A DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING
SYSTEM FOR THE PRINTING, NEWSPAPER AND
PACKAGING INDUSTRIES

by

DAVID LLEWELLYN THOMAS

Submitted in fulfilment of the requirements
for the degree of

MASTER OF EDUCATION

in the subject

DIDACTICS

at the

UNIVERSITY OF SOUTH AFRICA

Supervisor: Professor Dr M P van Rooy
Date Submitted: June 1994
SUMMARY

A DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM FOR THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

The study centres on the development of a didactically justified design model of a competency based modular training system for the Printing, Newspaper and Packaging Industries.

The design model is represented in a diagram form identifying the components of the design model in relation to their systems function. The components of the design model are: training needs analysis, aims and objectives of training, the learner initial situation, the code of practice for training within industry, the pre-interactive training phase, the interactive training phase and training outcomes.

Checklists are developed for using the design model as well as some practical examples of the implementation of the design model in creating a training system which features sound andragogic didactic principles and practices.

The use of the design model enables the development of a practical competency based modular training system which meets the unique requirements of the Printing, Newspaper and Packaging Industries.

KEY TERMS:

Design model; Training Systems; Competency Based Modular Training; Training Models; Career Progression; Adaptive Skills; Core Skills; Basic Skills; Interpersonal Skills; Job and Task Skills; Systems Theory; Accreditation; Trainability Testing.
A DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM
FOR THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION AND ORIENTATION</td>
<td>1</td>
</tr>
<tr>
<td>1.1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>FACTORS LEADING TO THE RESEARCH</td>
<td>2</td>
</tr>
<tr>
<td>1.2.1</td>
<td>The role of the NATIONAL INDUSTRIAL COUNCIL (NIC)</td>
<td>2</td>
</tr>
<tr>
<td>1.2.2</td>
<td>The Education-Training dichotomy</td>
<td>5</td>
</tr>
<tr>
<td>1.2.3</td>
<td>The role of employer organisations</td>
<td>8</td>
</tr>
<tr>
<td>1.2.4</td>
<td>Career Progression Prospects</td>
<td>10</td>
</tr>
<tr>
<td>1.2.5</td>
<td>The role of the NATIONAL PRODUCTIVITY INSTITUTE (NPI)</td>
<td>13</td>
</tr>
<tr>
<td>1.2.6</td>
<td>The role of THE SOUTH AFRICAN TYPOGRAPHICAL UNION (SATU)</td>
<td>17</td>
</tr>
<tr>
<td>1.2.7</td>
<td>Synthesis of the Problem</td>
<td>17</td>
</tr>
<tr>
<td>1.3</td>
<td>STATEMENT OF THE PROBLEM</td>
<td>20</td>
</tr>
<tr>
<td>1.4</td>
<td>ANALYSIS OF THE PROBLEM</td>
<td>21</td>
</tr>
<tr>
<td>1.5</td>
<td>AIMS OF THE STUDY</td>
<td>24</td>
</tr>
<tr>
<td>1.6</td>
<td>CLARIFICATION OF TERMS</td>
<td>26</td>
</tr>
<tr>
<td>1.6.1</td>
<td>Definition of a design model</td>
<td>26</td>
</tr>
<tr>
<td>1.6.2</td>
<td>The definition of the Industry</td>
<td>26</td>
</tr>
<tr>
<td>1.6.3</td>
<td>Competency Based Modular Training (CBMT)</td>
<td>27</td>
</tr>
<tr>
<td>1.6.4</td>
<td>Training Systems</td>
<td>27</td>
</tr>
<tr>
<td>1.7</td>
<td>THE PROGRAMME OF STUDY OF THE DISSERTATION</td>
<td>29</td>
</tr>
</tbody>
</table>
1.7.1 Training of skilled workers in the RSA
1.7.2 Competency Based Training as a didactic tool for skills training
1.7.3 Training Models and Training Systems
1.7.4 Development of a Model of a Competency Based Training System
1.7.5 Implications and Applications of the Design Model for the Printing, Newspaper and Packaging Industries in the RSA

CHAPTER 2: THE STATUS OF TRAINING OF SKILLED PERSONNEL IN THE RSA

2.1 IDENTIFICATION OF THE SKILLED WORKER IN TERMS OF ARTISAN TRAINING IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES
2.2 TRAINING SYSTEMS CURRENTLY IN USE TO DEVELOP SKILLED PERSONNEL
   2.2.1 Time Based Training Systems
   2.2.2 CBMT Training Systems
      2.2.2.1 THE METAL AND ENGINEERING INDUSTRIES ARTISAN TRAINING BOARD (MEIATB)
      2.2.2.2 THE CLOTHING INDUSTRY TRAINING BOARD (CITB)
      2.2.2.3 THE FURNITURE INDUSTRY TRAINING BOARD (FITB)
      2.2.2.4 THE BUILDING INDUSTRIES FEDERATION OF SOUTH AFRICA (BIFSA) TRAINING COLLEGES
   2.2.3 Other Training Systems

2.3 TRAINING IN THE RSA
   2.3.1 The Macro Training Environment in the RSA
2.3.1.1 National Manpower policies, objectives and planning 74
2.3.1.2 The Role and Function of the DEPARTMENT OF MANPOWER in Training and Development of the Manpower Resources of the RSA 75

2.3.2 The Meso Training Environment in the RSA 78
2.3.2.1 Industry Training Boards 78
2.3.2.2 Regional Training Centres 81
2.3.2.3 Private Training Centres 82
2.3.2.4 Industry Training Centres 82

2.3.3 The Micro Training Environment 83
2.3.3.1 The extent and size of the Printing, Newspaper and Packaging Industries in the RSA 86
2.3.3.2 The role and function of the Printing, Newspaper and Packaging Industries Training Board (PNPITB) 88
2.3.3.3 The Accreditation of training through the PNPITB 90

2.4 SYNTHESIS 92

CHAPTER 3 : A SYSTEMS PERSPECTIVE ON THE DEVELOPMENT OF A COMPETENCY BASED MODULAR TRAINING MODEL 94

3.1 JOB COMPETENCE IN AN INDUSTRIAL SETTING 95
3.1.1 Definition of Competence 95
3.1.2 Competence in an Industrial Setting 96
3.1.3 Competence and the Organisation 98
3.1.4 Synthesis 101

3.2 COMPETENCE IN A MODULAR TRAINING CONTEXT 102

3.3 SYSTEMS APPROACHES TO TRAINING AND DEVELOPMENT 103
3.4 FACTORS TO CONSIDER WHEN DEVELOPING A DESIGN MODEL OF A TRAINING SYSTEM FOR TRAINING OF ARTISANS

3.4.1 The andragogic didactic situation requirements

3.4.2 The job or function competence

3.5 A MODEL OF A COMPETENCY BASED TRAINING SYSTEM

3.6 SYNTHESIS

CHAPTER 4 : THE DEVELOPMENT OF A DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM FOR THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

4.1 THE ANDRAGOGIC DIDACTIC SITUATION IN WHICH TRAINING OF THE SKILLED WORKER TAKES PLACE IN AN INDUSTRIAL SETTING

4.1.1 The adult learner and effective instruction in the andragogic didactic situation

4.1.2 Further thoughts on the adult as learner

4.1.3 Synthesis

4.2 THE NATURE OF NON-FORMAL EDUCATION AND TRAINING REQUIREMENTS IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

4.3 BLOOM'S TAXONOMY OF LEARNING AND ITS APPLICATION IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

4.4 THE NEEDS OF THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES FOR A DESIGN MODEL OF A COMPETENCY BASED TRAINING SYSTEM

4.5 THE DEVELOPMENT OF THE DESIGN MODEL

4.5.1 Training Needs Analysis

4.5.2 Training Aims and Objectives

4.5.3 A Code of Practice for Training: Establishing a Training Ethic
4.5.4 Learner Variables
4.5.5 The Pre-Interactive Phase: Course Content and Evaluation Design
  4.5.5.1 Skills Analysis: Specific Categories
  4.5.5.2 Course Structure: Phase Development Procedures
  4.5.5.3 Evaluation System: Internal and External Evaluation
4.5.6 The Pre-Interactive Phase: Resource Availability
  4.5.6.1 Accreditation to Train and Accreditation Categories
  4.5.6.2 Pre-entry Requirements for the Trainer
  4.5.6.3 Decentralised Industry Training
  4.5.6.4 Centralised Southern African Printing College Training
  4.5.6.5 The Training Management Sub-system
4.5.7 The Interactive Phase
  4.5.7.1 Trainer Aspects: The Trainer-Learner Interaction
  4.5.7.2 Learner Variables
4.5.8 Evaluation System
  4.5.8.1 External Testing: Pre-requirements and Evaluator Training
  4.5.8.2 Structure of External Tests
  4.5.8.3 Internal Testing: Check Lists and Evaluation System
4.5.9. Output Competencies and Feedback
4.5.10 The Design Model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries

4.6 A CHECK LIST FOR DEVELOPING TRAINING PROGRAMMES DERIVED FROM THE DESIGN MODEL OF THE COMPETENCY BASED MODULAR TRAINING SYSTEM
CHAPTER 5: THE IMPLEMENTATION OF THE DESIGN MODEL OF A
COMPETENCY BASED MODULAR TRAINING SYSTEM FOR THE
PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

5.1 THE IMPACT OF THE DESIGN MODEL ON TRADE DESIGNATION

5.2 THE FACILITATION OF CAREER PROGRESSION

5.3 THE PROVISION FOR MAINTAINING SOUND DIDACTIC PRACTICES IN
THE INTERACTIVE LEARNER-TRAINER SITUATION THROUGH THE
MECHANISMS OF THE TRAINING SYSTEM

5.4 PRACTICAL EXAMPLE OF THE COURSE CONTENT OF A DESIGNATED TRADE

5.5. PRACTICAL EXAMPLE OF CURRICULA AND SYLLABI OF TECHNICAL
THEORETICAL MODULES

5.5.1 Module Designation: TT1
5.5.2 Curriculum for TT1

CHAPTER 6: RECOMMENDATIONS AND CONCLUSIONS

6.1 REVIEW OF THE FACTORS MOTIVATING THE STUDY

6.2 SUMMARY OF FINDINGS

6.3 CONCLUSIONS

6.4 RECOMMENDATIONS

6.5 FINAL OVERVIEW
1.1 INTRODUCTION

This study began in March 1990 shortly after the establishment of the PRINTING, NEwsPAPER AND PACKAGING INDUSTRIES TRAINING BOARD (PNPITB). The establishment of the Training Board was facilitated by the Manpower Training Act, Act No 56 of 1981, as amended.

The amended Manpower Act provides for, in the main, the following:

(1) The establishment of Industry Training Boards, their constitutions and the functions of such established boards.

(2) The accreditation of Training Boards at the first level.

(3) The privatisation of artisan training.

(4) The role and functions of Regional Training Centres.

(5) Grants-in-aid with respect to training in labour relations and funds for training of unemployed persons.

(6) The role and functions of the NATIONAL TRAINING BOARD (NTB).

The Printing, Newspaper and Packaging Industries of South Africa has had a history of active involvement in skills training of its employees. A number of different bodies were and are involved in the development and crystallisation of the importance of training in general and in particular the varied perceptions of what education, training and Competency Based Modular Training (CBMT) are, their areas of application and how they are to be implemented.

These different perceptions, coupled to the impact of external environmental factors, as well as to the views on various educational and didactic matters and the amended Manpower Training Act of 1990,
all contributed to the problems which prompted this study.

1.2 FACTORS LEADING TO THE RESEARCH

With the advent of the amended Manpower Training Act in 1990, the training of artisans, particularly via the route of indentured apprentices, was now to be achieved by Competency Based Modular Training methodology exclusively. This presented didactic challenges to the PNPITB in that the concept of competence was new and the vehicle of a didactically founded modular training programme for training in a designated trade did not exist.

Within the Industry a variety of bodies had been, and are, involved in the training debate. These bodies all had very definite ideas regarding such didactic issues as course content, course design, evaluation systems etc. and were constantly articulating their ideas and perceptions as experience and circumstances impacted on their thinking.

1.2.1 THE ROLE OF THE NATIONAL INDUSTRIAL COUNCIL (NIC)

One of the major players in this training debate was the NATIONAL INDUSTRIAL COUNCIL (NIC) OF THE PRINTING AND NEWSPAPER INDUSTRY OF SOUTH AFRICA. The NIC was founded in 1920 and was dissolved as a body corporate in 1989. At the time of its foundation (NIC, 1920) the NIC consisted of the Federation of Master Printers of South Africa representing the employers and the South African Typographical Union representing the employees. At the first meeting of the Executive Committee held in 1920 the issue of training of linotype apprentices was raised. Thereafter, there appeared as a regular agenda item, apprentice training.

The Apprenticeship Act, Act No 26 of 1922 gave impetus to the formalisation and structuring of apprentice training in industry. The NIC responded to the Act by establishing in June 1923 the NATIONAL
PRINTING APPRENTICESHIP COMMITTEE (NPAC) which was the first such committee in South Africa (NPAC, 1923:4).

The committee consisted of the Executive Committee of the NIC. The NPAC swiftly established its credentials as a body concerned with training by formalising apprentice training within the industry by gazetting a variety of definitive, binding and establishing clauses under the Apprenticeship Act, Act No 26 of 1922 which had established the NPAC and identified and appointed its members, designated the trades within the industry and fixed the entrance qualifications for prospective apprentices, the period of training for an apprentice, their grades and wages.

Government Gazette No 754 of 6 May 1924 allowed for additional designation of new trades which was influenced by new technology. Technological influences on the industry and particularly on designated trades and the training of apprentices has since those early days required continuous attention by the industry (RSA, 1924).

The NPAC had a dramatic and lasting influence on training in the Industry. The Chairman of the Committee in his annual report of 1926 (NPAC, 1926:1) stated:

'The Apprenticeship Committee of the Printing Industry is the only committee that exercises a Union-wide jurisdiction; it was the first Committee to be instituted under the Act of 1922, and it operates in the most highly organised of the skilled industries. These facts endow its activities with a special interest since it can be taken in a very special sense as a pioneer in a great field of experiment'.

Within the NPAC, various sub-committees were formed to deal specifically with apprentice training matters, as and when they arose. With the advent of the Manpower Training Act, Act No 56 of 1981, the NPAC as a body became renamed the NATIONAL MANPOWER TRAINING COMMITTEE FOR THE PRINTING INDUSTRY (NMTC) in March 1982.

The NMTC continued with the work of its predecessor and through its sub-committees continued to establish a trend the NPAC started. The
Technical Education Sub-Committee, as an example, became more active in the field of education as offered by Technical Colleges. This technical education formed an integral part of an apprentice's training. The Technical Education Sub-Committee (NMTC, 1983:6) was involved in developing new syllabi and lecturers guide notes and, for instance, introduced Computer Science into the field of technical educational studies for indentured apprentices in certain origination trades such as Electronic Composition.

Another feature of the NPAC and the NMTC was that not only were their concerns with apprenticeship training in general but through their sub-committees and internal structures they were involved in the area of trade testing. In essence, their activities centred about:

(a) Designating new trades and de-designating obsolete trades.

(b) Prescribing schedules of practical training.

(c) Developing syllabi and associated materials for technical education.

(d) Evaluation of apprenticeship training by means of a decentralised industry based trade testing system (NMTC, 1984; 1989).

(e) Establishing working conditions for apprentices including wages.

The NIC established a training fund for the Printing and Newspaper Industry in 1973. This fund was established so as to refund employers whose apprentices attend the 11 week block release periods in which the technical education component of apprentice training was given over three years at technical colleges (NIC, 1973:16).

The training fund was established with the prime motive of encouraging the industry to indenture and train apprentices. This was in response to the perennial skills shortages experienced by the industry.
The Wiehahn Report (Wiehahn, 1982:223-235) which included aspects of artisan training and made specific recommendations on the Apprenticeship Act, 1944 as well as the HUMAN SCIENCES RESEARCH COUNCIL (HSRC)/NATIONAL TRAINING BOARD (NTB) Investigation into the Training of Artisans in the RSA (HSRC, 1985:116-117) had immediate effects on the NMTC. The issue of the recommendations of the latter report in favour of modular referenced training was of vital importance. The industry took cognisance of the reports opting for such modular referenced training with its implied continuous practical testing during training, whether that training took place institutionally or on-the-job.

1.2.2 THE EDUCATION-TRAINING DICHOTOMY

The emergence within the NIC and NMTC of a perception of what competency referenced training was, merged with the concept of Competency Based Modular Training (CBMT). A feature of this development was the continued separation of the education and training components (NMTC, 1986a:4-12; NMTC, 1986b:1-10). Education in the form of technical theory and training in the form of on-the-job practical learning were seen as two opposites.

Both the NIC and NMTC expressed distinct dissatisfaction with the educational component and the most common complaints were:

* Technical education syllabi were not relevant to the practical training (NMTC, 1986a:5).

* Technical education syllabi were not keeping abreast with technological developments in products and processes (NMTC, 1986a:5).

* Actual subjects included at the various levels of technical educational studies were of no relevance to the actual scope of requirements for a specific designated trade but were merely 'filler' subjects so as to satisfy the requirements of the
educational authorities (NMTC, 1986a:9).

* Syllabi changes led to protracted debate and involved a long and tedious process to implement in the various Technical Colleges (NMTC, 1986b:6).

* Racially separated Technical Colleges administered by various own affairs bodies placed inordinate costs on the industry and were seen as being morally wrong (PIFSA, 1986:4).

Despite this debate the emergent CBMT model still saw education and training as being two opposite domains. This model of instructional development had developed over a long period of time. The only issue that was being addressed when moving toward CBMT methodology was the form of the delivery mechanism of practical on-the-job training.

On examination of the Conditions of Apprenticeship from 1923 to the final version issued in 1986, which applied to time-based training, one sees a well trodden familiar content which excludes educational issues but includes the listing of the designated trades, apprentice remuneration, the conditions of apprenticeship in relation to entrance criteria, the courses of training and the courses of study (NIC, 1986:1-40).

Romiszowski (1981:1-15) acknowledges that even though models of instructional development differ in their names and by the process through which they achieve their end, most of these models exhibit three basic components: An analysis that results in the definition of training objectives, planning now to achieve the objectives and once the plan is implemented some sort of evaluation of the training outcomes take place.

Romiszowski suggests that there is a fundamental difference between education and training and this he believes rests in the area of pre-planned learning goals. Training has very focused goals, the outputs of training are quantifiable and qualifiable. Education on the other hand has vague goals.
'Those of us who know where they are going, and can define the path that leads there, are in the business of training, whereas those who neither know their destination nor the means of getting there are in the business of education' (Romiszowski, 1981:3).

Training and education according to Romiszowski is not seen as being separate opposite entities but more as opposing points on an education training continuum as shown in Figure 1 (Romiszowski, 1981:3).

In the above framework education is seen as an open opportunity for learning and may include events outside the formal schooling or academic environment.

Training, however, is seen as a pre-planned approach well focused and may include events outside the training and development arena of human resource development.

Somewhere along this education-training continuum there is a point where education ends and training begins. Romiszowski (1981:3) argues that to try to determine this precise point is unimportant, for on closer examination of training, elements of education are included and vice versa for education.
When analysis has taken place for a proposed learning experience, and a pre-planned strategy used to achieve the objectives defined by the analysis, instruction has taken place.

Romiszowski's Instruction system approach is one which can be readily applied to the field of vocational training and education. The system is defined in terms of the inputs from the external environment in the form of the applicable technology and human involvement. The actual conversion process again involving the applicable technology and human involvement and finally the outputs from the conversion process. A feedback mechanism can be a feature of such a system but may not necessarily be in place. The most important issue that systems address is that they are purposeful and goal directed.

The NIC and NMTC prior to 1985 frequently advocated that the education and training components of apprentice training must be complementary and, if possible, relevant. After 1985 these bodies, with the advent of competency referenced training began to move forward the view that apprentice training was vocational education and training and somehow a mechanism to integrate education and training was desirable and necessary if skills training was to be effective and successful (PIFSA, 1986:6; NMTC, 1990:3).

This contradiction in thinking by the two bodies contributed to the problem which prompted this research.

1.2.3 THE ROLE OF EMPLOYER ORGANISATIONS

The next major player in the training debate was the employer organisations of the industry. The involvement of employer organisations in training dates back to the foundation years of the NIC. The Federation of Master Printers of South Africa was founded in October 1916 and over the years the name of this organisation changed twice. In September 1978 the organisation became known as the SOUTH AFRICAN PRINTING AND ALLIED INDUSTRIES FEDERATION
(SAPAIF) and finally, in March 1990, the name changed to the PRINTING INDUSTRIES FEDERATION OF SOUTH AFRICA (PIFSA).

The present Printing Industries Federation of South Africa is constituted as a Section 21 company and does not operate as previously under the Industrial Conciliation Act, Act No 28 of 1958. The input of the employer organisation under its various names with regards training in the NIC, NPAC and NITC and all their sub-committees was real and at all times dynamic and helped shape the perceptions of training in those bodies. Notwithstanding this deep involvement, the employer organisation did have its own training committee and out of this forum certain specific concepts were developed.

This Training Committee (PIFSA, 1985:4) recommended the formation of a body of experts to study and devise a training system using competency referenced instruction which would be most suitable for the Industry's requirements in South Africa.

This was the first mention of a training system and was the first approach to develop an integrated training system.

This body of experts became a sub-committee of the Training Committee and proceeded to investigate modular training, concentrating on the practical aspects of the designated trades. These practical training components were of major concern and active development continued in this direction. How the technical education component was to be accommodated in the training system was a continuing problem.

'Amongst other problems, it would have to be decided when apprentices should attend the Technical College during the course of their career, what could be done to accommodate lecturers who would be required to teach as many apprentices not for as long as previously; what could be done about lecturers in subjects which would no longer be taught, such as mathematics; and whether it was possible to convince the Government that the academic standard reached by apprentices after 12 weeks study was sufficiently high to warrant the awarding of the NTC III Certificate. Concerning the last point, it was suggested by the Executive Director that attempts be
made to obtain union interest in the British System resulting in an industry qualification in which it was not necessary to obtain government sanction for' (PIFSA, 1986:6).

The implications of international accreditation of skills training as well as moving away from formal to non-formal education in the developing training system were also compounded further by other concepts and proposals formulated by the Training Committee of the SA Printing and Allied Industries Federation (PIFSA, 1986:6).

These were:

* The possibility of providing institutionalised training by establishing a School of Printing for Southern Africa.

* The establishment of an Industry Artisan Training board.

* The implementation of any modular training scheme within industry could only be effective if there existed a cadre of trained trainers or instructors within the companies that undertake skills training of apprentices.

* The principle of Competency Based Modular Training as the only training methodology to be adopted by the industry.

* The concept of a progression of modules from a common base to the skill of a qualified printer rather than a large number of designated trades.

1.2.4 CAREER PROGRESSION PROSPECTS

Another concept which had far-reaching implications for the development of a didactically sound model for CBMT was developed by the employer organisation; that of a career progression path system. This was introduced by means of a Training Agreement (PIFSA, 1987:3). (See Figure 2 overleaf).
WORKS MANAGER

UNIVERSITY DEGREE or NDPM

PRODUCTION MANAGER

UNIVERSITY DEGREE or NDPM

FACTORY MANAGER

CERTIFICATED TECHNICIAN

SECTION MANAGER

Skills Level 7

FOREMAN

Skills Level 6

JOURNEYMAN (PRINTER)

Skills Level 5

NON-DESIGNATED SKILLED PERSON

Skills Level 4

SENIOR OPERATOR

Skills Level 3

OPERATOR

Skills Level 2

GENERAL ASSISTANT

Skills Level 1

FACTORY AID

Matric or NTC 3 Raw Entrance Barrier

• Std 8 minimum educational requirement Raw Entrance Barrier

- For trainee printer

• The qualifications listed here and above are recommended only and not mandatory

THE CAREER PROGRESSION PATH SYSTEM

FIGURE 2.
This progression path in the industry represented a bold and far-sighted step. The system identified skills levels based on the existing job grades. These job grades had developed over a long period of time and were entrenched in the working rules of the NIC. Of major importance, the system postulated a theoretical career progression path where the lowest skilled employee could attain the highest skills levels in the industry. The mechanisms of how and what was needed for the employee to progress upward were not articulated.

This aspect in particular ignored the fact that if an employee was to progress up a career path, particularly from the lowest skills level, that employee would need to be literate and numerate and have an understanding of basic sciences in the language medium of English or Afrikaans. The educational entrance criteria for a prospective apprentice, on the otherhand, were very specific. No indication was made as to how educationally disadvantaged employees would breach the educational gap to progress with training programmes designed to facilitate skills development and career progression up to artisan status. Beyond artisan status the problem was compounded in that no thought was given as to how the formal or non-formal education system of the disadvantaged employee could be re-integrated back into the formal Technikon level where the National Diploma in Printing Management was seen as one of the requirements for career progress into management.

The career progression concept did, however, indicate a departure in industry thinking on training. It sadly overemphasised the industry's pre-occupation with content and curriculum, course development and the education and training institutional arrangements, the entire delivery system and the training and development of teaching and training staff and only looked at the problem from the perspective of the employers in respect of their needs. Jessup (1991:3-6) identifies this as provider-led training and education, where the learner as an equal partner in didactically sound education and training was ignored.
The progression path system as postulated looked at training and education more from the learners point of view.

Jessup (1991:4) states:

'If learning is perceived from the viewpoint of the learner rather than that of the teacher or trainer and more particularly those who manage the education and training industry, one has to change the conventional model and the concepts used. If one accepts that the central process with which we are concerned is learning, and that learning can take many forms, education and training may be seen as helping to make that possible. The focus on learning should help to eradicate the distinction between education and training, and the establishment and agencies which divide learning into two camps. As a learner I do not make this distinction. My head does not have separate compartments to receive education and training'.

Jessup further reiterates that people will learn more effectively if they are clear about the outcomes they are trying to achieve. The concept of incorporating some definite learning experience to achieve some of the career aspirations of the employees in the industry was both implicit and explicit in the proposed system (Jessup, 1991:4).

An important issue raised from this proposed progression system was that entry requirements, as far as formal schooling was concerned, were not mandatory.

The nature and form of the learning experiences were not articulated and how they would fit into the CBMT Training System that was being developed were not alluded to.

1.2.5 THE ROLE OF THE NATIONAL PRODUCTIVITY INSTITUTE (NPI)

The NATIONAL PRODUCTIVITY INSTITUTE (NPI) was commissioned in 1989 by the NIC to conduct an in-depth training needs analysis of the industry with the objective of identifying training priorities and developing a strategic plan for an Industry Training Board.
The findings and recommendations of the report, with special reference to the skills training of apprentices, reinforced previous perceptions, postulated new ideas and raised new problems.

The recommendations were:

(a) The time-based system of apprenticeship was ineffective and inappropriate for the needs of the industry and was being rejected quantitatively by the industry.

(b) The training of apprentices occurred in both large and small companies. The latter raised concern since their ability to deliver CBMT was questioned.

(c) The role and functions of the educational part of the training conducted in Technical Colleges was questioned and again revealed that although such education was relatively cheap, it was seen to be not relevant to the needs of the learner.

(d) The quality of qualified artisans (journeymen) in the industry was a direct result of the selection, training and development of apprentices.

(e) Apprentice training was seen as influencing in the short-term the quality of technical skills but in the long-term it had a direct influence on the quality of managers in the industry. This was due to the industry practice of promoting artisans to management positions.

(f) Any envisaged Industry Training Board would need to develop a suitable training delivery system that will be acceptable to all sectors of the industry especially the smaller companies.

(g) A major overhaul of the entire apprentice training from an ineffective time-based one to a more effective integrated competency based system was urgently needed (NPI, 1989:90-96).
Arising out of the NPI report and the Training Needs Analysis conducted by the PNPITB and the opportune coincidence of a project initiated by the Training Committee of the PRINTING AND ALLIED INDUSTRIES FEDERATION OF SOUTH AFRICA (PIFSA), which was an investigation into the selection criteria for apprentices, an opportunity was seen to broaden the scope of this investigation.

An investigation into the designated trade of Photo-Lithography was designed by the PNPITB in 1990, which would not only aid in establishing selection criteria for apprentices but would:

(a) Examine the competence of an artisan from an overt output stance by critical observation of activities rather than a task listing.

(b) Attempt to identify some of the attributes and intangible skills that contribute to overall job competence.

This investigation corresponds with guidelines regarding critical steps in doing a job analysis. Mirabile (1990:1) suggests that the first step in doing a job analysis is to identify the success factors for the job; the second step is to build a profile of the job; then a profile of the incumbents in those jobs.

The investigation reveals (PNPITB, 1990a:3) that job competence depended on skills and attributes beyond those that any task listing approach would reveal. Blank (1982:56-65) identifies a task listing as being a prerequisite before any trainer can develop a Competency Based Modular Training programme. To be competent, a Photo-Lithographer, other than performing the tasks of the job to a satisfactory quantitative and qualitative output, would need to have the following skills and attributes: good numeracy, literacy and communication skills; certain artistic and creative abilities; good manual dexterity skills; good colour discrimination abilities; good perceptual skills; the ability to organise; good analytical skills; an ability to 'think' in the negative; a preference and ability to work in isolation.
The profile of a competent Photo-Lithographer offered pointers to the nature of the 'man' and the problems in accommodating this nature when the role of trainer is played by the person. It offered insights into how the person should be trained as a trainer of apprentices. The profile also achieved its primary role of identifying those attributes which could be tested in the selection process for apprentices.

The investigation also proved valuable in creating an awareness of the need to look at training course content and structure so as to accommodate the intangible skills necessary for on-the-job competence.

Certain salient points were also raised by the NPI Investigation:

'The weak points in the apprentice training process in the Printing and Newspaper sector clearly are training needs analysis and training presentation and to a lesser degree in-company proficiency evaluation' (NPI, 1989:54).

Furthermore, the NPI pointed out that:

' The traditional apprenticeship system is outdated because:

* effluxion of time is considered by the industry to be inappropriate

* trade tests are considered outdated and irrelevant by employers

* in-company training systems are haphazard and ineffective largely because of production interfering with training, but also because training needs analysis and evaluation of the system are rarely attempted

* the Technical College contribution to apprentice training is considered by the industry to be ineffective on the basis of its being out-dated and too theoretical' (NPI, 1989:87).

All these points confirmed the views by the various bodies involved in the training debate.
1.2.6 THE ROLE OF THE SOUTH AFRICAN TYPOGRAPHICAL UNION (SATU)

The SOUTH AFRICAN TYPOGRAPHICAL UNION (SATU) representing the most important employee organisation within the industry was the final major player in the training debate in the Industry.

The SATU has had a long history of involvement in training within the Industry. From its foundation years 1898 - 1904, right through to its involvement in the Industrial Council system in the 1920's, the SATU has shown particular interest in the training of apprentices (Downes, 1952:435).

The SATU has had a particular interest over the years in the designation of trades; the schedules of practical training and courses of study; the entrance criteria for apprenticeship; the duration of training; the wages and general working conditions for apprentices.

As a party to the NIC and being represented on the NPAC and NMTC the involvement of the SATU in the training debate must be read in conjunction with the workings of those bodies.

1.2.7 SYNTHESIS OF THE PROBLEM

The Printing, Newspaper and Packaging Industries of the RSA had over the years highlighted specific deficiencies in the training of its skilled manpower.

These deficiencies centred about the time-based system of apprentice training where practical training and technical education were seen to be unrelated. Control over the technical education component of the training remained outside the control of the industry and course syllabi were seen to be irrelevant to the practical training taking place within the industry.

The time-based system was perceived by the industry to be
inappropriate for the needs of the industry in providing a competent skilled artisan. Moreover, the very strict educational entrance criteria for prospective apprentices did not recognise the need for flexibility in order to facilitate career progression from the ranks of the unskilled educationally disadvantaged employees.

The very schedules of training for the time-based system emphasised trade specialisation from the onset and no common basic training in the broader aspects of the industry and its recognised sectors of origination, machining, finishing and maintenance existed.

The Manpower Training Act, Act No 56 of 1981 as amended which provided for the establishment of Industry Training Boards, their accreditation, as well as the privatisation of artisan training, prescribed that CBMT would be the only acceptable method to be used for the training of artisans in industry.

With CBMT training to be introduced a mechanism had to be found to train the training instructor in the industry in the new methodology.

The problem in relationship to the Printing, Newspaper and Packaging Industries in South Africa was that since CBMT for artisans training was a new approach to be used in general throughout all industries in South Africa, none of the other industries had the diversity of ingredients nor the experience to offer any didactically founded, sound model of a training system which would meet the needs of the Industry.

The Training Systems of the METAL INDUSTRIES ARTISAN TRAINING BOARD, THE FURNITURE INDUSTRY TRAINING BOARD, THE BUILDING INDUSTRIES FEDERATION OF SOUTH AFRICA and THE CLOTHING INDUSTRY TRAINING BOARD were examined. These revealed that:

(a) They had no model available that included such diverse aspects as required by the Printing, Newspaper and Packaging Industries.

(b) Those who did Trade Tests had not decentralised Trade Testing
and still would use the services of the CENTRAL ORGANISATION FOR TRADE TESTING (COTT). Thus they would be unable to influence the training of Trade Test evaluators.

(c) Those who used the Technical Colleges to provide technical education would still retain this as an integral part of their delivery mechanism for their CBMT programmes.

(d) The design and content of courses centred about mechanistic system placing greater emphasis on schemes of work, lesson plans and presentation and fell into the guise of provider-led training.

The training of the skilled manpower for the Printing, Newspaper and Packaging Industries needed to incorporate the following features:

* Flexibility and be pro-active in the arena of technological changes and develop the skills to cope with changes in technology.

* Able to incorporate content and structure to facilitate career progression growth for employees in the industry, including non-formal education.

* Be easily understood by the industry and equally applicable to large companies with sophisticated training structures and small companies with no training structures.

* Be applicable in form and content to a dedicated Printing College of Southern Africa which would institutionalise the training of skills for the Industry.

* Have appropriate content to ensure competence occurs on-the-job thus going beyond the well-used paradigm that competence depends solely on skills, knowledge and ability.

* Have a delivery mechanism that through appropriate quality
control structures and systematic evaluation will ensure the outcomes are appropriate and meet the needs of the learners, the industry and attain international recognition.

1.3 STATEMENT OF THE PROBLEM

Under the time-based training of apprentices for the skilled manpower needs within the Printing, Newspaper and Packaging Industries in the RSA very little, if any, consideration was given to the general didactic situation under which such training occurred. The journeyman, as the trainer, had no instructional model to work from, nor any comprehensive learning content to pass on to the apprentice (learner). In fact, the time-based system was a 'sitting-by-Nellie' experience for the apprentice with no specific objectives, except a very brief description via the Conditions of Apprenticeship of what areas of the designated trade he/she had to be exposed to.

The courses of training, as described in the Conditions of Apprenticeship, were merely a schedule of what practical training the apprentice was to be exposed to in each year of training. The courses of study related to the technical education an apprentice was to undergo. Interestingly, the passing or failing of a course of study ultimately had no effect on the apprentice reaching artisan status via a trade test or simply by effluxion of time. No true evaluation system thus existed.

For the period 1985 - 1990 of those apprentices that reached artisan status via a trade test only 64% had completed the Printers' Certificate III final course of study; 10% had only completed Printers' Certificate II; 10% had completed Printers' Certificate I; 16% had not completed any prescribed course of study. Interestingly, in the same periods, up to 17% obtained artisan status merely because of effluxion of time.

A model of instructional development, whether articulated in the form of written documentation or presented merely from a process of
evolutionary formation and unwritten, is usually intended to act as a
guide for those persons involved in the design, development and
implementation of learning systems and is applicable to the fields of
education and training. Clearly no model was in use within the
Industry for time-based training and with the advent of competency
based training no reference point was available for developing this
logically and with due regard for the didactic situation in which it
occurred!

Fraser, Loubser & Van Rooy (1991:11) refers to the andragogic
didactic situation applying not only to students but to apprentices.
They postulated a didactic situation triad involving the trainer
(journeyman), the learner (apprentice) and the learning content in an
interdependent inter-related relationship. Furthermore Fraser et al
(1991:21) refers to systems theory didactics and state that advocates
of systems didactics view the didactic situation as a complex system.

Within this didactic situation, specific aims and objectives, methods
of instruction, teaching principles, evaluation etc. in the form of
structures and processes are necessary and operate dynamically and
can form the basis for optimal learning.

Merely looking at the problem from the perspective of the
technological changes which impact on learning content in the various
trades within the Industry, it was apparent that in order for the
Printing, Newspaper and Packaging Industries to survive and grow, the
training of its skills manpower cadre required a model of a
Competency Based Modular Training System which is learner centred and
does justice to the andragogic didactic situation so as to ensure
that the industry is able to meet the challenges of the future.

1.4 ANALYSIS OF THE PROBLEM

The problems the industry had encountered in relation to the
time-based system of training for artisans had resulted in the
industry's total rejection of the system as being inadequate and
inappropriate for the needs of the industry. There existed no doubt that an alternative method of training was needed. Coinciding with this dissatisfaction, research was done on a national basis, namely, the HUMAN SCIENCES RESEARCH COUNCIL (HSRC)/NATIONAL TRAINING BOARD (NTB) Investigation into the Training of Artisans which was published in 1985. One of the recommendations made by this investigation and of major importance was the change in the training system from time-based to competency based.

'Practical training should be of a systematic modular type with performance evaluation as part of each module. There should, however, be lower and upper time and repetition limits set by the IATB's for progression through the modules. If the trainee cannot meet the performance requirements then he should move out of the system. Certified artisan status is achieved by completing an accredited training programme and passing a final performance evaluation at an accredited centre' (HSRC, 1985:116).

The Printing, Newspaper and Packaging Industries saw competency based training methodology as a viable alternative to the outdated time-based system. The use of CBMT methodology as a means of developing artisans in the industry presented a number of problems. From an andragogic didactic perspective the industry had no real basis to proceed from since the time-based system merely listed a schedule of what an apprentice needed to be exposed to within definite time frames. Testing was only done at the end of the time period via a standardised trade test which was not compulsory and moreover did not measure true competence since the test did not cover all facets of the trade.

