning has been determined by short term returns and economic thinking, the result has been to attend mainly to the absolute developmental needs necessary for the personnel.

- Companies concerned themselves primarily with training affecting production, thereby increasing the prevailing educational inequality in societies.
- Company specific training, narrow in scope, does not contribute to the overall occupational development.
- Limited adult education satisfy their own short term needs through fragmented training of short duration which is of little value and makes no contribution to lifelong development.

A national human resource development and capacity building strategy should aim at building scientific, technological and managerial abilities and capacities at individual, institutional and community levels. The key enabling mechanism for such an approach is the National Qualifications Framework (Department of Education, 1996:70). One of the objectives of the National Qualifications Framework (NQF) is to create an integrated national framework for learning achievements.

A study of national and international trends with reference to the integration of education and training, in order to establish an integrated approach for the electrical construction industry is needed. The remainder of this chapter will deal with national and international trends in the integration of education and training.

2.7 DEVELOPMENTS IN SOUTH AFRICA REGARDING THE INTEGRATION OF EDUCATION AND TRAINING

In April 1994, a task team made up of members of the National Training Board, business, labour, the state and providers of education and training was established. A discussion document, called *A National Training Strategy Initiative*, was also developed. It included proposals on how to close the gap between education and training and recommended a NQF for South Africa. The document emphasised that a human resources development system should reflect an integrated approach to education and training to meet the economic and social needs of the country and the development of individuals (Education information centre, 1996:6).

According to the Department of Education (1995:15), an integrated approach implies a view on learning, which rejects a rigid division between academic and applied knowledge, theory and practice, knowledge and skills, head and hand. Such divisions have characterised the origination of curricula and the distribution of educational opportunities in many countries of the world, including South Africa.

An integrated approach to education and training in South Africa will link one level of learning to another and enable successful learners to progress to higher levels, without restriction from any starting point in the education and training system (Department of Education, 1995:26).

The national task team responsible for the National Training Strategy Initiative clarified the concept of an integrated approach to education and training into a single system. A system that will demand a paradigm shift from thinking about education and training as separate entities, each with their own unconnected justification for existence, to thinking about "learning" as a lifelong process and the breaking down of barriers that separate education and training (National Training Board, 1994:91-93).

Van den Berg (1991:9) called for synergy between education and training systems. A broad training and education partnership embracing the State, employers, employees and trade unions, could assist such a process significantly. Training boards could be enhanced to include an education component, in order to link education and training systems. More emphasis is being placed on outcome-based and skills-based training.

The perception of education and training not being linked needed to be altered. Education and training have been separated both by the way they are organised and by the way society thinks about them. Academic study is generally perceived to be more valuable than training for useful occupations. This thinking has led to

the formation of the NQF. It is envisaged that the NQF will prevent learners from being locked into learning compartments (Gerber, et al. 1998:422).

The NQF will regulate education and training and ensure that an assessment of education and training will be outcomes-based. Assessment of skills will, for example, take place in the work place (Department of Education, 1997:47-48).

This approach will provide opportunities for lifelong learning. Formal qualifications and training through informal institutions, work-based learning and life-experience will be recognised. A credit system will give formal recognition to any form of prior learning. An integrated approach should integrate education (the obtaining of knowledge) with training (the obtaining of skills). Acquired knowledge and skills may qualify employees for entry into further education and training levels.

At present, the South African education system is mostly based on lecturing, with little application in the work place. Assessment in the present system is based on summative assessments and in many instances, learners are required to repeat what was learned in the classroom, once again with little practical application.

It is necessary to examine education and training policies and practices with regard to their integration, in a number of countries.

2.8 GENERAL INTERNATIONAL TRENDS REGARDING THE INTEGRATION OF EDUCATION AND TRAINING

According to surveys done on national education policies, virtually all countries, particularly those in Western Europe, are questioning their current systems of education and training. As the need for a better educated and trained work force increased, most countries are placing increased emphasis on improving education and training programmes. The Inter-Ministerial Task Team (1996:25) summarises the main global changes and their influence on education and training systems as follows:

- The convergence of education and training (or more generally of academic and vocational learning). This is a consequence of the increasingly short life-span of specific occupational skills and the need for all to develop generic capabilities such as “learning how to learn” and the ability to transfer knowledge and skills between contexts.
- The gradual reduction of the extent to which learning is the monopoly of schools, colleges and universities as it becomes a feature in all contexts, in work and in the community as well as in formal education, and at every stage of life, not only the first 25 years.

Increasingly, people need to be able to gain recognition for "learning" and experience, wherever or whatever it has taken place. This resulted in many countries seeking ways of separating the assessment of learning from attendance at specific institutions or participation in specific study programmes.

Education and training systems in some countries will be discussed in the following sub-paragraphs.

2.8.1 The Netherlands

A large-scale re-organisation of the educational system involving secondary vocational education, the apprenticeship system, part-time non-formal education for young people and adult education, is currently underway in the Netherlands (CEDEFOP: 1996:6). A new system has been introduced in which the whole education and training system will be organised on a regional basis through the following types of subsystems:

- secondary vocational education and training;
- apprenticeship schemes;
- further education for adults;
- basic education for adults; and
- formative education for adults.

The Dutch system does not distinguish between the terms “electrical and electronics” in the same way as the South African system. From a training and development viewpoint, they focus on a single trade described by the term “elektrotechnisch”. Electricians are trained in two ways. The first system is called an Apprenticeship System. Students are released for education and training on a daily basis. The second system is referred to as a Trainee System, where students are released on a full-time basis. The amount of practical training for both routes is stipulated. The apprentice might have covered 60% of the required study time in the form of practical training while the trainee might have covered between 20% and 60%. Direct teaching times are also specified at no less than 10% of the total study time for both categories. Time is also allowed for external validation and moderation (National Electrotechnical Training Organisation, 1997:40).

In the Netherlands, education and training are integrated insofar as trainees attend direct teaching classes as well as practical training on a daily basis. Table 2.1 indicates four electrical and electronic levels, gradually increasing in complexity, existing in the Netherlands.

Table 2.1: Electrical and electronic qualifications in the Netherlands

Level (Levels increase in complexity)	Number of qualifications available	Examples of subjects covered for Electrotechnisch
1	5	Low voltage networks, building work, aircraft installations, electro-technical assembly, electronics component mounting
2	14	Low voltage networks, high voltage installations, power installations, instrumentation, panels, winding, appliances, electronics, and communications.
3	13	Low voltage networks, high voltage installations, instrumentation, panels/ winding, appliances, electronics, and communications.
4	18	High voltage installations, communication systems and Information Technology

A number of qualifications are available at each level. These qualifications culminate in high voltage, communication systems or information technology technicians.

2.8.2 Australia

In March 1996, the Federal Government introduced the Modern Australian Apprenticeship and Traineeship System (MAATS). It replaced the Australian Vocational Training System (AVTS) (Department of Employment, Education, Training and Youth Affairs, 1997:5). AVTS was a national training system, which combined education, training and structured work experience. Training focused on “outputs-based” industry-developed competency standards, which were endorsed nationally. This implied that trainees achieved core competencies such as communication, planning and organising, problem solving and vocational competencies required to perform to the working standards expected by industry. Competencies were measured against national industry competency standards, recognised by the Australian Standards and Curriculum Council.

In Australia, two training systems are available namely an apprenticeship and a traineeship system (MAATS) respectively. The system (MAATS) is administered under the Industrial and Commercial Training Act of 1989 (Department of Employment, Education, Training and Youth Affairs, 1997:6). Most apprenticeships take four years to complete, while college courses usually take three years part-time study to complete. Within the competency-based training system, apprenticeships and traineeships are required to complete training on the basis of demonstrating skills achievement. Apprenticeships and traineeships are work-based training programmes that combine on-the-job training and institutionalised formal training, which can be completed at Technical and Further Education Institutes (TAFE). A combination of the institutionalised and on-the-job training leads to a nationally recognised qualification. Trainees learn basic skills and achieve competencies that relate directly to the industry where they work. There are four skills levels for trainees. At the end of the traineeship period,

trainees receive an Australian Qualifications Framework certificate, 1 to 4, depending on their level of traineeship.

The key aspects of MAATS are:

- an increased emphasis on work place-based training;
- less emphasis on centralised regulation;
- greater flexibility in terms of work/training mix;
- an emphasis on ensuring the provision of quality training; and
- user choice and flexible instruction.

In order to obtain the electrician construction qualification, a pre-employment qualification and electrician's qualification (Certificate III in Electrical (Electrician)) is needed. The pre-employment course is taken full-time and allows trainees to apply for an electrical apprenticeship. The majority of employers seek applicants with this qualification. The electrician course is designed to provide the student with the job skills and required training to qualify as an "A Grade" electrician. The method of instruction is block or day release while it includes subjects such as: electrical theory, safety, regulatory knowledge and communication skills with practical work-based experience. Entry requirements are high marks in Mathematics, Science and English at year 10 level. The electrical construction course is a mixed course that is part-time attendance in the evenings and an individually assessed project. Subjects include: electrical requirements, establishing a Construction business, general legislative requirements and reticulation, protection and metering (Technical and Further Education Institute, 1998: 2-6).

The skills and attitudes required from an apprentice or electrical trainee include: handling skills (practical by nature), good at problem solving (thinking skills), reliable, willing to study, enthusiastic, punctual and safety conscious.

Knowledge and skills are divided into individual learning units called unit standards. These were developed from input by the Electro-Technology Industry Training Organisation (ETITO) and industry. Unit standards are assessed by a

mixture of on-the-job and off-the-job methods that benefit both the employer and trainee. Off-the-job unit standards are assessed within the training institution where the apprentices or trainees are studying. These unit standards are often representing the theoretical part of the qualification. Assessment methods such as building a circuit, identifying used components and discussing their functions are used to determine whether a trainee has mastered the required knowledge and skills. Written assignments, tests or a combination thereof are also used to establish competence (Electro-Technology Industry Training Organisation, 1997: 8).

The employer or an external assessor assesses on-the-job (in the work place) unit standards. After initial training, practical work needs to be assessed, as the trainee skills and acquires experience. During normal work tasks, the employer is able to check whether the apprentice is competent in the skills and knowledge stipulated in the unit standard.

