PREDICTING LEARNER PERFORMANCE IN THE CLOTHING INDUSTRY

by

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SUMMARY

The aim of the research is to determine the predictive relationship between mental alertness, personality traits, psychomotor ability and learner performance, in the selection of clothing industry learners. A concurrent validity study is described in which 213 learners were given an assessment battery and assessed on their learning performance and work performance. The psychometric assessment battery measured the domains of mental alertness, personality traits and psychomotor ability in a four-hour session. A combination of paper-and-pencil and practical sewing work assessments were used to assess learner performance. The domain learner performance comprised the assessment scores for the learnership's theoretical and practical modules. The work performance domain was measured by supervisor appraised work-quality and work-quantity. The assessment domains were then examined for their potential to predict work performance. Linear multiple regression equations reported $R^2 = 0{,}3266$ for work performance.

ACKNOWLEDGEMENTS

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CHAPTER ONE

INTRODUCTION AND AIM OF STUDY

1.1 INTERNATIONAL COMPETITIVENESS AND PRODUCTIVITY IN THE CLOTHING AND TEXTILE INDUSTRIES

If the South African manufacturing industry is to survive the continuing onslaught of international competitiveness it must identify avenues to increase its own competitiveness by the year 2015 and beyond. As indicated in Figure 1.1, the decline in manufacturing productivity has been substantial since 2008.

Figure1.1: Graph of productivity decline in South African manufacturing
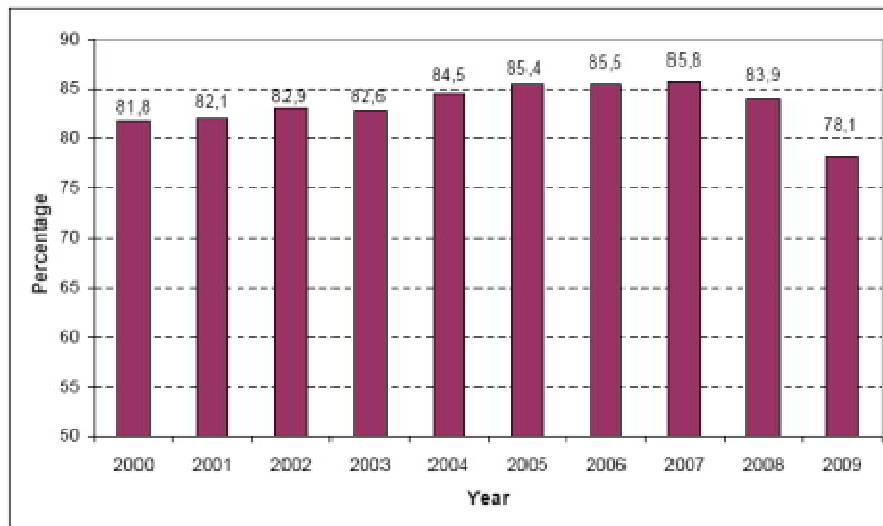
Source: Statistics SA (2010:4) Utilisation of production capacity by large enterprise. August 2010:4.

The clothing industry is one of the worst affected sectors and it has Johann Baard, Chair of the Cape Clothing Manufacturers Association, lobbying for increased tariffs and anti-dumping protection against cheap imported apparel from China (Baard, 2010:6).

To achieve this competitiveness, a number of factors need to be addressed. One factor is the increase in the supply and quality of sewing skills in the clothing and textile sector. The changing nature of fashion, coupled with the volatile rand, has resulted in this labour intensive sector being unstable since around 1990 and it has continued to decline, as displayed in Figure 1.2.

Figure1.2: Under-utilisation due to skills shortage

Manufacturing major groups				Utilisation	Reasons for under-utilisation					
					Total under-utilisation	Shortage of			Insufficient demand	Other
						Raw materials	Labour			
							Skilled	Semi- and unskilled		
Wearing apparel	Weight = 2,4	2008	Aug	82,7	17,3	1,6	1,4	0,7	8,9	4,7
			Nov	81,3	18,7	1,1	1,1	1,9	10,0	4,6
			Year	82,6	17,4	1,4	1,1	1,0	9,0	5,0
		2009 1/	Feb	80,4	19,6	1,7	1,0	0,2	12,5	4,2
			May	80,4	19,6	1,1	0,8	0,6	13,8	3,3
			Aug	78,7	21,3	1,0	0,7	0,5	15,0	4,2
			Nov	80,2	19,8	1,3	1,4	0,9	12,7	3,5
			Year	79,9	20,1	1,3	1,0	0,6	13,5	3,8

Source: Statistics SA (2010) Utilisation of production capacity by large enterprise. August 2010:6.