Furthermore:

* The technical educational component of the training was designed and contained content of such a nature that it created an education-training dichotomy where the course content, subject matter and delivery mechanism were seen to be of little or no relevance to the practical training that was taking place.
The industry recognised that there existed a need for technical education and that the design and content of such technical education needed to be integrated with the actual practical training taking place. Any CBMT system would need to overcome his education-training dichotomy problem.

The desire of the Printing, Newspaper and Packaging Industries to have a CBMT training system which would be equally adaptable and flexible enough to be used within companies in a decentralised manner, as well as in a centralised training institution such as a printing college, further complicated the issue. No experience within the industry was available on which to build a suitable training system which would satisfy these needs.

The concept of a progression of modules from a common base to the skill of a qualified printer rather than a large number of designated trades posed the problem of creating an entire new structure for trade designation, as well as the design and development of appropriate didactically sound training programmes. These programmes would need to incorporate the central theme of basic common modules for the entire spectrum of the industry's core activities and progress to specific sector and discipline specialisation in the form of a trade.

The journeymen that are operational in the industry would, in the context of a decentralised training delivery system, assume the guise of the trainer in the work situation. As has been previously stated, many of the journeymen obtained their artisan status either by effluxion of time or by opting for an easier version of a trade test. A compounding problem was that via the NIC agreements prior to 1990, many operative staff who did not undergo any form of apprentice training were granted exemption and given red card status, that is artisan status, by the SATU.

The industry realised the need to create a cadre of experienced
trainers capable of training apprentices using CBMT methodology. The problem that arose was what was the appropriate training? The very structure and content and how the training was to be delivered hinged on the model of a Competency Based Modular Training (CBMT) System that was to be adopted.

* The nature and ordering of learning content in a designated trade under the time-based system, as previously mentioned, had evolved merely by a method of listing what an apprentice was to be exposed to for the practical training component. This listing did not consider important didactic principles, such as hierarchical listing of functions and learning tasks and no teaching objectives and evaluation criteria. There was no hint as to how the training was to take place or what method of training was to be used. There was no logical sequencing of content nor any structure where theory and practice were integrated.

* A premise of Competency Based Modular Training programmes according to Blank (1982:3-9) is that for each function and task very clear entry requirements need to be established, as well as concise objectives and matching criteria. Moreover an evaluation system needed to be in place so as to test competence on a continuous basis. Success in a module enables progress at the learner's own pace onto further modules in the programme. The time-based system had no proper evaluation system other than a final trade test the passing of which was incidental rather than crucial for an apprentice to attain artisan status.

1.5 AIMS OF THE STUDY

1. The main aim of the study is to investigate and develop a design model of a Competency Based Modular Training System which would, when implemented, result in a training system
which would suit the Printing, Newspaper and Packaging Industries in the RSA and provide for the long term growth and survival of the Industry.

2. Flowing out of the main aim of the study there is a need to ensure that the CBMT training programmes were didactically sound with due consideration to content, structure, evaluation, etc. and were learner-led in nature. The programmes also needed to integrate theory and practice.

3. The training of the trainers for delivery of the CBMT programmes was an essential ingredient and the development of a suitable training programme for the trainers was necessary.

4. The development of an integrated evaluation system which would cater for internal criteria which operate during the training encounter, and some form of external criteria which would represent an industry standard for training. The external criteria should also ensure trainee output in the form of performance was at the industry accepted performance standard.

5. A secondary aim of the study is to investigate existing models of the competency based training format that are currently in use in other industries in the RSA and internationally, with a view to evaluating their applicability to the Printing, Newspaper and Packaging Industries.

6. Taking into consideration the various viewpoints of the players in the training debate, an important aim was that whatever design model of a CBMT system was to be developed, it had to result in a training system that would be simple and easily understood - in other words, 'user friendly'.
1.6 CLARIFICATION OF TERMS

1.6.1 DEFINITION OF A DESIGN MODEL

A design model, for the purposes of this study, is a conceptual blueprint of a Competency Based Modular Training System from which a practical training system can be developed. Components of the design model are sub-systems in the model and consequently will aid in developing specific components of the actual Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries.

1.6.2 THE DEFINITION OF THE INDUSTRY

The PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES TRAINING BOARD (PNPITB) started operating on 1 January 1990 and in order to establish the broad parameters in which this research project was undertaken it is necessary in the first instance to determine what the definition of the Printing, Newspaper and Packaging Industries in South Africa is. In terms of Section 39(5) of the Manpower Training Act, Act No 56 of 1981 the definition of the industry is clear:

'Printing, Newspaper and Packaging Industries' or 'Industry' means the industry in the broadest sense in which employers and their employees are associated for the purpose of producing printed matter and/or for the packaging of any nature whatsoever, and includes work commonly known as sub-contract work, reproduction houses and the like' (RSA, 1981).

From the above definition one will note that the word 'industries' and 'industry' in terms of the definition, both collectively mean Printing, Newspaper and Packaging. This misnomer with regards the singular and plural is used extensively to describe the three distinct industries.

Section 39(5) of the Act defines the industry in a collective manner and enables training levies to be collected from the said industries. The training scheme hones into two main areas, one being
the financing of an Industry Training Board; the other being that the scheme is to ensure that the industry has an adequate supply of trained employees as well as to assist the industry via financial means with the training and development of all levels of labour in that industry.

1.6.3 COMPETENCY BASED MODULAR TRAINING (CBMT)

There is a need to clarify the terms, competency and competence. The word competency is used in connection with modular based training systems or methods. Competency based is used interchangeably with competency referenced modular training and the semantics must not confuse since both refer to the same thing. Competence on the other hand according to the NTB (1989:3-5) is seen as a personal internal and external condition of a very personal nature and that Competency Based Modular Training is a modern training system or method aimed at and focused on the ability of a learner to master a specific skill thereby displaying competence.

'In other words the training programme comprises a set of learning or performance objectives that are clearly defined so that they can only be attained if specific actions or tasks are carried out. The training method to be followed is designed and structured as accurately as possible so that the learner will be able to attain the required level of mastery or competence' (NTB, 1989:4).

1.6.4 TRAINING SYSTEMS

A system can be classified broadly into physical and non-physical terms. A system according to Laird (1985:5-6) has the essential features of an input, a conversion and an output. In most systems some sort of feedback mechanism exists. Diagramatically a system can be depicted as follows in Figure 3.
Laird (1985:6-15) further states that a training system within the world of work has inputs consisting of people (some of the people are trainees) technology, materials and time. The conversion process is the application and exposure of the inputs via a training encounter such as face to face instruction. The outputs are essentially that the trainees in question can perform the tasks they have been taught to the desired standard. Systems may contain sub-systems and any change in a sub-system has an effect on the system as a whole.

Systems theory when applicable to didactics according to Fraser et al (1991:20-22; 81-84; 89-92) identifies important didactic issues such as teaching objectives, instruction methods, instruction media and evaluation. These issues are essential components of the conversion phase of the system depicted in Figure 3.

The initial situation of the learner represents the starting point of the process and the output is the result due to the conversion process. The curriculum on the other hand represents the interrelationship of aims, learning content, evaluation and the teaching-learning activities in a coherent justified planned manner for implementing the didactic activities.
1.7 THE PROGRAMME OF STUDY OF THE DISSERTATION

1.7.1 TRAINING OF SKILLED WORKERS IN THE RSA

In Chapter 2 by means of a combination of empirical research and literature surveys clarity will be made as to the definition of a skilled worker in a broad sense and specifically in a narrow field as defined in the Printing, Newspaper and Packaging Industries.

In the same Chapter, using literature surveys the various training systems that are used to develop skilled workers in the RSA will be analysed and evaluated in relation to specific didactic issues.

Chapter 2 will also include an analysis and description of the macro training environment in the RSA in which the Central Government and the DEPARTMENT OF MANPOWER play a vital role.

Due to the newness of Industry Training Boards and the changing role of Regional Training Centres, the meso environment aspects will by means of literature surveys be described so as to determine the role of these bodies in this environment.

The micro training environment in terms of a specific industrial sector, namely, the Printing, Newspaper and Packaging sector, will be investigated and described in Chapter 2. A combination of literature studies, direct observation and the practical day to day running of the industry will be the basis of this research.

The training systems particularly those using CBMT in selected training boards who train apprentices in designated trades will by means of literature surveys and structured interviews be analysed and evaluated in Chapter 2 with a view to their possible suitability for the Printing, Newspaper and Packaging Industries.
1.7.2 COMPETENCY BASED TRAINING AS A DIDACTIC TOOL FOR SKILLS TRAINING

Chapter 3 will by means of literature surveys identify what competence is in relation to the output performance of a skilled worker within an organisational setting. How this identified competence matches with reality to the output competence desired within the Printing, Newspaper and Packaging Industries in the RSA will be put in perspective.

Chapter 3 will also explore through literature surveys and investigation how competency based training can be used as a didactic tool in the Printing, Newspaper and Packaging Industries.

1.7.3 TRAINING MODELS AND TRAINING SYSTEMS

In Chapter 3 key concepts such as a systems approach to training, competency referenced instruction, and didactic models will be elaborated on. Naturally literature surveys will be used to identify what a system's approach to training is; what a didactic model is and how such models can be applied to training in an industrial setting.

1.7.4 DEVELOPMENT OF A MODEL OF A COMPETENCY BASED TRAINING SYSTEM

A generic model of a Competency Based Modular Training System by means of literature surveys will be described in Chapter 3 with a view to its application in the Printing, Newspaper and Packaging Industries.

In Chapter 4 the design model needs of the Printing, Newspaper and Packaging Industries will be identified. These identified needs will be used to develop the components of the design model of a Competency Based Modular Training system as well as the support system for the model.
Chapter 4 will also provide a detailed description of the design model of a Competency Based Modular Training System.

1.7.5 IMPLICATIONS AND APPLICATIONS OF THE DESIGN MODEL FOR THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES IN THE RSA

The application of the design model in the Printing, Newspaper and Packaging Industries in the RSA will be discussed in Chapter 5 by means of practical examples of its implementation.

Chapter 6 will contain a summary of the findings, a general conclusion and recommendations.
CHAPTER 2 : THE STATUS OF TRAINING OF SKILLED PERSONNEL IN THE RSA

The development and status of training of skilled personnel in the Republic of South Africa needs to be analysed from the aspect of identifying who that skilled worker is and how the Printing, Newspaper and Packaging Industries define that worker. On the establishment of the 'identity' of the skilled worker a brief investigation and analysis of what training systems have and are being used and how the training environment from a macro, meso and micro level influence training of the skilled worker in the RSA, will be made. The skilled worker will be identified within the context of the Printing, Newspaper and Packaging Industries.

2.1 IDENTIFICATION OF THE SKILLED WORKER IN TERMS OF ARTISAN TRAINING IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

The Printing, Newspaper and Packaging Industries in South Africa has had a history of deep involvement in the training and development of a skilled workforce especially in the area of artisan training. The National Industrial Council of the Printing and Newspaper Industry of South Africa was established in 1920 (NIC, 1920).

This council, as early as January 1923, published the first scheme of training for apprentices and established the first apprenticeship committee which held its first meeting in June/July of that year. This apprenticeship committee was formed in terms of the Apprenticeship Act, Act No 26 of 1922.

The brief of this first apprenticeship committee was to assist and advise the Minister as to:

(1) The classification and designation of trades which the Apprenticeship Act will be applicable to.

(2) The period or periods of apprenticeship for the various designated trades.
(3) The wage rates of apprentices.

(4) The entrance qualifications upon which apprenticeship shall commence.

(5) The nature and number of the educational classes that will be attended by an apprentice.

(6) The course of training prescribed for a designated trade of the industry.

(7) The number of apprentices who may be employed.

(8) Any other matter concerning apprenticeship referred to the Committee by the Minister.

Not only have the employers of the industry had a keen interest and deep involvement in the training and development of artisans but the employees in the form of the SOUTH AFRICAN TYPOGRAPHICAL UNION (SATU) has from as early as its foundation years in 1898 to 1904 been actively involved in all matters concerning apprenticeship training. This involvement assumed greater impact when industrial co-operation was achieved between 1920-1929 when the SATU became a party to the National Industrial Council of the Printing and Newspaper Industry of South Africa (Downes, 1952:49).

"Amongst the many problems to be dealt with by the Union and the NIC were the operations of the Apprenticeship Act - which also covered other industries; its relation to the association of our apprentices with mechanical typesetting; the question of "skilled" and "unskilled" work in bookbinding which had very important effects in view of the increased part which female labour was to play; and the place of "copper-hands" and platen pressmen in letterpress machine operations' (Downes, 1952:435).

The interest and deep involvement of both employers and employees in training has over the years broadened and it was no surprise that both the employers and employees through their organisations were
party to the formation of the industry training board and serve as members of that board today. The dilemma facing South African industries in the 1990's is in many ways a perennial one. Skills shortages exist and will exist in the future and training being costly is usually cut back in times of recession in the economy.

Of importance to the survival and growth of many industries is the need to have a pool of skilled manpower available. This is equally true of the Printing, Newspaper and Packaging Industries.

A training needs survey of the industry revealed that the training of skilled workers in the form of artisan training was seen to be of great importance. Indications were that from the respondents to the survey, although only representing a 15% response to all the surveys sent out, this 15% response de facto employed 23,181 wage earning employees out of an industry which had at that time had 46,232 employees, thus representing 50.1% of the total number of wage earning employees (PNPITB, 1990d:1-4).

Furthermore, of all companies that were actively involved in apprentice training the respondent companies represented in excess of 86% of apprentices indentured at that time. Respondents also indicated that their intention was to increase apprentice intake for the period 1991 to 1993 by 51%, 40% and 41% respectively.

The same needs analysis revealed that the retraining and further training of qualified artisans over a broad range of disciplines also enjoyed high priority.

The Printing, Newspaper and Packaging Industries has always had a very clear perception of what it considers a skilled employee to be. Joubert (1991:9) identified the composition of the skills market as follows:
COMPOSITION OF THE SKILLS MARKET

<table>
<thead>
<tr>
<th>SKILLS CATEGORY</th>
<th>TYPICAL JOBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Management and Services</td>
<td>Ministers, Directors, Officers, Policemen, Soldiers, Wardens, Lawyers, Attorneys, Doctors</td>
</tr>
<tr>
<td>Education, Training and People Development</td>
<td>Professors, Lecturers, Teachers, Trainers, Instructors</td>
</tr>
<tr>
<td>Technology Management and Development</td>
<td>Scientists, Engineers, Technologists, Technicians</td>
</tr>
<tr>
<td>Resources Management</td>
<td>Managers, Supervisors, Accountants, Human Resources Practitioners, Economists</td>
</tr>
<tr>
<td>Crafts</td>
<td>Fitters, Electricians, Miners, Others exposed to Vocational Training</td>
</tr>
<tr>
<td>Sales and Marketing</td>
<td>Salesmen, Liaison Officers, Public Relations Officers</td>
</tr>
<tr>
<td>Information Support</td>
<td>Clerks, Computer Operators</td>
</tr>
<tr>
<td>Production Workers</td>
<td>Operators, Labourers</td>
</tr>
</tbody>
</table>

A skilled worker as seen from the perspective of the Printing, Newspaper and Packaging Industries would be related to the category of crafts and production workers but who have undergone formal training by means of an apprenticeship.

2.2 TRAINING SYSTEMS CURRENTLY IN USE TO DEVELOP SKILLED PERSONNEL

Bearing in mind the Printing, Newspaper and Packaging Industries perspective of what a skilled worker is, namely an artisan who has been trained via a system of apprenticeship, all subsequent discussions on the training of skilled personnel in other industries in the RSA will be addressed from this specific viewpoint.
2.2.1 TIME-BASED TRAINING SYSTEMS

The training of artisans prior to 1981 was regulated in the RSA by various pieces of legislation. However, with the passing of the Manpower Training Act, Act No 56 of 1981 all these pieces of legislation were consolidated under one act and established, amongst other things, the tripartite relationship between State, employer and indentured apprentice.

The Manpower Training Act, Act No 56 of 1981 regulated artisan training which at that time was time-based.

The essential features of the time-based training systems used to train artisans according to the Manpower Training Act, Act No 56 of 1981 are the following:

A. Entrance criteria: For an employee to be indentured into a trade a contract could not be entered into unless:

- The trade has been designated and conditions of apprenticeship described.

- The proposed apprentice had attained a minimum age of sixteen years and had a standard seven school certificate, as well as having a favourable medical report.

- Indentured apprentices could be indentured into a designated trade provided they were still minors. If they were adults, that is, over 21 years of age, they would be considered adult trainees who could undergo training in adult training centres which were provided for this purpose.

B. Period of Apprenticeship

A definite period of apprenticeship is prescribed, the shortest period being three years and the average period being four.
Within this time period provision was made for attending technical education (theory). Special compensation in terms of a reduced period of apprenticeship of eight months for two years of initial national service was made. A proviso, however, was that irrespective of the circumstances, an apprentice would be required to undergo a minimum practical training period of between 80 to 93 weeks before doing a trade test (HSRC, 1985:33).

C. Apprentice Remuneration

The minimum wages for an apprentice would depend on the industry involved. However, as a general rule, an apprentice would receive a certain percentage of an artisan's basic wage. This percentage would increase for each year of apprenticeship. Some innovation was introduced where additional payment was made on completion of certain levels of the compulsory technical education component.

The innovation of a financial incentive to pass compulsory technical education can be seen as an attempt at an extrinsic motivator for the learner in the andragogic didactic situation (See 4.1.1).

D. Technical Education

Apprentices were required to attend classes at a technical college or, if due to unavailability of suitable colleges within easy reach, they were obliged to study via correspondence courses. The attendance at a technical college for technical education was commonly called the 'Block Release System' which consisted of a ten week period of live classes for five days a week and a further one week for examination purposes. The minimum educational requirement an apprentice had to attain was usually at the NTC I level with a trade theory only.
An important area of concern with regards the technical education in the Printing, Newspaper and Packaging Industries was that the subject choices, syllabi and content of courses were seen to be not relevant (See 1.2.5). Fraser et al (1991:32) in discussing the adult in the learning environment put forward one of Gagné & Briggs' recommended strategies for teaching an older student, namely, that the objectives of the course should be focused, very specific and drawn to the learner's attention. Here the relevance of the course is vital if the older student is to be motivated. Moreover, relevance must be seen in relation to the practical training that is taking place.

E. Recording of Progress in Logbooks

An employer with an apprentice under contract in a designated trade is obliged to provide training according to the prescribed schedule of training as described in the conditions of apprenticeship. The progress of the apprentice is to be monitored by means of a logbook supplied by the employer to the apprentice. The entries by the apprentice as to what he/she has been trained in on a daily basis need to be checked by the employer to ascertain the progress and problems that may occur. In essence this system of progress monitoring was an attempt at managing training in its broadest sense in relation to the apprentice as learner.

F. Courses of Training

Within the conditions of apprenticeship for a designated trade courses of training were prescribed. These courses of training would indicate what practical training would be necessary and indicate very often how much time should be spent on a particular task. Moreover, the schedule of training would also indicate what training needs to be covered in each year of apprenticeship.
Within this schedule of training the course of study, i.e. the technical education, was prescribed indicating the subjects deemed necessary for the trade at the NTC I, II or III level.

The content of the training schedules for the apprentices in the Printing, Newspaper and Packaging Industries emphasised specialisation from the onset (See 1.2.7) and ignored the need to move from a common basic industry-wide generic content to specialisation (See 1.2.3). The relevance of course content when viewed from the perspective of job competence will be discussed in Chapter 3.

G. Testing

The time-based system allowed for trade testing. The trade test could be taken on a voluntary basis before the full period of the contract had expired provided that certain stipulated criteria had been met which centred about the minimum period of practical training and a specified minimum level of technical education achievement. Compulsory trade tests were a feature of the system in that toward the end of the contract, usually two months before the expiry date of the contract, a trade test had to be undergone.

The very content of trade tests often only tested a part of what an apprentice had learned or would need to be competent in as an artisan. Moreover trade tests once established were of the same form and no variety was allowed for with regards content. This enabled short intensive coaching of an apprentice prior to a trade test aimed at passing the test and not concerned with job competence.

Failing a voluntary and a compulsory trade test did not hinder the apprentice in attaining artisan status. Merely by the effluxion of time of the period of the contract enabled the apprentice to receive full artisan status.
According to the HSRC/NTB Investigation into the Training of Artisans the existing approaches to training under the time-based system were:

1. With an artisan "sit-by-Nellie"
2. With an artisan "sit-by-Nellie" assisted by an instructor
3. Training centre and on-the-job experience
4. Training centre and on-the-job training
5. Training centre and on-the-job training and on-the-job experience
6. Institutional training and on-the-job training and experience

It must be noted that even though some of the systems used hinted at a modular concept none in fact included competence as a prerequisite. The report further identified that the time-based system with all the variations in training systems used lacked control, fostered poor training, ignored the differences in the learning tempo of apprentices. It also identified that training facilities in industry were often inadequate to train the full spectrum of the trade and that in many cases the training style used was inappropriate for the needs of the industry (HSRC, 1985:8).

The time-based system of training as applied to the Printing, Newspaper and Packaging Industries reflected all the above. The conditions of apprenticeship for the Industry using time-based methods (NIC, 1986) had a confused and cluttered training schedule for the different trades.

The trade of Carton Making (NIC, 1986:13) described what the apprentice was to be exposed to and trained in each year of apprenticeship whereas in the trade of Electronic Composition (NIC, 1986:16-18) it not only identified what the apprentice was to be trained in and exposed to in each year but specified a month by month schedule.
The schedules indicate in certain instances that the apprentice needs only knowledge of a particular facet of the job and training on the equipment that is available. No reference was made as to what equipment and facilities were necessary for all the trades.

Addendums were made in certain selected trades only specifying that if the facilities do not exist for practical training in certain aspects of the trades, arrangements should be made for the apprentices to receive training at another firm who do have such facilities. This was commonly known as the 'loan of services' system (NIC, 1986:22-23).

The general didactic situation under which an apprentice found himself reflected the shortfalls of the system.

The content of the courses, particularly the sequence of training events and the method to be used when training takes place such as a lecture, case study, or practical demonstration, etc. were not identified and no guidance to the trainer was offered as to how to manage the didactic situation with the apprentice.

Fraser et al (1991) as mentioned, (See 1.4) adheres to the andragogic didactic situation triad for apprentices training. This triad involved the tutor, learner and learning content.
In the time-based system of training the journeyman assumed the role of the trainer for all the practical training in a designated trade. Within the printing industry this journeyman was at all times considered a productive worker, highly paid and responsible for producing goods at the right cost and quality. Production was seen to be the main activity of the journeyman.

According to Fraser et al (1991:53) learning and instruction will only be effective if the journeyman as trainer could assess his/her training on the basis of the following criteria:

1. Succeeded in exposing the selected subject content through his proficiency as an artisan, the actual training and the use of a variety of teaching and training methods.
No attempt was made to provide the journeyman with the necessary teaching and training skills in the Printing, Newspaper and Packaging Industries.

2. Convinced that the content that is to be taught and mastered by the apprentice is scientifically and technically correct.

The schedules of training which contained the content of the courses were inappropriate (See 1.2.5) and too vague, thus in practice they were of little or no use to the journeyman in the Printing, Newspaper and Packaging Industries.

3. Has the opportunity to determine if the apprentice has mastered the content of the practical training and is able to use it and apply it in new situations.

Journeyman as trainers did no testing of the apprentices on an ongoing basis they merely recorded in the log books what the apprentice had been exposed to in the Printing, Newspaper and Packaging Industries.

Simply because of the secondary role that the journeyman was perceived to have as a trainer of apprentices, no training of the journeyman as a trade training instructor took place.

The schedules of training for a designated trade did not set any learning objectives. According to Laird (1985:102-103) when learning objectives are clearly defined as to what a learner would learn to do as a result of a training encounter, it assists the andragogic didactic situation in that the learner knows what precisely is expected and also where he/she is going. The trainer can better control the training encounter by using correct stimuli on learners, have a better response to learners' reactions, understand clearly the desired behaviour they require from the learner and most importantly have a sound basis for an evaluation tool.

As has been discussed, the only evaluation tool available in the
time-based training system was the trade test. This trade test was administered at the end of a contract period and by an external body which made no reference to the journeyman as trainer and was almost incidental in that artisan status could be achieved merely by effluxion of time.

2.2.2 CBMT TRAINING SYSTEMS

To evaluate the variety of CBMT training systems in use in the RSA would present problems. According to Blank (1982:7) there are a variety of brand names or labels given to the CBMT approach to training, such as:

* Competency-Based Instruction (CBI)
* Mastery learning
* Systems Approach to Education
* Personalised System of Instruction (PSI)
* Performance-Based Instruction
* Criterion-Referenced Instruction (CRI)
* Learning for Mastery (LFM)
* Programmed Instruction (PI)
* Self-Paced Learning

Blank (1982:6-7) further states that although the various names given are not entirely synonymous with each other, there exists enough similarity to generalise that they essentially contain four main elements:

(1) Identifies exactly what the trainee should learn,

(2) Provides for meaningful quality instruction,

(3) Specifies mastery in a module or task before the learner can progress to the next module or task,
(4) Requires overt demonstration by the learner that they are competent, that is, an evaluation system based on demonstrated mastery.

Of more value to this study was to investigate how various industry sectors approach CBMT training for their skilled employees.

A suitable cross-section of established training boards for various industrial sectors was chosen with a view to investigating what systems they employed in training. Of particular concern was to establish if any of the systems of training were applicable or adaptable for use by the Printing, Newspaper and Packaging Industries.

The investigations were approached from the point of view of specific didactic issues, particularly the trainer, the learner, the course content, the methods of training, the aims and objectives and the evaluation of training and to a lesser degree the management of training.

2.2.2.1 THE METAL AND ENGINEERING INDUSTRIES ARTISAN TRAINING BOARD (MEIATB)

According to the MEIATB (1991:1), the MEIATB was established in 1989 and in March 1990 it completed the take-over of all the metal industry apprentice contracts from the DEPARTMENT OF MANPOWER, assuming the administrative responsibilities for artisan training. This was in anticipating the amendments to the Manpower Training Act.

The MEIATB was accredited by the Department of Manpower on the 5th August 1991 and made a ruling that any apprentice indentured after the 5th August 1991 would be trained under their new modular system within the thirty-two designated trades (MEIATB, 1991:1).

The conditions of apprenticeship for training under their new modular system (MEIATB, 1991:1-10) featured the following:

A. The initial situation of the learner as a didactic category in the Metal Industry Training System:
The initial situation of the learner in terms of entry criteria specified a minimum qualification for commencing apprenticeship as sixteen years of age and a standard seven education with English or Afrikaans, Mathematics or Science, as well as at least two other subjects or a four-subject National Certificate Part I (NI).

Other than a mechanical aptitude test no other form of trainability assessment is done. The emphasis was on educational standard and precluded any persons who did not have such qualifications. No career progression system exists for the industry. The MEIATB by its constitution only caters for artisan training. More particularly it prescribes to a narrow interpretation of who may be indentured as an apprentice, namely, a minor under the age of 21. The adult over 21 therefore does not at present have the opportunity to become indentured as an apprentice.

Indications are that during the course of 1993 the MEIATB would take over the 'ATRAMI' project from the NATIONAL INDUSTRIAL COUNCIL FOR THE METAL INDUSTRY. This project caters for the training of persons older than 21 in the designated trades of the industry.

B. The course content as a didactic category in the Metal Industry Training System:

The course content for the apprentice training revealed that it included technical studies. The technical studies via a block release system within the requirements of the training schedule for a specific trade is compulsory. The block release system states that the technical studies are to be provided by the Technical Colleges or by Correspondence Technical College.

The establishment of curricula and syllabi for the technical studies are still a joint industry and national education venture and a clear distinction is made between training and education which reflects itself in the course contents for the two components. By and large the practical modules, reflect practical training in the trade craft
and contrasts with the technical studies which reflect the requirements of national education with regards number of subjects for each level. The education training dichotomy is very evident (See 1.2.2).

The period of training was specified with a minimum of two years practical to a maximum of four years which will include time spent at technical colleges.

There is no real integration of the technical studies with a specific stage of the practical training nor is there a link-up of the theoretical content to the on-the-job practical requirements of the job.

The schedules of practical training for the various designated trades reveal that:

(i) The modules in each trade are all task orientated. The concept of a progression of modules from a common metal and engineering base to the skill specialisation is not evident. The emphasis is rather on a large number of specialised fields and consequently the large number of designated trades.

(ii) The methodology used in determining the practical training course content centred around task analysis and emphasises task competence within the narrow confines of a specific trade.

(iii) The evaluation system consists of a progress record chart which is controlled by the employer of the apprentice and submitted to the MEIATB for up-date purposes.
The conditions also prescribe the wage rates payable to an apprentice for each year of apprenticeship.

Provision within the conditions is made for the payment of class or course and examination fees provided the apprentice performs satisfactorily.

This latter provision can be seen as the attempt at some form of intrinsic motivator for the apprentice in the andragogic didactic learning situation.

C. Evaluation of training as a didactic category in the Metal Industry Training System:

A training evaluation process is in place in the MEIATB training system. Trade testing is compulsory for all apprentices. However, for an apprentice to be accepted as a trade test candidate, the apprentice would need to meet the following criteria:

(a) completed the off-the-job modular training programme, as well as the on-the-job modular training programme approved by the MEIATB,

(b) have obtained a minimum theoretical qualification as prescribed in the training schedule for each trade,

(c) have completed a minimum of 100 weeks for the practical off-the-job and on-the-job prescribed modules,

(d) have passed the MEIATB approved criterion test for the various modules,

(e) have supplied documented proof of having met all the above requirements. This is referred to as a training record.

The training can only be truly evaluated at the trade test stage which is conducted by the CENTRAL ORGANISATION FOR TRADE TESTING (COTT). The actual trade test for the designated trades have not had
any fundamental changes in that the same trade test is used for both existing time-based apprentices, which are still in the system, and for CBMT trained apprentices.

In order to facilitate the on-going evaluation of training the MEIATB has adopted an accreditation process whereby companies wishing to train apprentices need to satisfy the following compulsory requirements:

* The facilities to train in a particular designated trade must be in place. In particular, emphasis is placed on the machinery, equipment and materials that are necessary.

* The trainer must be a qualified artisan who attained artisan status by means of a trade test in the designated trade that he or she is to train apprentices in.

This accreditation process is represented in Figure 5.

**ACCREDITATION PROCESS**

*In terms of the new apprentices training system, companies wishing to train apprentices will need to make formal application to the MEIATB for accreditation.*

- Application form received by MEIATB
- Self-evaluation form sent out (checklist)
- Self-evaluation carried out
- Documents sent to MEIATB
- Training adviser visits and evaluates
- Report plus recommendation tabled at accreditation committee
- Accreditation committee

- Not approved with guidelines to employers
- Grants temporary or provisional accreditation
- Accreditation certificate plus plaque issued
- On-going monitoring by MEIATB

**MEIATB ACCREDITATION PROCESS**

*(MEIATB, 1991:3)*

**FIGURE 5.**
On analysis of the training system promoted by the MEIATB, competency-referenced instruction is predominantly used with a variety of other techniques which all fall within the Competency Based Modular Training guise.

The training offered through the MEIATB is restricted to a select part of the employee cadre within their industry. No career progression path system exists and no training for operatives or any other category of employee other than apprentices is offered.

D. The trainer as a didactic category in the Metal Industry Training System:

The trainer within the MEIATB is prescribed as being a qualified journeyman. No further requirements other than having obtained artisan status by means of a trade test are needed.

The impact of the andragogic didactic situation which arises when the apprentice as learner and the trainer interact, is not considered since the training of the trainer is not an issue and not a condition of accreditation, for a company, or for the journeyman.

2.2.2.2 THE CLOTHING INDUSTRY TRAINING BOARD (CITB)

The Clothing Industry Training Board was established in 1977 and has established training centres in Johannesburg, Durban and Cape Town. These centres offer a variety of training courses in different fields ranging from work study to sewing machine mechanical training. Of all the training undertaken by the CITB their sewing machine mechanical training is by and large the closest in nature to that of an apprenticeship and the CITB have a close association with City and Guilds of London Institute.

The City and Guilds of London Institute Craft Certificate for sewing machine technicians is for all intents and purposes identical to a trade qualification within the metal and engineering industries of
the RSA and is used by the CITB to train their sewing machine mechanics.

The salient features of the sewing machine mechanic traineeship according to the CITB within specific didactic categories are the following (CITB, 1993:1-12):

A. The learner as a didactic category in the Clothing Industry Training System:

Very specific selection criteria are set for prospective sewing machine mechanic trainees. A standard eight school certificate with mathematics and science are a prerequisite. No age restrictions apply. Most candidates are school leavers and new to the industry.

The CITB does not have a career progression path system, due to the fact that the various sectors in the industry are so diverse in nature that within a single production unit the requirements in the design section, cutting room, sewing operations and final finishing are so wide that the entrance criteria for trainees, the actual training requirements, course content and evaluation systems are too broad to accommodate.

B. The course content as a didactic category in the Clothing Industry Training System:

The course duration for a trainee sewing machine mechanic is four years. The courses of study are divided into three main sectors. According to the CITB TECHNICIAN DEPARTMENT YEAR PLANNER (CITB, 1993:11-12) the sectors cover the following:

(i) Clothing machinery covering the theory of machinery, stitch formation and classification, stitch forming action, machine construction, sewing technology, thread technology, fabric classification, preventative maintenance and safety and health.

The practical component involves the development of skills...
related to the overall operation, set up and maintenance of fourteen different types of sewing machines.

(ii) Workshop practice, which involves practical skills training in the use of handtools, fitting and machining, basic electronics, electro mechanics, pneumatics, metallurgy, gas welding, brazing, soldering, health and safety.

(iii) Related studies of a purely theoretical nature covering clothing manufacturing system, appreciation of quality control, work study, pressing equipment, cutting room equipment and cutting room operations.

Since the inception of the City and Guilds of London Institute (CGLI) scheme in 1984 and up to and including the 1992 intake of trainees, all trainees attended a block release system for technical education. This technical education was facilitated by the Technical Colleges and led to National Technical Certificate qualifications at an N1, N2 and N3 level. The CITB has the perception that the course content of the technical education was too theoretical and inappropriate for the needs of the clothing industry indicating that they also are involved in the education training dichotomy debate.

As of 1993 the block release system was to be dropped and a more appropriate practical component of training would replace the technical education.

C. Training methods as a didactic category in the Clothing Industry Training System:

The mechanism by which the training and instruction for the trainees takes place is entirely centralised. All trainees as from 1993 will do practical and theoretical training for 1 day per week at the CITB training centre for 2 years, as well as attend the basic electronics course scheduled to take 32 hours over a number of Saturday mornings. The workshop practice components of handtool skills, fitting and machining will require an additional 1 day per week at the Defence
Workshops at Wingfield, until the 36 hour course has been completed.

On closer examination of the training programmes it is evident that the format is modular in nature and exclusively task orientated. The ultimate aim for the trainees is to undergo the LCGI Craft examination which entails a three hour written examination, and a practical examination of 9 hour duration on nine types of sewing machines out of the fourteen types that practical skills training was given in over the four year training period.

2.2.2.3 THE FURNITURE INDUSTRY TRAINING BOARD (FITB)

The Furniture Industry Training Board was established in 1976 and has been actively involved in the training of apprentices.

Smith, the Executive Director of THE FEDERATION OF FURNITURE MANUFACTURERS stated that problems with the time-based system of apprentice training did exist and went on to say:

'As manufacturers we have for years complained about the state of our industry's artisan training - and with some justification. Any industry employing around 35 000, that indentures less than 120 apprentices per year and has 83% of these fail their trade test, has reason to worry about its skills future' (FITB, 1990:1).

In 1990 the FITB introduced their new modular training scheme for apprentice training. Examining the FITB training system in terms of specific didactic categories it revealed the following (FITB, 1990:1-27):

A. The learner as a didactic category in the Furniture Industry Training System:

The FITB training system allows for the indenturing of apprentices in six designated trades. According to the conditions of apprenticeship (FITB, 1990:11-27) the minimum age requirement is again 16 years of age with at least a standard six school certificate with Afrikaans or
English, Mathematics and at least two other subjects. A trainability test which has a distinct cut-off point needs also to be satisfied before a contract of indentureship can be signed. The period of apprenticeship is set at between a minimum of two and a maximum of four years. The minimum period of 2 years (104 weeks) is specified and within this period at least 78 weeks are spent on practical on-the-job experience and a minimum of 14 weeks on modular off-the-job training.

The FITB does not provide for career progression for all its employees. It does, however, provide for exit points within a specific course of training at any stage with due certification for the level that was achieved.

B. Learning content as a didactic category in the Furniture Industry Training System:

The modular programme for the off-the-job training is divided into five stages and the conditions prescribe a minimum wage for each stage, which is calculated as a percentage of an artisan's minimum rate.

The courses of training are depicted in course maps for each trade. The course map of the Cabinet Making trade is shown in Figure 6 (FITB, 1990:18-19) and identifies the module title, stages and skills qualification.
CABINET MAKING COURSE MAP
(FITB, 1990:19)

FIGURE 6.
The actual modules for a designated trade revealed that they are purely task orientated and were arrived at by means of a task listing. The majority are practical in nature, some do however contain certain relevant theoretical input.

The concepts of core competences and underpinning knowledge are not part of the FITB training system. Moreover, the recurrent education-training dichotomy (See 1.2.2) is evident in their training system.

Each trade has modules which enhance specialisation from the onset and do not progress from a broad base of industry generic common modules to specialisation.

C. Training methods as a didactic category in the Furniture Industry Training System:

The salient features of the FITB apprentice training methods are:

All indentured apprentices must undergo modular training which can be obtained by means of three options:

(i) at one of the FITB accredited training centres or at one of the five FITB training centres situated in Johannesburg, Durban, Cape Town, Bloemfontein and Knysna;

(ii) by one of the accredited training officers from one of the accredited training centres provided in-house at an organisation;

(iii) at a company accredited by the accreditation committee of the FITB to provide modular training for specific stages of a training programme or for the entire training course for a designated trade.

Employers are obliged to release the apprentice for five periods of training at an accredited training centre or in-house if the accreditation criteria are satisfied. According to the Staff
Development and Apprentice Co-ordination Training Officer of the FITB, a typical period of release to do the modular training for stage 1 of a course is 7 days.