Australia has a national training system, which combines knowledge, skills and structured work experience for apprentices and trainees. The training system (MAATS) allows for work based training programmes and flexibility in terms of the work and training mix. Formal training is done at the TAFE or technical institute.

2.8.3 The United Kingdom

The distinction between educational and vocational training has been quite distinct in Britain, where vocational training has been regarded as a substantially inferior preparatory phase to academic education (Esland, 1991:67).

Until 1964, the state has been responsible for providing general education while business/industry had the sole responsibility for preparing its own work force. The 1964, legislation supported a new view on the role of employers in the education and training of the youth. Legislation has increasingly drawn the state into the training field while business has concerned itself with the quality and structure of

schooling. This has led to employer and union involvement in schooling (Esland, 1991:68).

In the course of developments over the past decade, the traditional separation of general academic education and vocational training has narrowed. The first year of training is usually done away from the work place at a college or training centre. The remaining years allow for in-service training to alternate with day or block release courses. An apprenticeship is considered to be concluded after its completion within a required period of time. Examinations can be written, but are not compulsory (Van Rooyen, 1988:19). Apprentices attend colleges within the system of further education. Modular training systems consist of two components. The first is off-the-job training in approved industry training centres and the second mainly on-the-job training.

The on-the-job training is organised in two stages. The first stage is known as basic engineering training. It serves as a link between school and industry. Its purpose is to create a firm foundation on which a variety of specialist craft skills can be based. The second stage is on-the-job training under real working conditions. The training may be conducted partially at the institution.

A modern apprenticeship system has been designed to meet the needs of the employers and to provide young people with training towards a nationally recognised qualification. Entrants to the scheme will normally be between the ages of 16 to 17 years. The modern apprenticeship system is flexible and capable of being provided by means of various methods. It is not time-based, but occurs at a pace appropriate to the apprentice's learning capabilities. Apprentices are released from the work place to attend off-the-job training, which can be provided by a college, university or appropriate training centre.

Formal vocational training is provided by/at approved facilities such as companies, groups of co-operating companies, or a college of further education. Work place skills development is provided in the work place and where appropriate supplemented by integrated periods of off-the-job training. Vocational

education is provided in an approved centre, which may be the same centre providing the vocational training aspect of the programme, or at a facility, such as a college of further education.

In a number of instances, the Youth Training Scheme (YTS) has replaced the apprenticeship system. It has now been established as a permanent part of vocational training and education and makes provision for 16 to 17 year old entrants. The main objective is to provide a foundation for broad-based vocational education, training and planned work experience. It also offers a guarantee of up to two years vocational training for all young people not in employment or involved in full-time education, and it provides broad-based vocational training both on-the-job and off-the-job, as well as planned work experience towards a qualification equivalent to NVQ, level 2 (CEDEFOP, 1998:7).

Three stages are needed to achieve artisan status in the technical services, namely foundation, intermediate and advanced training. Core skills are determined by the National Council for Vocational Qualifications (NCVQ) and include communication, information technology, personal skills (improving own learning and performance), personal skills (working with others) and problem solving (Rotherham, 1999:4).

Foundation training takes place off-the-job while the duration depends on the apprentice's level of knowledge, skill and experience upon entry to the scheme. The integration of training, education and skills development should take the form most appropriate to the circumstances of the employer taking into account the needs of the trainee and the availability of the local training provision. The foundation phase is compulsory and encompasses an intensive period of induction, grounding of the industry, understanding the company and the development of essential skills required for the job. The intermediate phase is largely work-based.

Formal vocational education may be provided at any suitable facility and in a way that meets the needs of the apprentice as well as the employer. A mentor is

assigned to each apprentice to maintain a watchful eye and to facilitate continuity during the apprenticeship. Mandatory units of learning include: installation requirements, audit of installations, commissioning, diagnosis, fault finding and testing of the installed systems. Core skills units include: communication, teamwork, improvement of own learning, information technology, and problem solving.

The advanced stage builds on the successful completion of the previous stages and includes additional skills, knowledge and the understanding needed to carry out complex activities, planning, organisation, control and assessment of operational activities, and the maintenance of a safe work environment within given areas of responsibility.

Employers invest in employee development to achieve industrial success. Although the social partners have played no formal role for since 1988, the main employers' organisation, the Confederation of British industry, has had a major influence on many of the changes since then (CEDEFOP, 1998:2).

During the past decade, attempts to integrate education and training through systems such as the Youth Training Scheme, modern apprenticeship system and National Vocational Qualifications (NVQ's), has been successful in closing the skills gap between education and training.

2.8.4 Germany

As stated in Esland (1991:76), the long-standing and highly regulated participation of business/industry in training has been an outstanding feature of the German system. This system reaches the majority of the population and is rated highly. Clearly defined roles and responsibilities on the part of the national government, specification of training content, standards determined by federal agencies, provision, supervision, assessment and enforcement of regulations by regional and local employers and work boards, have all contributed to the success of the system.

According to Haasbroek (1991a:3), general training of apprentices can either be totally institutionalised or the institutional part can be done in tandem with on-the-job training. This is normally referred to as the dual system, which implies a combination of school-based and work place training. This system allows students to be trained on-the-job three to four days per week.

The dual system involves an apprenticeship that takes from two to three and-a-half years to complete. The rest of the week can be spent part-time at a full-time vocational school (*Berufsschule*). At the *Berufsschule*, students receive additional academic instruction, appropriate to their chosen field. These schools provide courses ranging from one to three years, culminating in a trade qualification (Van Rooyen, 1988:35).

Vocational training schools provide continuation courses on the basis of already received training received and the opportunity to extend general education. It also makes provision for specialised trade testing. In the electrical field, training starts with a general one-year training course. The basic training covers the full spectrum of metal allied trades. This is followed by a six months training programme, specialising in electrical training. A further six months are devoted to specific occupational training. The apprentice spends the remaining 18 months preparing for the electrical trade. The full-time vocational school (*Volkzeitberufsschule*) provides courses on the basis of training received within the dual system. They provide the opportunity to extend general education and make provision for specialised trade testing.

In Germany, adult education provision is associated with the *Volkshochschule*. Programmes presented at such an institution include long-term formal courses, which lead to organised examinations on federal level, courses with regard to life-skills, computer literacy, vocational-orientated or literacy programmes (Dekker & Lemmer, 1993:314).

Both Britain and Germany compete in highly competitive world markets. These countries declare that the ability and skills of their people are key aspects in there

attempt to maintain their competitive edge. There is a close link between educational systems and occupational training. On completion of secondary schooling, various forms of trade training are available parallel to general education (Van Rooyen, 1988:23).

2.8.5 France

France has had a strongly developed system of vocational training within the regular school system, alongside a relatively limited system of apprenticeship training. The Ministry of Education allowed the employers' groups to be involved in establishing the curricular outlines and content of the vocational preparation, but they were excluded from participation in school-based training as well as involvement in academic education in the schools (Esland, 1991:74).

This exclusionary policy has been greatly modified in recent years, with a good deal of central government encouragement for business/industry to offer teachers and students information, counseling, work experience, tools, material and opportunities for collaboration on specific products and projects.

In France, it is not practice to lump together the provision of initial training (school pupils) and continuing training (employees or those seeking employment) under one heading, vocational training. There has always been a division between the two, despite the development of alternative training systems and debate on the recognition of the work place as a place of training.

As a result the reforms initiated over the past few years, it is reasonable to expect that in the near future the two disjointed systems may disappear and that channels and resources may be defined in the light of shared objectives. This prospect will result in one of the greatest challenges of the 1990s: to bring initial and continuing training closer together (CEDEFOP, 1994:7). The boundaries between education and training seem to disappear. Skills offered by training systems or required by professionals increasingly make reference to educational

values linked to behavioural and relational knowledge in particular, whereas educational systems tend to be occupation centered.

In France, trainees are entitled to receive three (3) to four (4) days on-the-job training within a company. One (1) or two (2) days are spent at a college or training centre where the trainee can acquire the theoretical knowledge to reinforce practical on-the-job training (Haasbroek, 1991b:7).

2.8.6 Synthesis: Integration of education and training (an integrated perspective)

In none of the countries studied was integration achieved organisationally by formal legal links between education and training. Australia has established a national qualifications framework while the United Kingdom has one pertaining to vocational qualifications intended to make vocational subjects acceptable alongside academic qualifications. Curriculum linkage is achieved in a similar manner with the business and trade unions assisting in setting curricula.

The relative importance of the different education and training systems in the various countries is difficult to compare, mainly due to the different definitions of apprenticeships that are in use. However, it is clear that the traditional approaches in most countries no longer satisfy the demands of modern times. The reason for this is that there is general consensus among employers, workers and governments that all people should have possess occupational qualifications, irrespective of the present and future person power demands and supply considerations. Technological changes have resulted in a balance between general and theoretical training on the one hand and practical training on the other hand, which eventuated in the development of new approaches to training (Van Rooyen, 1988:26)

The contents of training and the training standards are derived from the industry needs and are expressed in terms of knowledge, skills and attitudes. Training is

based on the underlying theory, problem solving and achievement in the understanding of high inherent standards of the profession.

A general international tendency is to arrange training programmes in such a way that they become applicable to a group of occupations (National Training Board, 1994:21). Although the concept of integration is not mentioned in most countries, their education and training systems are mostly based on a combination of education, practical and work experience in the development of workers.

The South African education and training system for the development of skilled workers is very similar to most international countries. In the South African system, trainees are released on a block system to undergo technical college training. The weakness of the system is that it is *time-based* rather than *competency-based*. Competency Based Modular Training (CBMT) focuses on actual accomplishment. CBMT focuses on the ability of the learner to master a specific skill (Gerber, Nel & Van Dyk, 1987:460): Increasing the trainee's ability *to do the task*. The underlying philosophy of CBMT is that the knowledge, skills and attitudes acquired during the training should be considered as learning tasks that will enable the learner to do his/her job competently. This will result in producing high quality results in a cost effective and time effective manner. A competent worker is one who can produce a worthy product or service without excessive cost in time or activity.