Some latitude is provided for in the training system in that an apprentice need only to undergo technical education prior to stage 4 of a particular course. Provision is also made that the trade theory subject Furniture Makers Theory at the N1 level is the minimum technical educational qualification required before a final competence trade test is undertaken. On the practical training an apprentice would require 96 module credits, together with the technical education minimum requirements. Module credits in fact are weighed for a group of related skills or competencies.

Modular training credits can be achieved by:

(i) Undergoing training and proving competence in each module.

(ii) Passing a stage test at the end of each test.

(iii) Applying for module exemption from certain modules by proving mastery in the skills specified and by meeting the criteria for the modules.

D. Evaluation of training as a didactic category in the Furniture Industry Training System:

The evaluation system is entirely controlled by the FITB and the trainers are the evaluators in most instances even at the final trade competence test at the completion of stage 5.

E. The trainer as a didactic category in the Furniture Industry Training System:

The andragogic didactic situation that arises between the trainers, who in all instances are qualified artisans, and the apprentices who attend the modules in groups, is one based on practical instruction with the objective of teaching a particular task related to the
manufacture of products in the Furniture Industry exclusively. No training of the trainer as an instructor takes place and very little attention is given to promoting sound didactic practices in the training situation.

2.2.2.4 THE BUILDING INDUSTRIES FEDERATION OF SOUTH AFRICA (BIFSA) TRAINING COLLEGES

THE BUILDING INDUSTRIES TRAINING BOARD (BITB) was established in 1990. This Board, however, operates more as an accreditation and testing body. The actual training of artisans in the building industry has been facilitated by THE BUILDING INDUSTRIES FEDERATION OF SOUTH AFRICA (BIFSA) training colleges. Two such colleges exist, one in Springs in the Transvaal and the other at Belhar in Cape Town.

At the BIFSA Belhar Training Centre, up to 52% of all artisan training in the RSA is done at the Centre. Furthermore, the research and development for CBMT programmes for the nine designated trades and most other training provided for the building industry, is done via the BIFSA Training Colleges.

The analysis of the Building Industry training system in the light of specific didactic categories revealed the following (BIFSA, 1990:1-31):

A. The learner as a didactic category in the Building Industry training system:

The minimum educational entrance requirement is a standard VII. However, for the trades of Carpenter, Joiner and Wood Machinist, Plumber, Roofer and Shopfitter, the recommended minimum educational entrance requirement is standard VIII.

The building industry does have a career progression system. In their BIFSA Skills Training Model (BIFSA, 1990:7) shown in Figure 7, it will be noted that provision is made for career progression even
Value this educational component has, the technical education component and raises the question as to what periods of relevant experience, which by this very mechanism, obviates these educational barriers are overcome by the mechanism of specific levels are set.
B. Course content as a didactic category in the Building Industry training system:

The general period of apprenticeship although competency based, thus dependent on the learners own pace, is three years.

The course content of the practical modules are very specific to a specialised trade and are task orientated. There is no building of skills from a broad based industry generic to a trade specialisation.

The education-training dichotomy debate exists in the building industry. A requirement under the conditions of apprenticeship are that technical education in the form of block release at a technical college is compulsory. Either an N1 or N2 needs to be completed. The courses of study are a relevant trade theory, Mathematics, Building Science and Building Drawing.

The actual integration of this theory with the CBMT practical modules in terms of the sequence, the underpinning knowledge and content were not taken into consideration and are seen as being separate issues.

C. Training methods as a didactic category in the Building Industry training system:

According to BIFSA training is to be done via the CBMT programmes as prescribed for the designated trade. These programmes consist of modules of a TRAINING PERFORMANCE CRITERIA (TPC) and PRODUCTION PERFORMANCE CRITERIA (PPC) type.

For the designated trade of Carpenter (BIFSA, 1990:12) the first ten modules illustrate the TPC and PPC time allocation as shown in Figure 8:
<table>
<thead>
<tr>
<th>MODULE NO</th>
<th>MODULE CODE</th>
<th>DESCRIPTION</th>
<th>TIME ALLOCATED IN HOURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CAR-CBO</td>
<td>Orientation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CAR-A01</td>
<td>Interpret basic knowledge</td>
<td>$\frac{3}{4}$</td>
</tr>
<tr>
<td>3</td>
<td>CAR-A02</td>
<td>Determine levels</td>
<td>$1\frac{1}{4}$</td>
</tr>
<tr>
<td>4</td>
<td>CAR-A03</td>
<td>Set out a building</td>
<td>$7\frac{3}{4}$</td>
</tr>
<tr>
<td>5</td>
<td>CAR-A04</td>
<td>Erect and dismantle scaffolding</td>
<td>$3\frac{1}{2}$</td>
</tr>
<tr>
<td>6</td>
<td>CAR-B01</td>
<td>Set out and fix reinforcement</td>
<td>$13$</td>
</tr>
<tr>
<td>7</td>
<td>CAR-B2a</td>
<td>Erect steel formwork for a rectangular column</td>
<td>$3\frac{1}{2}$</td>
</tr>
<tr>
<td>8</td>
<td>CAR-B2b</td>
<td>Erect purpose made steel formwork</td>
<td>$3$</td>
</tr>
<tr>
<td>9</td>
<td>CAR-B2c</td>
<td>Erect steel formwork for walls</td>
<td>$13$</td>
</tr>
<tr>
<td>10</td>
<td>CAR-B2d</td>
<td>Erect steel formwork for beams and slab</td>
<td>$17$</td>
</tr>
</tbody>
</table>

TPC VERSUS PPC TIME ALLOWANCES
(BIFSA, 1990:12)

FIGURE 8.

The TPC modules are to be trained at an accredited training institution such as the BIFSA Training Colleges. This off-the-job training entails 18 weeks spread over three years.

The PPC modules are completed on-the-job.

The relationship between the TPC and PPC modules are that both modules often refer to the same task. However, the time allocation to complete the task differs.

The design of the programmes were done via a task listing for a specified trade and concentrated on developing those task skills from the outset. The concept of a progression of modules from a common base to that of a skilled artisan are not a feature of the BIFSA training system. A typical course map for carpentry training is shown in Figure 9.
C. Training evaluation as a didactic category in the Building Industry training system:

An apprentice may undergo a trade test provided he/she has achieved an N1 or N2 technical education qualification (depending on the trade), and all the prescribed TPC's and PPC's completed plus a minimum of 18 months on-the-job exposure. The trade test is decentralised and controlled by the BITB.

Should an apprentice fail a trade test provision is made for a further 6 months of practical experience before the trade test can be readministered.

D. The trainer as a didactic category in the Building Industry training system:

An interesting feature of the building industry CBMT training system is that there are certain criteria specified for a trainer in order for a training institution providing TPC or a company providing PPC modules to do so. The trainer must be a qualified journeyman who obtained artisan status by passing a trade test and have a minimum educational qualification of N3 and have 5 or more years post trade test experience. It is understood that developments are well in hand to further qualify the training instructors by the BITB by means of formally approved and accredited training the trainer courses.

2.2.3 OTHER TRAINING SYSTEMS

The training of artisans in the RSA has also been undertaken by various organisations who have, within the requirements of the legislation governing apprentice training, adopted some unique approaches based on past experiences and innovations. These adopted formulas have within these organisations become workable and acceptable.

As an example of this type of approach the case of MERCEDES BENZ OF
SOUTH AFRICA (MBSA) is used. A training centre was established in 1981 at the East London assembly plant. This training centre was envisaged to train artisans and factory operatives for MBSA's own needs.

The initial trades offered for the training of artisans were Fitter and Turner, Jig Tool and Die Maker, Electrician and Fitter. The first intake of 42 apprentices occurred in 1981. At a later stage the trade of Fitter was dropped in favour of Motor Mechanic.

The MBUSA training system by and large stemmed from those practices that were in operation in the parent company, DAIMLER BENZ AG, in Germany.

The essence of the German system of training which was in operation in West Germany and which system has since been adopted in the now United Germany is termed the 'Dual System'.

According to Zentral-Fachausschuss Druck-Industrie (ZFD, 1989:1-25) Vocational Training in Germany is provided on the job and in vocational training schools. Based on what is referred to as the dual system, practical vocational training is given at work, backed up by theoretical training and general education provided in vocational training schools which are generally attended on one or one and a half days a week or more and as required.

A. Features of the German dual training system with regards the didactic category of course content (ZFD, 1989:1-7):

The characteristic feature of the German dual system is that the provision of knowledge and skills is linked to the acquisition of the required job experience. This ensures that training will proceed under the same conditions that the trainee will encounter when practising his chosen occupation. Only while on the job will a trainee be able to learn to cope with the constantly changing demands of the job and to appreciate the variety of social relationships that exist in the field of labour. In addition, learning by doing will
give a sense of achievement and provide a special source of motivation for the trainee. It promotes independence and a sense of responsibility, which are indispensable qualities in a developed industrial country. By tackling concrete tasks under true working conditions the trainee can give evidence of the knowledge and skills he has acquired and can himself experience the success of his efforts. This shows that training on the job is more than just a process of institutionalised and organised learning (ZFD, 1989:1-6).

The attention to detail in developing course content and the sequencing of learning events is characteristic of the dual system.

Technical developments have meant that training contents, particularly in the field of industrial training, have become increasingly complex, so much so, in fact, that in training for a large number of occupations specific training contents, especially what are known as the basic skills, have to be imparted independent of production, in separate training courses. For this purpose, medium and large-scale enterprises have installed special training workshops. For those firms that are too small to operate their own facilities, training workshops above single-firm level have been established by the Chambers of commerce and by professional associations. However, such facilities are no substitute for, but only a supplement to, training on the job, as they cannot provide the above-mentioned advantages of in-plant training. They can at best provide only a simulation of practical work (ZFD, 1989:7).

Attendance at the vocational training schools, which accompanies on-the-job training, is compulsory for every trainee for eight to twelve hours of instruction a week. The schools are state-run and the emphasis in instruction is on the occupation in question, and instruction is generally given in classes specialising in one occupation.

B. The trainer and training body as a didactic category in the German dual system of training (ZFD, 1989:9-10):
The importance of plants for training is reflected in the fact that standards and rules for this kind of training were set up until comparatively recently by the self-governing economic bodies, that is the various Chambers of Industries. It was not until 1969 that a Vocational Training Act was passed by the German parliament that brought together the few relevant regulations contained in other legislation and gave force of law to much that had until then been regulated by the statutes of the various Chambers of Industries. The Act made no alteration in the training system itself (ZFD, 1989:8).

The German Vocational Training Act laid down qualification requirements for the persons who would do the training in the dual system. Part of these qualifications included a large teaching/instructing component. Prospective trainers needed to have to undergo formal education in these components.

The Vocational Training Act regulates not only the training of young persons after their period of compulsory school attendance, vocational training comprises initial training, further training and vocational retraining. In conformity with the powers of jurisdiction laid down in the German constitution, the Vocational Training Act does not apply to vocational training schools, for which the constituent states of the Federal Republic (the 'Laender') are responsible. The form of German vocational training, with its basis of learning by doing and with the employers who do training as its central element, meant that the regulations governing it could not be taken from education law alone. There is also a very extensive labour law component. For instance, the relationship between employer and trainee is based on a civil law training contract which is subject to the legal principles and provisions governing contracts of employment, provided there are no other provisions to the contrary.

The consequence of this is general freedom to contract. The employer can decide whether he wishes to take on trainees and with whom he concludes a training contract. The same applies to the prospective trainee. Neither for employers nor for young persons is there an obligation to train or to learn. Nor are young persons directed into
specific occupations; the labour offices merely give vocational advice and help to find training places for prospective trainees (ZFD, 1989:9-10).

With this system there is a direct link between training capacity and the demand for skilled labour. There is no call for state planning, nor even for regional or nationwide planning. The decisions taken by individual companies as to their trainee requirements make up both the aggregate demand and the aggregate supply of trainee vacancies. Thus the aggravating consequences of misdirected planning are avoided. There is in addition a constant exchange between training and non-training companies, so that any necessary adjustment of individual company decisions is effected via the labour market. One can hardly think of a more effective co-ordination of the systems of training and employment.

Such close integration of training in the companies concerned will obviously have implications for the funding of training, which is effected by the companies themselves. In other words, expenditure on training is operating expenditure, and is thus reflected in costing.

While any company is free to decide whether or not to take on trainees, the process of training itself is of course governed by certain rules. This is especially true with regard to the scope of individual training. Section 1 of the German Vocational Training Act states that the object of initial training shall be to provide, through a systematic training programme, a broadly conceived basic preparation for an occupation and the necessary technical abilities and knowledge to engage in a skilled form of occupational activity. Initial training shall also enable a trainee to acquire the necessary occupational experience. The Act says in another section that as a basis for this system of training and for the adaptation of that system to technical, economic and social requirements and changes in the same, the responsible federal minister is charged with issuing training regulations specifying the name of the trainee, occupation, the period of training (generally between two and three years), and the abilities and knowledge to be imparted in the course of training.
C. The training methods employed in the dual system as a didactic category (ZFD, 1989:1-11):

The methods employed in the dual system reveal that every training employer is obliged to provide training systematically in accordance with a syllabus and timetable and in a form appropriate to the aim of the training programme. The nature, syllabus, timetable and purpose of the training must be set forth in writing in the training contract. To assist employers in setting up the training plan relating to each course of training, the training regulations are issued together with an annex giving guidelines on the systematic presentation of the syllabus and timetable of training. There has been a tendency in recent years to present training contents in the form of learning objectives. It is of decisive importance for any such presentations to make it quite clear that the essential feature of in-plant training is learning by doing. Thus there is no need to adopt categories of learning objectives such as have been formulated in educational theory. Instead, concepts should be employed that will be readily intelligible to the training employer as well (ZFD, 1989:7-11).

In Germany there are currently some 380 officially-recognised training occupations, representing the basis for more than 20,000 adult occupations. That is to say that specialisation does not come until training is completed, but that young persons are then able on the strength of their training to choose between several occupations. They are highly mobile, as training on the job also imparts qualifications that may be put to general use and are not bound to occupational skills (ZFD, 1989:2).

D. The management of training as a didactic category of the German dual training system (ZFD, 1989:14.17):

The training regulations are a central element of the German vocational training system. Although they are incorporated in state law, trade and industry also play a decisive part in their formulation. In the preparation of these regulations, the
The responsible federal minister is assisted by the Federal Institute of Vocational Training, which in turn is advised by committees of experts representing the different occupational groups and appointed at the suggestion of the leading organisations of trade, industry and the unions. In their discussions, which are often difficult and protracted, the representatives must aim at making due allowance for the widely differing conditions throughout the working environment.

An important issue in Germany's dual training system is the allocation of training contents to the training employers or to the vocational training schools. Based on the qualifications required, which in turn are derived from the demands made by the work process, this allocation will depend solely upon which of the two sources of training provide the optimum conditions for imparting specific training contents. The simple pattern of practical training at work and theoretical training at school is no longer adequate for present-day demands. Co-ordination is made more difficult in practice, because the powers of jurisdiction over vocational training as laid down in the constitution assign the training employers to the Federal Ministry of Economic Affairs and the vocational training school to the ministries of education of the federal Länder. The agreed procedure requires a great deal of time and work, and does not always lead to satisfactory results.

The above-mentioned need to make due allowance for differing conditions throughout the working environment in formulating training regulations does not mean that every employer will have to be able to undertake training in accordance with these regulations. Nor is this so in practice. Figures supplied by the Chambers of Industry and Commerce, for instance, show that only slightly more than ten per cent of those firms that are members of the Chambers undertake to provide training. In the crafts sector, however, the share is larger (approx. 40 per cent). There will always be firms that are unable to provide training, whether because of their structure, their facilities, their degree of specialisation, their production programme, the services they offer, their personnel structure and the like.
The principal tasks undertaken by the Chambers of Industries in vocational training are looking after and supervising training matters.

One of the most important tasks of the Chambers is advising training employers on all problems connected with training, such as, the training occupations to be considered, how training should be structured, the use of training aids, and educational, psychological and legal questions related to training. The Chambers also give advice to trainees (but not on the choice of occupation, as this is the exclusive task of occupational guidance installed at the labour offices). Any employer wishing to engage trainees must fulfil certain conditions as regards his suitability for this task. The firm must be able to offer facilities, production programmes or services on the basis of which the prescribed knowledge and skills may be imparted to the trainee. In addition, the training employer and any training officers must have specific personal, professional and teaching qualifications. The Chambers will ascertain before the start of training and also during the course of training whether these qualifications are present. This is done on the basis of a vocational training register kept by the Chambers, in which all vocational training contracts must be entered. The task of looking after and supervising training matters is assigned to the training counsellors on the staff of each Chamber of Industries (ZFD, 1989:14-17).

E. Training evaluation in the German dual training system (ZFD, 1989:18-25):

Every trainee must sit an interim examination in the course of his period of training. The examination serves to ascertain the level the trainee has reached. The competent Chamber establishes boards of examiners to hold these examinations. They are all external evaluators upholding industry standards.

Every trainee may sit a final examination at the end of his period of training in order to show that he has acquired the necessary
professional qualifications. To hold these examinations, the responsible Chamber will establish boards of examiners consisting of at least three members, being employers' and employees' representatives in equal numbers and at least one vocational school teacher. Rules to be observed in connection with final examinations are issued by the Vocational Training Committee of the Chamber, consisting of employers' and employees' representatives in equal numbers and vocational school teachers as consultant members. These rules make provision for the conditions of admission, the form of the examination, the criteria for marking, the issue of examination certificates, the consequences of breaches of the rules and the possibility of repeating the examination.

The abilities to be examined are laid down in the training regulations. According to the occupation, they may provide for a test of practical and/or theoretical skills. The practical examination will call for samples of work and/or test work-pieces. The theoretical test is conducted as a written and/or oral examination. In the written examinations, increasing use is being made of programmed questions. The examinations for a large number of occupations already make use of questions that are uniform throughout the Federal Republic, while in other occupations the Chambers of one Federal Land or several Chambers collaborate in setting the questions.

After having passed the examination, the trainee will receive an examination certificate issued by the responsible Chamber. This certificate is not an authorisation. Its principal purpose is to show that the person concerned has acquired the qualifications necessary for a specific occupation. But it is also the basis for professional progress and career advancement. Passing the final examination is one of the conditions for admission to the Masters' examination and many other further training examinations.

The Chambers may hold examinations to test the knowledge, abilities and experience acquired as a result of further training. The Vocational Training Committees issue special regulations governing the subject matter, purpose, standards, procedure and conditions of
admission of such examinations. The Chamber establishes boards of examiners to hold the examinations, subject to the similar conditions as for the final examinations of the trainee from the dual system. To achieve an orderly and uniform system of further training, the Federal Minister for Education and Science may issue ordinances regulating the examinations. The Chambers collaborate in formulating such regulations through experts whom they appoint.

However, the activities of the Chambers in the field of further training are not confined to holding examinations. They also provide further training measures. In this context one may distinguish between training for advancement, the object of which is to enable the trainee to gain advancement in his job, that is to take on a better-qualified position in his firm, and training for adaptation, the object of which is to retain and to extend occupational knowledge and skills and to adapt them to technical developments. These are generally short-term measures, while training for advancement will normally require the trainee to attend courses totalling at least 500 hours of instruction which as a rule, are completed by sitting an examination held by the Chamber (ZFD, 1989:18-25).

The Mercedes Benz of South Africa (MBSA) experience based on the above is that at their training centre at East London they have combined the concept of institutional training and education with practical on-the-job training.

The MBSA training centre includes the in-house technical education necessary for the apprentice to attain the National Technical Certificates at level 1 and 2.

According to the MBSA Technical Training department, during the first twelve months of training the apprentice spends all the time in the training centre. All apprentices from all the trades undergo an identical first project. This project, which is modular in nature, teaches basic hand tool skills. Thereafter, further projects, again in modular format and competency based, are taught together with the necessary technical educational input for the various trades.
From the second year onward practical on-the-job training is facilitated by the mechanism of an in-plant rotation programme for six months and a six month period at the training centre for further project exercises and technical education input.

In the third year of training the period of time in the training centre is reduced to between three and four months, the balance of the time is spent on the job by means of the in-plant rotation programme.

Trade testing as an evaluation mechanism is still done within the requirements of the Manpower Training Act and is conducted by the Central Organisation for Trade Testing (COTT).

The internal controls MBSA exercises with regards the training is reflected in the very strict evaluation system they impose for each of the projects an apprentice is obliged to complete. The requirements of the schedules and modular programmes set out by the Metal Industries Artisan Training Board are met by the MBSA training system on all accounts.

2.3 TRAINING IN THE RSA

In order to examine the training environment under which skills training takes place in industry it is necessary to examine this environment from the macro, meso and micro perspective.

As a point of departure the macro training environment for the purposes of this study is examined in the light of the role Central Government through the Department of Manpower influences and directs training in the Republic of South Africa.

The meso training environment is set and influenced by Industry Training Boards.

The micro environment is examined from the perspective of a specific
industry sector, namely, the Printing, Newspaper and Packaging Industries.

2.3.1 THE MACRO TRAINING ENVIRONMENT IN THE RSA

The macro training environment for any country is usually provided for by a national manpower policy and the structures developed to implement such a policy. These policies impact on the macro and micro training environment of the country in question.

2.3.1.1 NATIONAL MANPOWER POLICIES, OBJECTIVES AND PLANNING

The complexities of the functioning of a modern state go beyond the scope of this study. However, it is recognised that if a country is to be successful it is necessary for it to manage its resources with foresight and due regard to the limits of such resources.

An important resource of a country is its manpower. By and large effective and efficient utilisation of a country's manpower is perhaps the most important contribution to the success of that country.

National manpower policies exist in most countries. The RSA is no exception with its own clearly defined policy with the concomitant objectives and planning strategies.

The complexity of formulating the national manpower policy, setting objectives and having effective planning and implementation take place are impacted on by the entire national environment.

Van Dyk, Nel & Loedolff (1992:13-14) identified that the manpower policies, objectives, planning and implementation of the RSA are influenced by a number of important megatrends, namely, the population explosion; the existing educational levels of the population; the chronic unemployment problems; the need for more
job creation; the impact of rapidly changing technology in daily life and the world of work; the supply and demand for management; and the limited resources available to implement policy objectives.

The Government of the day in the RSA has its own national manpower policy. According to the Haasbroek (1988:2) an important objective of the National Manpower policy is to improve the quality and utilization of the available manpower, through the mechanism of training and retraining. The Government implements this policy through the Department of Manpower.

2.3.1.2 THE ROLE AND FUNCTION OF THE DEPARTMENT OF MANPOWER IN TRAINING AND DEVELOPMENT OF THE MANPOWER RESOURCES OF THE RSA

The Department of Manpower is responsible for the entire execution of the manpower policy of the Government of the RSA. The responsibility for the execution of its duties is realised through its administration of various legislated Acts. These Acts cover the broadest aspects of labour policy but of particular interest to the macro environment of the training field are:

* The Manpower Training Act, Act No 56 of 1981,
* The Machinery and Occupational Safety Act, Act No 6 of 1983,
* The Labour Relations Act, Act No 28 of 1956.

Of particular importance is the Manpower Training Act, Act No 56 of 1981.

This Act sets out its main objectives as (RSA, 1981:1-50):

(a) To provide for the promotion of the training of manpower

(b) Regulate the training of manpower
(c) Establish a NATIONAL TRAINING BOARD (NTB)

(d) Establish a Manpower Development Fund and a fund for the training of unemployed persons

(e) Establish, accredit and determine the functions and powers of Industry Training Boards

(f) Register Regional Training Centres, Private Training Centres and Industry Training Centres

(g) The imposing on certain employers of a levy in aid of training.

The above Act had further amendments, namely, the Manpower Amendment Act, Act No 39 of 1991 which elaborated and provided for (RSA, 1991:3-73):

(a) The privatisation of artisan training,

(b) Clarified and extended the role and functions of the NATIONAL TRAINING BOARD,

(c) Clarified and further defined the role and functions of Regional Training Centres,

(d) Provided for the accreditation of training at the first and second levels,

(e) Made reference to cash grants in terms of certain training in industrial relations with particular reference to the Labour Relations Act.

The vocational training environment created by the Manpower Training Act is conceptualised by the writer and is shown in Figure 10 overleaf.
Minister of Manpower

National Manpower Commission

Department of Manpower

National Training Board

Education Department

Accreditation Process.
(First Level)

Industry Training Board

Accreditation Process
(Second Level)

Regional Training Centre
Group and Private Training Centres
Industry Training Centres

Individual Companies
in specific Industrial Sectors

Macro Level
National policies and macro issues

Meso Level
Industry sector policies and Industry sector Meso issues

Micro Level
Company policies and company Training issues

MACRO, MESO AND MICRO TRAINING ENVIRONMENT OF THE RSA

FIGURE 10.
2.3.2 THE MESO TRAINING ENVIRONMENT IN THE RSA

The Manpower Training Act, Act No 56 of 1981, as amended, made provision for the meso level of training activities in the RSA. In particular, it provided for the establishment of industry training boards, private training centres and industry training centres, as well as redefining the role and functions of regional training centres.

To understand the meso training environment it is necessary to examine the role and functions of these bodies.

2.3.2.1 INDUSTRY TRAINING BOARDS

Industry training boards can be established via the mechanism of the Manpower Training Act.

These boards can be accredited by the Department of Manpower provided they supply an application for accreditation and the constitution of the board. Provision is made for employee representation on a training board and the Minister of Manpower can appoint such a representative if the constitution of a board does not include such representation.

Training in industry is the joint responsibility of employers and employees. THE NATIONAL UNION OF METAL WORKERS OF SOUTH AFRICA (NUMSA) stated in their VOCATIONAL TRAINING PROJECT (NUMSA, 1991:8-11) that trade unions as employee representatives have a central role to play in human resources development and furthermore that training policies should include all workers - not just artisans, be continuous throughout working life, ensure employment security, have a career path system with training courses moving from broad general skills to specialisation, be modular and competency based and be based on industry-wide standards whilst at the same time providing for a particular workplace skills requirement and be the basis for further development.
The functions of training boards according to the Manpower Training Act are (RSA, 1981:10-28):

(a) To carry out the duties and powers which the Act confers on the board;

(b) Establish conditions of apprenticeship for the industry and formalise the training schemes which in the board's opinion will serve the needs of the industry;

(c) The board will take over the administration of apprenticeship training within the industry. This administration covers application for indenturing apprentices, drawing up and legalising apprenticeship contracts, maintaining apprenticeship progress records and the administration of trade testing and issuing of certification;

(d) The board is to enquire into disputes arising out of any apprenticeship contract, as well as those disputes that may arise when the apprentice is required to attend classes or study via correspondence for the technical educational qualifications deemed necessary;

(e) Provide for the training of trade test officers and any person engaged in evaluating and conducting testing of apprentices;

(f) Establish a suitable system for the governing of trade testing;

(g) Provide for the training and retraining of qualified artisans;

(h) Encourage the flow of candidates for training as artisans to the industry by eliminating restraining factors which mitigate against training in an industry;

(i) To take all possible steps to encourage and promote training in all economic circumstances and conditions that the industry may find itself in;
(j) To promote closer co-operation between the board and formal education in the design and content of curricula;

(k) Provide the Department of Manpower with statistics about training in the industry; co-operate with the Department in framing guidelines for the selection of apprentices and provide prospective apprentices with vocational guidance information;

(l) Out of their own funds, training boards need to provide financial incentives for the training of apprentices and other employees in the industry.

This privatisation of training makes good business sense.

Van der Merwe (1988:19) reiterated that in order for decision making to be on the level where training takes place, industry training boards need to be established with the objective of structuring and controlling the training in that industry.

Baker (1991:6) described the advantages of private sector industry training boards as:

(a) Specific industry training needs can be more accurately determined;

(b) Industry training boards can be a strong force in promoting an awareness and acceptance by employers that training is an industry responsibility;

(c) All categories of employees in an industry can have their training needs addressed at a lower cost per unit;

(d) Industry training boards by their unique position within an industry can facilitate, co-ordinate and standardise training through accreditation mechanisms more effectively and at lower costs.
The influence of industry training boards at the meso level in the RSA cannot be under-estimated and will increase as more and more industries establish their own training boards.

2.3.2.2 REGIONAL TRAINING CENTRES

The Manpower Training Act of 1981, Act No 56 of 1981 as amended, prescribes the constitution of a Regional Training Centre and makes provision for the establishment of an advisory committee for Regional Training Centres. On registration of such Regional Training Centres, it would include the following (RSA, 1981:41-49):

(a) The courses of training which that Regional Training Centre may provide.

(b) The exact nature and duration of the course.

(c) The nature and qualifications and experience of those trainers and instructors who will provide the training at the Regional Training Centre.

(d) The premises and facilities including equipment and materials that will be used to provide for the training in question.

(e) The governing body of such a Regional Training Centre would be required to furnish the Registrar with any information relating to the control, functioning or management of the Centre.

These Regional Training Centres offer a wide range of training, some of which is accredited training for skills development of trainee artisans. The accreditation of the training for artisan skills development is done via the Industry Training Board concerned. Thus the development of course content and the requirements for this type of training is done at Industry level.

The Regional Training Centres nevertheless provide the general
private sector with a wide range of training courses. The Natal Regional Training Centre, for example, offers training in building and construction, driving, vehicle maintenance, hand skills, security, hotel and catering, computer and management training.

2.3.2.3 PRIVATE TRAINING CENTRES

The Manpower Training Act, Act No 56 of 1981 as amended, provides for Private Training Centres in Section 32 of the Act. In essence, any employer, group of employers or other persons may establish and run a training centre and have such a centre registered by the Department of Manpower. It excludes Regional or Industry Training Centres and those training centres established under Section 48 of the Labour Relations Act, Act No 28 of 1956.

Upon registration, such a Private Training Centre is obliged to provide information to the Department of Manpower on the control, management or function of the Centres.

The Private Training Centres operational in the RSA are diverse and address a number of specific training issues. Of particular interest is that Private Training Centres do provide training for the unemployed and a mechanism exists that an Industry Training Board, provided it has the facilities and training staff, can register as a Private Training Centre as well. The PNPITB has adopted this route so as to facilitate its programme of instructor, supervisor and other training to the industry.

2.3.2.4 INDUSTRY TRAINING CENTRES

In terms of the Manpower Training Act, Act No 56 of 1981 any training board or Industry Training Board can apply for registration of an Industry Training Centre. It excludes, of course, Regional or Private Training Centres and Centres established in terms of Section 48 of the Labour Relations Act, Act No 28 of 1956.
The requirements from Industry Training Centres on registration are identical to those of Private Training Centres.

The meso training environment which includes Industry Training Boards, Regional, Private and Industry Training Centres, are provided for by the enabling legislation of the RSA. A feature of this meso level is the important role Industry Training Boards play, particularly from the aspect of their accreditation at the first level, and their crucial role in artisan training.

The fusing of the macro, meso and micro level takes place in the structures of Industry Training Boards and their accreditation.

According to NUMSA (1992:9) in their document on 'Designing The Future', they believe that an essential step in the development of training in the RSA is that single industry education and training boards operate within each industry and deal with all the skills training which is specific to that industry. Furthermore, the boards must also redesign existing training modules for artisan training and develop new higher level modules which will enable all workers with the skills to deal with new technology and the world of work.

2.3.3 THE MICRO TRAINING ENVIRONMENT

The meso and micro training environments to a large extent overlaps. Industry Training Boards created at the meso level by means of the mechanism of the Manpower Training Act have duties and functions prescribed in very broad details. However, being constituted by the particular industry sector, the Board will address the issues and needs at the micro level and confine their actions within a specific industry.

Each Training Board represents a particular sector of the total labour force in the RSA and at present is confined to the formal sector only.
The PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES TRAINING BOARD (PNPITB) has a very distinct constituent, consisting of a variety of players that are involved in the vocational training debate.

The PNPITB covers three related industrial sectors, namely Printing, Newspaper and Packaging.

Each sector has its own character and within these sectors there are different needs.

The PRINTING AND ALLIED INDUSTRIES FEDERATION OF SOUTH AFRICA (PIFSA), the NEWSPAPER PRESS UNION (NPU) and the SOUTH AFRICAN TYPOGRAPHICAL UNION (SATU) agreed to establish an Industry Training Board to continue the work of the NATIONAL MANPOWER TRAINING COMMITTEE (NMTC) but with an enlarged scope of application involving training of all skills areas in the industry including management development (NMTC, 1989:2). Figure 11 depicts this training triangle identifying the bodies responsible for the various areas of training.

![Training Triangle Diagram](image-url)
The proposed structure of the Board as developed by the NMTC (1989:2) is depicted in Figure 12:

According to the proposal (NMTC, 1989:2-3) the functions of the various committees were expanded upon:

The Executive Committee would act as a day-to-day policy making body with any matter referred to it by the Training Board and was seen to be the Management Committee of the PNPITB.

The Reduced Quorum Committee would attend to all matters relating to the selection, registration and discipline of apprentices and all other trainees.

The Modular Training Committee would deal with all those matters regarding Competency Based Modular Training.

The Education Committee would deal with all the matters regarding institutionalised training which would in fact be technical theory relating to the various trades and operations.

The Management Development Committee would deal with the training and development of employees at the post artisan level.

The Accreditation Committee would deal with the matters relating to the setting of standards, the evaluation and monitoring of training and testing.

The Investigating Committee appointed by the Accreditation Committee would deal with investigations of training institutions.

From the proposed structure of the Board shown in Figure 12 it is obvious that the intention was to manage training within the industry by means of committees. This was understandable in the light of the past operation of the NIC where compromise and consensus between employer and employee were a feature of its modus operandi.
2.3.3.1 THE EXTENT AND SIZE OF THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES IN THE RSA

To determine the exact size of the industry in relationship to the number of employees in the sectors of Printing, Newspaper and Packaging is difficult and almost impossible when one takes into consideration the definition of the industry.

In Chapter 1 (See 1.6.2) the Printing, Newspaper and Packaging Industries is defined as the industry in the broadest sense and as such includes in-house printing and sub-contract work and reproduction houses.
A far better method of establishing the size and extent of the industry is in terms of the number of employers and employees in the industry. This figure naturally fluctuates from time to time dependent on the level of activity in the economy as well as the activity levels in a specific specialised sector.

The data on the number of employees in the industry is based on the number of skilled and unskilled employees directly engaged in the production processes involved in the manufacture of Printing, Newspaper and Packaging products and is shown in Table 1. Those employees in the administration, service and management categories are not included in this table.

<table>
<thead>
<tr>
<th>YEAR (JANUARY)</th>
<th>TOTAL NO OF SKILLED EMPLOYEES</th>
<th>TOTAL NO OF UNSKILLED EMPLOYEES</th>
<th>TOTAL NO OF EMPLOYEES</th>
<th>NO OF EMPLOYERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>10 497</td>
<td>36 768</td>
<td>47 265</td>
<td>1 958</td>
</tr>
<tr>
<td>1991</td>
<td>9 376</td>
<td>34 277</td>
<td>43 653</td>
<td>1 976</td>
</tr>
<tr>
<td>1992</td>
<td>8 923</td>
<td>32 216</td>
<td>41 139</td>
<td>2 010</td>
</tr>
</tbody>
</table>

THE NUMBER OF EMPLOYEES AND EMPLOYERS IN THE INDUSTRY
(PNPITB, DATA BASE, 1992)

TABLE 1.

The geographical distribution of the Printing, Newspaper and Packaging Industries in the RSA shown in Table 2 is concentrated in three main areas: Johannesburg and the Witwatersrand, Durban and Pietermaritzburg, Cape Town and the Western Cape. Minor but important concentrations of the Industry are in Port Elizabeth and the Cape Midlands, Bloemfontein, Kimberley and the Northern and Eastern Transvaal.
<table>
<thead>
<tr>
<th>GEOGRAPHICAL AREA</th>
<th>% SKILLED</th>
<th>% UNSKILLED</th>
<th>% TOTAL EMPLOYEES</th>
<th>EMPLOYER DISTRIBUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPE TOWN &amp; WESTERN CAPE</td>
<td>32.9</td>
<td>26.3</td>
<td>27.8</td>
<td>20.4</td>
</tr>
<tr>
<td>DURBAN &amp; P'BURG</td>
<td>20.0</td>
<td>24.7</td>
<td>23.7</td>
<td>19.9</td>
</tr>
<tr>
<td>JOHANNESBURG &amp; WITWATERSRAND</td>
<td>31.9</td>
<td>32.4</td>
<td>32.3</td>
<td>45.7</td>
</tr>
<tr>
<td>PORT ELIZABETH</td>
<td>4.1</td>
<td>3.8</td>
<td>3.8</td>
<td>4.7</td>
</tr>
<tr>
<td>BORDER</td>
<td>2.0</td>
<td>2.5</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>BLOEMFONTEIN &amp; OFS</td>
<td>1.5</td>
<td>1.0</td>
<td>1.1</td>
<td>2.1</td>
</tr>
<tr>
<td>PRETORIA &amp; NORTHERN TVL</td>
<td>7.2</td>
<td>9.1</td>
<td>8.7</td>
<td>4.4</td>
</tr>
<tr>
<td>KIMBERLEY</td>
<td>0.4</td>
<td>0.2</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

EMPLOYEE/EMPLOYER GEOGRAPHICAL DISTRIBUTION IN THE RSA
(PNPITB, DATA BASE, 1992)

TABLE 2.

2.3.3.2 THE ROLE AND FUNCTION OF THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES TRAINING BOARD (PNPITB)

Upon the establishment of the PNPITB certain principles and procedures were adopted so as to define the PNPITB's terms of reference.

The Training Information Manual (PNPITB, 1990c:2) details the mission statement, goals and objectives of the PNPITB.

These objectives are stated as:

"To promote, stimulate and encourage interest and expertise in technical, economic and scientific education, training and research in all matters associated with production and distribution in the Industry."
* To establish, support or promote education, research and training in or for the Industry by establishing, improving and maintaining facilities for such activities.

* To associate and co-operate with existing facilities.

* To provide training, whether in-company or at suitable facilities, for employees in the Industry, throughout the Republic of South Africa.

* To provide Training Incentives to employers as may be determined from time to time by the Training Board by way of grants, subsidies, bounties or other financial benefits to educate and train employees subject to certain minimum standards being complied with.

* To receive contributions from employers for the purpose of furthering the objectives detailed herein and to utilise such funds in accordance with these objectives and the provisions of this scheme.

* To borrow, invest, lend, subscribe or donate money for the furtherance of these objectives.

* To do all such things as may be necessary to achieve the aims set out above, provided that the objectives herein detailed shall be strictly interpreted to aim at securing benefits for the Industry as a whole.

* To operate the Training Board affairs by following sound business principles and practices.

To facilitate training in a more regulated manner and to avoid unnecessary delays due to the proposed committee structure, a Code of Practice for Training in the Industry was adopted in October 1990. This Code of Practice identified the types of training that are recognised and facilitated for, namely, basic training for unskilled and semi-skilled employees, training courses for skilled operators and apprentices, generic management skills training and company specific technical and management training (PNPITB, 1990b:3).

The Code of Practice for Training also created a more mechanistic and user-friendly accreditation procedure which obviated the need to establish an accreditation committee. Within the broad scope of the Code of Practice for Training suitable structures, procedures and control systems obviated the need to create permanent Reduced Quorum,

2.3.3.3 THE ACCREDITATION OF TRAINING THROUGH THE PNPITB

Industry controlling its own training, particularly apprentice training, has been a gradual evolutionary process in the Republic of South Africa. The extent of industry control on training only really gained momentum in the 1980's.

The Wiehahn Report noted in its recommendations on the training of apprentices that more controls needed to be put in place and exercised over this type of training. A suggestion was made to increase inspection with the use of designated agents of a particular industry (Wiehahn, 1982:220).

The NATIONAL TRAINING BOARD in its study into the devolution of training stated that the motivation for the study was to implement the Government's policy of the devolution of decision-making in training and the privatisation of artisan training (NTB, 1986a:2).

A further outcome of this study by the NTB was the recommendation that each industry should establish a training board organised and structured in such a manner that it meets the industry's particular training needs. The industry training board would also be accommodated in the emerging accreditation system (NTB, 1986a:15-16).

Furthermore the advantages put forward by the NTB of creating private sector industry training boards would be that the promotion of training within a particular industry would be enhanced, training would be better facilitated, the actual co-ordination of training would be more effective, the training could be standardised across an industrial sector, and training boards would become integral parts of an accreditation system (NTB, 1986a:5-7).
The National Training Board in their Guidelines for the Establishment, Management, Financing and Functioning of an Industry Training Board outlined the procedures for accreditation of a training board by the Department of Manpower. In Chapter 5 of the Guidelines (NTB, 1986b:14-23) a training board seeking accreditation would need to apply for accreditation and meet specific accreditation criteria such as supplying a proposed constitution, list of the founding members and proof that the founding members are representative of the industry concerned. The other salient features of accreditation and, only if applicable, relate to the courses of training to be presented, the training personnel, the general physical facilities necessary, the services to the trainees, the financial resources and inspections by officials of the Department of Manpower.

The PNPITB was accredited by the Department of Manpower on the 7th October 1991. This first level accreditation privatised artisan training in the industry and enabled the PNPITB to practice the general principle of accrediting training institutions, organisations or training specialists against certain industry accepted criteria.

The PNPITB mindful of its role as the leading body in the industry with regards the setting of standards for training of artisans and bearing in mind the stated desire of the industry to have a Competency Based Modular Training System (See 1.4) which would approach training in a dynamic holistic manner, the accreditation process at the second level needed to become an integral part of the whole training system. Here the issue of what training inputs were necessary for the trainer arose, as well as the design and structure of the competency based programs and naturally the facilities necessary for the practical and theoretical training. The aspects of this accreditation process will be examined and developed in Chapters 3 and 4 of this study.
2.4 SYNTHESIS

The training environment on the macro, meso, and micro levels in the RSA were created by the mechanism of the Manpower Training Act, Act No 56 of 1981 which has facilitated the creation of industry training boards, provided for the privatisation of artisan training and generally catered for the devolution of all training in the RSA.

With the privatisation of artisan training and the accreditation of industry training boards, this Act also made direct reference and prescribed Competency Based Modular Training as the only method to be used in artisan training.

The actual interpretation by selected industries of how they apply CBMT within their industries indicated that the training systems were designed for their own needs and were unsuitable for the Printing, Newspaper and Packaging Industries. Of particular concern was that other industries did not meet the requirements of the Printing, Newspaper and Packaging Industries in the following areas:

* They saw competence and defined competence narrowly, concentrating on technical specialisation from the onset. This contrasted with the Printing, Newspaper and Packaging Industry's requirements for a progression of modules from a common base to the skill of a qualified printer (See 1.2.3).

* Because of rigid pre-entry educational requirements and a separation of education and training, career progression to the degree required by the Printing, Newspaper and Packaging Industries was not catered for in their training systems (See 1.2.7).

* They had no model of a training system available which would, or could, be usable which included the diverse requirements of the Printing, Newspaper and Packaging Industries for its need of international recognition for its training (See 1.2.3).
The content and design of their courses were mechanistic and were provider-led rather than learner-led. Moreover, the important andragogic didactic issues that were a concern of the Printing, Newspaper and Packaging Industries were not addressed in full and were selectively catered for in some of the industries.

The actual interpretation of what competence is and how competence is measured needs to be addressed. The very breadth, range and scope of how an industry sees job competence will have a marked effect on how training is done and what components would be necessary in a training system to meet these competence requirements.

Experience in the time-based system of training has tended to influence how training will be done in future using Competency Based Modular Training systems. Unfortunately, very little experience in Competency Based Modular Training exists and existing CBMT training systems do have deficiencies and do not address all the important andragogic didactic issues.

A systems perspective of how Competency Based Modular Training methods can be incorporated in a model, needs to be explored and conceptualised. This is crucial for the development of a suitable design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries.

It is important to reiterate that the Printing, Newspaper and Packaging Industries desired a Training System that would incorporate Competency Based Modular Training methods (See 1.2.7). This aspect will be discussed in Chapter 3 where a systems perspective of a Competency Based Modular Training model will be developed.
The Printing, Newspaper and Packaging Industries expressed a desire for a training system (See 1.2.3) which would, amongst other features, use Competency Based Modular Training methods in the delivery of training, and in which the andragogic didactic situation would be enhanced by a cadre of capable, trained and experienced trainers (See 1.4).

Using Competency Based Modular Training as a method for delivering training in a specific training system requires a clear and concise understanding of what competence is. As has been previously stated, any change in a sub-system affects all the other sub-systems in the system (See 1.6.4). The very nature of the definition of what competence is, its range and scope, would have an influence on an actual training system. This, of course, would alter the design model for such a training system if such a model were conceptualised. The more comprehensive competence is perceived to be, the greater are the implications in the design of the course of training, particularly with regards the aims and objectives, course content, delivery sub-system, evaluation and management. Notwithstanding all the above it is the writer's contention that the more comprehensive competence is defined the greater will be the need to emphasise, cater for and control the andragogic didactic situation which in turn implies that sound didactic principles should form part of the training system and as such should be a recurrent theme in any design model for such a training system.

Competence as applied to doing a job of work is further complicated because performance must be demonstrated on-the-job in an industrial setting in an organisation. The organisation has to also perform so as to produce goods and services to a demanding market.
3.1 JOB COMPETENCE IN AN INDUSTRIAL SETTING

3.1.1 DEFINITION OF COMPETENCE

The Concise Oxford English Dictionary (1992: 232) defines competence as: 'ability; the state of being competent ...'. The word competent on the other hand is defined as: 'adequately qualified or capable ...'.

Competence is a capacity to do what needs to be done and can be seen as a generalised human trait. People learn how to learn, how to innovate, how to solve problems and how to integrate their past experiences, both the successful and unsuccessful ones, into a bank of experiences on which to call, thus adding to their store of knowledge.

Hall (1988: 1-28) states that competence is really a more fundamental thing which goes beyond those skills that are associated with an expert. The expert displays skills which have a specific domain and create an aura of exclusivity in the layman. A danger exists in judging competence only on the basis of the specific skills domain of an expert.

Hall (1988: 33) refers to White's definition of competence as the key to adaptive fitness. Adaptive fitness by its very nature implies and even demands adaptive behaviour. Adaptive behaviour is seen as any behaviour which meets those demands the environment may place on a person in a variety of situations. Two basic criteria are further identified for adaptability, namely, the ability and capacity to learn and profit from past experiences and the ability and capacity to initiate new and more complex experiences; in fact, the ability and capacity to synthesise.

Hall summarises his definition of competence as follows:
'As a state of adaptive fitness and response readiness, is the sustained capacity of people to respond in a committed and creative fashion to the demands placed on them by their environment' (Hall, 1988:35).

Work is seen as the context of individual competence in a job related capacity and the organisation is the context for work.

3.1.2 COMPETENCE IN AN INDUSTRIAL SETTING

Business organisations and any organisational structure or body in which people work have varied and different understanding of the word competence.

Competence used within the context of vocational training for a job and especially within the parameters of Competency Based Modular Training offers a large variety of interpretations of what competence is.

To some, competence is seen as simply the application of knowledge and skill; to others, the application of knowledge only. Argument exists amongst some that knowledge and skill are entirely different and require different definitions of competence.

Jessup (1991:27) elaborates that within the broad range of competence in a job performance context there are other factors which are of importance. A specific competence can be underpinned by a related body of knowledge and theory. More importantly, certain core skills which in themselves are not competencies, can and do contribute to overall competence.

The Guide to National Qualifications of the NATIONAL COUNCIL FOR VOCATIONAL QUALIFICATIONS (NCVQ) identifies three core skills that are apparent and essential in a job related context. These are (NCVQ, 1991:10): problem solving, communication skills and personal skills. In certain instances, within specific occupations, further core skills such as numeracy, the ability to use information
technology and modern language competence can be essential core skills.

Core skills can be seen to enhance transferability of competent performance between different contexts and occupations and enable a person to respond in a dynamic, feasible manner to changing job requirements. Core skills are seen as enabling in nature and congruent with the concept of adaptive fitness via the mechanism of adaptive behaviour.

The NCVQ Guide to National Qualifications identifies further that the higher the level of skills required, there is an increasing complexity in determining job competence. The very nature and character of the breadth and range of the competence would increase. The more complex the competence, the more difficult the skill would become. The nature and extent of the competence would be influenced by the person's ability to undertake specialised activities (NCVQ, 1991:10).

Higher level skills also display the following characteristics:

- The ability to transfer competencies from one context to another, as well as within different environments.

- The ability to cope with non-routine work and activities by means of innovation.

- The ability to organise and plan in a dynamic environment.

- The ability to supervise and manage other people (NCVQ, 1991:10-11).

The NCVQ Guide to National Qualifications (1991:9) also identifies that four distinct components of competence are evident when analysing a job or function that is being done competently. The components are:
A. Task performance
B. Task management
C. Contingency management
D. Job/role environment

3.1.3 COMPETENCE AND THE ORGANISATION

Competence as seen from the perspective of an organisation in which people work, requires an examination of organisations as being the context for work.

Rummler & Brache (1988:45-53) identify an organisation in terms of its behaviour as an adaptive system:

Schematically the organisation behaves as an adaptive system, as shown in Figure 13.

THE ORGANISATION AS AN ADAPTIVE SYSTEM
(RUMMLER & BRACHE, 1988:48)

FIGURE 13.
An organisation provides a product or service for a very specific market and operates as a processing system converting its inputs into outputs which are of value to the target market. By nature, organisations are adaptive systems. Unless they adapt to the feedback from their target market in a dynamic manner, they are in danger of losing their market and not surviving economically.

Within an organisation, departments act as sub-systems that support the basic organisational process by being converting units using resources to achieve specific goals and outputs. All organisations operate within larger systems, such as the competitor system where competitors compete for both the organisation's markets and its resources. Furthermore, the larger systems include the economic environment, government policy and legislation, culture, socio-economic and other important influencing factors. Human job performance takes place within the context of an organisation.

Rummler & Brache (1988:47) see human performance in a systems context and infer job competence takes place in a dynamic milieu. They identify that an employee doing a job of work is required to process a variety of inputs which require correct outputs. All job outputs carry certain consequences and hopefully through a feedback mechanism the performer receives information about the worth of his/her performance.

In most instances, each performer is most likely to be part of a hierarchy of performers. This hierarchy of performers may be part of a function. An individual is thus a part of a human performance system.

'In essence, this system view of performance breaks down to three levels:

* The organisational level: The total organisation is part of an economic system. It responds to the market place, competition, fluctuating resources and so on. At issue is how well the organisation is adapting to the demands of this external system.
The process level: The organisation is a giant processing system, converting a range of inputs into products and services for the market place. This conversion takes place via a myriad of processes and sub-processes which must be wired together to form an efficient system. The outputs required of each process are determined by the demands of the market place, as interpreted by management. At issue on the process level is whether these are the correct outputs for the business to remain competitive, and whether the internal processes are sufficiently effective and efficient.

The individual job level: Each performer's job outputs are determined by the demands of the various processes. Further, each individual is part of a human performance system. At issue is whether the job outputs have been correctly identified as the ones needed to support the process and whether the performance system will support the employees effort to achieve those outputs' (Rummler & Brache, 1988:48-49).

Competence on the job must be seen in its relationship to not only focus on the ability of an employee to master a specific skill but also on the inherent core and other skills which are necessary to perform competently within a specific organisation. A model of job competence can be seen as going beyond the paradigm of what is often seen as the only components necessary to perform satisfactorily in the job, namely skills, knowledge and ability.

The job competence model which was postulated by Mansfield and Mathers in fact conceives of competence as consisting of four inter-related components (Jessup, 1991:149):

A. Task skill - the largely technical components of a job;

B. Contingency management skills - the skills to identify and deal with the changes and irregularities in the working environment;

C. Task management skills - the skill and ability to manage a group of tasks and organise them in an effective priority listing;
D. Role/job environment - the interpersonal skills necessary to work with others and cope with the world of work and the wider role expectations in this environment.

3.1.4 SYNTHESIS

Competence when applied to a person performing a job of work in an organisation can imply that that person exhibits the following:

1. Being in a state of adaptive fitness and ready to respond to the demands placed on them by their environment.

2. Having core skills which enhance the transfer of competence between different contexts and occupations.

3. Have the necessary task skills demanded by the job.

4. Have the skills to identify and deal with changes and irregularities in the working situation.

5. Have the skills and ability to manage a group of tasks, to organise them and prioritise them effectively.

6. Have the interpersonal skills necessary to work with other people and cope with the world of work and the wider expectations in this world of work.

The above broad concept of competence goes beyond the paradigm that to train a person to do a job of work one should only concentrate on the 'need to know'. A competent person in an industrial setting has skills beyond those related to the tasks of a job only.

This broad understanding of competence has implications in training and in particular the determination of training needs, the design of the training courses, the evaluation of training; in fact, the entire training system that is to be adopted.
For the Printing, Newspaper and Packaging Industries the design model for a Competency Based Modular Training System would need to adopt and take cognisance of the broader definition of competence.

3.2 COMPETENCE IN A MODULAR TRAINING CONTEXT

Blank (1982:4) describes a competency based training programme exhibiting certain characteristics: what is learned, how it is learned, when it is learned, and if it is learned up to a specific predetermined standard.

Nichse & McClure (1981:19) describe certain attributes of competency based training programmes. Seen from the learner's perspective because of a learned ability to master certain skills, confidence is gained. From given objectives and predetermined performance criteria the learner through manipulating skills knowledge and abilities can achieve the objectives. If these objectives are seen as worthwhile they can be applied to the learner's personal life in the present and the future.

Competency Based Modular Training programmes when applied within a specific industry and to a specific occupation or job, need to be developed with a view to producing those skills which will give an organisation the desired performance output it requires to meet its goals.

Cilliers (1991:4) identified a skill as being the capacity and capability of a person to do a specific job efficiently in a specific situation. He further identified specific broad categories of occupational skills:

* Handling skills where psychomotor skills are harnessed to handle tools, equipment and machinery to produce goods or services.
Technological knowledge skills where the understanding and insight to carry out the tasks and functions demanded by a job are necessary.

Thinking skills needed to apply both the handling and technological knowledge skills.

Human skills which are required when interacting with people such as communication, interpersonal and intrapersonal skills.

Management skills such as planning, organising, leading, co-ordinating, motivating and controlling.

The skills identified as necessary for job competence unfortunately do not always fall into a single broad category. An artisan in the printing, newspaper and packaging industry would need skills in all the broad categories to a greater or lesser degree and the mix of these skills would vary from trade to trade.

Opperman (1988:35) suggests that the success of any competency based training can be established only by means of continuously testing and monitoring. Intrinsic to competency based training is that it can be seen as a training system in which human performance is assessed against very definite predetermined criteria and, as such, deviates markedly from norm-based evaluation.

If the Printing, Newspaper and Packaging Industries wants to survive and grow, the training of its skilled employees, using a competency referenced modular system, would need to examine carefully the competences that it requires for those skills and must go beyond the traditional route of identifying only job specific tasks for a specific job and must include core and other skills, underpinning knowledge and other necessary human adaptive behaviours.

3.3 SYSTEMS APPROACHES TO TRAINING AND DEVELOPMENT

A system has inputs, a conversion phase and an output (See 1:6.4).
In practice, systems are complex and may consist of many sub-systems acting in a dynamic environment.

A training system does not just occur, it is created and in this creation process the designing is critical. Gropper & Ross (1987:195-216) believe that consistently effective training outcomes are possible from a training system if the development process is systematic, generalizable and valid.

Gropper & Ross (1987:196-197) furthermore state that systematic development implies that a standardised process requires formal rules for decision making on what to do, when and how to do it and also alternative routes to follow when appropriate. Comprehensiveness is a feature of systematic development and in the interests of training integrity all training issues must be fully addressed. New tasks must be built on prior tasks to ensure internal consistency and the adherence to strict rules is essential for internal reliability.

Gropper & Ross understand that for the development process to be generalisable it must be applicable to jobs, to the people, both learner and trainer, that the training system is to serve, as well as to the training needs that will arise from time to time. To be valid the training development process must be job-related and address the skills and knowledge critical for competent job performance. The goal of training is to improve performance and according to Rummler (1987:217-247) the training function in an organisation is a processing system consisting of training needs, training resources, the learner and trainer all interacting and resulting in an output of a trained person capable of performing at the competence level desired by the organisation as a receiving system.

The primary inputs of training needs, training resources and the learner and trainer operate in sub-systems which include the training course design and development, the training delivery mechanisms and the evaluation system.
Training systems like all systems are subject to the same laws for systems where any change in a sub-system affects the other sub-systems. Feedback, a component of a system, when present in a training system, is of two types:

Self evaluation against internal criteria, and external evaluation by the receiving system against their criteria (Rummler, 1987:222).

Thus a training system can be seen from two aspects: The training function as a sub-system of an organisation which is the ultimate receiving system of the training system and the trainee-performer sub-system. Whilst the trainee is undergoing training the trainee is a performer and ideally the internal criteria and the external criteria, represented by the organisation as the receiver should be in agreement and synchronised.

Figure 14 illustrates the training function as a key organisation sub-system and Figure 15 illustrates the trainee in the trainee-performer sub-system.
To summarise the systems view of the trainee-performer, we see that:

- Any sub-system in the organisation in which a trainee is present, is limited to the organisation system through key inputs and outputs.
Each sub-system of an organisation has processes which convert the inputs into outputs which are some form of work being done.

There are hierarchies of performers who interact and operate within the various processes.

The performance output of a worker is a function of a number of performance factors such as, is the worker aware of the performance specifications, is he aware of the consequences of his performance, does he receive feedback on his performance so that he can take corrective action if necessary, does he have the necessary resources to be able to perform and does he have the capacity to perform effectively.

3.4 FACTORS TO CONSIDER WHEN DEVELOPING A DESIGN MODEL OF A TRAINING SYSTEM FOR TRAINING OF ARTISANS

Notwithstanding the needs of the Printing, Newspaper and Packaging Industries for a CBMT training system designed for its requirements, an important prerequisite is to formalise the said system in the form of a model. A tangible and usable model for developing training programmes on an on-going basis is needed.

According to Steyn (1988:3-5) when a course of training is being developed the developers of such courses make use of a model which consists of actions, structures and individuals. Furthermore, the development of a model is seen as being necessary for the effective development of training programmes.

The actual development of the model I believe should be seen from the point of view of whether the training is to be provider-led or learner-led. As highlighted previously (See 1.2.4), the career progression system of the Printing, Newspaper and Packaging Industries created an open system in which the employee as the learner could progress at his pace throughout his working career to
the level which suited his abilities. Clearly this advocates a learner-led training system.

The training of skilled artisans coupled to the career progression system makes it necessary to examine some of the parameters that operate in the andragogic didactic situation and build these into the design model wherever applicable.

3.4.1 THE ANDRAGOGIC DIDACTIC SITUATION REQUIREMENTS

An adult as a learner differs from a child as a learner. Knowles (1987:170-173) lists the following assumptions about adults as learners:

- They have a need to know why they should learn something.
- They want to be self-directed.
- They have greater experience of different quality and volume than a child.
- Their readiness to learn springs out of a life situation in which they need to know or be able to do something effectively and efficiently.
- They enter a learning experience with either a task, a problem or life-centred orientation to learning.

Laird (1985:125) adds to the above by listing a number of features which recognise the maturity of the adult learner when designing learning:

- The design should be problem-centred rather than content-centred.
- The design should at all times encourage active participation.
Facilities and mechanisms should be created in the design so as to encourage the learner to use past experiences as building blocks for new experiences.

The learning climate must not be authority-oriented but more collaborative in nature - rather a mentor-learner type relationship.

Where possible planning and evaluation should be a mutual activity between trainee and trainer.

The evaluation process should act as a feedback mechanism to reappraise aims and objectives of the training.

The training activities should be experimental in nature.

All the above indicates that an adult as a learner desires to know what the objective of the course of training is. Furthermore, because of the fundamental differences in the quality and variety of experience of individual adults these differences should be recognised and training should as far as possible be individualised. The evaluation of the training must have meaning and purpose to the learner and should inform the learner how well he or she has done as well as what corrective action is needed.

3.4.2 THE JOB OR FUNCTION COMPETENCE

Beach (1985:97) describes a job as a group of positions that generally contain the same knowledge requirements, skills and responsibilities. Within a job there are a number of broad based job functions and tasks. A task is described as a group of actions that are necessary to produce work.

In assessing the ability of a worker to do a specific task competently it is necessary to establish some form of performance test or standard which would require the establishment of very specific criteria.
A qualified worker, according to the INTERNATIONAL LABOUR ORGANISATION (ILO) (1979:236) is a person who has the necessary physical abilities, the motivation, the mental capacity and the skills and knowledge to carry out work to a prescribed standard. This standard includes safety, quantity and quality aspects.

The quantity aspect implies time related criteria; the quality aspect on the other hand would depend on the task or job at hand.

This combination of safety, quantity and quality as integral components of any job competence criteria implies that there must be some standard performance concept.

The ILO (1979:240) describes standard performance as the rate of output which a qualified worker will achieve working at a normal pace without over exertion during a normal working day, with the proviso that the prescribed job method is used and the worker is motivated. The standard performance rate is set at 100 and the average worker rate is 75 on the 0-100 standard scale.

All the above has implications for any envisaged evaluation sub-system for a Competency Based Modular Training System.

3.5 A MODEL OF A COMPETENCY BASED TRAINING SYSTEM

The various definitions of models all tend to include a notion that a model is a symbolic representation of a simple or complex event, a system or aspect of a system or a function and how they interreact and what relationship they have.

Lippett (1976:2) defines a model as:

'... a symbolic representation of the various agents of a complex event or situation, and their inter-relationships. A model is by nature a simplification and thus may or may not include all the variables. The true value of a model lies in the fact that it is an
abstraction of reality that can be useful for analytical purposes ... models are analogies which problem-solvers use to clarify their thinking'.

Donnelly (1987:4) states that a model designed to represent a training function or system should be relevant, comprehensive and comprehensible. Donnelly further advocates a move away from the early models of training systems or functions which concentrated on four main areas only, namely, the identification of training needs on the macro level, assessment of training requirements on the micro level, designing the programme and the evaluation and feedback.

This traditional model is seen to be too simple to cover the complexities of modern day training.

Donnelly (1987:5) further suggests a new model shown in Figure 16 in which there are four main blocks in the cycle: the resource availability, the assessment of training needs for the organisation, the assessment of training needs for the job and the programme design.

This model is seen to overcome the limitations of traditional models. The importance of pre-assessing the availability or resources is emphasised; the attention to the training of trainers is highlighted and evaluation is an integral part of all the main blocks.
Cycle of Training: Modified Model

- Span of assessment
- Confidentiality
- Availability of performance criteria
- Likelihood of organisational/market changes
- Projected cost-benefit
- Acceptability
- Availability of analytical techniques

Assessment of training needs: The organisation
- Sequence of operation
- Methodology
- Budgets
- Perceived problems
- Current structures and policies
- Areas of sensitivity
- Projected change areas (organisation - technology - markets)
- Statistical requirements
- Cost benefit projections
- Statutory requirements

Evaluation
- Availability of objectives
- Acceptability
- Potential evaluators

Pre-entry requirements

Cost-benefit potential
- Acceptability of training to employees
- Availability of performance criteria
- Availability of analytical techniques

Programme design
- Behavioural objectives
- Sequence of syllabus
- Target population: selection criteria
- Learning modes
- Learning aids
- Theory/practice mix
- Sequence of training
- On/off job training

Evaluation
- Method, context and timing of evaluation
- Evaluators
- Use of evaluation material

Pre-entry requirements

Selection and training of direct trainers
- Potential evaluation strategies
- Availability of learning resources (internal/external)
- Acceptability of training
- Favoured methodologies of learning

Evaluation
- Performance criteria
- Target population

Pre-entry requirements

Cycle of Training
(DONELLY, 1987:5)

Figure 16.
A model of a competency based training system could be derived from the actual development for a competency based training programme.

Blank (1962:26) identifies twelve tasks that need to be accomplished in developing a competency based training programme. These tasks are:

1. Identifying and describing specific occupations or jobs.

2. Identifying the essential prerequisites the trainee would need to undergo the training, that is evaluating the initial situation of the learner.

3. Identify and verify the various tasks in the job.

4. Do an indepth analysis of job tasks and, where necessary, add knowledge tasks.

5. Determination of terminal objectives and articulate them in writing.

6. Determine the sequence of tasks in some sort of logical hierarchy together with their terminal performance objectives.

7. The development of performance tests which will evaluate if training objectives have been achieved.

8. The development of written tests and where applicable practical tests.

9. The development of draft learning guides.

10. Pilot test of programme and revision, where necessary.

11. Development of a system to manage the learning.

12. The implementation and evaluation of the training programme.
Accordingly, Competency Based Modular Training System like any other training system is a means to an end. Because of an identified training need a training intervention is identified as being necessary. Viewing competency based modular training as a system and bearing in mind the twelve tasks necessary in developing CBMT training programmes a model of a competency based training system would include the following:

1. A training needs analysis.

2. The initial situation of the learner.

3. The pre-interactive phase before learning or instruction takes place.

4. The interactive phase which is the face to face learning and instruction.

5. The training output and its evaluation.

6. A feedback mechanism to inform the learner on progress.

For a diagramatic representation of such a model of a Competency Based Modular Training System, see Figure 17.

This model will be considered as the basis for developing the appropriate design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries.

The model is a systems model which has inputs, conversions and outputs characteristics and has sub-systems operating dynamically with other sub-systems.
Being a model of a Competency Based Modular Training System, it contains elements considered to be essential for Competency Based Modular Training, namely: training needs analysis, training aims and objectives, the evaluation of the initial situation of the learner, a pre-interactive phase which considers course content, facility evaluation, media and trainer training. All these are important didactic issues, especially when viewed from a systems perspective.

The interactive phase is where the trainer-learner interaction takes place and where the conversion phase of the training system occurs. The evaluation phase is where output is measured and via feedback to the initial situation of the learner and the training objectives determines if the objectives have been achieved.

It is important to note that the model approaches didactic issues from a systems theory viewpoint and as such will consider the essential didactic components in the development of the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries.
TRAINING NEEDS ANALYSIS → INITIAL SITUATION OF LEARNER

TRAINING OBJECTIVES

PRE-INTERACTIVE PHASE

<table>
<thead>
<tr>
<th>COURSE CONTENT</th>
<th>FACILITY REQUIREMENTS</th>
<th>MEDIA</th>
<th>TRAINER TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development:</td>
<td>Equipment</td>
<td>Practical</td>
<td>Identification of trainer</td>
</tr>
<tr>
<td>- Job identification</td>
<td>Machinery</td>
<td>Video</td>
<td>Trainer training</td>
</tr>
<tr>
<td>- Task analysis</td>
<td>Finances</td>
<td>Audio/visual aids</td>
<td>course development</td>
</tr>
<tr>
<td>- Task listing</td>
<td></td>
<td></td>
<td>Training the trainer</td>
</tr>
<tr>
<td>- Job task/Knowledge task differentiation</td>
<td></td>
<td></td>
<td>Evaluating the trainer</td>
</tr>
<tr>
<td>- Task objectives and criteria</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Task sequencing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Performance tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Learning guides</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Management system</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

INTERACTIVE PHASE

Trainer ← Learner

EVALUATION PHASE

Performance/competence tests

DIAGRAMATIC REPRESENTATION OF A MODEL OF A COMPETENCY BASED TRAINING SYSTEM

FIGURE 17.
3.6 SYNTHESIS

* Competence when applied to the performance of a worker in an industrial setting goes beyond performing job and task skills to an accepted level of mastery. Other skills such as adaptive, core and basic skills are necessary. They may not be competences in themselves but contribute to overall job competence.

* For training of a vocational nature to be successful the training must be systematic and should view training from a systems stance. Training systems function as a sub-system of an organisation and ultimately the organisations receive the outputs from the training sub-system.

* Using a model as a means of describing a training system offers an abstraction of reality and can be useful for analytical purposes. Moreover, a model can be also used as a designing instrument and as such offers opportunities to create training systems which in themselves will be able to deliver training that is measurable and produces the desired training outcomes.

* Competency Based Modular Training as a delivery method can, if needs be, be part of a training system.

* The traditional approach to developing Competency Based Modular Training programmes concentrates mainly on job identification, job task and task analysis and ignores the adaptive, core and basic skills and ascribes to viewing competence in a narrow sense and not the broad view adopted by the Printing, Newspaper and Packaging Industries of the Republic of South Africa.

* The Printing, Newspaper and Packaging Industries clearly saw the need for a training system which would use competency based modular methods to deliver training that was flexible, pro-active, facilitated career progression, easily understood by the users, applicable to both centralised and decentralised training and ensuring competence on-the-job (See 1.2.7).
4.1 THE ANDRAGOGIC DIDACTIC SITUATION IN WHICH TRAINING OF THE SKILLED WORKER TAKES PLACE IN AN INDUSTRIAL SETTING

Asgar (1990:49) states that one of the main reasons that the value of training in an industrial setting is difficult to determine is that little has been done to establish training as a legitimate field of study. Furthermore, he feels that instructional technology suffers from an emphasis on 'education' and 'technology'; the former is inappropriate, the latter incomplete, bearing in mind that within the Printing, Newspaper and Packaging Industries skills training, particularly for the artisan sector, is aimed at producing highly skilled employees who are competent in the broadest sense of the word (See 3.1.4).

Feuer & Geber (1988:31) contend that those who are involved in adult education and training are guilty of being more concerned with the methodology and outcomes of instruction rather than with the learner in the process. Feuer & Geber (1988:35) commented on Knowles' original stated characteristics of the adult as against the non-adult learner. They offered the notion that andragogy has perhaps always been more a 'model' of effective instruction rather than a 'theory' of adult learning. As previously discussed (See 3.4.1) Knowles made certain assumptions about adults which lend themself to developing effective instructional strategies.

Feuer & Geber (1988:35) quote Rossett who states that one of the key questions to ask is whether children are any different from adults as learners in their demand for attributes of effective instruction. She feels that there is no difference.

Knowles (1987:176) makes an important statement which indicates that less emphasis should be placed on andragogy versus pedagogy when
adults are in the learning situation. The pedagogical assumptions on learning are perhaps appropriate, realistic and usable when an adult is faced with course content which is totally strange to them. Conversely, the andragogical assumptions on learning would be the only appropriate route for adults faced with different course content building on the known life experiences.

4.1.1 THE ADULT LEARNER AND EFFECTIVE INSTRUCTION IN THE ANDRAGOGIC DIDACTIC SITUATION

The adult learner, in the case of this study, operates in the world of work. The adult learners in an industrial setting must be placed in their true contextual situation as full-time employees occupying job roles.

Effective instruction for an adult in the work situation would demand a very systematic approach to all facets of training from training needs analysis to evaluation.

Klausmeir & Goodwin (1971:13) identify the variables that affect the school learning environment as:

1. Objectives of the course of study in terms of how outcomes are incorporated, how they are formulated and used.

2. The subject matter in terms of what the matter is, how it is organised and sequenced.

3. Instructional materials: What kind, the quality and availability.

4. The characteristics of the learner: Intellectual ability, level of achievement, physical maturity related to psychomotor abilities, affective characteristics, health, perception of situation, age and sex.
5. Characteristics of the teachers: Knowledge of subject matter, development, learning and teaching skills, psychomotor abilities, affective characteristics, health, perception of situation, age and sex.

6. Classroom interaction: Student-Teacher, Student-Student, Teacher-Teacher, Teacher-Administrator.


8. Physical characteristics: Pertaining to facilities such as space, supplies, equipment, etc.


Modifying the above variables to those that would affect the training learning environment, using competency referenced terminology, a familiar list appears:

1. Objectives of the course of training in terms of outcomes, now expressed in competencies, how they are incorporated, formulated and used.

2. The course content in terms of what the content or matter is, how it is organised and sequenced.

3. Instructional materials: What kind, the quality and availability.

4. The characteristics of the learner: Intellectual ability, level of achievement, physical maturity related to psychomotor abilities, affective characteristics, health, perception of the situation, age and sex.
5. Characteristics of the trainer: Intellectual ability, level of achievement, physical maturity related to psychomotor abilities, affective characteristics, health, perception of the situation, age and sex.


8. Physical Characteristics: Facilities to train, materials, equipment, etc.

9. Work organisation-Training sector-Industry relations. Trainers of particular trainees-organisation in which the trainees are being trained. Total trade sector in organisation-Total trade sector in industry. Total organisation training-Total industry training.

To the above would naturally be added a tenth item, namely, the evaluation of the training. True evaluation is implicit in all teaching and training situations. However, in the field of training, evaluation of training in an industrial setting demands more attention simply because of the cost factor.

All the above are core didactic issues and must be adhered to in order to ensure a sound and justified didactic basis for any envisaged model or training system.

Fraser et al see the above as sub-systems of the curriculum as a didactic system. They define curriculum as:

1. The curriculum is the interrelated totality of aims, learning content, evaluation procedures and teaching-learning activities, opportunities and experiences which guide and implement the didactic
activities in a planned and justified manner' (Fraser et al, 1991:82).

Fraser et al also point out that there is a dynamic interrelationship between the components of the curriculum and warn against the dangers of curriculum development being directed at a single component. They advocate that all the components of the curriculum must be considered when curriculum development takes place (Fraser et al, 1991:89-92).

A design model of a Competency Based Modular Training System must of necessity take into consideration the above variables and ensure that they are addressed.

Coupled to the above, any design model of a competency based training system must identify, incorporate and reinforce sound didactic principles.

Fraser et al (1991:54-76) identify the following didactic principles:

1. Motivation: Namely extrinsic and intrinsic motivation and motivation as a component of teaching practice.

2. Individualisation: Supports in a greater measure the concept of learner-led training (See 1.2.4).

3. Perception: Centred about the concept of giving meaning to what is being taught which is dependent on and influenced to a large extent by the learner's cultural background and previous experiences.

4. The principle of active participation (activity).

5. Totality and globalisation in relation to the course or subject content.

6. Scientism: By this is meant the science of teaching which is practised by the teacher, instructor or trainer to successfully
pass on the course content to the learner as well as the very methods used to teach or instruct.

7. Control: Basically this involves the evaluation process and its value to the learner, teacher, trainer and instructor.

8. Planning: Related to long-term planning which looks at curriculum development and subject curriculum development. Short-term planning which looks at daily planning and lesson planning.

9. Socialisation: Which aims at primary, secondary and tertiary education and are created only when such opportunities for socialisation are available.

4.1.2 FURTHER THOUGHTS ON THE ADULT AS LEARNER

Pfeiffer (1991a:189-190) expands on Knowles' assumptions (See 3.4.1) by including additional characteristics of andragogy as put forward by Good and Hanson. These are:

1. Learning is seen as a process rather than a series of finite unrelated steps and learning should ideally take place throughout a person's life span.

2. Active involvement by the learner is seen as enhancing the transfer of learning.

3. The responsibility for learning should rest with the learner not with the teacher or trainer.

4. The learning process has an emotional (affective) as well as an intellectual (cognitive) component.

5. Adults need to experience and want to be involved; they actually prefer to do the task themselves, even though it may take longer.
6. Adults want relevance, problems and examples must be realistic to them as learners.

7. Adults relate their learning to what they already know and have experienced. It is thus important to know something about the background of the adult so as to provide examples to which they can relate.


9. The five senses of the learner are important and variety stimulates. The use of a variety of instructional techniques helps to mitigate against boredom and fatigue.

10. Learning will flourish in a win-win situation. Checking that learning objectives have been achieved is more effective than the traditional forms of testing and grading.

11. The training facilitator or instructor must be more of a change agent. The trainer's role is to present the information or skills and to create an environment in which exploration and experimentation can take place in a non-threatening manner. The learner's role is to take what is offered and apply it in a way that is relevant and best for them. The trainer's responsibility is to facilitate. The participants' responsibility is to learn.

4.1.3 SYNTHESIS

The above elaboration on didactic issues imply that any design model of a competency based training system must ensure that the andragogic didactic requirements are met via a structured deliberate process so that when the design model is used the training outcomes will satisfy the competency objectives that were set initially and that the learner is the focus of the system. Learning must be seen as a process and as such the process needs to be adaptable and dynamically
aligned to the nature of the course content, the method of course delivery and the initial situation of the learner.