South Africa stands on the brink of implementing a new education and training system. Greater co-operation is expected between education and training, in order to equip South Africans with relevant and market-orientated skills and knowledge.

2.9 CONCLUSION

This chapter dealt with the mission of the Electrical Contractors' Association, its services as well as education and training policies.

A national and international view on an integrated approach to education and training was studied. Traditional thoughts were that education and vocational training were to remain separate. Esland (1991:84) asked whether we are witnessing, or perhaps even assisting in a shift in the way on which institutional learning is embarking with reference to education and training. The need for practical relevance is urged. There is a definite movement towards expanding provision of technical and vocational education initiatives and a need for competence in information technology, especially in the electrical engineering field where this technology is utilised for the operation and control of manufacturing and production processes.

More recent thoughts are to narrow the gap between general education and vocational training. Teachers and trainers are developing new and innovative approaches both inside and outside the educational system. Innovative methods are also emerging for adult education, where courses offer exercises and approaches that will transform the context of traditional continuing training by seeking to adapt behavioural patterns rather than abstract knowledge (Department of Education, 1995:44).

An integrated approach to education and training, linked to the development of a new NQF, based on a system of credits for learning outcomes achieved, will encourage creative curriculum design and will enhance the recognition of learning attainments wherever education and training are offered (Department of Education, 1995:15).

The next chapter will be dealing with the research design and in particular with the research instrument and empirical research. The purpose of the empirical study will be to analyse the current education and training systems in the Electrical Construction Industry in order to devise proposed guidelines for a framework to establish an integrated education and training approach.

CHAPTER 3

THE RESEARCH DESIGN, RESEARCH INSTRUMENT AND EMPIRICAL INVESTIGATION

3.1 INTRODUCTION

The literature study carried out in chapter two formed the framework for the empirical investigation. With reference to the integration of education and training international and national trends were highlighted, which served as a basis for the development of the research design.

The focus of this chapter will be the research design, conducted through a descriptive case study.

3.2 THE RESEARCH DESIGN: DESCRIPTIVE CASE STUDY

3.2.1 Rationale for the case study

In all industrialised societies tension exist between the systems inherited from the past, the functions they fulfilled and new demands for skills and knowledge (Inter-Ministerial Working Group, 1996:25). From the researched literature, it appears that some developed countries have an integrated education and training system in place. According to BMI Issues Management (1996:76), there is an integration of a well-developed education system that combines formal schooling, learning and subsequently out of school training in such developed countries. Training boards are often used to optimise this integration.

There seems to be a clear need for an approach to make education and training more flexible, efficient and accessible in the electrical construction industry. The answer will be integrated education and training into a single, coherent and unified approach.

3.2.2 Research objective

The overarching objective of this empirical investigation is to determine the nature of, reasons for and possible proposals to "close" the education and training "gap" at Elconop, Level 1, in the electrical construction industry.

The existing education and training systems should be assessed before the development of an integrated framework can be initiated. Obtaining this information is in fact the aim of the case study.

3.2.3 Typifying of the research design

The research design for this study can be typified as descriptive, contextual and qualitative.

(1) Descriptive

The research design is descriptive and aims to determine options, attitudes, preferences and perceptions of persons within the electrical construction industry. According to Borg and Gall (1993:218), descriptive research, as its name implies, aims to describe the characteristics of the phenomenon being studied.

In this study, descriptive research was used to develop a basis for the way in which various education and training providers integrate education and training for skilled and semi-skilled workers in the electrical construction industry.

(2) Contextual

The research design is contextual. Mouton and Marais (1992:52) state that a typical study using contextual principles, aim at making a "description and declaration of the particular phenomenon, event or group". This case study will thus concentrate on identifying the perceived "gap" between education and

training in the electrical construction industry and provide a description of the findings, while declaring the perceived reasons for the phenomenon.

(3) Qualitative

A qualitative approach is being followed, as Lancy (1993:3) indicates "topic, theory, and methodology are usually closely interrelated in qualitative research". Qualitative research is associated with interpretative approaches from respondents. This study will focus primarily on the various education and training providers and training boards associated with the Electrical Construction Industry. Their various views will be explored rather than measuring their discrete, observable behaviour.

A qualitative approach will be followed to allow the researcher to develop an overall picture of how the respondents interpret and cope with the integration of education of training within their daily structures.

The research format in terms of the validity, reliability and objectivity will be discussed next.

3.3 TYPIFYING THE RESEARCH FORMAT

Case studies focus on phenomena by studying a single feature of the phenomenon in its total context (Borg & Gall, 1993:203).

A descriptive case study (consisting of various elements in order to obtain information from respondents) will be used to assess the current education and training systems used by industry training boards for semi-skilled workers within the electrical construction industry (with reference to an integrated approach).

The criteria developed in the quantitative methodology (as an answer to the specific nature of research questions) are: internal validity, external validity, reliability and objectivity.

Due to the specific meaning attached to the structures of a qualitative methodology, Lincoln and Guba (1985:290) propose four alternative structures appropriate for qualitative methodology. These are credibility, transferability, dependability and confirmability.

3.3.1 Validity and transferability

Halpin and Troyona (1994:163) state that validity can be crudely defined as the context to which the data we collect, relates and can answer the research questions asked. Validity of data collection addresses the question of whether a data collection process is really measuring what it purports to be measuring (Vockell & Asher, 1995:99), while Silverman (1994:149) states that validity means truth: interpreted as to what extent an account accurately represents the social phenomena to which it refers.

Generalisation within the quantitative methodology depends on the nature and manner of the representative statistical sample. Qualitative methodology does not allow for statistical generalisation, but allows for transferability, due to the nature of the research. The degree of transferability depends on the degree of understanding between the context described in the research and the understood received context. The possibility for transferability is situated in the holistic nature of the qualitative description.

Lincoln and Guba (1985:290 and further) alluded to the fact that researchers should ask the following four criterion questions, in order to establish the validity of the research in the qualitative domain:

- **Internal validity:** What is the true value of the findings of the research?
- **External validity:** How appropriate are the findings in other situations or with other groups of people?
- **Dependability:** How do we determine if the findings will be replicated if the same study (or a similar study) using the same respondents in the same context (or similar context) is used?

- **Confirmability:** How do we determine if the findings were ascertained by the researcher and not through the researcher's judgement, interest and views?

In this study the dependability (construct), confirmability and validity (internal validity referring to the observation during the interviews and external validity primarily concerned with the integrated approach theory) will build on one another. This means that the questions of each validity type presupposed an affirmative answer to the previous one. The construct will establish if there is a relationship between the cause and effect (the idea of an integrated approach an approach as what it should look like ideally). The internal validity will determine the nature of the relationship, while the dependability phase will establish if any generalisation is possible. The external validity will allow for the generalisation of the integrated approach to other, persons, places and times or to what degree the conclusions of this study will hold for other persons in other places and at other times.

3.3.2 Reliability

Lancy (1993:17) states that one's goal should be to obtain information, but also to remove any constraints from the interviewee's responses so that their conceptualisation of the phenomena emerges rather than having them fit their views into the investigator's framework which indicates consistency of the instrument. Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or by the same observers on different occasions (Silverman, 1994:145).

Yin (1989:1) emphasised three strategies to ensure the reliability within the case study format of the research. These strategies include the following:

- use of various sources;
- establishment of a chain of evidence; and
- examination of the concept report by one of the respondents involved in the research.

The following is a description of how this study addressed the three strategies:

- A variation of sources were used in this study, namely a research overview which was used to form the basis for the establishment of a framework for the integration of education and training in the electrical construction industry, as well as individual interviews with various stakeholders.
- The establishment of a chain of evidence (with reference to argumentation) was achieved through the use of an objective external researcher.
- The concept report was examined by the Chairman of the Electrical Contraction Industries Training Board.

An important aspect of the reliability measure (with reference to individual interviews) is that the research will be non-directive and no leading questions will be asked. The researcher will only encourage participation and request clarification of certain issues.

3.3.3 Objectivity

Replicating of the findings is not necessarily applied in qualitative research (as compared to quantitative research). Qualitative research is predicted on the assumption that each individual, culture and setting are unique (Borg & Gall, 1993:195). The researcher's purpose is to avoid controlling the research conditions, situational context and inter-relations as they occur. Objectivity of the qualitative study is encapsulated in the methodology that is utilised by the researcher (including the strategy for data collection and analysis) to explicitly state, justify, and utilise a chain of evidence. An additional objectivity measure is to make all collected data available to other researchers who would like to review its contents.

The following section will explore the measuring instrument and the course of the investigation.

3.4 MEASURING INSTRUMENT

The measuring instrument was a structured questionnaire used for conducting individual interviews. The questionnaire is attached (see Annexure A) to this study.

3.4.1 The design of the questionnaire

The questionnaire was formulated in a bid to obtain information on the perceptions and views of various stakeholders, in order to determine whether any structures or processes in integrating education and training exist.

The motivation for the questions was to establish if an integrated approach and/or structure for education and training, or provision for linkages between education, training, business and labour exist.

The questionnaire consisted of the following four sections:

3.4.1.1 Section 1: Situational analysis of the stakeholders

Education and training is closely related to the culture and environment of a specific economical sector. In order to establish the basic strategies and guidelines for education and training in the electrical construction industry, a situation analysis was done in section 1 of the questionnaire. The situation analysis dealt with the target group, nature and extent of the education and training, the various skills demands required, the role and involvement of the employers and the relationship between the education and training institutions in the electrical construction industry.

3.4.1.2 Section 2: Education and training needs assessment with respect to the Electrical Construction Industry

This section focuses on the priority of education and training in the electrical construction industry. The aim was to establish whether any form of integration between theoretical, practical and on-site training and the balance between thereof existed in the electrical construction industry. It further concentrated on the knowledge and skills component contained in the programmes used by the electrical construction industry and finally the methodology and delivery methods applied by the service providers in the electrical construction industry.

3.4.1.3 Section 3: Education and training assessment methods

Section 3 deals with assessment methods used by the various stakeholders. The purpose and types of assessment with regard to the trainees was investigated, for example the employer - (see paragraph 1.1), assesses the Elconop 1 on-site.

3.4.1.4 Section 4: General

This section extracted views with reference to the proposed legislation on education and training by the government.