The importance of systems theory when applicable to didactics will be taken into consideration when developing the design model. Particular attention will be taken to stress the interrelationships and equal importance of training aims, learning content, evaluation procedures and the teaching-learning activities.

During the development of the design model the important didactic principles of motivation, individualisation, perception, participation, totality, scientism, control, planning and socialisation will be accommodated.

4.2 THE NATURE OF NON-FORMAL EDUCATION AND TRAINING REQUIREMENTS IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

Walters (1991:1) referring to the De Lange Report on the provision of education in the RSA defines formal education as that education that takes place in a planned, structured way at recognised institutions such as schools, technical colleges, technikons and universities. Non-formal education is defined as education that takes place in a planned, structured but highly adaptable way in organisations and institutions outside the sphere of formal education.

The training of the skilled worker cadre in the Printing, Newspaper and Packaging Industries is of a vocational nature and includes an education component. Traditionally the education component of the vocation training has been done in the formal education sector. The industry perceived this formal education to be inadequate, out of step and inappropriate for the needs of the industry (See 1.2.2).

The career progression aspects (See 1.2.4) created an open system for employees with free access, unencumbered by pre-entry formal educational requirements. The career progression aspects cannot be viewed in isolation and must be accommodated in the non-formal vocational education and training sector.
Because of the industry's need for a unique training system (See 1.2.3) non-formal education and training would naturally be a feature of this training system. The non-formal education and training would have to be well structured, well planned, dynamic and needs driven.

4.3 BLOOM'S TAXONOMY OF LEARNING AND ITS APPLICATION IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

A feature of Competency Based Modular Training Systems is that the competence must be measurable; mastery needs to be attained. Competence in the Printing, Newspaper and Packaging Industries is seen in its broadest context (See 3.1.4) and as such goes beyond the paradigm of training only the 'need to know'. Thus the identified adaptive, interpersonal, basic, core, task and job skills for a skilled worker in the industry would need to have very specific and meaningful objectives. The more detailed the objective the better one is able to establish criteria against which the objective can be measured when evaluation takes place. Competence on the job is manifest by the behaviour of the worker in the job situation. According to Romiszowski (1992:20) Mager was in 1962 promoting the use of behavioural objectives for learning and popularised the use of precise statement of objectives for instruction. Furthermore, it is now usual to think of three categories of objectives:

1. Cognitive objectives: These are centred about what the learner should know or be able to do.

2. Affective objectives: These are centred about what the learner should feel and be prepared to do.

3. Psychomotor objectives: These are centred about the physical skills the learner should develop.
According to Curzon (1990:144-145) Bloom expanded on the three domains and created sub-divisions for each. In the cognitive domain Bloom developed a continuum ranging from simple knowledge of facts through a hierarchy of skills up to the intellectual process of evaluation. Within this hierarchy from the lowest to the highest are: knowledge, comprehension, application, analysis, synthesis and evaluation. The affective domain is about attitude and Bloom postulated five major categories in this domain: receiving, responding, valuing, organizing and conceptualizing and characterizing by value or value concept.

The psychomotor domain involved motor skills. Curzon (1990:145) suggests Harrow's taxonomy as a system based on Bloom's general approach. This taxonomy has six major categories: reflex movements, basic fundamental movements, perceptual abilities, physical abilities, skilled movements and non-discursive communication.

The application of Bloom's taxonomy of learning to the learning situation of the trainee undergoing skills training in the Printing, Newspaper and Packaging Industries has great value in developing concise objectives which can categorise the level of skill needed in any of the three domains or a combination of the three. This allows for developing objectives for unskilled, semi-skilled, skilled and highly skilled tasks and their concomitant criteria for measuring and evaluating. Put simply, it helps establish within any skills level attained by the learner of what thinking, feeling and doing must be taught to and used by the learner so as to be competent in the work situation.

Competency Based Modular Training by its nature requires mastery of a module. Thus an objective with specific criteria is necessary in order to evaluate mastery and within the criteria clear reference is possible to identify what domain of Bloom's taxonomy is in use.
Essentially, the industry had found many deficiencies in the way the training of its skilled manpower was done and desired a new training system which would use Competency Based Modular Training as the preferred method of training (See 1.2.5).

Adopting CBMT as a method of training without incorporating it in a training system would have not rectified the problems. For example, in-company training systems were haphazard and ineffective due largely to production interfering with training as well as the fact that training needs analysis and training evaluation of the system were rarely attempted (See 1.2.5).

A design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries offers a blueprint for developing not only course content which is competency based but would ensure that the entire andragogic didactic situation is structured and that sound didactic principles are applied in the andragogic didactic situation when it occurs. The design model should have sufficient built-in checks and balances so that the industry could collectively train its skilled workforce to a common standard of competency irrespective of whether the training was done in a decentralised or a centralised manner (See 1.2.3).

The design model of a Competency Based Modular Training System would need to accommodate and exhibit the following features (See 1.2.7):

* Flexibility and be pro-active in the arena of technological changes and develop the skills to cope with changes in technology.

* Incorporate the important core didactic issues and ensure that sound didactic principles are features of the design model. The core didactic issues of the interrelationship of training aims and objectives, learning content, training procedures and
the teaching-learning activities will be stressed in the design model.

* Able to incorporate content and structure to facilitate career progression growth for employees in the industry, including non-formal education.

* Be easily understood by the industry and equally applicable to large companies with sophisticated training structures and small companies with no training structures.

* Be applicable in form and content to a dedicated Printing College of Southern Africa which would institutionalise the training of skills for the industry.

* Have appropriate content to ensure competence occurs on-the-job thus going beyond the well-used paradigm that competence depends solely on skills, knowledge and ability.

* Have a delivery mechanism that through appropriate quality control structures and systematic evaluation will ensure the outcomes are appropriate and meet the needs of the learners, industry and attain international recognition.

**4.5 THE DEVELOPMENT OF THE DESIGN MODEL**

The design model was developed incrementally over a period of nine months. The first milestone was the acceptance by the Printing, Newspaper and Packaging Industries of the Code of Practice for Training in the industry. This document established a training ethic which was articulated and incorporated specific rights and duties of employers with regards training.

The various components of the design model were investigated and developed, not necessarily in sequence, but often in tandem, since the output of any one of the sub-systems could impact on other sub-systems.
Of overriding consideration was the need to ensure that all the requirements of the industry were met.

4.5.1 TRAINING NEEDS ANALYSIS

Van der Stoep (1988:3) postulates five criteria which are necessary if training needs analysis is to be an effective strategy for training programme development. These are:

1. Clear identification of a target group that is to be trained as well as who the trainer is and the trainer's involvement in instruction.

2. The aims and objectives of the training programme in terms of the behavioural changes which should result from the training.

3. The actual content of the training programme that is, what is to be taught, when, how and by whom.

4. The amount of work the learner would have to put into the training programme in order to be successful.

5. The actual priority of the programme in terms of the organisation or industry in question.

Smith, Delahaye & Gates (1986:63-66) put forward that the Training Needs Analysis (TNA) process can be difficult or even ineffective due mainly to the lack of an adequate model, restrictive views concerning what data is available and appropriate, and the lack of a relatively objective process for choosing TNA data-gathering methods. They postulate that TNA data can come from the organisation, the operation or job in question and the person or individual involved.

Smith et al (1986:64-66) recommend data sources for the organisation as:
Organisational goals and objectives, manpower inventories, skills inventories, organisational climate indices, analysis of efficiency indices, changes in system or sub-system, management requests, management interrogation, exit interviews, MBO or work planning, and review systems.

Data for the operations or job:

Job descriptions, job specifications, task analysis, performance standards, performing the job, observations of job-work samples, literature reviews concerning the job, asking questions about the job, training committees or conferences, analysis of operations and card sort.

Data for the person or individual data:

Performance data or appraisals as indications of 'sickness', observation of work-samples, interviews, questionnaires, tests, attitude surveys, check-lists or training progress charts, rating scales, critical incidents, diaries, devised situations, assessments centres, coaching and MBO or work planning and review system. The individual as the learner should also be assessed for their training need requirements, especially the issue of career progression requirements. These career progression requirements could be, as is the case in the RSA, for literacy and numeracy training and more advanced non-formal basic adult education.

A fourth category for obtaining data is suggested especially for a Training Board such as the PnPITB and that is for an industry in its broadest sense. The data would concentrate on such macro issues as technology and its impact on products, production processes, industry systems and sub-systems. International issues such as world trade, socio-economic and political needs, as well as regional requirements.

Training needs analysis as such should result in some form of aims and objectives. However, as Donnelly indicates (See 3.5) there should be some form of evaluation centred about the availability of
objectives, the acceptability of the objectives and their potential evaluators. The objectives arrived at would need to be expressed in terms of competencies. Competencies when applied to skills training in the Printing, Newspaper and Packaging Industries would be seen in its broadest sense (See 3.1.4).

As has been illustrated, Training Needs Analysis is said to be a difficult if not impossible process and is often ineffective due to the lack of an adequate model and data sources that are too restrictive and inappropriate.

To avoid the pitfalls that have been illustrated, the Training Needs Analysis of the design model is constructed in such a manner that it presents a usable model which identifies what data collection processes are used. The model also identifies the broad base from which data is to be collected and has the essential feature of evaluation. This evaluation is to determine if identified objectives for training are available and acceptable in terms of competence.

Training needs analysis as the first component of the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries is depicted in Figure 18.

<table>
<thead>
<tr>
<th>DATA COLLECTION PROCESSES</th>
<th>DATA SOURCES</th>
<th>EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation</td>
<td>1. Industry</td>
<td>Objectives availability and acceptability in terms of competence</td>
</tr>
<tr>
<td>Analysis</td>
<td>2. Organisation</td>
<td></td>
</tr>
<tr>
<td>Surveillance</td>
<td>3. Operation or job</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Person or individual</td>
<td></td>
</tr>
</tbody>
</table>

AIMS AND OBJECTIVES OF TRAINING
- Industry
- Organisation
- Operation or job
- Person or individual

Code of Practice for Training within the industry

DESIGN MODEL: TRAINING NEEDS ANALYSIS

FIGURE 18.
The aims and objectives arrived at out of the TNA process would express the combined requirements of the industry, organisation, operation or job and the person or individual. This broad base TNA approach would offer clear directives as to what training is needed.

The training needs analysis component of the design model can be seen in relation to the other components of the design model in Figure 30 (See 4.5.10).

4.5.2 TRAINING AIMS AND OBJECTIVES

According to McNeil (1976:9) when a learning activity works it is considered good. In other words, when a learning activity has led to the attainment of the original instructional objective it has been effective.

Kello (1986:50) contends that one of the most common causes of ineffective training is due to a lack of clearly defined training aims and objectives. He contends that the first principle of training is to establish very specific goals which answer the question of what problem the training is supposed to address.

The focus of the proposed training and its aims and objectives should somehow identify the specific ways in which people should change or develop or behave.

Pfeiffer & Ballew (1988a:27) identify predetermined aims and emergent aims and believe the following questions should be asked:

* Who should determine the learning aims and objectives? Should it be the facilitator, the learner or both?

* What learning aims can possibly be determined prior to training taking place?

* Is there a possibility of additional aims emerging whilst training is taking place?
Furthermore, Pfeiffer & Ballew (1980a:27-28) feel there is a need to determine the extent of objectives.

If training aims are cognitive or emotional, for example, they will affect the nature of the design of the training course, the materials needed and the type of facilitation to deliver the training.

The Printing, Newspaper and Packaging Industries have established that the preferred training methodology for training of the skilled worker is to be competency based and modular in nature and that Bloom's Taxonomy of Learning offers a ready procedure for developing concise objectives (See 4.3).

The training aims and objectives would thus need to be expressed in terms of the overall competency desired as well as indicating objectives of a cognitive, psychomotor or affective nature.

In developing the aims and objectives component of the design model, care has been taken to ensure that the aims from such divergent sources as the industry, the organisation, the job or task and the person are accommodated. The aims and objectives arrived at for each category are expressed wherever possible in cognitive, affective and psychomotor terms.

This broad based approach to determining realistic aims and objectives is a combined effort of the providers of training, the training facilitators and the learners. It also provides value in that aims and objectives can be determined prior to training taking place.

The aims and objectives component of the design model is a sub-system of the model and being a sub-system it interacts with all the other sub-systems in a dynamic manner. This factor enables for additional aims to be added even whilst training is taking place.

The aims and objectives component of the design model facilitate for making didactically sound statements of objectives for training in the Printing, Newspaper and Packaging Industries.
The aims and objectives of training as a component of the design model is depicted in Figure 19:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INDUSTRY</td>
</tr>
<tr>
<td>Overall Competency aims and objectives</td>
<td>Job competence in broadest sense</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific objectives of a cognitive nature</td>
<td>Objectives as applicable</td>
</tr>
<tr>
<td>Specific objectives of an affective nature</td>
<td></td>
</tr>
<tr>
<td>Specific objectives of a psychomotor nature</td>
<td></td>
</tr>
</tbody>
</table>

**DESIGN MODEL: AIMS AND OBJECTIVES**

**FIGURE 19.**

The aims and objectives component of the design model can be seen in relation to the other components in the design model in Figure 30 (See 4.5.10).
The Code of Practice for Training in the Industry is aimed at establishing a training ethic for the industry. The Code of Practice reinforces and entrenches the training aims and objectives derived from the Training Needs Analysis process. The Code of Practice also protects the divergent aims and objectives of the industry, organisation, job or task and the person.

The Code in essence covers the following important aspects (PNPITB, 1990b:1-18):

(a) The accreditation rights of the PNPITB of in-service training for skilled workers within organisations in the industry using Competency Based Modular Training methods exclusively.

(b) The appointment and registration of training instructors who meet with the prescribed registration criteria. These criteria not only required the instructor to be qualified technically, but also having satisfied the requirements of being trained as a trainer. A training course specifically designed for the industry is specified.

(c) The actual accreditation procedure which granted accreditation based on:

* The facilities necessary to train, including plant and equipment.

* The course of training in a CBM format.

* The registered trainer.

For ease of reference this component is referred to as the accreditation triad and is depicted in Figure 20.
(d) The automatic lapsing of the PNPITB's accreditation every twelve months so as to facilitate an annual re-endorsement and updating.

(e) The management of in-service training within specified guidelines.

(f) The claiming of cash grants or allowances or any other form of reimbursement for accredited training that has taken place.

(g) Submission to the PNPITB of an annual training needs analysis for consolidation and reassessing the industry's needs in the medium to long term.

The main aim of the accreditation procedure (PNPITB, 1990b:7) was to ensure that any training, especially skills training for artisans within the industry, complies to the minimum standards set by the industry.

4.5.4 LEARNER VARIABLES

Jessup (1991:99) in discussing vocational education and training believes that the key process to concentrate on is the learning by
the student or trainee, the clients in the system and not the teaching or training by the providers. The role of teachers and trainers is to facilitate learning, rather than control the process.

Learner-led training must of necessity examine the learner or the target group of learners before the learning encounter takes place. Competency Based Modular Training as envisaged by the Printing, Newspaper and Packaging Industries is individualised training in nature.

The National Training Board (NTB, 1989:11) supports the view that a CBMT approach to training is a shift in emphasis from the group to the individual, where the individual is the focal point of training from the beginning to the end. This view supports the career aspiration needs of employees in that they can make progress in a career over the entire life span of their career by obtaining module credits at their own pace.

The traditional time-based system of training for the skilled worker in the Printing, Newspaper and Packaging Industries and other industries in the RSA had certain educational prerequisites (See 2.2.1) as well as the minimum and maximum age at which a person may be indentured into an apprentice training contract. These prerequisites impact on the career progression aspects (See 1.2.4) of the industry. Consequently, a deliberate move was made to integrate theory and practice via the mechanism of the non-formal education route (See 4.2). The non-formal education route could, if properly used, eliminate the education training dichotomy that plagued training in the Printing, Newspaper and Packaging Industries (See 1.2.2).

A worst case scenario for a potential learner for skills training up to a skilled worker as defined in the industry as a qualified artisan would be:

* Illiterate and innumerate without any formal schooling,
* Over twenty-one years of age,
Entered the industry at the lowest job entry level.

Conversely, a learner who enters the industry under a contract of apprenticeship could have a best case scenario of:

* A very high level of literacy and numeracy with a high level of formal schooling, such as a matric certificate,
* Be over sixteen but under twenty-one,
* Entered the industry with a formal apprentice training contract.

For both cases some instruments or mechanisms have to be available to act as a selection criteria for the target population which will accommodate both career progression trainees and indentured apprentices. The National Union of Metal Workers (NUHSA, 1991:35) believe that the traditional methods of selecting trainees and apprentices for artisan training, namely, psychometric tests and formal educational minimum standards discriminate against the culturally and educationally disadvantaged people of the KSA. They believe that alternate methods such as trainability tests should be used.

Trainability testing as described by Craig (1990:1-7) offers instruments which can be used to assess whether the potential learner is trainable within a specific training programme. Trainability tests are described as mini-task or job-samples and as such are more relevant to the task or job that has to be trained. Trainability tests can, however, range from pure practical tests to those that would test knowledge. Trainability tests can be developed to test basic and core skills. Furthermore, Craig (1990:8) states that selection instruments based on a trainability test, if well designed, can match the training target group more realistically to the intended programme. Trainability tests can also be designed to diagnose problems and as such identify some form of remedial training.

Using trainability tests in the Printing, Newspaper and Packaging Industries, especially for the career progression training, enable the industry to identify the inputs that are necessary to make an employee trainable.
Further prerequisites are required in the Printing, Newspaper and Packaging Industries, particularly in the pre-press and printing press sectors. An important physiological attribute for potential trainees is that they are not colour blind and do have good colour discrimination abilities.

In order to ensure that the andragogic didactic situation, particularly the trainer-teacher and trainee-learner relationship, is better matched, further selection instruments are necessary. Learning styles evaluation offers meaningful information before training takes place. As an example, Honey & Mumford (1986:1-10) have a learning style questionnaire which on analysis identified four distinct learning styles:

**Activists:** Those who like to involve themselves fully without bias in new experiences. They are open-minded and enjoy the here and now.

**Reflectors:** Those who prefer to stand back to ponder and collect data and prefer to think about things before coming to a conclusion.

**Theorists:** Theorists tend to adapt and integrate observations to complex but sound theories. They think logically and are systematic in their approach to solving a problem.

**Pragmatists:** Those who are keen to try out an idea, theory or technique to see if it works in practice.

Honey & Mumford (1986:1-10) developed norms for a variety of jobs and established an instrument which is user-friendly and offers both the learner and trainer the opportunity to develop appropriate strategies for improved learning, better design of training courses, as well as enhancing the trainer-learner interaction.
The complexity of learner variables requires careful consideration when developing the appropriate component of the design model that deals with the learner initial situation.

In the design model that deals with the learner in the initial situation it is taken from two extremes. The potential apprentice who is literate and has a high level of formal education and the potential career progression trainee who is illiterate and has no formal education. Both categories are accommodated in the learner component of the design model and are evaluated against practical trainability tests, appropriate physiological tests and where applicable learning styles tests.

Competency Based Modular Training (CBMT) is an individualised training strategy (See 1.6.3) and is learner-led in nature. Thus the importance of evaluating the initial situation of the learner is crucial.

The initial situation of the learner as a component of the design model is a sub-system of the model and as such interacts dynamically with the training aims and objectives and the pre-interactive component where learner variables do influence course content, course design and evaluation procedures (See 4.5.5) as well as the interactive component where teaching-learning activities occur (See 4.5.7).

The learner as a component of the design model and its relation to the training needs analysis, aims and objectives of training and the code of practice for training is depicted in Figure 21.

The learner initial situation component of the design model can be seen in relation to the other components of the design model in Figure 30 (See 4.5.10).
THE LEARNER (Expanded View)

INITIAL SITUATION

APPRENTICE
Pre-requisites
- Minimum Educational requirements
- Age restrictions

CAREER PROGRESSION TRAINEE
Pre-requisites
- No scholastic requirements
- Over 21 years of age

EVALUATION SYSTEM
- Trainability testing - minimum criteria
- Physiological testing - minimum criteria
- Learning Styles testing - minimum criteria

DESIGN MODEL: THE INITIAL SITUATION OF THE LEARNER

FIGURE 21.
THE PRE-INTERACTIVE PHASE: COURSE CONTENT AND EVALUATION DESIGN

Learning content is an important constituent of the andragogic didactic situation, notwithstanding the delivery method that is to be employed.

The Printing, Newspaper and Packaging Industries in electing to use Competency Based Modular Training methods as its delivery mechanism within its CBMT training system obviously implied the use of the typical features of CBMT programmes as supported by Blank (See 3.2; 3.5).

The importance of learning content needs examination from the point of view of certain criteria which are applicable to the vocational education and training requirements of the industry.

Du Plooy (1985:61) identifies certain criteria which, in the writer's opinion, are applicable to the needs of vocational training and education in the Printing, Newspaper and Packaging Industries.

1. There must be a purposeful choice of learning content, implying scientifically designed, meaningful and justifiable training and teaching systems based on clear and concise aims and objective formulation.

2. The choice of learning content using the insights of the psychology of learning with particular emphasis on:

   2.1 The deliberate choice of learning content which will lend itself to creating an ideal learning situation.

   2.2 The choice of learning content which relates new content to previous learning experiences and content so as to have optimal progress in learning.

   2.3 The degree of difficulty in the learning content when considered in relation to the learner.
2.4 The choice of learning content in relation to the rate at which the learning content can be handled.

2.5 The motivation of the learner through the choice of learning content. In the writer's opinion, the choice of learning content is also important for the motivation of the trainer in the andragogic didactic situation.

3. The choice of learning content and the structure of the subject or course of training.

4. The necessity for a balance in criteria.

5. The choice of learning content so as to facilitate logical ordering of the learning content.

The important learning content criteria identified will need to be incorporated in the pre-interactive component of the design model. The process of obtaining clear and concise aims and objectives are catered for by the appropriate aims and objectives component of the design model (See 4.5.2).

The purposeful choice of learning content which implies scientifically designed, meaningful and justifiable training systems as well as the structure of the subject, the facilitation of logical ordering of learning content and the necessity for balance in criteria would depend on the aims and objectives.

The Printing, Newspaper and Packaging Industries, identified competency in its broadest sense (See 3.1.4). Thus in order to ensure that learning content is appropriate the correct identification of adaptive, interpersonal, job and task, core and basic skills are necessary.
4.5.5.1 SKILLS ANALYSIS: SPECIFIC CATEGORIES

The Printing, Newspaper and Packaging Industries understands competence in the broadest sense (See 3.1.4) and in order to arrive at the choice of learning content a deliberate categorisation of skills is made:

1. Adaptive Skills: The input via an analysis process would by nature have to include the technological advances that would influence the job in question in the future. The actions necessary by an employee to respond to the demands placed on them by their environment can be accommodated by providing skills training in those areas analysed as being adaptive skills.

2. Core Skills: The core skills (See 3.1.2) that are essential for job competence in the broadest sense are, for example, the ability to innovate, planning and organising skills and the ability to supervise and manage people. In the Printing, Newspaper and Packaging Industries the skilled worker in the machine minding sector of printing and packaging usually have a number of operatives assisting them and the skill to supervising and managing people is essential for competence on the job.

3. Task and Job Skills: Generally these skills can be classified as technical skills. Blank (1982:60) identifies these skills to be the subject of job and task analysis and are part of the process of developing Competency Based Modular Training programmes.

The Printing, Newspaper and Packaging Industries with its expressed desire for a progression of modules from a common base to the skilled qualified printer, rather than a large number of designated trades (See 1.2.3) implies that instead of concentrating purely on the
task and job skills, more industry generic skills and knowledge would have to form part of the initial course content which could contain a large proportion of 'nice to know' information and underpinning knowledge.

4. Interpersonal Skills: With the cultural diversity in the RSA, the changes currently taking place in our society and in the workplace make it vital that the skilled artisan has good interpersonal skills. These interpersonal skills are communication skills, negotiating skills and change coping skills.

5. Basic Skills: Basic skills are said to be enabling skills. Gordon (1990:50) believes reading, goal setting, problem solving, etc. are enabling skills. Basic skills are seen as essential before a person is trainable in a vocational direction. Very often reference is made to the term functional literacy. This writer believes that basic skills go beyond functional literacy and within the career progression aspects of the Printing, Newspaper and Packaging Industries should form the foundation training for its entire Competency Based Modular Training System. The initial situation of the learner (See 4.5.4) demands the needs of the disadvantaged learner to be accommodated within a common CBMT training system which would lead to skills training to at least artisan level.

The Printing, Newspaper and Packaging Industries has labelled this basic skills training as 'occupational literacy'.

According to the PNPITB (1993:1-2) occupational literacy consists of literacy, numeracy and basic science training which is aimed at enabling a trainee to progress in the CBMT courses for skills training up to artisan level.
Out of the analysis of the various skills, from adaptive to basic skills an overall skills listing can be made. The procedure is as follows:

1. Skills listing from lowest skills level to highest skills level.

2. Development of objectives for each skill which is identified in terms of modules. The objectives are expressed in terms of competencies using Bloom's taxonomy of cognitive and affective objectives and Harrow's psychomotor objectives. These objectives will define the range of the skill in terms of the complexity of the cognitive, affective and psychomotor skills that have to be learned.

3. For each objective a set of criteria need to be developed. These criteria must be measurable and be of a quantitative and qualitative nature and be set at Qualified Worker Standard (See 3.4.2).

4. For each identified skill there would exist some essential underpinning knowledge. This knowledge needs to be identified. Naturally, some skills would be purely knowledge based. Traditionally the pure knowledge based skills formed part of the technical education component of the vocational education and training of the skilled worker in the Printing, Newspaper and Packaging Industries (See 1.2.7).

Out of this procedure the purposeful choice of course content is made bearing in mind the creation of an ideal learning situation.

Competency Based Modular Training (CBMT) identifies the prerequisites the potential trainee would need to undergo the training. It also identifies the various tasks in the job, the terminal objectives and the other procedures identified to develop a Competency Based Modular Training programme. All these need to be considered in developing the pre-interactive component of the design model (See 3.5) and will influence the actual content and design of training courses.
An important component of this pre-interactive phase is the logical sequencing of the modules of training in a hierarchy so as to ensure new skills and knowledge are based on the sound didactic principle of being built on the known (See 4.5.5).

Out of the process of logical sequencing of modules a course map can be developed, together with phases of training which are related to the skills levels described in the career progress path system of the industry (See 1.2.4).

In order to accommodate the specific categories of skills and the skills analysis process in the design model, these items are included in the pre-interactive phase of the design model which deals specifically with training course and evaluation design.

The analysis of the job via a process of job identification followed by a detailed analysis of the adaptive, core, interpersonal, basic, job and task skills are contained in a sub component of the design model which also provides for determining the identified skills deemed essential for job competency. The training objectives with their concomitant criteria are quantifiable and qualifiable and can be expressed in cognitive, affective and psychomotor terms.

In order to position the above aspects in the design model, the pre-interactive phase consists of:

* Training course and evaluation design which contains analysis of the job, course design, course map and course evaluation items.

* Resource evaluation which contains accreditation items.

* Trainer training which contains pre-entry requirements and trainer training items.

* External evaluator training which contains pre-entry requirements and external evaluator training items.
4.5.5.2 COURSE STRUCTURE: PHASE DEVELOPMENT PROCEDURES

In order to satisfy the needs of the Printing, Newspaper and Packaging Industries requirements for a CBMT training system which would be a progression of modules from a common base to the skill of a qualified printer, as well as being adaptable and flexible enough to be used in a decentralised and centralised delivery system and for satisfying the career progression aspects (See 1.2.7) a procedure for categorising phases of training and skills levels in a logical structure is needed. Sequencing of training course content is also an important didactic consideration. The cardinal point in the process is in what sequence modules or learning content is to be taught. In the design model the structure of courses of training for skilled artisans in the Printing, Newspaper and Packaging Industries is shown in Figure 22 and reveals the following:

* Skills level 1 involves training that will make the learner trainable via occupational literacy courses, i.e. basic skills. The concept of 'trainable' is applied specifically to the learner proceeding into the phase 1 of a programme designed to train skilled artisans.

* Phase 1 of an identified skilled training programme would contain modules which are industry generic, that is, cover such aspects as the commercial aspects of running a business, a broad overview of the entire Printing, Newspaper and Packaging Industries in the RSA, as well as such essential work-related general skills as first aid, safety, disciplinary procedures, etc. Some of the core skills would be given in this phase. Basic skills and core skills would dominate in this phase, as well as some practical task skills.

* Phase 2 of an identified skills training programme would contain modules which would cover the skills and knowledge of distinct sectors of the Printing, Newspaper and Packaging Industries, such as:
The Origination Sector:
- Origination is that sector of the industry which is to do with all the processing prior to the press, that is, before printing.

The Machine Minding Printing Sector:
- Machine minding printing is that sector to do with the actual printing process.

The Machine Minding Packaging Sector:
- Machine minding packaging is that sector of the industry where packaging is manufactured and printing on packaging takes place.

The Finishing Sector:
- The finishing sector of the industry is where the printing products from the machine minding sector are further processed in books or final product.

The Maintenance Sector:
- The maintenance sector of the industry is to do with that sector of the industry concerned with the electrical and mechanical maintenance of the machinery and equipment used to manufacture printed and packaging goods.

In phase 2 basic skills, core skills, job and task skills, together with the underpinning knowledge, would be dominant.

* Phase 3 of an identified skills training programme would contain modules which would specialise in a specific technical direction and would be job and task skills. In phase 3 more complex core and adaptive skills would be included.
Phase 4 of an identified skills training programme would contain modules which would be more specialised and very technically orientated and would be almost exclusively job and task skills. More complex adaptive skills modules would be also included in this the final phase of training for a skilled artisan in a specialised technical direction.

The phase structure is depicted in Figure 22.

<table>
<thead>
<tr>
<th>PHASE</th>
<th>SKILLS LEVEL</th>
<th>DESCRIPTION</th>
<th>MODULE CONTENT</th>
<th>GENERAL SKILLS DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Qualified Artisan</td>
<td></td>
<td>Qualified Artisan</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>Technical Specialisation</td>
<td>Job and Task skills Adaptive skills and underpinning knowledge</td>
<td>Skilled</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Technical Specialisation</td>
<td>Job and Task skills Adaptive skills Core skills and underpinning knowledge</td>
<td>Semi-skilled</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Sector Specialisation</td>
<td>Sector skills, some job and task skills, core and basic skills and underpinning knowledge</td>
<td>Semi-skilled</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Broad based Industry Knowledge</td>
<td>Industry &quot;generic&quot; skills Basic and core skills and underpinning knowledge</td>
<td>Unskilled</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Occupational Literacy</td>
<td>Basic skills, namely literacy, numeracy and basic science which would enable learner to handle course content in phases 1-4 of a programme</td>
<td>Unskilled</td>
</tr>
</tbody>
</table>

**DESIGN MODEL: PHASE STRUCTURE SCHEME**

**FIGURE 22.**

Within these phases the modules of training could be of a pure practical nature, practical and theoretical or pure theory.
Practical modules and those modules that contain practical and theoretical components would need to have content that makes training possible in the actual decentralised work situation or by means of simulation within a centralised training institute within the Printing, Newspaper and Packaging Industries.

Modules which contain pure theory, 'Technical Theoretical Modules', would contain underpinning knowledge only and the training of these modules would be of such a nature that teaching in its broadest sense as distinct from training will take place. Generally, 'Technical Theoretical Modules' will be taught within institutions and organisations that are capable of doing such teaching.

The phase structure scheme of the design model is located in the pre-interactive phase of the design model and can be seen in relation to the other components of the design model in Figure 30 (See 4.5.10).

4.5.5.3 EVALUATION SYSTEM: INTERNAL AND EXTERNAL EVALUATION

With the development of the course content and the course map there is the need to have an evaluation system for each module, phase of training and final competence testing.

As has previously been discussed (See 3.3) evaluation can be categorised in terms of self evaluation against internal criteria and evaluation by the receiving system against their criteria.

The success of any Competency Based Modular Training System as previously stated (See 3.2) can only be established by means of continuous testing and monitoring.

Module tests can be seen as testing against internal criteria. These tests are conducted by the trainer. The learner undergoing the test receives immediate feedback because of the basic feature of CBMT training systems where progress to a higher level module depends on mastery of the lower level module first. The module tests, if
properly structured, can give immediate feedback to the trainer and learner. This offers the learner motivation since success is seen to have been achieved and tangible goals are attained.

Those tests that are to be evaluated by the Printing, Newspaper and Packaging Industries Training Board for their industry, should be to those standards of competence the industry desires from well trained skilled artisans.

The monitoring of the Competency Based Modular Training that is to take place in the Printing, Newspaper and Packaging Industries needs to be an integral part of the training management sub-system in the design model.

Notwithstanding the above the Printing, Newspaper and Packaging Industries desired a training system that could accommodate a wide range of learner variable (See 4.5.4). This wide range of the initial situation of the learner complicates how evaluation is done and more importantly what needs to be evaluated. Competency according to the Printing, Newspaper and Packaging Industries is seen in its broadest sense (See 3.1.4) and evaluation of training outcomes would need to reflect this broad understanding of competence.

What needs to be evaluated is important. Odiorne (1991:43-46) describes learning as somewhere between present behaviour and desired behaviour. The understanding of that behaviour must be seen from the following perspective:

- Behaviour is that 'action' a person does; the activity that can be seen or measured.

- The effects of the behaviour upon the person in the form of feedback that either reinforces or extinguishes the behaviour.

- The inner drives within a person who is learning such as motivation, perceptions, attitudes, personality traits, tensions or social influences that act upon the person to produce the desired volume and quality of behaviour.
Satisfying what needs to be evaluated is only part of the problem in designing a suitable evaluation system. Of equal importance is to determine the role of evaluation as a component of the design model.

The Printing, Newspaper and Packaging Industries adopted the notion of Competency Based Modular Training methods as being integral in their desired training system (See 1.2.3). CBMT is by nature learner-led therefore it is important to establish the correct form in which evaluation is done bearing in mind the broad base from which Training Needs Analysis data is obtained (See 4.5.1).

Stemming out of the Training Needs Analysis broad aims and objectives will be obtained satisfying the broad base from which the TNA data was obtained. In essence each client namely the industry, organisation, job or task and person would see training aims and objectives differently and would need to be involved and informed in the evaluation system.

Evaluation according to Pfeiffer & Ballew (1988b:111-112) revolves about an essential question as to whether we are trying to 'determine' something or to 'justify' something. Furthermore, Pfeiffer & Ballew (1988b:113-114) suggest that even though one is either trying to determining or justifying something through evaluation a series of important methodological questions need to be asked:

* For whom is the data being generated and by whom is the data generated?

* From whom should the data be obtained; when and how should evaluation take place and how should the data be collected?

* Where should evaluation take place; what resources are needed and who should prepare and provide feedback of the data?

* How should the data be distributed and who should distribute the data?
* Will the data being generated be used with commitment for its original purpose?

A feature of Competency Based Modular Training is that progress can only be made if a preceding module has been mastered. This implies some form of testing. The test may be of a purely practical nature or of knowledge only or a combination of both. In the Printing, Newspaper and Packaging Industries, training can take place in decentralised organisations, as well as in centralised organisations and institutions. The entire question of evaluation of training, particularly for artisan training, needs a more systematic approach when CBMT methods are to be used (See 1.2.5).

An evaluation sub-system for the design model of a CBMT modular training system would need to address the questions raised by Pfeiffer & Ballew and also take cognisance of the andragogic didactic issues at play in the training situation.

In order to satisfy the aforementioned requirements, the sub-system of the design model contains the following elements:

1. Module Testing: Each module needs to be tested against the objectives and concomitant criteria. The individual module testing is done by the trainer, and with immediate feedback to the learner, satisfies the didactic category of motivation since knowledge of progress and success is integral in the process. It also identifies who does the tests and for whom the data is destined and the purpose of the data.

2. Phase Testing: As previously discussed (See 4.5.5.2) a course of training for a skilled worker in the Printing, Newspaper and Packaging Industries is broken up into four phases. Each phase will involve a composite test of those modules within that phase.
Phase 1 - Tested by the accredited organisation and institution where the trainee is based.

Phase 2 - Tested by external evaluators, duly trained as such and accredited by the PNPITB.

Phase 3 - Tested by the accredited organisation and institute where the trainee is based.

Phase 4 - Tested by external evaluators, duly trained as such and accredited by the PNPITB (See Figure 30; 4.5.10).

The evaluation sub-system is depicted in Figure 23.

<table>
<thead>
<tr>
<th>TESTING</th>
<th>STANDARDS</th>
<th>NATURE OF TESTS</th>
<th>VALUE</th>
</tr>
</thead>
</table>
| Individual Modules | Objectives and Criteria to Qualified Worker Standard | • Internal criteria  
• Practical and Theoretical | • Immediate feedback  
• Motivation to learner  
• Remedial strategies for trainer |
| Phase 1 & 3 | Standards of Mastery set within an accredited organisation or institution | • External criteria  
• Practical and Theoretical | • Performance evaluation of trainee and trainer |
| Phase 2 & 4 | Standards of Mastery in terms of industry's broad based competency requirements | • External criteria  
• Industry controlled via the PNPITB  
• Practical and Theoretical | • Evaluating the entire training system as well as competence of the trainee |

DESIGN MODEL: THE EVALUATION SUB-SYSTEM

FIGURE 23.

The evaluation sub-system forms part of the training management system.
The sub-system in Figure 23 satisfies the following:

* Individual module tests generate data at the point of training and is usable immediately by the trainer to implement remedial action. For the learner, module test results act as motivation and satisfy certain career progress needs of the learner. Success in a module results in the learner being exposed to new material only when mastery in the previous module has been attained and thus the course of training becomes individualised.

* Phase 1 and 3 tests conducted within the accredited organisation or institution satisfies management that the training has taken place, progress is being made and acceptable competence levels are demonstrated by the learner.

* Phase 2 and 4 tests conducted by external evaluators satisfies the industry as a whole that an industry-wide standard of training to a predetermined level of competence has taken place and that such training can be certificated by an external awards body such as the PNPITB.

The use of external evaluators, who by the very nature of the tests that they need to conduct and the competence standards that have to be applied, would involve the evaluators having specific pre-entry requirements including being trained how to evaluate competence and to understand the training management structures of the Competency Based Modular Training System (See Figure 30; 4.5.10).

The pre-interactive phase as a component of the design model which covers the features of training course and evaluation design needs to be conceptualised and put into perspective. This conceptualisation needs to establish the relationship between training course and evaluation design with the Training Needs Analysis, Aims and Objectives, The Learner and the Code of Practice components of the design model.

Figure 24 presents the design model component of the pre-interactive phase which concerns training course and evaluation design.
PRE-INTERACTIVE PHASE
TRAINING COURSE AND EVALUATION DESIGN
(Expanded View)

<table>
<thead>
<tr>
<th>ANALYSIS OF JOB</th>
<th>COURSE DESIGN</th>
<th>COURSE MAP</th>
<th>COURSE EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Job identification</td>
<td>• Module identification</td>
<td>• Subdivision of course, skills levels, phases</td>
<td></td>
</tr>
<tr>
<td>• Adaptive skills analysis</td>
<td>• Underpinning knowledge module identification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Core skills analysis</td>
<td>• Sequencing of modules</td>
<td></td>
<td>• Module testing procedures</td>
</tr>
<tr>
<td>• Task and job skills analysis</td>
<td>• Phase and skill identification</td>
<td></td>
<td>• Check lists</td>
</tr>
<tr>
<td>• Interpersonal skills analysis</td>
<td></td>
<td></td>
<td>• Trainer</td>
</tr>
<tr>
<td>• Basic skills analysis</td>
<td></td>
<td></td>
<td>• Learner</td>
</tr>
<tr>
<td>Objective categories</td>
<td></td>
<td></td>
<td>• External criteria</td>
</tr>
<tr>
<td>- Cognitive</td>
<td></td>
<td></td>
<td>• Phase testing</td>
</tr>
<tr>
<td>- Affective</td>
<td></td>
<td></td>
<td>• Final Competence Testing</td>
</tr>
<tr>
<td>- Psychomotor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criteria:</td>
<td></td>
<td></td>
<td>Design Model: The Evaluation Sub-System</td>
</tr>
<tr>
<td>Quantifiable and qualifiable</td>
<td></td>
<td></td>
<td>(See 4.5.5.3)</td>
</tr>
</tbody>
</table>

Objective in competence terms range and scope
Criteria in Competence terms at qualified worker standard

Design Model: Phase Structure Scheme (See 4.5.5.2)

DESIGN MODEL: THE PRE-INTERACTIVE PHASE:
TRAINING COURSE & EVALUATION DESIGN

FIGURE 24.
4.5.6 THE PRE-INTERACTIVE PHASE: RESOURCE AVAILABILITY

The modified model of the cycle of training as advocated by Donnelly (See 3.5) identifies an important component of the model as resource availability and suggests that such factors as budget, attitudes, professionalism, cultural values, policies and responsibilities, as well as an evaluation of options and acceptability are considered.

The Code of Practice for Training in the Printing, Newspaper and Packaging Industries establishes a training ethic for the industry which would satisfy the attitudes and values, as well as establish broad training policies for the industry (See 4.5.3).

The accreditation to train component of the design model will address the issues of resource availability in terms of budgets and professionalism in training.

4.5.6.1 ACCREDITATION TO TRAIN AND ACCREDITATION CATEGORIES

According to Vorster (1991:8) accreditation for industrial training functions is set at two levels in terms of the Manpower Training Act.

At the first level, the Department of Manpower accredits industry training boards which have met the specific criteria and standards set by the Department of Manpower. At the second level the industry training boards set their own criteria and standards that training institutions, organisations and employers would require to have to be accredited to train.

The Printing, Newspaper and Packaging Industries in its desire for a competency based training system reiterated the need for having a cadre of trained trainers or instructors that would train the future skilled workers within the industry (See 1.2.3). Bearing in mind also the need for properly designed CBMT programmes and the requirements of a training ethic as described by the Code of Practice for Training (See 4.5.3) the accreditation to train component of the
design model would hinge on three important issues.

1. The actual course of training: This course of training would have to be in a competency based modular form. Modules would need clear objectives and concomitant criteria and be supported by an evaluation system. The competence standards must be set by the industry.

2. The facilities and equipment necessary for the training: Cardinal to on-the-job practical training and simulated institutionalised practical training would be the need for the machinery, equipment and raw materials. Theoretical teaching would likewise need the facilities necessary for such teaching.

3. The Trainer: The pre-entry requirements of the trainer would include an appropriate qualification within the area that is to be trained, as well as the successful completion of a course of training which would equip the trainer for the job of a trainer in the industry.

Because of the diversity of the industry in relation to products produced and the different sizes of the work force at the various employers in the industry, categories of accreditation will be awarded which will accommodate these diversities.

Category 1: The accreditation will be given to an organisation or institution that is capable of training and teaching all the modules of a CBMT course for a designated skill, that is, a designated trade covering all practical and technical theoretical modules with their concomitant content.

Category 2: The accreditation will be given to an organisation or institution capable of training all the practical modules or technical theoretical modules of a CBMT course for a designated skill, that is, a designated trade.
Category 3: The accreditation will be given to an organisation or institution capable of training part of the practical modules or technical theoretical modules of a CBMT course of a designated skill, that is, a designated trade.

Category 4: The accreditation will be given to an organisation or institution capable of training practical or technical theoretical modules of a CBMT course other than those for a designated skill, that is, a designated trade. An example of this is the 'occupational literacy' training in skills level 1 (See 4.5.5.2).

Notwithstanding the category of accreditation, the principles of a course in an acceptable CBMT format with standards set by the industry, the necessary facilities such as machinery, equipment and raw materials necessary to present such a course of training, and the pre-entry qualifications of the trainer or teacher are still operational. The registration of the trainer is provided for within the Code of Practice for Training in the Industry (See 4.5.3).

As part of the accreditation process, the PWPITB acts as the accreditation body and as such either supplies the CBMT programme or approves such programmes in the light of the standards set by the industry.

The pre-interactive phase of the design model with the accreditation component is depicted in Figure 25.
PRE-INTERACTIVE PHASE OF THE DESIGN MODEL  

FIGURE 25.

4.5.6.2 PRE-ENTRY REQUIREMENTS FOR THE TRAINER

Traditionally the role of the trainer for artisan training in the Printing, Newspaper and Packaging Industries was undertaken by a qualified artisan in a specified designated trade. This, of course,
was in line with the practices in other industries. The Metal and Engineering Industry with their version of Competency Based Modular Training for skills development specify that a trainer in a specified trade must be a qualified artisan. This qualified artisan must have attained artisan status by means of passing a trade test in the designated trade in which he is to train other employees (See 2.2.2.1).

The role of the trainer differs markedly from the role of a qualified artisan in an industrial setting. The former needs to be involved in an andragogic didactic situation with the learner and the process of teaching and training. The latter is to do with the production of goods and services.

The qualified artisan has the task and job skills, as well as the underpinning technical knowledge to perform in the work situation to produce goods and services. What needs to be done, how, when, where and to what standard are known. The artisan as a trainer would need to be given specific training for the role of a trainer if he is to be a competent training instructor.

The pre-entry requirements for a trainer in the Printing, Newspaper and Packaging Industries would, because of the career progression aspects and the categories of accreditation, identifies that a need exists for the artisan to be trained as a trainer so as to be able to offer either practical training and theoretical teaching or both to a trainee.

According to City and Guilds of London Institute (CGLI, 1992:7-8) the course of study prescribed for a trainer at NVQ level three needs to enable the trainer to master the following:

1. Identify the current competence of individuals and groups.

2. Agree short term learning priorities.

3. Identify and agree learning strategies to meet training and development requirements.
4. Agree on learning plans and processes to monitor outcomes.

5. Present information and give demonstrations to learners.

7. Support the achievement of individuals learning objectives.

8. Assist and support the application of learning.

9. Evaluate the achievement of outcomes against objectives.

10. Modify and adapt learning plans.


In view of the very specific needs of the Printing, Newspaper and Packaging Industries the training of the trainer is essential and was a need expressed by the industry (See 1.4). With the above in mind and taking cognisance of the exclusive Competency Based Modular Training approach a course of training for the trainer would contain the following aspects:

- How to develop a course map for CBMT.

- Task analysis.

- Developing evaluation check lists.

- Write learning guides.

- Demonstrate tasks.

- Complete the administration tasks related to the training management sub-system of the CBMT training system.

The underpinning knowledge within the course would be:
- Understanding skills levels in the Printing, Newspaper and Packaging Industries.

- The career progression aspects.

- Understanding training phases and phase evaluation.

- Knowledge of the optimum and minimum requirements before a candidate can undergo final competence testing.

- Andragogic didactic aspects of instruction.

- Knowledge of adult education: andragogy.

- Some basic knowledge of learning theories.

- Knowledge of specific training methods especially competency based modular.

The evaluation of the above training course would be by means of a competence test based on an on-the-job project.

The trainer pre-entry requirements component of the model is depicted in Figure 26.

<table>
<thead>
<tr>
<th>PRE-INTERACTIVE PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trainer: Pre-Entry Requirements</td>
</tr>
<tr>
<td>- Qualified in area of specialisation for what he/she will train</td>
</tr>
<tr>
<td>- Completed trainer training course</td>
</tr>
<tr>
<td>- Proof of competence in training via an on-the-job project</td>
</tr>
</tbody>
</table>

DESIGN MODEL: THE PRE-INTERACTIVE PHASE:
TRAINER PRE-ENTRY REQUIREMENTS
FIGURE 26.
The entire pre-interactive phase component of the design model in relation to the other components of the design model can be seen in Figure 30 (See 4.5.10).

The external training evaluation is included in Figure 30 and the pre-requirements for an external evaluator are described in (4.5.8.1).

4.5.6.3 DECENTRALISED INDUSTRY TRAINING

The Printing, Newspaper and Packaging Industries with an employer body of 2 010 separate companies or organisations employing 40 139 employees is distributed throughout the Republic of South Africa (See 2.3.3.1). Within these 2 010 employers there exists 1310 apprentices as of January 1992 and these apprentices are distributed in 406 individual companies. Part of the problem with regards the way that skilled artisan training was done using the traditional time-based apprenticeship system was that in-company training systems were haphazard and ineffective because production interfered with training. Furthermore, training needs analysis and evaluation of the system were rarely attempted (See 1.2.5).

The industry's desire to use Competency Based Modular Training methods as the means to train its skilled workers has an impact on the training system that would deliver such training especially in decentralised employer organisations and institutions. In order to ensure training standards are maintained in the decentralised situations a sound training management sub-system is essential in the design model.

Watson (1990:32) contends that managing a modular course makes two principal demands upon the administrative and consultative system, namely, that the system can cope with a high degree of complexity and that accountability and responsibility is clearly defined as well as the lines of authority in the system.

The decentralised delivery of training in the industry would of necessity be part and parcel of the entire CBMT training system and
the training management sub-system component of the design model would need to be comprehensive, effective and efficient.

4.5.6.4 CENTRALISED SOUTHERN AFRICAN PRINTING COLLEGE TRAINING

The Printing, Newspaper and Packaging Industries had expressed the idea of establishing a school of printing for Southern Africa (See 1.2.3). In this school of printing, both practical and theory training should take place.

Furthermore, the industry's desire for a training system using Competency Based Modular Training methods which could be equally adaptable to both centralised and decentralised delivery mechanisms was clearly stated (See 1.2.3; 1.2.5).

The above requirements naturally impact on the training management sub-system component of the design model. The nature of the training management sub-system would have to be able to cope and apply the same standards to both the centralised and decentralised delivery mechanisms within the industry.

4.5.6.5 THE TRAINING MANAGEMENT SUB-SYSTEM

The training management sub-system as a component of the design model is concerned with those structures, procedures, checks and balances that interconnect the design model and ensure that the resultant training system has an output which meets the industry's requirements and also maintains the integrity of the training system.

The problem facing the Printing, Newspaper and Packaging Industries was that the time-based system of training of artisans was ineffective. The course content was inappropriate and sound andragogic didactic principles were not in practice (See 1.2.5). Moreover, the problem also begged the question of how career progress
aspects and Competency Based Modular Training methods could be included in a training system which satisfied the needs of the industry (See 1.2.7).

It is the writer's contention that within a design model of a competency based modular training system clear and unambiguous authorities and responsibilities must be allocated at the design stage so as to ensure that when learning ultimately takes place it is effective and efficient and has the desired output.

Within the design model a number of key players are identified. These are:

* The learner who is either an apprentice or a career progression trainee.

* The trainer or technical theoretical teacher duly qualified and trained to instruct or teach.

* The employer or institution in which training or teaching takes place.

* The industry as a whole, who establish industry accepted competence standards.

* The Printing, Newspaper and Packaging Industries Training Board as the training quality assurance body.

* The training evaluators which are those independent trained external evaluators who conduct phase 2 and 4 testing (See 4.5.5.2; 4.5.5.3).

Over and above the identified key players, the Competency Based Modular Training method, if applied correctly, acts as an important data generating system and controls the andragogic didactic situation within the parameters of the overall course design and identified output competences.
All the identified key players have authorities and responsibilities and manage and control the training process and training system.

The original proposed structure of the Printing, Newspaper and Packaging Industries Training Board (PNPITB) assigned the responsibility of apprentice training, artisan re-training and all other training of various skills levels below artisan level to the PNPITB (See 2.3.3).

The Code of Practice for Training in the Industry gave the PNPITB the authority and responsibility for establishing competency standards for the skilled worker, trainer and evaluator in the industry. It also gave authority and responsibility for the accreditation of training and technical education bodies who were to deliver such training or technical education. The Code of Practice made the PNPITB the quality assurance body for training within the industry (PNPITB, 1990b:1-18).

Notwithstanding the accreditation requirements being met by an organisation or institution, namely, having an approved course in a CBMT format, the facilities and equipment, and the qualified trainer, the PNPITB, as the recognised industry quality assurance body for training would need certain structures and procedures in place to monitor training and training outputs. Of paramount importance are the checks and balances which would monitor and control training as it took place. In order to facilitate these requirements, the following is required:

* At the pre-interactive phase the trainee as identified, together with the employer and the PNPITB should enter a formal contract of training. With the training of apprentices, a contract of indentureship had always been a feature of such a training arrangement. No training contract had ever been in use for employees undergoing training via the career progression route but is seen as being essential.

* This training contract should feature the following characteristics:
- Identify the tripartite nature of the agreement where the employer, learner and PNPITB are joint signatories.

- Must identify that the training methodology is competency based modular.

- Must identify the specific modules of training that are to be undertaken.

- Identify clearly the training obligations of the employer, the learning obligations of the learner and the quality assurance role of the PNPITB.

- Identify clearly the scope and extent of the training contract, particularly the non-performance clauses applicable both to the employer as trainer and employee as learner.

- Must be registered and become a legal document, thus binding on the parties within the parameters of the contract.

- The contract should be part and parcel of a control system which monitors progress and initiates corrective action.

- The training contract would become a pre-entry requirement before the interactive phase of the design model takes place. The interactive phase deals with the trainer-learner interaction where instruction and learning takes place via practical and theoretical lessons.

The training needs analysis because of its importance and the starting point of the entire training process and a key component of the design model needs also to be managed. Authority and responsibility for this process is catered for in the Code of Practice for training in the industry (PNPITB, 1990b:1-18) where the PNPITB is designated as being responsible and having the authority to conduct annual training needs analysis on an industry-wide basis.
For ease of reference the various components of the design model with the bodies responsible and accountable for implementing and controlling the processes in the training system are illustrated in Figure 27.

<table>
<thead>
<tr>
<th>COMPONENT OF DESIGN MODEL</th>
<th>AUTHORITY AND RESPONSIBILITIES TO IMPLEMENT AND CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Training Needs Analysis</td>
<td>PNPITB</td>
</tr>
<tr>
<td>2. Aims and objectives of Training</td>
<td>PNPITB and experts from the industry and the Employer and Employee organisations</td>
</tr>
<tr>
<td>3. The initial situation of the learner</td>
<td>PNPITB and experts from the industry as well as the learner</td>
</tr>
<tr>
<td>4. Code of Practice for Training</td>
<td>The industry as a collective body</td>
</tr>
<tr>
<td>5. Pre-Interactive Phase Training Course and Evaluation Design</td>
<td>PNPITB in consultation with the industry. Authority to authorise programmes via Government Gazette using the mechanisms of the Manpower Training Act</td>
</tr>
<tr>
<td>6. Pre-Interactive Phase Accreditation to Train</td>
<td>PNPITB</td>
</tr>
<tr>
<td>7. Trainer Training</td>
<td>PNPITB</td>
</tr>
<tr>
<td>8. Training Contract</td>
<td>PNPITB - learner - employer or training institution</td>
</tr>
<tr>
<td>9. Training Progress</td>
<td>Trainer, Employer and PNPITB</td>
</tr>
<tr>
<td>10. Evaluation</td>
<td></td>
</tr>
<tr>
<td>• Internal Evaluation</td>
<td>Trainer - learner - employer or training institution</td>
</tr>
<tr>
<td>• Phase 1 and 3 testing</td>
<td>Employer or training institution</td>
</tr>
<tr>
<td>• Phase 2 and 4 testing</td>
<td>External Evaluator - PNPITB</td>
</tr>
<tr>
<td>• External Evaluator training</td>
<td>PNPITB</td>
</tr>
<tr>
<td>• Total Training Evaluation</td>
<td>PNPITB</td>
</tr>
</tbody>
</table>

DESIGN MODEL: AUTHORITIES AND RESPONSIBILITIES IN THE TRAINING MANAGEMENT SUB-SYSTEM

FIGURE 27.
The aims and objectives for training derived out of the training needs analysis need to be jointly agreed upon by the employer and employee organisations. The responsibility for drawing up the aims and objectives rests with the PNPITB and co-opted experts from the industry.

The initial situation of the learner requires careful analysis and as such the authority and responsibility is a joint one between the PNPITB experts from the industry, and the learner. The PNPITB sets the minimum entrance criteria and specifies selection instruments to be used to evaluate the prospective learner. This ensures correct target group selection for the course of training.

The code of practice and accreditation components of the design model are intimately connected and through this connection the PNPITB is given the authority via the Manpower Training Act and the industry to control who legitimately qualifies to take on trainees for training.

In the pre-interactive phase the responsibility for developing the Competency Based Modular Training courses and all evaluation systems is assigned to the PNPITB. This is in part due to the first level accreditation offered by the Manpower Training Act. The PNPITB in carrying out its duties would need to consult directly with experts in the industry with regards course content and underpinning knowledge requirements. The test parameters and the form in which testing will take place, which is part of developing the evaluation system, would be again a responsibility of the PNPITB. Consultation would however take place with the industry as an integral part of the process.

Whilst training takes place, the andragogic didactic situation is to some extent controlled through the accreditation process and by the binding nature of the training contract. To satisfy the requirements for effective and efficient training the mechanisms of the training management sub-system are concentrated on when the andragogic didactic situation exists. This is facilitated by the training progress sub-system which is founded on the following:
(a) Each module of training being competency based has a clear objective and concomitant criteria.

(b) For each module a test for mastery is required. Visible proof via a module test check list must be generated by the trainer. The results must be immediately fed back to the learner, which satisfies the important didactic category of motivation. Moreover, remedial action by the trainer is facilitated by establishing from the test check list the shortfalls in learner performance and the inadequacies which may exist in the instructional technique of the trainer.

(c) For each module successfully completed a progress record card is completed by the trainer, countersigned by the learner and made available to both the employer and the PNPITB to update progress and highlight any problems with regards training progress.

(d) Phase 2 and 4 testing are to be carried out by an accredited external evaluator who reports finding to the PNPITB. Feedback is facilitated by the PNPITB to the trainer, the learner and the employer or institution in which the training has taken place (See 4.5.5.3).

How the evaluation of training is managed is multi-faceted.

The nature of the evaluation in the form of competency testing for each module is aimed at the internal level and is used in the andragogic didactic situation to foster the important category of motivation for the learner and remedial action for the trainer (See 4.5.5.3).

Phase 2 and 4 evaluation tested by external evaluators and controlled by the PNPITB (See 4.5.5.3) ensures that evaluation of an external nature with industry-wide criteria are applicable ensuring training outputs meet industry standards.
The failure of a trainee to master a phase 2 or phase 4 test indicates not only that the trainee has been unsuccessful in demonstrating competence but that the training system has failed.

In practice, this failure demands an external investigation of all components of the training system. In essence each component of the design model will need to be referred to so as to determine whether the requirements of the design model for the training system were met.

4.5.7 THE INTERACTIVE PHASE

The interactive phase of the design model is the conversion phase seen from a systems viewpoint (See 1.6.4).

Curzon (1970:7-10) refers to the teaching-learning situation in the formal classroom. The elements he includes in this situation are in the opinion of the writer equally applicable to the training-learning situation.

According to Curzon the elements in the teaching-learning situation would include the following:

1. A learner, whose nervous systems, senses and muscles are operating in sequences of patterned activity, which we speak of as behaviour.

2. A teacher, selecting and organising instructional methods, consciously planning and controlling a situation directed to the achievement of optimum student learning.

3. A series of learning objectives, related to students' anticipated and desired behavioural changes. We may consider objectives as 'intended learning outcomes', the level of attainment of which can be observed and measured.

4. A sequence of S-R situations affecting teacher and learner, resulting in persistent and observable changes in the learner's behaviour from which we may infer 'learning'. That learning is directed by the teacher to an enhancement of students' cognitive, affective and psychomotor abilities.
(Note, however, that the learner's knowledge acquired in situations such as these interacts with his hereditary knowledge.)

5. Reinforcement of that behaviour. By 'reinforcement' we refer to an activity which increases the likelihood that some event will occur again; it may take the form of a response of the environment, an automatic response of the student, or something added to the learning situation by an individual other than the student, e.g. an overt expression of approval by the teacher.

6. The monitoring, assessment and evaluation of the learner's changes in behaviour in relation to the objectives of the learning process' (Curzon, 1990:8-9).

Naturally, when the interaction occurs in the training field the andragogic didactic situation in totality must be considered. This includes such diverse aspects as the very act of instruction, course content, structure, motivation, teaching principles, etc.

4.5.7.1 TRAINER ASPECTS: THE TRAINER-LEARNER INTERACTION

Blank (1982:280) believes that any student or trainee can master a task or job at a high level of proficiency, provided that the right kind of instruction is given and that enough time is allowed. The actual time it takes a trainee to master a task or job has little, if anything, to do with how well the task or job can be performed once mastery has been attained by the trainee. In essence, mastery of a task or job prescribes that a trainee can either do the job or task or is unable to do it, a go, no go situation.

The trainer in the Printing, Newspaper and Packaging Industries has to be suitably qualified to train. This need of the Printing, Newspaper and Packaging Industries for a cadre of professional trainers (See 1.4) was expressed and has been accommodated in the design model by the strict pre-entry requirements for the trainer (See 4.5.6.2).
The training of the trainer would have equipped the trainer in the most effective way to deliver the course content by using the correct instructional technique and be able to complete the administrative and training management functions within the training system.

In order to facilitate effective feedback and remedial action between the trainer and the learner, each individual module of the Competency Based Modular Training programme would have to be tested by the trainer.

The trainer, in order to satisfy the internal evaluation requirements, would have to develop a check list for each practical module of training that is undertaken. This check list cannot be prescribed by the PNPITB since in the actual training situation the variety of equipment and machinery mitigates against a standardised checklist. Moreover, the scope and range of products produced in the industry is of such a nature that depending on the customer requirements different levels of quality standard are acceptable. In fact, products produced to a quality standard higher than that desired can be uneconomical and wasteful.

The theoretical modules of training are more easily accommodated in the interactive phase since the underpinning technical knowledge, as well as that knowledge which underpins adaptive, core and basic skills, are industry generic and standardised external criteria for evaluation can be applied.

Artisan training, particularly the practical components of the training, makes the practical training component skills-based. Rakow (1990:59-60) describes skills-based training as simply a different way of organising the information that is presented to the trainee. The trainer essentially is instructing in tasks that are part of a job. Artisan training in the Printing, Newspaper and Packaging Industries is to do with a large measure of practical training and as such productive skills are practised earlier and more frequently. The important didactic category of practise and repetition is catered for.
To ensure that the overall requirements of the industry are met, the evaluation of training is carried out by external evaluators at specific phases of the training to the criteria set by the industry. This evaluation not only tests for competence but is an audit of the entire training system and offers the trainer a realistic assessment of how the training has taken place and offers an opportunity to implement remedial and corrective action.

The trainer-learner in the interactive phase represents the conversion component of the design model. This component represents the instructional-learning process taking place and is represented in Figure 28.

<table>
<thead>
<tr>
<th>INTER-ACTIVE PHASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice - Learner - Trainee</td>
</tr>
<tr>
<td>Formal Career</td>
</tr>
<tr>
<td>Indentureship Progression</td>
</tr>
<tr>
<td>Trainer Path</td>
</tr>
<tr>
<td>Evaluation - Internal and External</td>
</tr>
</tbody>
</table>

DESIGN MODEL: THE INTERACTIVE PHASE

FIGURE 28.

4.5.7.2 LEARNER VARIABLES

The learner being the centre of focus for training is accommodated by the following in the design model:

* The contract of training which binds the learner, trainer and the PNPITB, into a tripartite agreement in which training and learning are facilitated.

* The CBMT methods of training and the very design and structure of the courses of training ensure that the training is individualised and didactically sound.
The evaluation of each module allows the learner to obtain immediate feedback offering intrinsic motivation. When success in mastering a module is credited the learner can progress.

In terms of the contract of apprenticeship extrinsic motivation in the form of wage increases on attaining specific skills levels is possible. Ideally, the wage increases should be made at the phase 2, 3 and 4 test levels of the training course (See 4.5.5.2).

4.5.8 EVALUATION SYSTEM

In the development of Competency Based Modular Training courses an integral part of that development process is the actual evaluation system that is to be used. The evaluation system of the design module contains module testing and phase testing against evaluation criteria of an internal and external nature (See 4.5.5.3).

The external criteria are those which are prescribed by the receiving system. Because the Printing, Newspaper and Packaging Industries wanted a training system which would produce competent artisans who were trained by CBMT methods, the training system itself would need evaluation on an ongoing basis.

4.5.8.1 EXTERNAL TESTING: PRE-REQUIREMENTS AND EVALUATOR TRAINING

As previously stated, the PNPITB would, via the training management sub-system for the training system, be the quality assurance and awards body representing the industry (See 4.5.5.3; 4.5.6.5).

The person doing the external evaluation would of necessity have to be qualified and trained to do such evaluation.

According to City and Guilds of London Institute (CGLI, 1992:15) the External Verifier Award qualification is designed for awarding bodies' representatives and as such the external verifier is seen as
a key link in the training quality assurance chain. The role of the external verifier is essential as they ensure that the agreed national standards (external criteria) and assessment specifications have been maintained by those bodies delivering training.

For the Printing, Newspaper and Packaging Industries it is essential that the external evaluator, who is an agent of the PNPITB, is both qualified and trained accordingly.

The pre-entry requirements would broadly be a qualified artisan in the designated trade to be practically trained how to test phase 2 and 4 of a course of training for a designated trade and complete the required administrative functions associated with such tests.

The training course for the external evaluator, taking due consideration of the entire Competency Based Modular Training system, would include the following aspects:

- How a CBMT programme is developed.
- How to read a CBMT course map.
- Understand skills levels in the Printing, Newspaper and Packaging Industries.
- Understand training phases and phase evaluation procedures.
- Knowledge of the optimum and minimum requirements before a candidate can undergo final competence testing.
- Understand the nature, scope and range of phase tests.
- Be able to conduct phase tests.
- Understand and be able to complete observation reports of tests.
- Complete the administration tasks related to the training management sub-system of the CBMT training system.
As part of the management sub-system the external evaluator, by conducting phase 2 and phase 4 competence tests, would in fact be evaluating the entire training system. A feature of Competency Based Modular Training Systems is that mastery has to be achieved before progress to the next module is undertaken. Phase 2 and 4 tests being composite tests of all the content in the respective phases allows for an audit of the training that has taken place (See 4.5.6.5).

4.5.8.2 STRUCTURE OF EXTERNAL TESTS

The structure of any external test especially developed for a competency based modular course designed for skills training of artisans would need to be developed on the basis of the pre-determined objectives and criteria for the course.

The Printing, Newspaper and Packaging Industries defines competence in its broadest sense (See 3.1.4). In order to show mastery in a skilled job the actual job and task skills are easily measured whereas the adaptive, core and basic skills may be more difficult to measure. Interpersonal skills because of their complexity and the situational circumstances that may be necessary are almost impossible to measure over a short time period.

Actual job and task skills particularly those of a practical nature are easily measured. The underpinning knowledge categorised for the practical training components in the Printing, Newspaper and Packaging Industries represented by technical theoretical modules are also measurable. The practical job and task skills are measured by means of tests of a practical nature designed specifically to evaluate mastery of skills.

The design of the practical job and task skills test would have to contain the following:
(a) A qualified worker standard for both quantative and qualitative output criteria would have to be established (See 3.4.2). This would be arrived at by the following procedure:

* An analysis of the objectives of the modules which would cover the phase 2 or 4 of course of training that is to be tested and creation of a composite set of objectives and criteria.

* The establishment of a synthetic standard time at qualified worker standard for the composite objectives and criteria.

* The establishment of the acceptable qualified worker quality standard for the composite objectives and criteria.

(b) The test construction in terms of work pieces for the tests. The validity of the test with regards its criteria, its content and construct validity and its reliability.

(c) The question paper that is to accompany the test work pieces which should not only identify the tasks that need to be done but indicate the time allowances for the tasks.

(d) An evaluation instrument needs to be designed for the external phase 2 and 4 tests which should be as objective as possible. Because of the Competency Based Modular Training methods used and with the underlining premise that a phase 2 and phase 4 is a composite test of modules already mastered, the evaluation instrument should be of a go, no go nature if possible.

Appendix 1 of this study contains a phase 2 question paper for a practical test and the mark sheet for such a test.

The evaluation instrument should consist of a mark sheet which would contain the following features:
* A procedure check list which should be as comprehensive as possible and used whilst the test is in progress. This implies continuous observation by the tester of all the practical tasks being done.

* A quality check list as comprehensive as possible against which the test piece produced by the tester can be measured.

* A clear listing of the tasks required to be done with the time standard for each task as well as an analysis column where the tester can record the actual times taken by the testee to perform the task.

(e) A detailed test procedure for conducting a test needs to be drawn up which will ensure that a standardised procedure will occur when a test is conducted.

(f) A moderation of tests completed by the PNPITB so as to ensure that the tests were fairly conducted and marked.

Appendix 1 of this study contains a typical Phase Two Practical Competence Test.

4.5.8.3 INTERNAL TESTING: CHECK LISTS AND EVALUATION SYSTEM

Blank (1982:155-156) believes that testing plays a crucial role in Competency Based Modular Training. Tests are invaluable in diagnosing entry-level competence of a trainee, providing feedback to the trainee during the learning process, actual assessment of the trainees level of competence or mastery of each task and evaluating the effectiveness of training materials.

Tenopyr (1987:287) accordingly also identifies that testing has an essential role in training. She identifies five specific roles testing plays in training:
(1) The selection of trainees.

(2) A diagnosis tool for determining training needs.

(3) An evaluation of training adequacy.

(4) An evaluation of a trainee's achievement.

(5) For use as a criterion for selecting future tests.

Furthermore Tenopyr (1987:288-293) identifies test characteristics that are most important relative to the use of tests namely:

* Validity particularly criterion related validity, which in the case of CBMT methods is relevant and appropriate.

* Content validity.

* Construct validity.

* Reliability, which is seen as being important for the Printing Industry especially with regards the external testing of phase 2 and 4 of a course of training (See 4.5.5.3).

Curzon (1990:346) believes that a test must be in a suitable form. The form of the test is in a large measure dependent on whether the test is of a pure practical or theoretical nature or a combination of both. Also it is dependent on the trainers answers to the questions of what is being tested, for what purpose is the test being done and how best can an answer or performance level be elicited from the trainee which will produce an unbiased indication of how well he has been trained. Appendix 2 of this study contains a typical written examination paper set for a technical theoretical module.

As has been indicated an important component of the design model is the resource requirements especially the trainer (See 4.5.6.2).
The training of the trainer would include the aspect of completing the administration tasks related to the training management sub-system of the CMBT training system, which indicates that for each module a test for mastery is required and visible proof via a module test check list must be generated by the trainer. The results of the test must be immediately fed back to the learner which will satisfy the important diadactic category of motivation as well as being a useful instrument to determine what remedial action the trainer could implement (See 4.5.5.3).

Naturally as part of the training of the trainer, one of the items would have to be how to construct a module test and how to develop a test check list.

Blank (1982:152-187) distinguishes between performance and written tests in Competency Based Modular Training Systems. To him performance tests are directly related to practical training and simply by a go, no go system of evaluation mastery can be tested easily. With written tests Blank identifies recall and recognition items. For recall items he recommends short answers, completion and essay type tests. For recognition items he recommends multiple choice, true-false and matching type tests.

Because of the diversity of equipment and facilities that exist in the Printing, Newspaper and Packaging Industries as well as the different processing systems adopted in individual companies, the trainer within that specific company is best placed to develop module tests using check lists for practical tests and the appropriate written tests that is applicable. As module testing is part of the training system, proof of such tests in the form of practical test check lists and written test should be available at all times. The actual progress made needs to be documented and reported to the appropriate receiver in the training system. A flow diagram of the process is depicted in Figure 29.
The issue of testing underpinning knowledge is more readily covered in that the Technical Theoretical modules can be evaluated by written tests.

It must be noted that recall items are dealt with by means of short paragraph and essay items and multi choice questions for recognition items.

FLOW DIAGRAM OF INTERNAL EVALUATION PROCESS

FIGURE 29.
4.5.9 OUTPUT COMPETENCIES AND FEEDBACK

The output component of the design model is the end result of the conversion process of the training system. Crucial to the entire Competency Based Modular Training System is that the output is trained skilled artisans who demonstrate a competence level in terms of mastery in the job and tasks associated with the job. The competence as defined by the Printing, Newspaper and Packaging Industries is competence in its broadest sense (See 3.1.4), and as has been previously stated, the final phase 4 externally controlled competence test establishes whether the training system has produced the desired levels of mastery in the trainee and whether the system itself has operated within the desired requirements (See 4.5.5.3; 4.5.6.5).

An important component in the design model is the feedback loop which via the structures of the training management sub-system (See 4.5.5.3; 4.5.6.5) ensure that the output is measured against the original aims and objectives for training as well as evaluating if the original aims and objectives were articulated properly and detailed enough. The feedback loop also links with the learner comparing the initial situation of the learner prior to the interactive instruction phase and the changes in behaviour in terms of competences after the instruction and testing has taken place.

The outputs of a Competency Based Modular Training System would depend to a large extent on how the training needs were arrived at, what the training aims and objectives were, how the course of training was designed, how the actual instruction took place and against what standards the evaluation in the form of tests were conducted. Thus for the Printing, Newspaper and Packaging Industries in its desire to have a Competency Based Modular Training System which would produce competent skilled artisans, the very development of courses of training, the allocation and evaluation of resources, and the actual methods of instruction and also bearing in mind the important crucial dynamics of the andragogic didactic situation, required a systematic well planned approach.
4.5.10 THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM FOR THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

The Printing, Newspaper and Packaging Industries desired a CBM training system which would accommodate all the features peculiar to the Industry (See 1.2.7). No model existed for a CBM training system from which the industry could develop its own training system, hence the need to create its own design model from which to work.

According to Pfeiffer (1991b:279-283) Dick & Carey contend that the general tendency is to focus on one element of the instructional process only when instructional design occurs. They feel that instruction is a systemic process in which every element in the system is essential to the learning process. All elements in the system should be interdependent for input and output and the mechanism of feedback is utilised to determine whether the training goals have been achieved. They also feel that the elements that interact and influence the creation of a sound learning environment are the trainers, learners, learning material and learning environment where tests are 'instructional thermostats' that provide feedback to the system whether the training aims and objectives are being attained.

It is the writer's contention that the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries meets the general criteria that Dick and Carey believe are necessary for the creation of a sound learning environment. The design model pays particular attention to the unique needs of the Printing, Newspaper and Packaging Industries and is shown in complete form in Figure 30.
A CHECK LIST FOR DEVELOPING TRAINING PROGRAMMES DERIVED FROM THE DESIGN MODEL OF THE COMPETENCY BASED MODULAR TRAINING SYSTEM

The design model of a CBMT training system for the Printing, Newspaper and Packaging Industries was intended to offer a solution to the problems the industry had experienced with the training of the skilled artisan in the industry by offering a blueprint from which a new training system can be created. The training system would have as a system inputs, outputs and conversions. The system would contain sub-systems in dynamic interaction with each other at all times. The training system would have to provide well trained competent artisans which would ensure the short and long term growth and survival of the industry.

The design model out of which the training system is to be created must facilitate for the various important didactic categories and ensure sound andragogic didactic practices occur on implementation.

The design model has taken due note of those didactic principles as conditions for effective instruction and learning as ascribed to by Fraser et al (1991:54-71).

* The principle of motivation is catered for, especially extrinsic and intrinsic motivation.

* The principle of individualisation is catered for by the use of Competency Based Modular Training methods and the learner-led approach particularly with regards the needs of career progression.

* The principle of perception is catered for since skills training in the industry involved practical and theoretical training and teaching using a variety of teaching training mediums.

* The principle of active participation is an integral part of skills training in the Printing, Newspaper and Packaging Industries and is part and parcel of the practical components of training programs derived from the design model.
The principle of totality is adequately provided in that the design model is a holistic approach where the concept of a progression of modules from a common base to the skill of a qualified artisan is applied.

The principle of scientism is provided for in that the design model caters for the training of the trainer as well as having very strict accreditation criteria for the trainer whereby he is an expert in the field in which he is to train others.

The principle of planning is provided for in the design model in that curriculum development and subject syllabi development are part of the process of the pre-interactive phase of course design and development.

The principle of control is provided for in the design model by the very nature of regular testing, dynamic feedback and the external quality assurance role played by the PWPIIIB.