3.5 THE COURSE OF THE INVESTIGATION

3.5.1 Literature overview

The literature overview for the study, which included international and national perspectives on the integration of education and training, was discussed (paragraph 2.7 - 2.8) and forms the theoretical basis for this study. The result obtained served as a basis for the formulation of a framework for the integration of education and training for the electrical construction industry, as well as the case study report.

3.5.2 Spontaneous sketch

A spontaneous sketch was used as a data collection method to gain insight into the views of the various stakeholders on the integration of education and training. The spontaneous sketch is a phenomenographical descriptive method, whereby a personal description is obtained from a respondent for the phenomenon being researched (Du Plessis, 1995:180).

All the stakeholders participated in the investigation voluntarily. The researcher acted as the convenor as well as the observer of the investigation for the study. An external researcher was used to record the answers of the respondents. Both researchers conducted the investigation and thus ensured direction with reference to the context and the course of the investigation, while remaining non-directive during the interviews.

3.5.3 Summary

The summary includes the highlights of the important facets of integrating education and training, as interpreted by the various stakeholders. A summary can be a useful method to assist with the focusing of thinking, while also enhancing conscious learning (Gravett, 1993:26).

3.6 RESPONDENTS

Respondents were selected from the various stakeholder groupings involved in education and training in the electrical construction industry. It was felt that the perceptions of the various levels of stakeholders involved in the industry should vary, and hence it was important to sample as wide a range as possible. Eleven interviews were conducted with respondents based in Gauteng, Bloemfontein, KwaZulu Natal, Port Elizabeth and Cape Town respectively. All respondents are currently either actively involved in education and training for the electrical industry, employed by the training board, union or employer organisation (ECA) or employers in the industry, and all serve on the various education and training

advisory committees of the industry training board. The respondents were all male of which 91% were white, while 9% were black. The ages of the respondents ranged from 30 to 66 years.

The following section describes respondents' perceptions of the current education and training system in the Electrical Construction Industry.

3.7 THE CURRENT EDUCATION AND TRAINING SYSTEM WITHIN THE ELECTRICAL CONSTRUCTION INDUSTRY: EMPIRICAL FINDINGS

The current system was assessed according to the information obtained from the questionnaire (see Annexure A), as discussed in paragraph 3.4.1. This section deals with a condensation of the obtained data. Du Plessis (1995:181) states that this phase is a condensation of the raw case data, which is organised, classified and edited into a manageable and accessible package.

3.7.1 Situational analysis of the stakeholders

(a) Question 1: The target group to be trained

- 1) The target group educated and/or trained in the electrical construction industry consisted of a structured work force including labourers, operators, apprentices, artisans, engineers and technicians.
- 2) The education and training systems extended from a formalised apprenticeship system, scheme for adults in terms of the current Manpower Training Act (registered with the Department of Labour) and in-service training for electrical construction operators, level 1 - 3.

(b) Question 2: Describe the nature and extent of your education and training programme.

- 1) It was said, *"the courses were basically skills-orientated with some general educational topics such as: life-skills, occupational health and safety and electrical trade theory, which was covered during institutionalised training sessions"*. The courses made no provision for basic education such as numeracy and literacy.

- 2) The training methods utilised for electrical construction operators were institutionalised training for two (2) weeks (off-the-job) and on-site training for the remainder of the year. This system was relatively cost-effective and allowed for flexibility among employers to develop their operators.

(c) Question 3: Explain the various skill demands required for operators/semi-skilled workers in terms of handling, technological, thinking, communication and interpersonal skills.

- 1) Handling skills did not require a great deal of thinking and applied mainly to the lower levels of the work force, as they are mainly repetitive and require mainly physical ability.
- 2) It was explained that, *“technological skills, knowledge, insight and ability to perform tasks specific to the individual's work, were very limited at the electrical construction operators' level”*.
- 3) Thinking skills required in the application of handling and technological skills, problem identification, problem solving and work planning (mental ability) was also limited to the operators.
- 4) Communication skills (written, verbal and non-verbal) were important, but are usually closely related to the type of output required from the employee.
- 5) The chairman stated that, *“interpersonal skills (relating to human/personal skills) were important as they formed the basis for further development”*.

(d) Question 4: Describe the employers' role and involvement in the education and training of the employees.

- 1) Most employers in the industry were committed to human resource planning in order to prevent problems and shortages of semi-skilled and skilled human resources, particularly in the medium and larger sized electrical companies.
- 2) It was said, *“the employers' role towards education and training was to encourage all employees to undergo basic education and training, further education and training or retraining”*. The employer had a responsibility to ensure that on-the-job education, training and development were maintained and improved.

- 3) Employers were involved through their own training facilities. They had all the necessary equipment to deal with all the aspects required in the ECITB training schedules and employed their own training staff.
- 4) Employers were further involved through a compulsory training levy that was paid to the Electrical Training and Development Fund (ETDF) monthly.
- 5) The Chairman stated that, *"employers had nominated senior staff to serve on the ECITB, technical colleges and government departments' education and training committees as well as on Electrical sub-fields Standard Generating Bodies (SGB's)"*.
- 6) It was imperative to integrate education and training to enhance learner mobility and progression, providing access to high quality education and training within the electrical construction industry. This will offer a wider range of learning options to a diverse range of learners, ranging from school-going youth to, out-of school youth, young adults and the larger adult population interested in the electrical industry.

(e) Question 5: How do you perceive the relationship between the educational and training institutions in the electrical construction industry?

- 1) The relationship between the education and training institutions and the electrical construction industry was fragmented and lacked co-ordination, due to the importance of the social, economic and human resources development needs of the industry. Widening participation, improving quality provision and the promotion of life-long learning needed to take place.

3.7.2 Education and training needs assessment with respect to the electrical construction industry

(a) Question 1: Please comment on the priority of education and training with reference to operators / semi-skilled employees in your sector.

- 1) The ECITB is embarking on the urgent establishment of new training systems which are responsive to the needs of the emerging sector, especially with regard to the provision of formal qualifications or credits towards a qualification at levels below that of artisan.

(b) Question 2: Please comment on the education and training objectives of the sector with reference to theoretical and practical provision.

- 1) The education and training objectives are to develop a successful education and training system that will provide diversified programmes, offering knowledge, skills, attitudes and values to individuals.
- 2) The training board recognises that structured on-the-job education and training and other alternatives to institutionalised training methods will be most beneficial for employers in terms of cost-efficiency and learning effectiveness.
- 3) It was explained that, *“small companies are least likely to invest in ABET courses, while large companies are most likely to run such courses”*.
- 4) The training board realises that more needs to be done to link ABET programmes to the skills context within which adults are learning.

(c) Question 3: Describe your perceptions/views of the balance between theoretical, practical and on-site training.

- 1) A balance between progressive education and training programmes, flexible labour practices and a sensitive wage/productivity relationship, needs to be negotiated with employers. Basic education as well as theoretical and practical training should be compulsory.
- 2) The relevant electrical trade theory is dealt with in tandem with the practical training during the institutionalised training session at electrical construction operator, level 1 (Apprentices are sent to technical colleges in addition to the off-the-job training received).
- 3) Training exclusively in an institutionalised centre is unacceptable, as trainees should practice their newly acquired knowledge and skills on-site.

(d) Question 4: Describe the knowledge and skill component contained in the education and training programmes.

- 1) The knowledge component contained in the education and training programmes is of vital importance, as semi-skilled and skilled workers undoubtedly make use of their knowledge, even when promoted to supervisory and middle management positions. Specific theoretical knowledge

applies especially if related to the work situation. The current Electrical Construction Operator, Level 1 course contains a 30% specific theoretical component.

- 2) It was said, *“skills components contained in the current Electrical Construction Operator, Level 1 course outweighs the knowledge component in many respects. Seventy percent of the course is dedicated to practical training (handling skills)”*.

(e) Question 5: Describe the education and training methodology applied by the educators or instructors (for example CRI, CBMT, education and training methodology and delivery methods).

- 1) On-the-job methods include mentoring, delegation, coaching, one-on-one instruction, Nellie and Fred, and GAFO (go away and find out).
- 2) Off-the-job training is based on the Competency Based Modular Training system for the transfer of knowledge and skills and includes the following instructional mechanisms: stand-up lecture type, group exercises, video's, visual aids and demonstrations.

3.7.3 Education and training assessment methods

(a) Question 1: Explain the importance if any of assessment methods in the sector.

- 1) The importance of assessment is to analyse how the trainee interprets and applies the information gained in various assessment practices during or after the programme.
- 2) Assessment practices utilised by the ECITB and accredited providers include written and oral assessment, observation of behaviour, and the ability to construct an electrical installation.

(b) Question 2: What is the purpose of assessment in the sector?

- 1) The purpose of the assessment is to obtain feedback about individual learners or groups during and after a course at an institution or on-site.

(c) Question 3: Comment on the assessment forms and methods utilised in the electrical construction industry (written tests or examinations, oral

examinations, observation of the learners behaviour, physical tasks, formative assessment and summative assessments).

- 1) Formative and summative assessments are applied throughout. Formative assessment is applied to assess progress during the programme as the training is based on CBMT (the trainee should demonstrate competence in each module before she/he is allowed to progress). Summative assessment is used at the end of the programme to measure integrated competence. The trainee should demonstrate that the various competencies achieved during the programme can be integrated to, for instance, complete a full electrical installation.

(d) Question 4: Are assessments done internally or externally (with the assistance of assessors and moderators) and elaborate on the practises used?

- 1) An internal assessment process is applied for electrical construction operators. Accredited service providers are entitled to assess operators, using their own staff. Apprentices are assessed at the Central Organisation for Trade Testing (COTT) or at ECITB accredited testing centres. Such assessments are externally examined and moderated, as the qualification obtained is a nationally recognised qualification. Both examiners and moderators are appointed by the training board.

3.7.4 General

(a) Question 1: Are you aware of the newly proposed legislative changes in education and training and if so what are your views with reference to these changes?