If the desire is to develop a training programme from the design model it would be necessary to identify who is responsible for the process and what authority is given to implement the process as well as identify what other resources and interaction processes are necessary as well as ensuring the programme is didactically sound.

To facilitate the process of developing CBMT training programmes and creating the training system for skills training of artisans using the design model, a series of check-lists for this process with the identified responsible and authorised body as well as the sources of information from the design model are necessary.

These check-lists would obviously start with the training needs analysis and progress through the pre-interactive, interactive and output components of the design model. The check-lists would be used as a means of ensuring that the process of development is done procedurally correct and is systematically approached.

The checklists for the various components of the design model follow:
<table>
<thead>
<tr>
<th>ITEM</th>
<th>CRITERIA</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>
| 1    | Was an industry wide needs analysis conducted which included the following:  

(a) Technology changes and their impact on the industry?  
(b) Product changes?  
(c) Production process changes?  
(d) World trade requirements with regards products?  
(e) The socio-economic needs of a national - nature?  
   regional - nature?  
   local - nature?  
(f) Political considerations.  
   - International?  
   - National?  

2    | Was an organisational needs analysis conducted which included the following:  

(a) Organisation goals and objectives?  
(b) Manpower inventories?  
(c) Skills inventories?  
(d) Organisational climate indices (labour turnover etc)?  
(e) Performance indices?  
(f) Job and work samples?  
(g) Changes in technology?  
(h) Changes in products?  
(i) Changes in production processes?  

<table>
<thead>
<tr>
<th>RESPONSIBILITY/ AUTHORITY/ SOURCE OF INFORMATION</th>
</tr>
</thead>
</table>
| Responsibility  
PNPITB - Annual training needs survey on industry wide basis.  

Authority  
PNPITB authorised by Code of Practice to do an annual T.N.A.  

Source of Information  
Design model items: Industry (See 4.5.1).  

Responsibility  
PNPITB and organisation in question. Annual training needs survey.  

Authority  
Organisation as an employer.  

Source of information  
Design model items: Organisation (See 4.5.1).
CHECKLIST FOR USING THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM

<table>
<thead>
<tr>
<th>DESIGN MODEL COMPONENT</th>
<th>TRAINING NEEDS ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM 3</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>Was operation or job analysis conducted which included the following:</td>
<td></td>
</tr>
<tr>
<td>(a) Analysis and categorisation of job?</td>
<td></td>
</tr>
<tr>
<td>(b) Simple rudimentary job analysis?</td>
<td></td>
</tr>
<tr>
<td>(c) Were performance standards available or determined for a job?</td>
<td></td>
</tr>
<tr>
<td>(d) Job questionaires from job encumbants? - Supervision and management?</td>
<td></td>
</tr>
<tr>
<td>(e) Operations analysis?</td>
<td></td>
</tr>
<tr>
<td>Was the training needs determined for the person in question occupying the job which included the following:</td>
<td></td>
</tr>
<tr>
<td>(a) Learner requirements for career progress?</td>
<td></td>
</tr>
<tr>
<td>(b) Interviews?</td>
<td></td>
</tr>
<tr>
<td>(c) Questionaires?</td>
<td></td>
</tr>
<tr>
<td>(d) Tests of competence?</td>
<td></td>
</tr>
<tr>
<td>(e) Critical incidents log analysis?</td>
<td></td>
</tr>
<tr>
<td>(f) Performance appraisal?</td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| 1    | From the training needs analysis, were training aims and objectives derived and did they:  
   (a) Define job competence in its broadest sense?  
   (b) Identify the specific cognitive objectives?  
   (c) Identify the specific affective objectives?  
   (d) Identify the specific psychomotor objectives?  
   (e) Identify the career progression aspects for the learner? |   |    | Responsibility  
PNPITB, industry, specific employers, employees and body of experts from the industry.  
Authority  
PNPITB.  
Source of information  
Design model items (See 4.5.2). |
### CHECKLIST FOR USING THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM

<table>
<thead>
<tr>
<th>DESIGN MODEL COMPONENT</th>
<th>THE LEARNER</th>
<th>RESPONSIBILITY/AUTHORITY/SOURCE OF INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
<td>YES</td>
</tr>
</tbody>
</table>
| 1                      | From the training needs analysis and the aims and objectives of training was an in depth analysis done of the initial situation of the learner which would include the following:  
(a) Identify the apprentice?  
(b) Identify the apprentice pre-entry minimum educational requirements?  
(c) Identify the apprentice's age restrictions?  
(d) Identify the career progression trainees scholastic achievements?  
(e) Develop a selection process which would include:  
- Trainability testing and minimum entrance criteria?  
- Physiological testing and minimum entrance criteria?  
- Learning styles test? | Responsibility  
PNPITB and experts from the industry.  
Authority  
PNPITB.  
Source of information  
Design model items (See 4.5.4). |
### CHECKLIST FOR USING THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM

#### PRE-INTERACTIVE PHASE:
**TRAINING COURSE AND EVALUATION DESIGN**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CRITERIA</th>
<th>YES</th>
<th>NO</th>
<th>RESPONSIBILITY/ AUTHORITY/ SOURCE OF INFORMATION</th>
</tr>
</thead>
</table>
| 1    | Job Analysis:  
(a) Was the job identified in terms of the agreed sectors in the industry, i.e. origination, machine minding (print), machine minding (packaging), finishing and maintenance?  
(b) Was a job analysis done?  
(c) Were tasks and elements identified?  
(d) Were adaptive skills identified?  
(e) Were interpersonal skills identified?  
(f) Were core skills identified?  
(g) Were basic skills identified?  
(h) Was underpinning knowledge identified for:  
   - Job skills?  
   - Task skills?  
   - Adaptive skills?  
   - Interpersonal skills?  
   - Core skills?  
   - Basic skills?  
(i) Were objectives developed for (b) to (h) above?  
(j) Were objectives expressed in terms of:  
   - Cognitive?  
   - Affective?  
   - Psychomotor?  
(k) Were criteria established for all the identified objectives?  
(l) Where possible, did all the criteria have elements of being quantifiable and qualifiable?  
(m) Where possible were criteria set at qualified worker standard? | YES | NO | Responsibility  
PNPITB a body of experts from the industry.  
Authority  
PNPITB.  
Source of information  
Design model items (See 4.5.5.1; 4.5.5.2). |
<table>
<thead>
<tr>
<th>ITEM</th>
<th>CRITERIA</th>
<th>YES</th>
<th>NO</th>
<th>RESPONSIBILITY/ AUTHORITY/ SOURCE OF INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td><strong>Course Design:</strong>&lt;br&gt; (a) Were tasks realistic identified and were they usable as a basis for developing modules of training?&lt;br&gt; (b) Were adaptive, core, basic and interpersonal skills classified in terms of developing modules of training?&lt;br&gt; (c) Were underpinning knowledge requirements developed in terms of modules of training of a technical theoretical nature?&lt;br&gt; (d) Were the identified modules sequenced, building up from a broad industry base to a technical specialisation?&lt;br&gt; (e) Were sequenced modules for a course of training divided into phases of training?&lt;br&gt; (f) Were sequenced modules for a course of training divided and identified into specific skills levels?&lt;br&gt; (g) Were phase 2 and 4 competence objectives set including the range and scope of the competence?&lt;br&gt; (h) Were phase 2 and 4 competence criteria stated in terms of qualified worker standards?</td>
<td></td>
<td></td>
<td>Responsibility PNPITB. Authority PNPITB. Source of information Design model (See 4.5.5; 4.5.5.1; 4.5.5.2).</td>
</tr>
<tr>
<td>3</td>
<td><strong>Course Evaluation:</strong>&lt;br&gt; (a) Were module tests developed to qualified worker standard?&lt;br&gt; (b) Were check lists developed for module tests?&lt;br&gt; (c) Were phase 2 and 4 tests developed?&lt;br&gt; (d) Were competence criteria for phase 2 and 4 tests set at qualified worker standards.</td>
<td></td>
<td></td>
<td>Responsibility PNPITB and body of experts. Authority PNPITB. Source of information Design model (See 4.5.5.3).</td>
</tr>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
<td>YES</td>
<td>NO</td>
<td>RESPONSIBILITY/ AUTHORITY/ SOURCE OF INFORMATION</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----</td>
<td>----</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>In accordance with the Code of Practice for training, were the required resources for training determined specifically: (a) Facilities required to do the practical training in a specialised technical sector of the industry? (b) Facilities required to do the technical theoretical training? (c) Man specification for the trainer for the specialised technical sector of the industry? (d) A course of training in the required CBMT format?</td>
<td></td>
<td></td>
<td>Responsibility PNPITB. Authority PNPITB. Source of information Design model: Code of Practice (See 4.5.3). Accreditation.</td>
</tr>
<tr>
<td>2</td>
<td>What category of accreditation would be required for the course of training?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Was an accreditation procedural check list drawn up?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
<td>YES</td>
<td>NO</td>
<td>RESPONSIBILITY/AUTHORITY/SOURCE OF INFORMATION</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----</td>
<td>----</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>For the identified course or courses of training developed, were the technical abilities of the prospective trainer identified?</td>
<td></td>
<td></td>
<td>Responsibility PNPITB and experts from the industry.</td>
</tr>
<tr>
<td>2</td>
<td>For the identified course or courses of training developed, were accreditation criteria set, that is the man specification for the trainer? (refer to accreditation check list).</td>
<td></td>
<td></td>
<td>Authority PNPITB.</td>
</tr>
<tr>
<td>3</td>
<td>Were the requirements specified for trainer training?</td>
<td></td>
<td></td>
<td>Source of information Design model (See 4.5.6.2).</td>
</tr>
<tr>
<td>4</td>
<td>Were the arrangements made for trainer training?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Was a competence test for the training of the trainer designed?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Was a registration category determined for the trainer in line with the requirements of the course or courses of training he/she was to instruct?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
<td>YES</td>
<td>NO</td>
<td>RESPONSIBILITY/ AUTHORITY/ SOURCE OF INFORMATION</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----</td>
<td>----</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Was the phase 2 and 4 test requirements accurately determined based on:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) An analysis of the objectives of the modules which would cover the job to be tested and their concomitant criteria?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) The establishment of a synthetic standard time at qualified worker standard?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) The establishment of the acceptable quality and quantity standards of all components of the test?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Were the phase 2 and 4 tests constructed in terms of realistic work pieces for the tests?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Were the tests validated?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Was a test procedure drawn up?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Were test designs and testing procedures as objective as possible?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Was a quality check list of tasks required to be done by tester together with time standards created?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Were the man specifications for the external evaluation drawn up with due regard to the nature of the tests that were to be administered by the external evaluator?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Was the external evaluator trained and registered to do the required phase 2 and 4 tests?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST FOR USING THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM

<table>
<thead>
<tr>
<th>DESIGN MODEL COMPONENT</th>
<th>TRAINING MANAGEMENT SUB-SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>1</td>
<td>Did the development of the training contract for the course or courses of training identify the following:</td>
</tr>
<tr>
<td></td>
<td>(a) The tripartite nature of the agreement?</td>
</tr>
<tr>
<td></td>
<td>(b) That CBMT methods would be the training delivery mechanism?</td>
</tr>
<tr>
<td></td>
<td>(c) The actual modules of training to be undertaken?</td>
</tr>
<tr>
<td></td>
<td>(d) The training and learning obligation of the employer, trainer and learner?</td>
</tr>
<tr>
<td></td>
<td>(e) The quality assurance requirements set by the PNPITB?</td>
</tr>
<tr>
<td></td>
<td>(f) The non-performance clauses?</td>
</tr>
<tr>
<td>2</td>
<td>Was an effect training progress system developed for the specific course or courses of training that were developed?</td>
</tr>
<tr>
<td>3</td>
<td>Were authorities and responsibilities allocated for the effective management of the proposed training identified?</td>
</tr>
<tr>
<td>4</td>
<td>Was the external evaluation system in the form of tests developed as per check list for external evaluation?</td>
</tr>
<tr>
<td>5</td>
<td>Was a control system developed for external evaluation of phase 2 and 4 in the course or courses of training?</td>
</tr>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>For the course or courses of training, was an inventory and inspection of facilities made?</td>
</tr>
<tr>
<td>2</td>
<td>Were progress logs developed for the trainee in the learning situation?</td>
</tr>
<tr>
<td>3</td>
<td>Are copies of the course or courses of training available to the trainee which highlight the following:</td>
</tr>
<tr>
<td></td>
<td>(a) A detailed course map?</td>
</tr>
<tr>
<td></td>
<td>(b) Each module specified with its objective and criteria?</td>
</tr>
<tr>
<td></td>
<td>(c) Clear indication of phase tests and the nature of the external evaluation of phase 2 and 4?</td>
</tr>
<tr>
<td>4</td>
<td>Were check lists developed by the trainer for each module in the course or courses of training to be used for internal module testing?</td>
</tr>
<tr>
<td>5</td>
<td>Were the organisation (as the employer), the trainer and the learner made aware of their respective obligations with regards the training to be undertaken?</td>
</tr>
</tbody>
</table>
### CHECKLIST FOR USING THE DESIGN MODEL OF A COMPETENCY BASED MODULAR TRAINING SYSTEM

<table>
<thead>
<tr>
<th>DESIGN MODEL COMPONENT</th>
<th>TRAINING OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITEM</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>1</td>
<td>Were phase 2 and 4 tests correctly developed and usable in the organisation situation in which the training is to take place?</td>
</tr>
<tr>
<td>2</td>
<td>Was a feedback mechanism created in which results of training - be they a module or phase test, are reported to the PNPITB?</td>
</tr>
<tr>
<td>3</td>
<td>Was a feedback link created for the training outcomes to be linked into the original aims and objectives and to the initial situation of the learner?</td>
</tr>
<tr>
<td>4</td>
<td>Were competency standards clearly understood by the employer, trainer and learner?</td>
</tr>
</tbody>
</table>
4.7 SYNTHESIS

The design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries was developed to provide a training system that would produce competent skilled artisans which would provide for the long term growth and survival of the industry. Within the design model, provision has been made for the diverse requirements needed by the Printing, Newspaper and Packaging Industries.

Other than the overall desire for the output of an industry specific training system, the design model provides the following:

* A training system that incorporates Competency Based Modular Training methodology.

* A training system that could accommodate both apprentices and other employees with widely divergent pre-entry educational achievements so as to incorporate training for career progression as an option for all employees in the industry.

* A training system that would produce CBMT programmes for skills development which were didactically sound with due consideration for course content, course structure and objective evaluation.

* A training system that would ensure that the resources for effective training were available particularly with regards the trainer, who as part of the delivery system was suitably trained and competent to give instruction using Competency Based Modular Training methods.

* A training system that through its management sub-system would ensure that the andragogic didactic situation during training is monitored and controlled and that industry training standards were maintained.
A training system that through independent external evaluation would audit the entire training system and ensure that the competence standards set as a criteria for courses of training were adhered to and met.

A training system that could be used by centralised or decentralised delivery bodies within the industry.

The implications of the design model for the Printing, Newspaper and Packaging Industries would to a large measure depend on its use and application. Of paramount importance to the industry, was the need for the training of artisans in a different manner to that of the traditional time-based system (See 1.2.5). The use of C&MT methods of instruction as the preferred delivery mechanism has identified the style and nature of the training system and influenced the actual design model.
The Printing, Newspaper and Packaging Industries recognised the need to have a different training system for the training or artisans other than the traditional time-based system. The National Productivity Institute (NPI, 1989:90-96) summed up the Printing, Newspaper and Packaging Industries sentiment towards the traditional time-based system as ineffective and inappropriate and recommended that a new training system be developed using Competency Based Modular Training methods.

The design model of the Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries is an attempt to conceptualise how to develop a training system for the industry. It is a blue print from which the training system can be developed and because the model is viewed as a training system with inputs, conversions, output and feedback, it is by nature dynamic and able to meet the requirements of the industry which were namely:

* The training system must have flexibility and be pro-active in the arena of technological changes and develop the skills to cope with changes in technology.

* Able to incorporate content and structure to facilitate career progression growth for employees in the industry, including non-formal education.

* Be easily understood by the industry and equally applicable to large companies with sophisticated training structures and small companies with no training structures.

* Be applicable in form and content to a dedicated Printing College of Southern Africa which would institutionalise the training of skills for the Industry.
Have appropriate content to ensure competence occurs on-the-job thus going beyond the well-used paradigm that competence depends solely on skills, knowledge and ability.

Have a delivery mechanism that through appropriate quality control structures and systematic evaluation will ensure the outcomes are appropriate and meet the needs of the learners, industry and attain international recognition.

The design model should also ensure that the CBMT programmes derived from the process of applying the model would be didactically sound with due consideration to content, structure, evaluation systems, trainer training, be learner-led in nature and integrate theory and practice where possible.

To illustrate the application and implications of the design model practical implementation in specific areas such as trade designation, career progression facilitation, the provision for maintaining sound didactic practices in the interactive learner-trainer situation through the design models training management sub-system and the development of course content of a practical nature as well as the curricula and syllabi for technical theoretical modules will be illustrated.

5.1 THE IMPACT OF THE DESIGN MODEL ON TRADE DESIGNATION

Part of the original analysis of the problem facing the Printing, Newspaper and Packaging Industries was that they desired the concept of a progression model from a common base to the skill of a qualified printer. This posed the problem of creating an entire new structure for trade designation so as to create didactically sound training programmes. These programmes would need to incorporate the central theme of basic common modules for the entire spectrum of the industry's core activities and progress to specific sector and discipline specialisation in the form of a trade (See 1.4).
In accordance with the design model and specifically in relation to course structure and design namely the phase schematic in Figure 22 (See 4.5.5.2). The requirements were:

- **Phase 1** - Broad based industry knowledge with module content which would include industry 'generic' skills, basic and core skills and appropriate underpinning knowledge.

- **Phase 2** - Sector specialisation with module content which would include sector skills, some job and task skills, core and basic skills and appropriate underpinning knowledge.

- **Phase 3** - Technical specialisation with module content which would include job and task skills, adaptive skills, core skills and appropriate underpinning knowledge.

- **Phase 4** - Technical specialisation with module content which would include job and task skills, adaptive skills and appropriate underpinning knowledge.

The application of this component of the design model for the re-designation of trades is shown in Figure 31.

The actual structure allows for developing training programmes and is a basis for curriculum development of the technical theoretical non-formal education component which emphasises the underpinning knowledge necessary for the trade in question and the underpinning knowledge for the adaptive, interpersonal, core and basic skills which enable competence on the job.
<table>
<thead>
<tr>
<th>UNDERPINNING KNOWLEDGE OF WORK RELATED THEORY</th>
<th>UNDERPINNING KNOWLEDGE OF SECTOR THEORY</th>
<th>UNDERPINNING KNOWLEDGE OF SPECIALISED DIVISION THEORY</th>
<th>NATURE OF THEORY UNDERPINNING KNOWLEDGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORIGINATION</td>
<td>ELECTRONIC COMPOSITION</td>
<td>ORIGINATION</td>
<td></td>
</tr>
<tr>
<td>Principles and Practices</td>
<td>ELECTRONIC ORIGINATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHOTO-GRAVURE CYLINDER PROCESSING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHOTO-LITHOGRAPH</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROCESS ENGRAVING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACHINE MINDING</td>
<td>CONTINUOUS STATIONERY MACHINE MINDING</td>
<td>MACHINE MINDING</td>
<td></td>
</tr>
<tr>
<td>Principles and Practices</td>
<td>FLEXOGRAPHIC MACHINE MINDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GRAVURE MACHINE MINDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LETTERPRESS MACHINE MINDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LITHOGRAPHY (PAPER SECTION)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LITHOGRAPHY (METAL DECORATING)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROLL LABEL MACHINE MINDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROTARY OFFSET MACHINE MINDING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACHINE MINDING (PACKAGING)</td>
<td>BAG MAKING</td>
<td>MACHINE MINDING (PACKAGING)</td>
<td></td>
</tr>
<tr>
<td>Principles and Practices</td>
<td>CARTON MAKING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CORRUGATED BOARD MANUFACTURING M/M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CORRUGATED BOARD PRINTING AND FINISHING M/M</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROTARY PRINTING AND RE-REELING - FLEXOGRAPHY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROTARY PRINTING AND RE-REELING - GRAVURE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FINISHING</td>
<td>BOOKBINDING CRAFT/CUTTING</td>
<td>FINISHING</td>
<td></td>
</tr>
<tr>
<td>Principles and Practices</td>
<td>BOOKBINDING MECHANISED/CUTTING</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RULING/CUTTING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FITTING</td>
<td>PRINTERS' MECHANIC</td>
<td>MECHANICIAN</td>
<td></td>
</tr>
<tr>
<td>Principles and Practices</td>
<td>STATIONERY AND ENVELOPE MACHINE ADJUSTER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELECTRICAL</td>
<td>PRINTERS' ELECTRICIAN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CLASSIFICATION SYSTEM FOR DESIGNATED TRADES IN THE PRINTING, NEWSPAPER AND PACKAGING INDUSTRIES

FIGURE 31.
It will also be noted that the designated trades in the scheme are origination, machine minding printing, machine minding packaging, finishing, maintenance, electrical and mechanical. This process has reduced the number of trades to five. Within each of the five identified broad trades technical specialisation is possible. The advantages of using the design model are that should for example technology change, the impacts of such technology changes can be accommodated within the existing framework for the designated trades, thus it is both practical and dynamic. It also allows for easier course design where due consideration can be given to a hierarchical build up of course content with increasing difficulty and complexity.

The GRAPHIC ARTS TECHNICAL FOUNDATION (GATF) in their Techno-Economic Forecast No. 26 (GATF, 1985: 2-6) forecasted that the Printing Industry is faced with a rapid change in technology resulting in jobs becoming obsolete and where the new skills required for the new technology will be very different from those currently in use.

The potential for further skills development beyond artisan status is implicit in the classification system for the designated trades and this would facilitate further career progression for employees.

5.2 THE FACILITATION OF CAREER PROGRESSION

The Printing, Newspaper and Packaging Industries expressed the need for a training system using Competency Based Modular Training methods to facilitate career progression in the industry and by inference to incorporate content and structures including non-formal education which is didactically sound (See 1.2.4).

The design model of the Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries is a systems model and as such by a process of examining the requirements of any sub-system within that entire system, that is the input into the sub-system and the outputs from that sub-system, makes it possible to identify the pre-entry requirements into that sub-system.
In the design model the initial situation of the learner is categorised into two target groups, namely the apprentice and the career progression trainee (See Figure 21; 4.5.4).

The apprentice has very specific pre-requisites of a minimum educational requirement, which depending on the trade, is either standard eight or matric. Thus all apprentices are literate and numerate. However the career progression trainee needs no scholastic pre-entry requirements. However, both apprentice and career progression trainee need to meet the minimum criteria for the trainability, physiological and learning styles test.

If the career progression trainee were to enter the phase 1 of a training programme, the analysis of the content of that phase in terms of the content of the modules would indicate the pre-entry requirements. Taking the case of a career progression trainee having no formal schooling and being illiterate and innumerate, literacy and numeracy training of some sort would have to be given.

Using the design model, particularly the schematic in Figure 22 (See 4.5.5.2) phase 1 of a training programme, which is identified at skills level 2, is preceded by skills level 1 which is described as the area in which occupational literacy is the crucial training component and where the module content would consist of basic skills which are namely literacy, numeracy and basic science. On successful completion of the modules the trainee would be able to cope with course content in phases 1 to 4 of a programme.

The debate on what the course content should be and how basic literacy and numeracy should be addressed goes beyond the scope of this study. However, the 'occupational' literacy derived from the use of sub-systems within the Printing, Newspaper and Packaging Industry's design model is described as follows:

* The literacy, numeracy and basic science modules have as their terminal objective that the trainee would become 'trainable' within the Printing, Newspaper and Packaging Industries.
The content and course structure is derived from the entry requirements into phase 1 of a training course for a designated trade as well as the entry basic knowledge required to attempt the first technical theoretical modules.

'Trainable' is used in a specific sense in that the employee as a trainee can progress into the career progression system for a variety of trades.

Using the design model, in particular, the initial situation of the learner. The learner in order to enter the 'occupational' literacy training modules should have:

A mother tongue literacy and numeracy ability set at a minimum of a standard four education level. This implies the ability to read and write and a knowledge of numbers in a mother tongue other than English.

Using the design model, particularly the pre-interactive phase on training course and evaluation design, one of the outcomes would be a course map and module identification as well as objectives and criteria for the occupational literacy modules.

The course map for the 'occupational' literacy training is shown in Figure 32 and is followed by examples of the literacy, numeracy and basic science modules, specifying the modules with its objectives and criteria. These examples illustrate that didactically sound statements of objectives are made as well as providing realistic criteria for the objectives from which the evaluation of training outcomes can be made. Moreover the ordering of learning content is given close attention with a sound hierarchical structure.
# Course Map

<table>
<thead>
<tr>
<th>SKILLS LEVEL</th>
<th>TRAINING PHASE</th>
<th>MODULAR TRAINING PROGRAMME</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>PHASE 1</td>
<td>ID3, ID4, ID5, ID6, ID7, ID8</td>
</tr>
<tr>
<td>1</td>
<td>PRE-PHASE 1</td>
<td>N1, N2, N3, N4, N5, N6, N7, N8, N9, N10, N11, BS1, BS2, BS3, BS4, BS5, BS6, BS7, BS8, BS9, BS10</td>
</tr>
<tr>
<td></td>
<td>ENTRY STAGE</td>
<td>L1, L2, L3, L4, L5, L6, L7, L8, L9, L10</td>
</tr>
</tbody>
</table>

### Figure 52

**OCCUPATIONAL LITERACY**

- **Skills Level 2**: Phase 1
- **Skills Level 1**: Pre-Phase 1 Entry Stage
<table>
<thead>
<tr>
<th>MODULE</th>
<th>CODE</th>
<th>OBJECTIVE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>LITERACY</td>
<td>L1</td>
<td>Be able to read short sentences of up to 7 words and understand the sentences. The words need to have different vowel sounds as well as selected consonant sounds. These words to be used in meaningful sentences and new words to be formed up to a vocabulary of 50 to 60 words with specified vowel and consonant sounds</td>
<td>1. Read the short extracts which contain the vowels a, e, i, o and u and all the consonants except q, x and z and answer the test sheet. Pass mark 80%.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Form 36 new written words consisting of 1 vowel and up to 3 consonants and use these in meaningful sentences.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. Use words of up to 10 letters to form short sentences of up to 7 words, both verbally and written.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4. Demonstrate the correct pronunciation of the:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ad sound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- et sound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- ill sound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- og sound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- un sound</td>
</tr>
<tr>
<td>MODULE</td>
<td>CODE</td>
<td>OBJECTIVE</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| WHOLE NUMBERS | H1   | To help the student gain a clear insight into the basic concept of WHOLE NUMBERS and to be able to use them in a neat, accurate and systematic method of working | 1. Experience the process of counting whole numbers with concrete material e.g. bottle tops, matchsticks or unifix blocks.  
2. Establish the terminology or names given to digits, symbols and words e.g. 7 is a digit or symbol, seven is the word.  
3. Explain place value and notations, making the distinction between HUNDREDS, TENS AND UNITS e.g. 9 tens means 90 and 7 units means 7  
   H T U  
   2 8 4 = 2 hundreds + 8 tens + 4 units  
   = (2 x 100) + (8 x 10) + (4 x 1)  
4. Counting in ascending and descending order in whole numbers from 1 to 100 or units, tens, hundreds and thousands.  
5. Identify the value of the number nought (0; 1; 2; 3; 4; ...) e.g. as a place holder;  
   Th H T U  
   9 0 0 4 means the noughts indicate there are no hundreds and no tens.  
6. Larger numbers such as 1 000 can be represented diagrammatically.  
7. Explain adding and subtracting using a number line from 1 - 10 e.g.  
   ![Number Line](image)  
   1 + 2 = 3  
8. Rearrange the numbers which comprises e.g. 6 thousands + 9 units + 6 tens + 9 hundreds = 6 959 |
<table>
<thead>
<tr>
<th>MODULE</th>
<th>CODE</th>
<th>OBJECTIVE</th>
<th>CRITERIA</th>
</tr>
</thead>
</table>
| WHOLE NUMBERS     | M1   | To help the student gain a clear insight into the basic concept of whole numbers and to be able to use them in a neat, accurate and systematic method of working | 9. Analyse numbers by means of simple extended notation e.g. 648 = 600 + 40 + 8 NOT 6 + 4 + 8  
<pre><code>                  |      | = (6 x 100) + (4 x 10) + (8 x 1)                                        | 10. Looking at patterns and sequences in whole numbers e.g. 1; 6; 2; 6; 3; 6; ...; 6; 5; 6 |
</code></pre>
<p>|                   |      |                                                                          | 11. Explain comparisons of whole numbers e.g. is 97 bigger or smaller than 197? |
|                   |      |                                                                          | 12. Rounding off or estimating whole numbers to the nearest ten and hundred e.g. 57 is closer to 10 means rounded off it is 60 BUT 53 is closer to nought which means it stays 50. |
|                   |      |                                                                          |                                                                          |
|                   |      |                                                                          | A written test with a pass mark of 60% is required to pass the module.    |</p>
<table>
<thead>
<tr>
<th>MODULE</th>
<th>CODE</th>
<th>OBJECTIVE</th>
<th>CRITERIA</th>
</tr>
</thead>
</table>
| MATTER | BS1  | To understand the basic properties of matter | 1. Explain what an atom is.  
2. Explain what a molecule is.  
3. Explain what compounds are.  
4. Explain what a mixture is.  
5. Explain what an ion is.  
6. Explain what the Kinetic Theory of matter is.  
7. Explain what the physical state of matter is. |
|        |      |           | A written test with a pass mark of 60% is required to pass the module. |
| SOLIDS | BS2  | To understand what a solid is and what the properties of solids are | 1. Explain what cohesion and adhesion is.  
2. Explain what a crystal is.  
3. Explain what the molecular forces are in solids.  
4. Explain: Elasticity  
   Tenacity  
   Hardness  
   Ductility  
   Malleability of solids. |
|        |      |           | A written test with a pass mark of 60% is required to pass the module. |
5.3 THE PROVISION FOR MAINTAINING SOUND DIDACTIC PRACTICES IN THE INTERACTIVE LEARNER-TRAINER SITUATION THROUGH THE MECHANISMS OF THE TRAINING SYSTEM

Watson (1990:32) states that managing modular courses makes two important demands on the administrative and consultative systems. These are namely that the systems are capable of coping with the complexities of modular courses and that the accountability for decisions made and the responsibility for carrying them out are clear and unambiguous.

Using the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries, the maintaining of sound practices in the andragogic didactic situation is facilitated by a number of important mechanisms:

The Code of Practice for training defines the accreditation rights of the PNPITB and establishes the principle of the registration of training instructors who meet with prescribed registration criteria. The criteria include the training of the trainer and proof of competence in training via an on-the-job training project as well as being qualified in the area of specialisation in which he/she is to do the training. Moreover, the Code of Practice for training also defines the accreditation criteria for an organisation or institution to deliver training and these are:

* The facilities, such as plant and equipment which are necessary for the practical or theoretical training of both.

* The actual course of training in a competency based modular format.

* A registered trainer.

Finally of cardinal importance the Code of Practice defines how the management of in-service training will be conducted with very specific guidelines. The guidelines for the management of in-service training which is arrived at attempts to maintain sound didactic
practices in the learner-trainer interactive situation and are features of the evaluation system. The important elements in the evaluation system are:

**Module Testing:** Competency Based Modular Training (CBMT) by nature sets clear and unambiguous teaching objectives which in turn form the basis for explicit evaluation and testing. CBMT is also a training system built on the premise that progress is possible only on successful completion of individual modules, therefore, each module needs to be tested against the objectives and concomitant criteria for that module. The individual module testing is done by the trainer, and with immediate feedback to the learner, satisfies the didactic category of motivation since knowledge of progress and success is integral in the process.

**Phase Testing:** As previously discussed a course of training for a skilled worker in the Printing, Newspaper and Packaging Industries is broken up into four phases. Each phase will involve a composite test of those modules within that phase (See 4.5.5.2).

To reiterate the provisions of the phase testing responsibilities these are:

- **Phase 1.** Tested by the accredited organisation and institution where the trainee is based.
- **Phase 2.** Tested by external evaluators, duly trained as such and accredited by the PNPITB.
- **Phase 3.** Tested by the accredited organisation and institute where the trainee is based.
- **Phase 4.** Tested by external evaluators, duly trained as such and accredited by the PNPITB.

The evaluation sub-system facilitates the maintenance of sound andragogic didactic practices by means of the following:

* Individual module test generates data at the point of training and is usable immediately by the trainer to implement remedial action. For the learner, this immediate feedback acts as
motivation and satisfies certain career progress aspects. Success in a module results in the learner being exposed to new material only when mastery in the previous module has been attained and thus the course of training becomes individualised.

* Phase 1 and 3 tests conducted within the accredited organisation or institution satisfies management that the training has taken place, progress is made and acceptable competence levels are demonstrated by the learner.

* Phase 2 and 4 tests conducted by external evaluators satisfies the industry as a whole that an industry-wide standard of training to a predetermined level of competence has taken place and that such training can be certificated by an external awards body such as the PNPITB.

The use of external evaluators, who by the very nature of the tests that they need to conduct and the competence standards that have to be applied, would involve the evaluators having specific pre-entry requirements including being trained how to evaluate and to understand the training management structures of the Competency Based Modular Training System.

A further feature of the design model is the binding nature of training contracts. These training contracts define and set the range and scope of what is to be trained. They also become registered and thus legal and impose the training and learning obligations on the signatories. The training contracts contribute to the maintenance of sound didactic practices in the learner-trainer interactive situation and facilitate the monitoring of progress. Should action be warranted the contracts are valuable and make the initiation of corrective action possible. To illustrate this a contract of training, particularly the leading page of the contract document as illustrated in Figure 33 makes specific reference to the official nature of the document and the tripartite co-operative agreement between the Printing, Newspaper and Packaging Industries Training Board the indentured apprentice and the employer (the training delivery institution) for the effective training of the apprentice.
PREAMBLE TO THIS CONTRACT

The contracting parties acknowledge that their rights and duties are regulated by the terms and conditions as contained in this contract, by the laws of the Republic of South Africa most notably the provisions of the Manpower Training Act, 1981, by the provisions of the Disciplinary Code and Procedure and the Conditions of Apprenticeship of the Printing, Newspaper and Packaging Industries, currently in force or as amended from time to time.

CONTRACT OF APPRENTICESHIP IN TERMS OF THE MANPOWER TRAINING ACT, 1981

This contract of Apprenticeship is specifically for the training in a trade, and is entered into between the following employer and apprentice:

1. This contract is binding on both parties and subject to the Manpower Training Act provisions as applicable for the indenture of apprentices to be trained in the Industry designated trades.

2. This contract is binding only until the apprentice has successfully completed the prescribed training and institutional education and achieved artisan competence via a trade test. Thereafter, both the employer and apprentice are free from any further binding contractual employment agreement unless a new employment contract is negotiated.

3. This contract of apprenticeship is an official document under the custody of the Printing, Newspaper and Packaging Industries Training Board (PNPTB) and binds the employer, indentured apprentice and the PNPTB in a tripartite co-operative agreement for the effective training of the apprentice.

DETAILS OF EMPLOYER

NAME OF EMPLOYER: ...........................................................

ADDRESS: ...........................................................................

DETAILS OF APPRENTICE

FULL NAME OF APPRENTICE: ..............................................

ADDRESS: ...........................................................................

NAME AND ADDRESS OF GUARDIAN (if applicable): ...............

................................................................................................

TRAINING CONTRACT

FIGURE 33.
In a similar manner, contracts of training for career progression trainees is of similar nature but does not include items such as the disciplinary code and procedures for apprentices nor the actual conditions of apprenticeship. This is understandable since the career progression trainee by inference would not necessarily have the minimum educational requirements or be a minor and thus qualify for an apprentice contract.

Through the mechanism of the training management sub-system of the design model the maintenance of sound didactic practices in the learner-trainer interactive situation are maintained and controlled by the PNPITB via progress records of each and every apprentice training contract. These are up-dated, audited, validated and kept by the PNPITB.

5.4 PRACTICAL EXAMPLE OF THE COURSE CONTENT OF A DESIGNATED TRADE

This example only serves to illustrate aspects of the design model, but training in all other trades is structured in a similar manner.

Through application of the design model of a Competency Based Modular Training System, a CBMT programme for the designated trade machine minding in the specialised division of lithography (paper) was arrived at.