1. The sector is aware of and is involved to some extent in the development of unit standards that are applicable and relevant to the electrical industry. This development is in line with the requirements of the South African Qualifications Authority and the National Qualifications Framework. The ECITB is optimistic about the recent initiatives ranging across all spheres of education and training in South Africa, however, reservations exist in terms of deadlines for implementation.

3.7.5 A note of caution

For the purpose of this discussion, it is important to note that nationally and internationally numerous studies, have been conducted in the domain of integrating education and training. The above mentioned information should be interpreted cautiously, as circumstances are not static and should therefore be monitored periodically. Interpretations may also be affected by dynamics of the changing legislation in South Africa.

3.7.6 Conclusion regarding the findings

From the case study, it was evident that respondents from the electrical construction industry supported an integrated education and training system in one form or another and were involved in developing electrical unit standards under the auspices of the National Standards Body (NSB) and the South African Qualifications Authority (SAQA). A link between knowledge, skills and on-site training is well established, but the “gap” between basic education and training needs to be addressed in the electrical construction industry.

3.8 CONCLUSION

In this chapter, an overview was provided of the empirical investigation undertaken by means of a descriptive case study. The research design, which was descriptive, contextual and qualitative, was discussed.

The measuring instrument and course of investigation, which included a literature study, spontaneous sketch and summary, were explained. The design and the motivation for the questions were also discussed. The empirical investigation and findings were presented based, on a situational analysis, an education and training needs assessment, education and training assessment methods, and a general section.

In chapter 4, guidelines for an integrated education and training framework will be proposed. The literature and empirical findings will be tabulated with proposed guidelines for an integrated approach. The proposed guidelines will be discussed in more detail to assist the Electrical Contraction Industries Training Board in the development of an integrated framework.



CHAPTER 4

GUIDELINES FOR AN INTEGRATED EDUCATION AND TRAINING FRAMEWORK FOR THE ELECTRICAL CONSTRUCTION INDUSTRY

4.1 INTRODUCTION

The aim of this chapter is to propose a possible framework (containing guidelines and principles) for the integration of education and training in the electrical construction industry, based on the information obtained from the literature study and the responses obtained from the case study.

4.2 LITERATURE AND EMPIRICAL FINDINGS

The literature study that was conducted in order to obtain a national and international view on an integrated approach to education and training (see paragraph 2.8) will be summarised together with the findings of the case study (see paragraph 3.7).

These findings will be tabulated in table 4.1 and grouped under three categories namely, situational analysis, establishing education and training needs and assessment guidelines. The purpose of the table is to extrapolate proposed guidelines for a framework that will assist the electrical construction industry with the development of an integrated approach.

4.3 GUIDELINES FOR A PROPOSED INTEGRATED FRAMEWORK FOR EDUCATION AND TRAINING

A framework can be defined as an essential supporting structure (Thompson, 1995:537).

Table 4.1 Proposed guidelines for an integrated approach, based on the literature and empirical findings

Category of guidelines	Literature Findings	Empirical Findings	Proposed guidelines for an integrated approach
<p>Situational analysis Nature and extent of education and training courses</p>	<p>The nature of education and training programmes all countries studied, is that vocational education, training and structured work experience is utilised throughout. Available qualifications and courses range from apprenticeships (various types) to traineeships. The apprenticeship system forms the core, while and all the other programmes are supportive thereof (par. 2.8.2 / 2.8.3).</p>	<p>The nature of the courses is typically skills orientated including electrical trade theory, life-skills, and occupational health and safety themes. The courses extend from a formalised apprenticeship system to in-service training, and adult education and training systems are registered with the Department of Labour (par. 3.7.1 (b)).</p>	<p>➤ The gap between basic education and training needs to be addressed. ➤ Although all semi-skilled and skilled levels are covered, the range of the programmes should be extended to include basic numeracy and literacy.</p>
<p>Skills demand required</p>	<p>Various skills demands are required and core competencies such as communication skills, thinking skills (planning, organising, problem solving) are introduced from basic levels (for example pre-employment courses) (Par. 2.8.3).</p>	<p>Handling and limited communication skills are required at operator level, while thinking and technology skills are less important at this level. Interpersonal skills are important for further development and life-long learning (par. 3.7.1. (c)).</p>	<p>➤ Handling skills remain important ➤ Planning, problem solving and communication studies should form a key component of the programme. ➤ Communication and interpreting skills should be upgraded through an integrated system.</p>
<p>Role and involvement of employers in the education and training of the work force.</p>	<p>In all international countries studied, employers are involved with on-the-job training. In France, the minister of Education has allowed the employers' group to become involved in curricula outlines and content for vocational training. In Australia, employers assist with assessment and development of unit standards (par. 2.8.2 / 2.8.3).</p>	<p>Employers encourage basic education, training and retraining. They have a responsibility towards on-the-job training, and some companies have their own training infrastructure. They are involved in advisory committees and fund training through a compulsory levy scheme (par. 3.7.1 (d)).</p>	<p>➤ The current role and involvement of the employer should continue ➤ An integrated approach should be motivated and marketed among employers.</p>
<p>Relationship between education and training institutions</p>	<p>In international countries studied a strong link between vocational education or training institutes for apprenticeship and traineeships systems exists, although no formal integration exists between education and training (par. 2.8.3).</p>	<p>The relationship between education and training institutions is fragmented. Operators do not attend any formal education institutions (par. 3.7.1 (e)).</p>	<p>➤ The relationship between education and training institutions should be enhanced through the involvement of education service providers and non government organisations.</p>

Table 4.1 (Continued) Proposed guidelines for an integrated approach, based on the literature and empirical findings

Category of guidelines	Literature Findings	Empirical Findings	Proposed guidelines for an integrated approach
<p>Establishing education and training needs</p> <p>Objectives of education and training</p> <p>Balance between theory, practical and on-site training</p>	<p>The broad objective for education and training can be viewed primarily as helping people to acquire the tools of development, to think for themselves and to make own decisions.</p> <p>Most international apprenticeship and traineeship systems make provision for well balanced theoretical, practical and on-site programmes among technical institutions, vocational schools and employers (par. 2.8.1 - 2.8.5).</p>	<p>The education and training objectives are to develop a successful system that will provide diversified programmes, offering knowledge, skills, attitudes and values to individuals (par. 3.7.2 (b)).</p> <p>Operators currently attend a two-week institutionalised course. The remainder of the year is completed on-site. Electrical trade theory and related occupational safety and electrical regulations are presented, while a strong emphasis is placed on practical (handling) skills. This includes for instance installation of equipment. Current programmes are not balanced between education and training (par. 3.7.2 (c)).</p>	<p>The objective of an integrated approach should be to:</p> <ul style="list-style-type: none"> ➤ facilitate change in the sector, ➤ to promote productivity and enhance personal growth or maturity ➤ A balance between basic education, training, a flexible labour practices and wage relationship needs to be negotiated with employers. ➤ Basic education should become a compulsory component of the programme ➤ Balance between the theoretical and practical section should be established.
<p>Knowledge and skills component contained in programmes</p>	<p>Programmes for electrical construction contain a high degree of knowledge, for example knowledge for establishing a construction business, general legislative requirements, and the maintenance of safe working environments. The skills component comprises installations, commissioning, fault finding and testing of installations (par. 2.8.3 - 2.8.4).</p>	<p>The knowledge component was found to be important as workers undoubtedly make use of their knowledge when promoted. The current electrical construction operator, level 1 course contains 30% specific theoretical knowledge (electrical trade theory, relevant safety and electrical regulations). The skills component in the current electrical construction operator, level 1 course is approximately 70% (par. 3.7.2 (d)).</p>	<ul style="list-style-type: none"> ➤ The "gap" between basic education and training should be bridged. ➤ A needs assessment should be used to identify what relevant education will have to be included. ➤ Technical centres, NGO's or technical colleges should be considered.
<p>Education and training methodology</p>	<p>Most international countries use a competency-based training system. In the United Kingdom, certain systems still provide for a time based system. Various instructional systems ranging from block release to one or two-day release systems exist (par. 2.8.3).</p>	<p>Institutionalised training is based on the CBMT system, while on-the-job training ranges from mentoring, demonstrations, coaching and one-on-one instruction. Instructional methods for apprentices include block releases at technical colleges and off-the-job training. Operators have a two-week release from employers to attend institutionalised training at technical centres. Methods of instruction include lecture types, video and audiovisual aids, group exercises and demonstrations (par. 3.7.2 (e)).</p>	<ul style="list-style-type: none"> ➤ The CBMT system currently used for skills training should be extending it to basic education. ➤ The duration of the current programme should be extended to accommodate the integrated programme. ➤ The selection of an education and training methodology should be made.

Table 4.1 (Continued) Proposed guidelines for an integrated approach, based on the literature and empirical findings

Category of guidelines	Literature Findings	Empirical Findings	Proposed guidelines for an integrated approach
<p>Education and training assessment guidelines</p> <p>Purpose and importance of assessment</p>	<p>The purpose is to give feedback to trainees on performance accuracy, level of understanding and time spent. It is important to assess learning progress, in order to ascertain what has already been learned so that what still needs to be learned can be identified.</p>	<p>Assessment is used to obtain feedback about individual trainees as it is important to analyse whether the trainee, can apply the knowledge and skills obtained during the theoretical and practical training (par.3.7.3 (a)).</p>	<p>The purpose of assessment is to: obtain feedback about the individual as well as the education and training system as a whole, determine if the process has achieved its objectives. Has the gap between education and training been bridged?</p> <ul style="list-style-type: none"> ➤ act as a form of quality control to determine the effectiveness of the programme. ➤ shape the curriculum and embodies the real purpose of learning.
<p>Forms and methods of assessment</p>	<p>Due to the nature of CBMT assessments (formative assessment) and an integration of the skills obtained during the end of the training (summative) assessment are required constantly. A mix of assessment is done in a various of ways, on and off-the-job to benefit the employer and trainee (par. 2.8.2).</p>	<p>Due the CBMT format of training (constant proof of competence is needed to progress Formative assessments are applied) while summative assessment is used as a final assessment. Written, oral (at Elconop 1 level), observational and practical tasks are used (par. 3.7.3 (b)).</p>	<ul style="list-style-type: none"> ➤ A variety of assessment methods should be investigated ➤ The formative (assessment during the programme) and summative assessment (integrated assessment) methods should be extended
<p>Applied process of assessment (internal and external)</p>	<p>An internal process is applied whereby, the employer assesses the trainee for competence on work tasks during on-site training. Institutions and technical centres use internal assessment methods. In Australia, the employer and an outside assessor assess on-the-job unit standards (par. 2.8.2).</p>	<p>The Electrical contracting industry applies an external process for national qualifications. Apprentices are assessed by accredited service providers, where external examiners and a moderator are used to do the assessment. Operators are only assessed internally by accredited service providers. Elconop, Level 1 is assessed on-site (par. 3.7.3 (c)).</p>	<ul style="list-style-type: none"> ➤ The process of using external examiners and moderators should be extended.

The proposed framework consists of three broad categories, namely: situational analysis, education and training needs assessment and education and training assessment methods. Figure 4.1 illustrates these categories and proposed actions to be taken.

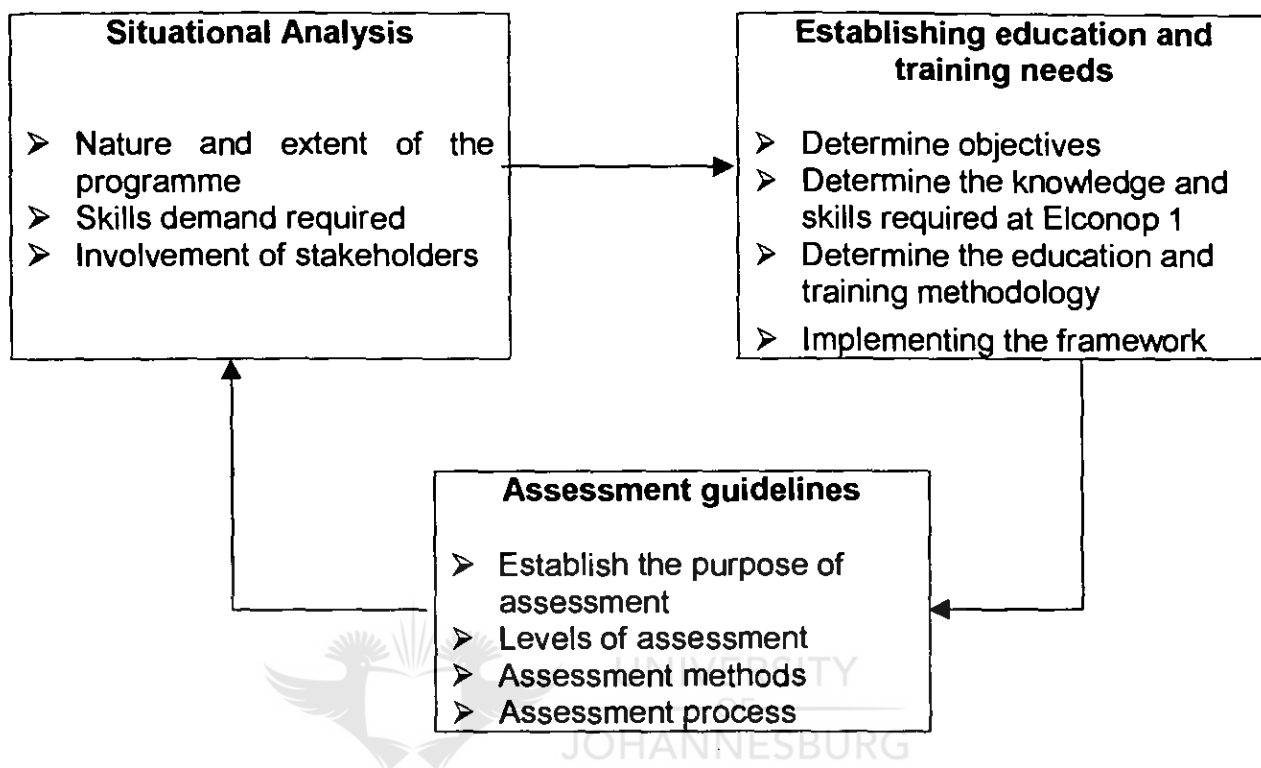


Figure 4.1: Schematic presentation of the proposed framework based on the research findings

The categories and actions should be addressed in detail in order to develop an integrated education and training system for the electrical construction operator: The following section will deal with each category individually and proposed guidelines to assist with the development of an integrated approach.

4.3.1 Situational analysis

A situation analysis should be conducted with the purpose of assessing the requirements. This does not only imply an isolation and description of situations, but inherently contains a goal as well as a functional analysis from which the results, namely the formulation of the goal and functional needs, are used (Olivier, 1988:10). It is thus a process of assessing the current situation in order to develop the unique

requirements needed for an integrated approach. The following issues should be addressed during the situational analysis:

- nature and extent of the integrated education and training programme;
- skills demand required for an Elconop, Level 1; and
- involvement of all relevant stakeholders.

4.3.1.1 Nature and extent of the education and training programme

The industry training board should decide on the nature and extent of the courses, which will satisfactorily bridge the “gap” between education and training. The following crucial questions should be answered before designing an education and training programme. However, it was established during the empirical finding that the nature and extent of the skills component of the existing course, were satisfactorily addressing the need, but that the knowledge component should be addressed.

1. Why are the participants attending the integrated education and training programme?
2. When, during the career path and where will the programme take place?
3. What should be learned from the integrated education and training programme?
4. How much will the integrated education and training programme cost?

The following options can be considered once the nature and extend of the programme has been determined:

Using existing courses: It may be possible that an existing course is relevant to the solution of the problem as identified in chapter 1, paragraph 1.2.2 and is available at other organisations. The board will then have to examine the appropriateness of the course in terms of its objectives and to what extent it needs to be supplemented. The ABET sector has been engaged in a consultative standard-setting process. The National Interim Guidelines document puts forward outcomes for language and numeracy at ABET 1 - 4 levels, in order to provide guidance for the ABET field. The South African Qualifications Authority has agreed that there standards for ABET below general education and training certificate (GETC) level, should be in place. These unit standards will provide a pathway to enable adult learners to achieve a GETC (Gauteng Department of Education, 1999:16).

Adapting existing courses: A course that already exist but does not satisfy all the requirements in every respect can be adapted or updated to include additional requirements.

Designing new courses: A new course should only be developed if a real problem exists that cannot be addressed by other means or adaptation of an existing course. The cost of designing and developing a new course can be very high.

4.3.1.2 Skills demand required

The ECITB should also ensure that the skills demands (handling, communication, thinking, i.e. problem solving and planning) are addressed when selecting or developing a suitable programme. Handling skills should remain important at this level, but planning, problem solving and communication studies should form a key component of the programme. Communication and interpreting skills will be upgraded through an integrated system. Although thinking skills are less important at this stage, problem solving should be a compulsory section of the programme.

4.3.1.3 Involvement of relevant stakeholders

The development of an integrated education and training system involves a number of important factors for the process to succeed. One of these factors is to gain support from the employers, relevant education institutions. Learning and its benefits of an integrated approach should be encouraged among the stakeholders. The following section deals with this issue.

(a) The role and involvement of the employer

The employer has a very important role regarding on-site education and training, in order to assist with the development and learning culture of his/her staff. Below are some advantages for the employer if employees are given access to education and training:

- Staff is more knowledgeable and skilled.
- Staff is more confident, efficient and effective.
- Staff act independently and require less supervision.
- Staff deliver a quality service.
- As a result profitability and competitiveness increases.

According to a survey conducted by BMI (1996:123), regarding training managers and trade union representatives, who introduced adult basic education and training programmes during the mid-nineties, companies benefit considerably from such programmes (compare table 4.2).

Table 4.2: Benefits of ABET programmes

Benefits of ABET programmes	Training Managers (%)	Trade Unions (%)
Improved productivity	44	55
Improved career pathing	43	82
Improved sense of self-worth to employees	92	100
Other	12	-

The category "other" includes improved awareness of operations, identification with the community, ability to be trained (as they can now read), improved company image, creation of good will, reduced absenteeism, reduced accidents in the work place and increased turnover (BMI, 1996:123).

Various opportunities exist for employers to become involved in education and training in the electrical construction industry. The ECITB has various functional advisory or technical education and training committees, standards generating activities for existing and future qualifications and involvement through assessment. Active examiners or moderators to assist with summative assessments or the development of assessments through the Assessment Sub-Committee of the Board, are thus provided.

(b) The relationship between the educational institutions and the electrical industry

The relationship between education and training institutions should be enhanced through the involvement of education service providers and Non-Government Organisation's (NGO's), in rural areas (at operator level). The levels of contact that exist between the electrical construction industry and technical colleges should be extended. The newly developed programme should be made available to such colleges, in order to expand their existing structures and possibly create new structures. As a result of their infrastructure, technical colleges have the potential to

eliminate and prevent instability in education and training. These colleges are in a position to ensure continued education and training under one roof. Badenhorst (1990: 37/38) states that relevant education offered by technical colleges should include the required basic skills and correct attitudes to qualify learners for training. It should also include rationalised syllabus to eliminate "soft options", and it should place formal and non-formal emphasis on life-skills (cognitive, affective and psychometric).

The relationship between educational institutions and the industry can be improved by means of:

- all parties becoming involved and creating a partnership;
- creating a climate for an integrated and multidisciplinary approach;
- positive interaction between informal, formal and non-formal education and training; and by
- integrating learner skills and knowledge in productive working situations (where possible).

The following sub-section deals with needs assessment (that is the gap between the current situation and the desired situation).

4.3.2 Establishing education and training needs

Needs assessment is a formal process for the identification of gaps between the present education and training courses and the desired results. This is an important phase in the development of an integrated education and training systems, involving a determination of the needs of the organisation, the existing skills level of the employee or trainee, and the components of the task or skill (Garrison & Bly, 1997:195).

According to BMI Issues Management (1996:95), some basic questions that should be asked when conducting a needs analysis include:

- What results are we obtaining, and how do they compare with the results that we should obtain?
- What contributions do we have to make?
- What do we use to set priorities and justify our needs?