The course map in Figure 34 (overleaf) identifies the four phases of the training course, the specific skills levels and identifies the modules by module code in each level. It is important to note how the modules are built into a matrix of modules and in an appropriate hierarchical structure. This facilitates for sound planning of training events identifying the clear sequence in which instruction should take place. The course map also clearly indicates when evaluation takes place particularly the external evaluation controlled by the PNPITB at Phases 2 and 4.
DESIGNATED TRADE: MACHINE MINDING

SPECIALISED DIVISION: LITHOGRAPHY - PAPER SECTION

<table>
<thead>
<tr>
<th>SKILLS LEVEL</th>
<th>TRAINING PHASE</th>
<th>EVALUATION EVALUERING</th>
<th>MODULAR TRAINING PROGRAMME</th>
<th>ON-THE-JOB TRAINING MODULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>OPLEIDINGSPHASE</td>
<td>PNPITB CONTROLLED PRACTICAL TRADE TEST</td>
<td>TRAINING MODULES</td>
<td>IN-TAAK OPLEIDINGSMODULES</td>
</tr>
<tr>
<td>5</td>
<td>PHASE 4</td>
<td>ODNVN-BEHEERDE PRAKTIASE AMBAGTOETS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PHASE 3</td>
<td>COMPANY TEST (PROGRESS)</td>
<td>MAATSKAPPYOETS (VORDERING)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PHASE 2</td>
<td>PNPITB CONTROLLED PHASE TEST</td>
<td>ODNVN-BEHEERDE FASETOETS</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PHASE 1</td>
<td>COMPANY TEST (PROGRESS)</td>
<td>MAATSKAPPYOETS (VORDERING)</td>
<td></td>
</tr>
</tbody>
</table>

COURSE MAP FOR MACHINE MINDING

FIGURE 34.
From the course map in Figure 34 the objectives and criteria for modules ID4, P1, IK1 and RP3 from phase 1, 2, 3 and 4 respectively, are given below and clearly illustrates how statements of objectives and concomitant criteria are catered for as well as indicating the increased difficulty and complexity of each module in relation to the skills level it falls into:

<table>
<thead>
<tr>
<th>MODULE</th>
<th>CODE</th>
<th>OBJECTIVES</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools and Materials</td>
<td>ID4</td>
<td>Familiarisation of tools and materials used in the Machine Minding trade</td>
<td>Complete a questionnaire on the identification and uses of tools and materials applicable to the apprentices' trade area i.e.: A. NT cutters B. Tape dispenser C. T bars D. Allen keys E. Feeler gauges F. Micrometers G. Film strips H. Spanners I. Desitometers A pass mark of 100% must be attained.</td>
</tr>
<tr>
<td>Lithographic Platemaking/</td>
<td>P1</td>
<td>Identify various types of plates</td>
<td>From given plates used by the company, e.g. A. Negative working plate B. Positive working plate C. Bi-metal plate Complete a multiple choice questionnaire that covers the uses and functions of the</td>
</tr>
<tr>
<td>MODULE</td>
<td>CODE</td>
<td>OBJECTIVES</td>
<td>CRITERIA</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>------------</td>
<td>----------</td>
</tr>
</tbody>
</table>
| The Inking System | IK1  | Mix and match colour ink to a given swatch | different plates i.e.:  
A. Negative working: General jobbing, newspaper, etc.  
B. Positive working: Multi colour, magazine and general high quality work  
C. Bi-metal: Used mainly in tin printing and packaging work  
A pass mark of 80% must be attained. |
| Running the press | RP3  | Print a multiple colour job | From given instructions on a work ticket, print a multiple colour job to the following specifications:  
A. 100% registration of colour to register marks and illustrations  
B. The ink coverage of each colour which forms part of the full colour set must be in accordance with the |
<table>
<thead>
<tr>
<th>MODULE</th>
<th>CODE</th>
<th>OBJECTIVES</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>ink density specifications used in the company</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C. Ensure that the printed product matches that of the original pass sheet/progressives/colour proof throughout the entire production run</td>
</tr>
</tbody>
</table>

### 5.5 PRACTICAL EXAMPLE OF CURRICULA AND SYLLABI OF TECHNICAL THEORETICAL MODULES

From the course map for the designated trade of machine minding specialised division of lithography (paper) in Figure 34 (See 5.4) it will be noted that stand alone technical theoretical modules, Coded TT1, TT2 and TT3 are provided for in phases 2, 3 and 4 of the course map.

The technical theoretical modules are arrived at by using the design model and specifically the course design and evaluation component shown in Figure 24 (See 4.5.5.3) as well as the phase structure schematic in Figure 22 (See 4.5.5.2).

The categorisation of skills required for job competence were basic, core, job, task, interpersonal and adaptive skills. These skills are supported by underpinning knowledge. The technical theoretical modules positioned within the course map as supportive of the practical modules of training contain the underpinning knowledge appropriate to the particular stage of training.

The curriculum for the TT1 module as an example highlights how the underpinning knowledge is accommodated in the training system.
5.5.1 MODULE DESIGNATION: TT1

The TT1 module covers the theoretical training for the following four print related designated trades of the Printing, Newspaper and Packaging Industries namely, origination, machine minding (paper), machine minding (packaging) and finishing.

5.5.2 CURRICULUM FOR TT1

A. Originsation

Business Studies
Printers' Computer Applications I
Origination Theory I

B. Machine Minding

Business Studies
Printing Material Technology I
Machine Minding I

C. Machine Minding (Packaging)

Business Studies
Printing Material Technology I
Packaging Theory I

D. Finishing

Business Studies
Printing Material Technology
Bindery and Cutting Theory I

It will be noted that the subject of Business Studies is compulsory to all the trades. The underpinning knowledge in the Business Studies is related to adaptive and core skills and is designed to
enable the learner to understand the work environment in which the learner operates. The area of application, objectives and syllabus for Business Studies are as follows:

A: Area of Application

Business Studies is part of the Technical Theoretical course. As such Business Studies forms part of TTI for:

* Origination and all the specialised divisions.
* Machine Minding and all the specialised divisions.
* Machine Minding (Packaging) and all the specialised divisions.
* Finishing and all the specialised divisions.

B: Objectives for the Course of Business Studies

On the completion of this course the student should be able to:

1. Describe the origins, development and structures of the Printing, Newspaper and Packaging Industries in the RSA.

2. Describe in brief how a company operated from a commercial perspective.

3. Identify and list the product produced in the Printing, Newspaper and Packaging Industries in the RSA.

4. Identify and state the career paths in the Printing, Newspaper and Packaging Industries.

5. Describe in general the mechanisms and functions operational in Industrial Relations in the RSA.
6. Describe the legislation and practices applying to the sale of products, the copying of printed matter and legislation relating to employment.

C: Syllabus

1. Describe the origins, development and structure of the Printing, Newspaper and Packaging Industries in the RSA:

1.1 Outline the growth of the industry and the developments of processes and products.

1.2 Outline the structure of the Industry in terms of multi-national, national, public and private companies large, medium and small firms.

1.3 Outline the importance of the Industry in terms of the economy of the RSA.

1.4 State the main sectors of the industry: origination, printing and publishing, packaging, finishing and maintenance.

1.5 State the source of materials and substrates.

1.6 State the geographical concentrations of the Industry in the RSA.

1.7 Briefly outline the latest advances in technology in the Industry.

2. Describe in brief how a company operates from a commercial perspective:

2.1 Outline how a company can satisfy human needs.

2.2 Describe the essential components necessary to start a business.
2.3 Outline the costs involved in running a business:

* fixed costs (overheads),
* variable costs,
* overheads.

2.4 Explain the need for budgetary control and the use of break-even charts:

* annual budgets - operational budgets,
* break-even charts.

3. Identify and list the products produced in the Printing, Newspaper and Packaging Industries in the RSA:

* Newspapers,
* Magazines,
* Commercial Printing,
* Metal Decorating,
* Packaging.

4. Identify and state the career paths in the Printing, Newspaper and Packaging Industries:

* Skills levels in the Industry (Technical),
* Career progress paths in the Industry (Technical),
* Career progress paths in the Industry (Non-Technical).
5. Describe in general the mechanisms and functions operational in industrial relations in the RSA:

* The Labour Relations Act,

* Apprentice discipline procedures in the Printing, Newspaper and Packaging Industries,

* Typical disciplinary and grievance procedures operational in the Printing, Newspaper and Packaging Industries.

6. Describe the legislation and practices applying to the sale of products, the copying of printed matter and legislation relating to employment:

* Sales contracts and related matters in general,

* Copyright, law and practice as applied to the Industry,

* Basic Conditions of Employment Act, Unemployment Insurance Act and practices as applied to the Industry.

It will be noted that didactically sound objectives are made for the Business Studies.

The implementation of the design model in practice is aimed at providing the Printing, Newspaper and Packaging Industries with a training system that incorporates Competency Based Modular Training methodology and results in a training output of competent artisans.

The need for competence implies that the training programs must be didactically sound, contain content which is well ordered and relevant as well as having an effective and efficient evaluation sub-system. This requires a systematic development process which is provided for by the design model.
The actual interactive training phase in which the andragogic didactic situation occurs is so structured via the mechanisms of the design model to ensure that sound andragogic didactic practices take place.

The design model when implemented provides for the important didactic principles of motivation, individualisation, perception, active participation, sound training/teaching practices, good control of the learning situation and a basis for sound planning.

Notwithstanding all the above, the design model is only the tool with which the actual training system is created and the end product when in use offers the only tangible evidence of the value of the design model.
CHAPTER 6 : RECOMMENDATIONS AND CONCLUSIONS

The development of the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries was a practical necessity to arrive at a new training system for the Industry and it is well to review the factors that motivated this study as well as summarising the findings and drawing some conclusions.

6.1 REVIEW OF THE FACTORS MOTIVATING THE STUDY

The Printing, Newspaper and Packaging Industries had over a number of years highlighted deficiencies in the training of skilled manpower using the time-based training system.

The time-based system paid scant attention to the anagogic didactic requirements that were operational in the instruction-learning situation and were provider-led in nature.

In the time-based training system course content was expressed merely as a schedule of what the apprentices as trainees were to be exposed to. No thought went into the design of course content and standard didactic practices were not considered.

The time-based training system separated practical training and theoretical education creating an education-training dichotomy where the curriculum for the education component and the educational arrangements satisfied the needs of the educational institutions but were of little relevance to the practical training taking place or to the apprentice as learner.

Sound evaluation practices were not evident in the time-based training system. There were no clear objectives set for training programs from which to derive effective evaluation criteria. Evaluation in the form of a final trade test were incidental rather than crucial for an apprentice attaining artisan status. Effluxion
of time was often sufficient to enable an apprentice to attain artisan status and thus no measure of competence occurred.

The trade tests themselves in the time-based training system tested very limited aspects of the trade in question. The tests were so standardised that a short intensive pre-test training session was sufficient for a prospective candidate to pass the test.

The time-based training system ignored the important training role the artisan as journeyman played in the practical training. No training of the journeyman as a trainer took place. The journeyman as a trainer of apprentices was however also under no illusion that the first priority at all times was production resulting in the apprentice gaining experience by a process of sitting-by-Nellie without any form of structured instruction. Notwithstanding the above even if the journeyman as trainer were inclined to give instruction, the schedules of training were so generalised and unstructured that they offered no real guidelines or assistance to him to carry out such instruction.

The time-based training system had a very rudimentary control system consisting of log books which only recorded what the apprentice had been exposed to and did not include any form of assessment, or, indicate the actual progress being made in terms of the trainee's competence.

It was recognised that a new flexible and adaptable training system was needed. This training system would have to cater for the needs of the employee in the industry to progress within careers as well as have a delivery system using skilled qualified trainers in centralised and decentralised training organisations and institutions.

The method of instruction to be used in the training system had to be competency based and modular, have appropriate structures and proper quality assurance mechanisms which would ensure the delivery of the proper training outputs in terms of the industries interpretation of what competence is. Industry accepted standards of training required
that the training system would need well structured, relevant and didactically sound training programmes as well as ensuring sound didactic practices while training takes place.

The vision of the industry in terms of its broad interpretation of what job competence was implied that there was a need to identify in a systematic manner what skills were crucial and how those skills should be imparted to the trainee. The broad definition and understanding of competence went beyond the paradigm that all a competent worker needed were job skills, knowledge and ability. Other skills such as adaptive, core, interpersonal and basic skills needed to be identified and training programs developed which would include them together with the job and task skills for a specific trade.

The training output requirements desired from the new training system by the Industry was competent artisans. The industry standards demanded that accepted didactic principles were operating in the training system. Moreover during the interactive andragogic didactic situation when the trainer and trainee interact and where instruction and learning take place, required careful attention and needed procedures and structures which would encourage and control the situation adequately.

Empirical research revealed that no training system existed which could accommodate all the requirements of the Printing, Newspaper and Packaging Industries. Thus the aim of this study was to develop a design model of a Competency Based Modular Training System that could be used for creating the desired new training system that the Printing, Newspaper and Packaging Industries desired. Being a model the intention was that it should conceptualise the various components of the design model and relate how they interacted as sub-systems as well as offer a systematic procedure for developing a specific sub-system of the training system or the entire training system.

The design model would also need to define a systematic approach to developing CBMT training courses which would contain content that was
relevant to the industry and would be learner-led in nature catering for the career progression requirements of the trainee as well as individualising the program of training.

6.2 SUMMARY OF FINDINGS

Stemming out of the problem facing the Printing, Newspaper and Packaging Industries in terms of the training of its skilled worker cadre and all the diverse factors that motivated this study, the industry first and foremost required a new training system.

In developing the design model from which a new training system could be created, the systems process was to be an integral feature of what was to be created and the mechanisms operating in open systems would be operational namely inputs, conversions and outputs.

The feature of an open system tended to be the only option in that the impact of technology and other external environment factors called for a training system which could react dynamically to the ever changing needs.

The diverse needs of the Printing, Newspaper and Packaging Industries in terms of its requirements which the envisaged training system would have to meet called for a more holistic approach in developing the design model. The design model had to cater for some important features, these features themselves led to specific consequences such as:

* With the need to facilitate the career progress aspects of the employees in the industry it necessitated the incorporation of non-formal education and had to at the same time resolve the education-training dichotomy that existed. The target population for training was also broadened to accommodate the career progression aspects and consequently a more realistic broad based pre-training evaluation of the trainee was needed in the form of trainability, physiological and learning style
tests. The facilitation of the career progression aspects also called for a new approach in structuring training courses and had to incorporate basic skills training such as occupational literacy from which a trainee could progress into the training content of a specific designated trade.

* The industry recognised and indicated that the only training methods to be used within its training system would be competency based and modular in form. The consequence of this need was that CBVT when used demands a systematic analytical approach in developing course content as well as prescribing a proper evaluation system. Compounding the complexity of the parameters to be taken into consideration in developing the design model was that the instruction and learning occurred in the andragogic mode and the requirements for creating a sound andragogic didactic situation were paramount. The inclusion of a pre-entry evaluation of resources including the trainer requirements were thus necessary as well as the formalisation of training contracts and to ensure sufficient structures checks and balance were in place to control, encourage and manage the andragogic didactic situation.

* The Printing, Newspaper and Packaging Industries also desired competent artisans as a training output from the training system. The way the industry perceived competence resulted in the need to look at the skills required to meet the broad definition of competence. Consequently the pre-interactive phase of the design model had to accommodate this broad definition of competence and by so doing moved away from concentrating solely on job and task skills. This enabled training programmes to contain content which not only satisfied the industry need of a broad base of common modules across the entire industry incorporating practical and theoretical modules with underpinning knowledge but allowed for a rationalisation of the number of trades within the industry.
The need to have didactically sound training programmes had the consequence of the design model having to take cognisance of learning theory and pay heed to sound didactic principles.

Because the training system had to be usable in both centralised and decentralised organisations the quality of the training had to be at an industry accepted standard. The design model had to have those mechanisms in place which would ensure the maintaining of minimum training standards. Consequently the training evaluation sub-system had to be comprehensive and include the training of the external evaluators as well as define unambiguously the quality assurance role of the Printing, Newspaper and Packaging Industries Training Board and the responsibility and duties of all the players in the training milieu of the industry. Notwithstanding the seemingly complex design model, the resultant training system that the Printing, Newspaper and Packaging Industries desired had to be user friendly and cater for the short and long term skills needs of the industry.

The implementation of the design model, as with the development of the model has been incremental. On the positive side the implementation of the design model has resulted in the Printing, Newspaper and Packaging Industries having a training system that is working and is proving flexible and dynamic enough to accommodate the diverse changing needs of the industry. It is proving to be practical and manageable. The important principles of andragogy and the use of sound didactic principles incorporated in the design model has resulted in a training system capable of producing the desired training output of competent artisans.

The delivery system, incorporating Competency Based Modular Training methods coupled to the strict accreditation criteria for training as well as those mechanisms at play whilst training takes place have practically demonstrated that sound didactical practices are possible and this has eliminated many of the deficiencies exhibited by the time-based system of training previously used by the industry.
Continuous evaluation of trainee progress is proving to be invaluable in that immediate remedial action now takes place. Unsuitable trainees are identified early with the resultant cost saving on training being made. Substandard training practices are being eliminated and the binding nature of the training contracts is proving to be a valuable aid in ensuring that training obligations are being met.

The promotion of sound andragogic didactic practices is being enhanced particularly through the training evaluation sub-system. The inclusion of external evaluation at phase 2 and 4 of a course of training has also enabled the PNPITB to exercise a quality audit of the training taking place and thus ensuring industry standards are being met.

The design model or components of the model, even though created especially for the Printing, Newspaper and Packaging Industries may well have applications in other industries. The design model is a point of departure from which a training system can be developed. The content of the components of the design model could be modified and tailor made for a specific need and still operate as a system incorporating a particular training method.

6.3 CONCLUSIONS

A design model is what the name implies. It is only a blue print for designing something. Inherent in any blue print is that it conceptualises and produces a plan. It may even specify certain parameters and even procedures but it does not give the visual, textural and physical appearance of the end product. This has been evident with the design model of a Competency Based Modular Training System for the Printing, Newspaper and Packaging Industries.

Notwithstanding the need of the design model to create a training system that meets the Printing, Newspaper and Packaging Industries diverse needs, the practical implementation of the design model has revealed several problem areas which are:
The mechanisms inherent in the training system which arose out of using the design model are in certain instances not sufficient to ensure sound andragogic didactic practices in the trainer-learner interactive phase. Further evaluation instruments, particularly for trainer selection, are needed as well as more extensive training of the trainer. There also exists a need to educate the industry to accept that the trainer in the industry has training responsibilities as well as any production responsibilities.

Course design and content, particularly with regards relevance in regard to technology changes in certain sectors of the Industry, has proven problematic and difficult to accommodate. A course of training for a designated trade can be completed in an optimum time of thirty months. Rapid technology changes have within eighteen months illustrated that even whilst training is in process, the trade in which training is taking place has become obsolete.

The clear identification of what core, interpersonal and adaptive skills are necessary for overall job competence is a very difficult task particularly with regards the impact of the rapid political and socio-economic changes taking place in South African society and the world as a whole. Compounding this problem is that very often core, interpersonal and adaptive skills are difficult to evaluate since any form of test for this category of skills can only be validated by observing performance over a lengthy period of time and in special situations that may occur infrequently. Moreover some core skills are by nature not competencies but merely enhance competence and are almost impossible to test.

The integration of theory and practice is proving difficult in determining the relevance and crucial timing of when theoretical instruction should take place.
Debate still exists as to what content should be contained in the Technical Theoretical modules which incorporate underpinning knowledge. Part of the underpinning knowledge relates to adaptive, core, interpersonal and basic skills and the relevance of some of the content is questioned. The non-formal education aspects are understood but the training-education dichotomy has not been fully resolved.

The individualisation of the training programs and the learner-led philosophy are not fully understood by the Printing, Newspaper and Packaging Industries. The career progression aspects require an open system with access by all employees and progress at the individual employees own pace. This is not fully understood and a provider-led attitude still exists in certain areas where emphasis is placed too much on the needs of the provider of the training.

The articulation of practical course and module objectives is proving difficult in certain instances. The vast range and make of equipment and the scope of production in terms of the simplicity or complexity of the products being made has resulted in module objectives and criteria being too generic in nature.

The application of the training system in a centralised training institution such as the South African Printing College has revealed that criteria for individual practical modules would need to specify more clearly the quantitative aspects in terms of qualified worker standard. The sequencing of modules in certain instances are not practical when used in the Printing College situation. This is because the Printing College does not operate as a production unit and the opportunity for regular practice as would occur in a production situation do not exist. The simulation of production situations has its limitations and a different training strategy is needed which could impact on course content and the evaluation sub-system of the training system and the delivery method.
The longer the training system is in operation further problems will be revealed which may well necessitate the review of certain aspects of the design model. The need for South African industries to approach training in a more pro-active manner is very evident and it is the writer's opinion that in the short to medium term much more focus will be placed on training particularly in the area of skills development at the artisan level.

6.4 RECOMMENDATIONS

With the deficiencies revealed by the implementation of the design model it is recommended that further studies be undertaken in the following:

* An investigation aimed at identifying the profile of an ideal trainer for the Printing, Newspaper and Packaging Industries. Once the ideal attributes are identified suitable training courses can be developed to enhance the skills of the existing trainer cadre as well as developing suitable pre-entry measurement instruments for prospective trainers for the industry.

* Regular technology scans need to become an integral part of the training system particularly in those sectors of the Printing, Newspaper and Packaging Industries where rapid technology changes are known to exist. The use of industry technical liaison committee structures meeting on a regular basis could be the ideal mechanism for doing regular technology scans. These technical liaison committees could in the light of their knowledge of technology changes review on a regular basis the courses of training including both practical and technical theoretical components and make the necessary alterations so that courses of training remain relevant and up to date.

* An investigation into the identification and categorisation of the ideal core, interpersonal and adaptive skills that are
necessary for job competence to occur on the job. This investigation would also need to identify and develop as many instruments as possible to measure the identified skills as well as determine what content would be necessary in the appropriate course of training.

* Devise a programme which will educate the industry to understand what learner-led training is, highlighted the importance of lifelong learning in terms of career progression training and emphasise the crucial role the trainer plays in the training environment.

* An investigation into identifying and cataloguing the range of equipment in the industry into specific categories, as well as developing more realistic practical modules of training for the categorised equipment in the industry.

* An investigation into the application of CBMT courses of training in the centralised training institution environment. Special emphasis is needed to identify the frequency with which practical modules need to be repeated so as to develop stamina in the trainee. Furthermore the investigation should also define in greater detail the quantitative requirements in terms of competence for the practical modules as well as examine the sequence of training. Note should also be taken of the number of trainees, the limitations of available equipment and the optimum trainer-trainee ratio in the centralised training institution.

6.5 FINAL OVERVIEW

This study was prompted by the Printing, Newspaper and Packaging Industries who because they had collectively rejected the time-based system of training for developing the skilled worker in the industry wanted a new training system.
The Printing, Newspaper and Packaging Industries wanted a training system which behaved as an open system and operated as a system with inputs, conversions and outputs. The training system would have interdependent sub-systems operating dynamically.

The desired training system also needed to accommodate further important features such as:

* The incorporation of Competency Based Modular Training methods as the exclusive delivery mechanism for training.

* The accommodation of lifelong vocational education and training articulated by the industry as career progression training.

* Training outcomes to industry accepted standards of competence where competence on the job was viewed and defined in a broad sense.

* Training courses that were didactically sound, integrating theory and practice and structured in such a manner that a broader base of industry generic skills were developed initially before specialisation took place.

* Training of the trainer would be an integral part of the training system.

* Flexibility and being pro-active in the arena of technological changes and develop appropriate skills to cope with technology change.

* Have appropriate quality control structures so as to ensure training and training outcomes were appropriate and at industry accepted standards.

* Be usable and easily understood in decentralised large and small companies and in a centralised training institution such as the Southern African Printing College.
Literature surveys, personal interviews and discussions revealed that no model of a training system existed which was appropriate to the unique needs of the Printing, Newspaper and Packaging Industries. The objective of the study was to research and develop a design model from which a training system could be derived. The design model development was approached in a holistic manner and incorporated those characteristics found in an open system. Components of the design model were so constructed as to meet the diverse requirements the Printing, Newspaper and Packaging Industries needed for their desired new training system. Particular attention was placed on structuring components of the design model in such a manner that they enhanced sound didactic principles, facilitated for good andragogic didactic practices and ensured that training outcomes were to the industry accepted standards of competence. Extensive literature surveys were used as well as the practical experience gained in training within the Printing, Newspaper and Packaging Industries.

The design model has the following components:

* Training needs analysis which articulates the training needs from four different sources and evaluates the needs.

* Aims and objectives of training.

* The learner from the point of view of the initial situation before training takes place.

* A code of practice for training within the industry which establishes a training and learning ethic in the industry.

* A pre-interactive phase component which details how training courses and evaluation of such courses is designed as well as the actual training evaluation sub-system and the training management sub-system.
Within the pre-interactive phase of the design model training resource evaluation is an integral part of this component and details the pre-entry requirements of the trainer and the external evaluator of training as well as the physical resources needed to do training.

An interactive phase component in which the andragogic didactic situation occurs and highlights what mechanisms are in place which facilitate for the maintenance of sound andragogic didactic practices in the training situation.

The training outcome component which examines the output of the training system in terms of job competence and provides for feedback loops to the original aims and objectives of training to evaluate if they have been met and to the initial situation of the learner to examine and evaluate what changes have occurred in the learner.

The development and implementation of the design model was a practical necessity for creating a new training system for the Printing, Newspaper and Packaging Industries.

This implementation has shown that the new training system is workable yet reveals certain problem areas which will require further study.
BIBLIOGRAPHY


38. NIC, 1920. Minutes of the meeting of the National Industrial Council of the Printing and Newspaper Industry of South Africa. Johannesburg. 1 April 1920.


41. NMTC, 1983. Minutes of the meeting of the technical education sub-committee of the National Manpower Training Committee of the Printing and Newspaper Industry of South Africa. Cape Town. 26 July 1983.

42. NMTC, 1984. Minutes of the meeting of the National Manpower Training Committee of the Printing and Newspaper Industry of South Africa. Cape Town. 23 March 1984.
43. NMTC, 1986a. Minutes of the meeting of the technical education sub-committee of the National Manpower Training Committee of the Printing and Newspaper Industry of South Africa. Cape Town. 6 February 1986.

44. NMTC, 1986b. Minutes of the meeting of the National Manpower Training Committee of the Printing and Newspaper Industry of South Africa. Cape Town. 21 March 1986.


47. NPAC, 1923. Minutes of the meeting of the National Printing Apprenticeship Committee. Cape Town. 29-30 July 1923.

48. NPAC, 1926. Minutes of the meeting of the National Printing Apprenticeship Committee. Durban. 28 September 1926.


64. PNPITB, 1990a. The investigation into the selection requirements for Photo-Lithography apprentices. Cape Town: Printing, Newspaper and Packaging Industries Training Board.


PHASE TWO
COMPETENCE TEST
(PRACTICAL)

For the Designated Trade:
Origination

Specialised Division:
Photo-Lithography
GUIDELINES FOR THE TESTER

The Tester must ensure that the apprentice to be tested does not consult text books or notes or receive assistance from anyone during the course of the test. While, the apprentice should not be left alone during the test, the supervision must be such that it does not result in the apprentice becoming unduly nervous.

The examination papers and the results of tests must be treated as being strictly confidential. Testers must ensure that the examination papers are not copied.

UNDER NO CIRCUMSTANCES WHATSOEVER SHOULD THE TESTER INDICATE TO AN APPRENTICE, HIS EMPLOYER OR ANY UNAUTHORISED PERSON OF THE POSSIBLE RESULT OF THE TEST.

Where a question calls for the setting or adjustment of a machine, the Tester must ensure that all settings or adjustments are thrown out before the test commences.

1 percentage mark for each minute exceeding the specified time must be deducted from the marks allocated to a question where it is quite clear that the excessive time spent is due to mistakes or incorrect procedures used or followed by the apprentice. No time penalties must be imposed for tea or lunch breaks.

Any time required by the Tester to arrange the facilities for any part of the trade test should not be included in the actual time spent by the apprentice undergoing the test.

Specimens or proofs of all work done by the apprentice during the course of the test must be signed and dated by the apprentice and Tester concerned and submitted to the office of the PNPITB.

Testers are to ensure that all copies of the trade test papers handed out to apprentices are recovered and returned with their reports.

The Tester must ensure that, where applicable, all data that is entered into a system relating to the trade test must be removed from the system after the test has been completed.

The home address of the apprentice must be inserted in the space provided on the report form.

Where necessary quality checks may be completed after the completion of the trade test.
PHASE TWO COMPETENCE TEST

IGNATED TRADE: Origination

IALISED DIVISION: Photo-Lithography

You will be penalised for excessive time taken in respect of EACH OPERATION. 1 percentage mark for each minute exceeding the specified time will be deducted.

TION 1: PAPER PAGE MAKE-UP

Minutes

From a given layout and bromide material, prepare camera ready artwork and produce a line negative of the artwork on the camera.

TION 2: HALFTONE MAKING

Minutes

Produce a halftone negative from the continuous tone original supplied to fit the space provided on the layout. The screen range of the negative must be 5% – 95%.

TION 3: BLACK AND WHITE STRIPPING

Minutes

Produce a combination line and halftone positive for a positive working lithographic plate from the negatives produced in questions 1 and 2.

TION 4: PLATEMAKING

Minutes

Position the positive produced in question 3 onto a lithographic plate. The grip required is 65mm. Expose and process the plate. A step wedge must be used for exposure control.
PHASE TWO COMPETENCE TEST - TRADE TESTERS' MARK SHEET

DESIGNATED TRADE: Origination
SPECIALISED DIVISION: Photo-Lithography

NAME OF APPRENTICE: .................................................. I.D. NO: ..................................................
HOME ADDRESS OF APPRENTICE: ..........................................
NAME AND ADDRESS OF EMPLOYER: ......................................
DATE: .............................................................................

QUESTION 1A: PAPER PAGE MAKE-UP

### SPECIFIED TIME

<table>
<thead>
<tr>
<th>EXCEL</th>
<th>GOOD</th>
<th>ACCEPT</th>
<th>NOT ACCEPT</th>
<th>MARKS OBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL: 40

Did the apprentice:
1) Clean his light table thoroughly
2) Use materials correctly (minimal wastage)
3) Work systematically
4) Use good housekeeping procedures

### QUALITY CHECK

<table>
<thead>
<tr>
<th>EXCEL</th>
<th>GOOD</th>
<th>ACCEPT</th>
<th>NOT ACCEPT</th>
<th>MARKS OBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL: 90

REMARDS: ..........................................................................

...
QUESTION 1B: LINE NEGATIVE MAKING

Did the apprentice:

1) Clean the copy board glass
2) Check that the lens was 100% clean
3) Mount the copy correctly
4) Set the percentage at 100%
5) Set the focus
6) Set the aperture and exposure time
7) Set the vacuum correctly
8) Load the film correctly
9) Process the film
10) Evaluate the developed line negative

POSSIBLE TOTAL 100

<table>
<thead>
<tr>
<th>EXCEL</th>
<th>GOOD</th>
<th>ACCEPT</th>
<th>NOT ACCEPT</th>
<th>MARKS OBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS: .................................................................................................................................

QUALITY CHECK

1) Size 100%
2) Focus
3) Quality of type on negative
4) Density of film

POSSIBLE TOTAL 80

<table>
<thead>
<tr>
<th>EXCEL</th>
<th>GOOD</th>
<th>ACCEPT</th>
<th>NOT ACCEPT</th>
<th>MARKS OBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>13</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>13</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>13</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

REMARKS: .................................................................................................................................
QUESTION 2A:  

HALFTONE MAKING (CAMERA)

<table>
<thead>
<tr>
<th>Did the apprentice:</th>
<th>SPECIFIED TIME</th>
<th>30 MINS</th>
<th>ACTUAL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Use a densitometer to take the end readings</td>
<td>EXCEL</td>
<td>GOOD</td>
<td>ACCEPT</td>
</tr>
<tr>
<td>2) Calculate the percentage enlargement/reduction required</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>3) Clean the reflection copy</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>4) Clean the copyboard glass</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>5) Check that the lens is 100% clean</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>6) Mount the copy correctly</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>7) Calculate/set the size</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>8) Set the exposure time and aperture</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>9) Set the focus</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>10) Set the vacuum</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>11) Load the film correctly</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>12) Handle the contact screen correctly</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>13) Process the film</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>14) Use film economically</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>15) Evaluate the developed results</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL 150

REMARKS:

QUALITY CHECK

<table>
<thead>
<tr>
<th>1) Size to layout (including trim)</th>
<th>EXCEL</th>
<th>GOOD</th>
<th>ACCEPT</th>
<th>NOT ACCEPT</th>
<th>MARKS OBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) Focus</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3) Screen range (5% - 95%)</td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4) Density of film</td>
<td>20</td>
<td>18</td>
<td>16</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>9</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL 60

REMARKS:
QUESTION 2B: PHOTO-LITHOGRAPHY - PHASE TWO

Did the apprentice:

1) Calculate the percentage enlargement/reduction required
2) Clean the scanning drum and lens
3) Clean the reflection copy
4) Mount the reflection copy
5) Check for newton rings
6) Load the film correctly
7) Set the percentage enlargement/reduction required
8) Set the screen angle (15°) and screen ruling
9) Set the unsharp masking aperture
10) Set the focus
11) Set the white align/autobalance
12) Set the highlight and shadow
13) Set the gradation (standard setting)
14) Set the co-ordinates
15) Check that the original is free from dust
16) Expose the original
17) Process the film
18) Use film economically
19) Evaluate the developed result

POSSIBLE TOTAL 190

REMARKS: ..........................................................

QUALITY CHECK

1) Size to layout (including trim)
2) Focus
3) Screen range (5% - 95%)
4) Density of film

POSSIBLE TOTAL 60
QUESTION 3:  BLACK AND WHITE STRIPPING

Did the apprentice:

1) Clean his light table thoroughly
2) Use a suitable masking method
3) Spot his negatives properly
4) Clean the contact frame thoroughly
5) Select the correct line and halftone exposures
6) Use materials correctly (minimum wastage)
7) Examine the final films negative/positive balance

<table>
<thead>
<tr>
<th>SPECIFIED TIME</th>
<th>ACTUAL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXCEL</td>
<td>GOOD</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL 70 TOTAL

REMARKS: .................................................................

QUALITY CHECK

1) Size to layout
2) Position of picture to layout
3) Appearance of final film
4) Registration and guide marks

<table>
<thead>
<tr>
<th>SPECIFIED TIME</th>
<th>ACTUAL TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXCEL</td>
<td>GOOD</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
</tbody>
</table>

POSSIBLE TOTAL 60 TOTAL

REMARKS: .................................................................

.................................................................
QUESTION 4: PLATEMAKING

Did the apprentice:

1) Clean his light table thoroughly
2) Clean the contact frame thoroughly
3) Select the correct exposure
4) Use a step wedge scale
5) Ensure optimum vacuum
6) Use materials correctly (minimum wastage)
7) Process and gum-up the plate

| POSSIBLE TOTAL | 70 |

REMARKS:  

| QUALITY CHECK |

1) Was the plate free of contact/dirt marks
2) Was the step wedge exposure control used effectively
3) Was the plate developed and gummed up correctly and evenly
4) Was the printing area correctly positioned on the plate, e.g. centre and square
5) Was the grip correct (65mm)

| POSSIBLE TOTAL | 100 |

REMARKS:  

### SUMMARY OF TIME TAKEN

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>SPECIFIED TIME</th>
<th>ACTUAL TIME</th>
<th>TIME PENALTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45 Minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30 Minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 Hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>30 Minutes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SUMMARY OF MARKS OBTAINED

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>MARKS OBTAINED</th>
<th>ADD QUALITY CHECKS</th>
<th>TOTAL MARKS OBTAINED</th>
<th>POSSIBLE TOTAL</th>
<th>% OBTAINED</th>
<th>LESS TIME PENALTIES</th>
<th>FINAL % OBTAINED</th>
<th>AVERAGE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 TOTAL</td>
<td></td>
<td></td>
<td>310</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A</td>
<td></td>
<td></td>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 B</td>
<td></td>
<td></td>
<td>250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>130</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A PASS MARK OF NOT LESS THAN 80% MUST BE OBTAINED FOR EACH INDIVIDUAL QUESTION AFTER QUALITY CHECKS HAVE BEEN ADDED, A PERCENTAGE MARK OBTAINED AND TIME PENALTIES DEDUCTED.

We, the undersigned, confirm the correctness of the recorded times of the various trade test tasks.

---

TRADE TESTER

APPRENTICE/TRAINEE
EXAMINER:
Mr M J Paterson

MODERATOR:
Mr E Canterbury

Answer ALL the questions.

Read the questions carefully and answer only what is required.

N.B. ALL QUESTION PAPERS TO BE HANDED IN WITH ANSWER BOOKS.

QUESTION 1

(a) Briefly discuss the principle of lithography and indicate how this principle is concerned with the image and non-image areas. (4)

(b) Who was responsible for the development of the first rotary gravure printing method? (1)

(c) Give THREE advantages and TWO disadvantages of the lithographic printing process. (5) [10]

QUESTION 2

(a) State FIVE points that need to be considered in "pre-layout" planning. (5)

(b) State the FIVE elements of design. (5)

(c) Discuss the principle of "Rhythm" when referring to a design. (2)

(d) Give THREE advantages of a layout. (3)

(e) List the EIGHT classifications of typefaces. (8)

(f) Mention the FIVE factors that need to be considered when choosing a typeface. (5) [28]

QUESTION 3

(a) Describe acetate, as a material when used for making overlays in the production of artwork. (3)

(b) Briefly discuss how simple colour separations may be made with overlays in producing artwork for photography. (4)
Question 3 (Continued)

(c) When combining photographs and linework, which THREE methods may be used for locating the photographs on the paste-up prior to camera exposure? (3)

(d) Describe how copy is waxed and attached to the base artwork. (4)

(e) List FIVE ways in which copy may be protected. (5)

QUESTION 4

(a) What do you understand by the following terms:-

(i) perfecting (2)

(ii) signatures (2)

(iii) collating marks. (2)

(b) Briefly discuss the differences between half-sheet work and sheet work when referring to impositions. (4)

(c) Draw the imposition scheme of a 16 page booklet to be printed as a half-sheet. Indicate the folios, heads and gripper-edge. (4)

QUESTION 5

(a) State the FOUR types of camera copy. (4)

(b) Briefly discuss quartz-iodine lighting as a method of illumination on a process camera. (4)

(c) Discuss TWO important characteristics required in a lens used in a process camera. (4)

QUESTION 6

(a) State the FOUR types of process camera. (4)

(b) Name and discuss the functions of the THREE exposures which may be used in halftone photography. (6)

(c) Outline a brief procedure for making a line negative on a process camera. (10)

QUESTION 7

(a) What is a colloid? (2)

(b) Discuss "wipe-on" plates as used in lithographic platemaking. (4)

(c) Briefly discuss the steps used to make diazo-coated presensitised lithographic plates, using hand processing techniques. (6)

(d) Briefly compare photopolymer and diazo-coatings that are used in the manufacture of presensitised plates. (4)

[16]
QUESTION 8

(a) How and why are diazo coated lithographic plates "baked"? (2)
(b) Briefly discuss how an automatic plate processor, for the processing of diazo-coated lithographic plates, works. (5)
(c) State TWO methods of deleting unwanted work on a diazo-coated presenitized lithographic plate. (2)

QUESTION 9

(a) Name and discuss the TWO types of "powderless" etching machines used in the making of letterpress blocks. (6)
(b) Briefly outline how a rubber stereo is made. (4)
(c) List the SIX steps used to make a photopolymer plate. (6)
(d) Briefly discuss the production of a gravure cylinder by the electro-mechanical engraving method. (6)

Total: 150 marks