The Industry Training Board should address the following issues in order to establish the education and training needs:

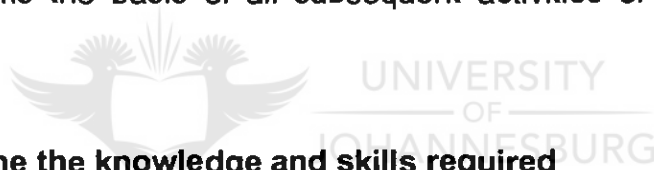
- determine objectives for the programme;
- determine the knowledge and skills required; and

- determine the education and training methodology.

The training needs will identify the placing of the gaps in order of priority. As a starting point the Industry Training Board should then select the gaps with the highest priority. This will be proven justification for identifying and choosing options for closing the gaps between basic education (fundamental and core) and specific training (practical training and electrical trade theory).

4.3.2.1 Determine the objectives

The overall objective of an integrated approach should be to facilitate change in the sector, to promote productivity and enhance personal growth and maturity among electrical construction operators. Learning objectives are designed to enable the trainer to structure sessions and evaluate trainees at various levels. During this phase the writing of instructional objectives to satisfy the identified education and training need. The objective will serve as a guide for the learner and trainer in the evaluation of training and forms the basis of all subsequent activities of the instructional design process.



4.3.2.2 Determine the knowledge and skills required

A balance between basic education, training, a flexible labour practices and wage relationship needs to be negotiated with employers. Basic education should become a compulsory component of the programme and a balance between the theoretical and practical section should be established during the needs assessment. The balanced programme development and driven by the industry training board, will have to be considered carefully, as the Electrical Construction Industry does not allow for meaningful and complete staff development, due to the structure of small, medium and micro enterprises. The short duration of some projects, where contract specifications make provision for the employment of local people (usually unskilled) to be skilled by the contractor as part of the social upliftment of the community, does not help either.

The Board could consider the following options, as indicated in the Department of Public Works draft paper on education and training for the construction industry (Department of Public Works: Draft paper, 1996:60):

- contract NGO's for remote communities and individuals where electrification projects are based in rural areas;
- utilise accredited training centres or technical colleges for centralised interventions; or
- establish temporary education and training facilities for lengthy projects.

4.3.2.3 Determine the methodology

When designing the integrated education and training programme the board should be concerned with what is the most effective method of getting the content across to the trainees. The programme will need to be linked to work experience that is well structured and has outcomes, which differ from the narrow training provided in the past and will include both theory and practice (Department of Education, 1997:37). The CBMT method used for technical training currently should be investigated and extended if possible to the integrated programme in order to achieve consistency in the education and training methodology.

When selecting the most appropriate training method to use, according to Larry and Smalley (1995:86), it is often helpful to identify the type of behavioural outcomes you desire in terms of knowledge and understanding, skills, attitudes and interests. Selection of instructional strategies or methods is becoming increasingly challenging with the increasing availability of resources and the development of training technology. Proper selection of strategy and the supporting instructional media will do more to promote efficiency and the effectiveness of instruction than any other measure (Van Dyk, Nel & Loedolff, 1992:223).

There have been significant advances in the technology available to deliver training. Examples of technology impacting on training include:

- television;
- audio and video tapes;
- computer based learning;
- simulations; and
- multi-media combining computer based learning with sound, video and text.

The development of a suitable programme should include consideration for cost, benefits and opportunity for the above technology (Skills New Zealand, 1995:7). Some of or a combination of these packages can be cost-effective if selected correctly.

Two important selection requirements that the board must meet in terms of their programme are: **Firstly**, the board must choose a **strategy** in terms of its compatibility with the:

- instructional objectives;
- nature of the training institution;
- available equipment and facilities;
- background and level of the students; and
- ability of the training staff.

Secondly, the **ability** to vary instructional methods and techniques. A number of factors should be considered, namely, instructional objectives, course content, student population, instructors, culture of the sector, instructional space, facilities, equipment and material, time and cost. The table below summarises various methods and what they are appropriate for.

Table 4.3: Education and training delivery methods and strategies

Method	Description	Appropriate for
Lecture	A structure presentation	Group presentations Orienting employees to policies, introducing topics, providing information
Tutorial	A one-on-one, structured instructional experience	Individual presentation On-the-job training Building skills, demonstrating how to use equipment
Case study	A narrative description of a situation, real or fictitious, prepared for instruction purposes, usually written	Motivating discussion, especially in a small group setting Identifying problems with realistic situations Weighing alternative solutions
Critical incident	A very short narrative description of a problem situation, usually only a sentence or paragraph length	The same as case study
Role play	Trainees are assigned parts to play in a dramatised version of a case study or problem situation	Groups of two and more Dealing with instruction about interpersonal situations
Game	A ritualised representation of a job	Group instruction Especially useful for developing co-operation or assessing leadership in a team setting
Simulation	An extended role or game	Same purpose as game
Buzz groups	A small group of people, assembled to identify a problem, consider and	Use with case study, critical incident Taking advantage of the ability of

	select alternative solutions	small groups to deal with unstructured problems more effectively than individuals
Panel discussion	A structured or unstructured presentation on a topic, problem or issue by a group of three to ten	Stimulating insight Posing problems Clarifying issues and problems
Computer-based instruction	The use of computers, usually a microcomputer, to present instructions	Communicating information very efficiently but not necessarily cheaply
Videotape	The use of a televised presentation to provide instructions, often in a form that mixes instruction with entertainment	Demonstrating effective interpersonal skills Conveying information in an interesting (but not necessarily cheap) manner

The following phase in the process is the implementation of the developed strategies.

4.3.2.4 Implementing the framework

The term implementation means, "to carry out" to put or to translate into practice (Taylor, 1988:3). Implementation is a process and not an event that takes time and moves through a series of phases depending on the nature of the programme and the organisation within which it is implemented.

The implementing steps involve putting into action the logical developed strategies, which emerged from the previous steps of the process. Without the effective implementation, organisations are unable to reap the benefits of performing an organisational analysis, established organisational direction, and formulating organisational strategy (Certo & Peter, 1990:13).

The board should consider a pilot project before the programme is implemented nationally. The assessment of the learning process is crucial during and after the process, which will be discussed next. Trainees should attend the first full session of the programme from the actual target population and the completed material should be used. The pilot will serve as the final test of the programme design and the integrated education and training material.

4.3.3 Assessment guidelines for an integrated approach

Assessment has two important, but distinctly related objectives. Firstly, it must provide valid and reliable information about the achievements and competencies of learners.

Secondly, assessment must be developmental and formative to provide learners with feedback and guidance on progress and performance (Gauteng Department of Education, 1999:6/14). The Board should use the following issues as guidelines during the assessment phase:

- establish the purpose of assessment;
- levels of assessment;
- assessment methods; and
- assessment process.

4.3.3.1 Establish the purpose of assessment

The success of education and training programmes are determined by assessing the trainees' reaction or the change in the level of knowledge and skills. The purpose of assessment is to firstly, identify the specific behaviour of the trainee during the programme and/or once the education and training programme has been completed. Secondly, to establish if the problem that was identified in the first place (during the situation analysis) has been resolved or improved and finally, to determine whether the cause of the problem was identified correctly. Assessment is important, as it shapes the curriculum and embodies the real purpose of education and learning. The operators will focus their learning on what is anticipated in the assessments.

The Board should ensure the validity (measurement of the cause-and-effect relationship) and reliability (the degree to which an evaluation instrument measures accurately or constantly) of the assessment methods, in order to measure the effectiveness of the programme.

4.3.3.2 Levels of assessment

Van Dyk, Nel and Loedolff (1992:253) identified various levels or steps of assessing the training programme. These levels or steps include the following.

- *Trainees' reaction:* Reaction should be seen as how well the trainees liked a particular programme and evaluating in terms of reaction which is the same as measuring the feeling of the trainees.
- *Change in trainee learning:* It is consequently essential that learning itself be assessed as there is no guarantee that learning has taken place.
- *Behavioural change on-the-job:* Evaluating behavioural change refers to the assessing a change in the job situation and not only a change in the learning situation.
- *Results in the organisation:* The process was started when a problem was identified. The board has to evaluate if the problem has been solved. What results have been achieved in terms of organisational effectiveness? In what way did the various stakeholders benefit from the integrated education and training approach?

4.3.3.3 Assessment methods

The assessment methods may include any of the following: diagnosis, evaluation, guidance, grading, selection, prediction and control. Most systems, which rely heavily on external examination, are subjected to the first three functions namely, formative, developmental and supportive. The last four grading, selection, prediction and control, are more summative and judgmental. Together with the purpose of assessment a number of principles emerge. Effective and informative assessment should contain the following:

- have clear, direct links with critical and specific outcomes;
- be integral to teaching and learning;
- be balanced, comprehensive and varied;
- be valid and fair;
- engage learners;
- value the education and training practitioner judgement;
- be time efficient and manageable;
- recognise individual achievements and progress; and
- improve the quality of learning.

The assessment of the education and training methods, as proposed during this phase of the framework, is intended to gather responses from the electrical construction

operator, level 1 who experienced training through formative assessments (after each module) and a final summative assessment at the end of the programme and feedback from the employers. The evaluation phase should answer four questions according to Garrison and Bly (1997:198). Did the trainees learn, was the learning transferred from the education and training setting to the work setting, has the performance change been the same for each group of trainees and does the education and training apply to all situations? These four questions collect information about the quality of learning, effective application, improved performance and improved education and training.

4.3.3.4 Assessment process

The utilisation of external examiners and moderators currently used by the Industry Training Board for the summative assessment of apprentices are valuable and should be extended to the electrical construction operators.

It is consequently necessary to validate each of these levels separately. The board must bear in mind that evaluation conducted at behavioural change and results in organisations involves effort, time and money.

4.4 CONCLUSION

This chapter dealt with the proposed guidelines for an integrated education and training approach for the electrical construction industry. The empirical findings of the case study was summarised and tabulated, in table 4.1. The literature findings together with and empirical findings formed the basis of the framework. The proposed guidelines for the framework, was based on three categories, namely a situational analysis, establishing the education and training need and assessment guidelines were discussed in detail.

The situational analysis concentrated on the nature and extent of the integrated education and training programme, skills demand required for an Elconop, Level 1, and the involvement of all relevant stakeholders. The second category, dealt with the establishment of the education and training needs and focused on determining

objectives, knowledge and skills required and guidelines on the education and training methodology needed for the programme.

The assessment guidelines dealt with the purpose of assessment, levels of assessment, assessment methods to be used and the assessment process to be followed. Various methods were mentioned and guidelines for effective and informative assessment were given. Questions to collect the information about the quality of learning, effective application, improved performance and improved education and training were discussed.

The final chapter will focus on a synopsis of the study and conclusions, as well as, recommendations regarding areas for further research in the electrical construction industry.



CHAPTER 5

SYNOPSIS, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

5.1 SYNOPSIS

The objective of this study was to develop an integrated education and training framework for the development of knowledge, skills, attitudes and values for electrical construction operators within the electrical construction industry.

There is a limited integrated approach to or structures for education and training, or provision for linkages between education, training, business and labour although there are however, elements of the structure which, when suitably modified, could be used to develop an integrated approach for the electrical construction industry.

The Electrical Contractors' Association (ECA) of South Africa is an employer organisation that strives towards the well being and development of its members and their employers in the construction industry as a whole. The association can be referred to as the administrative arm of the electrical contractor and provides training for apprentices and in-service training for semi-skilled workers. The conditions of an apprenticeship are drawn up by industry and are published in a Government Gazette while the in-service training is excluded from the Manpower Training Act. The training system suffers from a lack of articulation and often very little relevance from theoretical or practical training. The electrical construction industry needs to re-assess the way in which learning is organised and certified. They need to develop their employees' abilities, enrich their knowledge, improve their qualifications or point them in a new direction to bring about change in their attitudes and/or behaviour. They need to create a culture of lifelong learning and the ability to adapt to constant technological change, in order to maintain high working standards.

All the training is Competency-Based Modular Training (CBMT) and allows for multiple entry and exit points. This implies that a candidate could enter and leave the training programme at any stage. It should, however, be understood that to obtain a

qualification, the full course should be completed and all relevant tests should be passed.

The Electrical Contraction Industries Training Board does not address or make provision for basic education. Specific theoretical knowledge is dealt with during institutionalised training while the emphasis during practical training is on skills. Competence is demonstrated by means of a practical assessment.

The research strategy was descriptive, declarative and explorative. The descriptive research included the gathering of information through a relevant literature and empirical study. The declarative research analysed the existing information and evaluated the current education and training system in the electrical construction industry, while the explorative research gained insight into and clarified concepts with regard to the integration of education and training.

National and international education and training systems were investigated to establish whenever education and training are integrated in general, and specifically in the electrical field. South Africa has established the South African Qualifications Authority, which will attempt to close the gap between education and training. Similar organisations were found in the international countries that were studied.

In Chapter 3, the research design, conducted through a descriptive case study was discussed. From the case study, it was evident that respondents from the electrical construction industry supported an integrated education and training system in one form or another and were involved in developing electrical unit standards under the auspices of the National Standards Body (NSB) and the South African Qualifications Authority (SAQA). A link between knowledge, skills and on-site training is well established, but the "gap" between basic education and training needs to be addressed in the electrical construction industry.

The research design for this study was typified as descriptive, contextual and qualitative. The criteria developed in the quantitative methodology as answers to the specific nature of research questions were: internal validity, external validity, reliability

and objectivity. The strategies to address the study were based on a variation of sources, namely a research overview of the electrical construction industry, as well as individual interviews with various stakeholders. The establishment of a chain of evidence (with reference to argumentation) was achieved through the use of an objective external researcher and the concept report was examined by the chairman of the Electrical Contracting Industries Training Board.

The aim of chapter 4 was to propose a possible framework (containing guidelines) for the integration of education and training in the electrical construction industry based on the information obtained from the literature study and the responses obtained from the case study. The framework was inclusive of a situational analysis, the establishing of education and training needs and assessment guidelines for an integrated approach.

The following section of this study deals with the conclusions and implications for the electrical construction industry.

5.2 CONCLUSIONS AND IMPLICATIONS

An integrated education and training system is of vital importance to the Electrical Contractors' Association and its members. In the advent of the new political era in South Africa a window of opportunity has opened that provides excellent opportunities to create a new education and training environment. The demands placed on the electrical construction industry by the Skills Development Act of 1998 and the South African Qualifications Authority in terms of addressing the imbalances of the past and the creation of a culture for life-long learning is crucial.

The proposed integrated approach to education and training for the electrical construction industry is based on the thinking where the electrical construction operators' should develop their analytic and cognitive skills to enable them to use their knowledge and skills in a range of new situations. The proposed system should equip the work force with the desired knowledge, understanding and attitudes and complement occupational skills with transferable life-skills insofar as the operators

ability to plan, monitor his/her work in a self reliant manner, decision making and the ability to work in a team.

The study provided guidelines for the development of an education and training system that is flexible and responsive to the knowledge and skill needs of the electrical construction industry, which will address the problem identified in chapter 1, paragraph 1.2. The concept of lifelong learning should form part of the integrated programme and the ways in which each component of the programme-enhancing learners' opportunities for lifelong learning should be evident and that learning should not cease after the programme has been completed. Everyone should keep adding to their skills and knowledge throughout their lifetime.

Assessment against unit standards will have an impact on the education and training providers as well as on the trainees as there will now be a continuous process that will allow for a wide range of assessment evidence, for example: oral, performance-based and prior learning-based. This should be implemented during the learning process, as well as during an integrated final assessment.

A serious implication for the stakeholders is that the current training system focuses on the content that was learnt (the inputs) rather than the standards (the outputs and outcomes) that the trainees should achieve to obtain credits towards an electrical qualification.

Perhaps the biggest challenge in attempting to integrate education and training in the electrical construction industry will be in obtaining broad consensus of the concept among all the relevant stakeholders. For electrical contractors to survive in a highly competitive market place, the decision to invest in the development of their human resources must be a business decision. The ECA should therefore provide the opportunity to assist their members. To maximise their investment enterprises will adopt the integrated education and training approach and in doing so they will enhance their productivity and motivate their work force. Paradoxically, while employers' acceptance is important, it should be noted that consensus of all stakeholders will lead to a system that will stand the test of time.

5.3 RECOMMENDATIONS FOR FURTHER RESEARCH

The author of this study would like to recommend that the following issues be further researched.

5.3.1 To research and establish further guidelines for the integration and incorporation of recognition of prior learning within the electrical construction industry.

5.3.2 To research and established guidelines for the integration and incorporation of entrepreneurial skills within the electrical construction industry for the emerging sector.

5.4 CONCLUSION

An integrated education and training system will be a major force in assisting the electrical construction industry to establish articulation between education, training and the world of work for semi-skilled operators. An education and training system that will be flexible and responsive to the construction environment with co-operation and partnerships between educational institutions, employers, the ECITB and the Electrical Contractors' Association should be developed. This will lay the foundation for lifelong learning and access to higher education and skilled jobs.

A starting point is the National Qualifications Framework, which will provide for an integrated approach to education and training. Qualifications may be achieved by full time, part time or distance learning, work based learning or a combination together with the assessment of prior learning. This system will generate coherence across the traditional divides of education and training and allow articulation between currently fragmented and divided sectors and institutions.

It is in recognition of this fundamental principle on integration of education and training, and with this focus in mind, that this study seeks to draw together all elements in order to assist with the development of human resources, which will simultaneously empower individuals to fulfil their aspirations which will effect the economic growth necessary to sustain the growth and development needs of the Electrical Construction Industry and the country.



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QUESTIONNAIRE FOR STAKEHOLDERS

AIM OF THE QUESTIONNAIRE

The aim of the questionnaire is to source specific answers from the relevant stakeholders. The results will be used to formulate a descriptive case study, based on the current state of an integrated approach to education and training within the Electrical Construction Industry. The questions are divided into various sections.

SECTION 1: SITUATIONAL ANALYSIS OF THE STAKEHOLDERS

1. Please identify the target group, which should be educated and trained in your sector (categories of skills).
2. Describe the nature and extent of your education and training programmes (e.g. education and training schemes).
3. Please explain the various skills demands required for operators / semi-skilled workers in terms of the following:
 - handling skills
 - technological skills
 - thinking skills
 - communication skills
 - interpersonal skills
4. Describe the employers' role and involvement in the education and training of the employees in the electrical sector.
5. How do you perceive the relationship between the educational and training institutions in the electrical sector?

SECTION 2: EDUCATION AND TRAINING ASSESSMENT NEEDS WITH RESPECT TO THE ELECTRICAL CONSTRUCTION INDUSTRY.

Every sector, irrespective of its type and structure, has certain education and training needs that should be satisfied to ensure that the sector will be economically viable and will continue to progress.

1. Please comment on the priority of education and training with reference to operators / semi-skilled employees in the electrical sector.
2. Please comment on the education and training objectives of the sector with reference to theoretical and practical provision.
3. Describe your perceptions/views of the balance between theoretical, practical and on-site training.
4. Describe the knowledge and skills component contained in the education and training programmes.
5. Describe the education and training methodology applied by the educators or instructors (for example CRI, CBMT, education and training methodology and instruction methods).

SECTION 3: EDUCATION AND TRAINING ASSESSMENT METHODS

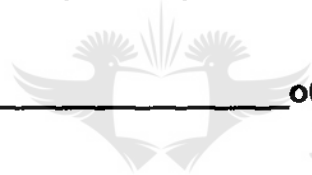
1. Explain the importance of any of assessment methods in the electrical sector.
2. What is the purpose of assessment in the electrical sector?
3. Comment on the assessment forms and methods utilised in the Electrical Construction Industry e.g.
 - written tests or examinations;
 - oral examinations;

- observation of the learner's behaviour;
 - physical tasks;
 - formative assessment (identifying progress and deficiencies in the process of learning);
and
 - summative assessments (final assessment).
4. Are assessments done internally or externally (with the assistance of assessors and moderators) please elaborate on the practices used?

SECTION 4: GENERAL

1. Are you aware of the newly proposed legislative changes in education and training, and if so, what are your views with reference to these changes?

Thank you for your time and voluntary response



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