Another factor is the level of unemployment in South Africa. Statistic S.A (2010:n.p.) reported that the unemployment rate for the first quarter of 2010 increased by 0,9 to 25,2%. With the total number of unemployed people at 4,3 million for the first quarter of 2010, and a further 79 000 jobs being lost in the first quarter of 2010, job losses are a critical agenda item for the government of South Africa.

Furthermore, if South Africa is to become internationally competitive, it needs to prioritise higher education and workplace skilling; furthermore, with adult functional illiteracy levels at 27% (41% of African people) the enhancement of educational standards and workplace training and development becomes paramount (Erasmus, Loedolff, Mda & Nel et al 2009:50).

Since the early 1960s the clothing industry has been the largest employer of labour in the Western Cape. Edwards and Morris (2006:2) illustrate that there has been an estimated decline in employment levels of 65 000 people from 2003 to 2006. This decline in employment is directly linked to the significant growth in imports from China over this period.

The increase in the number of Chinese-made garments being imported into South Africa has become a tangible threat for the South African clothing industry and the South African government has proposed the introduction of trade quotas in an attempt to curb this threat. One of the main reasons why these imports are a threat and why this sector is struggling to perform is the shortage of highly skilled and versatile sewing machinists.

The perceived threats and continued job losses in the formalised sector of the clothing industry have resulted in a large number of multi-skilled and experienced machinists turning to employment in other industrial sectors, or opening up their own small businesses. This migration has resulted in a severe shortage of qualified sewing machinists in the Western Cape clothing industry, as illustrated in Figure 1.3. The responsibility for quality and quantity falls squarely on the shoulders of the machinists and they are the focus of this selection and development dilemma. The role of the sewing machinists is crucial: a clothing company makes its profit at needle point.

Furthermore, with regard to garment quality the key aspect is that quality is sewn into, not examined into, a garment. Therefore, if the machinist is poorly skilled the reduction in quality, and hence income, can be significant. Especially, when considering that the garment price may measure as high as R1 200.00 per unit. With 3 000 units being made in one style run, should human error result in an order being returned, the cost to the manufacturer may be exorbitant in both monetary terms and loss of good faith between themselves and their retail customer (Stein,2010:n.p.)

Figure 1.3:   Prediction of the number of sewing machinists

Source: Naicker, P.K. (2010a) (Paper presented to Clothing, Textile, Footwear and Leather Sector Education and Training Authority Training Forum, 29.)

A garment is costed at a 'per minute rate', which is the total cost of the garment divided by the number of minutes it takes to sew. This 'minute rate' is used to set the hourly target for the sewing machine floor, and unless each machinist produces the correct number of garments per minute, at the quality standard set per sample, the profit margin is reduced. The 12.32% increment in workers' wages negotiated in July 2008 by the South African Clothing and Textile Workers Union (SACTWU, once again places the industry's labour costs in the top five percent internationally, and unless this sector is productive it is likely to become economically unsustainable.

A line supervisor who is responsible for the quantity and quality on the production line manages the machinist. The supervisor has spent a number of years as a sewing machinist and understands the quality and quantity standards required.

When machinists are promoted to a supervisory position, they are trained in basic managerial skills which enhance their ability to plan, organise, lead and control the production line. The supervisor, in turn, reports to a production floor manager who is responsible for ensuring that the hourly targets are met by the sewing lines on the production floor. The production floor manager answers to the production director who plans and controls the flow of work in order to meet the retail customers' deadlines. The sheer number of sewing machinists in the industry strengthens the focus of this research, as 80% of the employees in a clothing company are sewing machinists. The aim of the research is to investigate the relationship between mental alertness, personality traits and psychomotor ability in order to design a cost-effective, fair, valid, and expedient method by which to select and develop clothing industry sewing machinist learners (Aamodt, 2010:215).

To help address the national skills shortage, the South African government implemented the National Skills Development Strategy II (NSDS II) (2005–2010). This strategy aims to identify problem areas in training, highlighting the role of training in restructuring the country and the integration of training and education. The National Skills Development Strategy II aims to improve workforce competence to increase worker responsibility and productivity and to enhance international competitiveness by:

- Enabling unemployed persons of working age to obtain nationally recognised qualifications for work readiness

- Allowing persons to secure and maintain employment and the associated lifestyle benefits

- Affording special assistance to targeted groupings to assist with employment (Department of Labour, 2005:4).

The strategy also provides for the introduction of the National Qualifications Framework (NQF) – a structure that categorises levels of education and training; the South African Qualification Authority (SAQA) ensures that standards are established and maintained, and it regulates this framework.

Being of five-year duration, these objectives are soon to be replaced by the New National Skills Development Strategy (NSDS III) which will be launched in 2011/2 and run until 2016. The new strategy addresses the training and development of unskilled South Africans to speed up growth and transform the economy through government managed initiatives such as learnerships (Department of Higher Education and Training, 2010:7).

The National Skills Development Strategy (NSDS III) gives further impetus to this study as the key focus area is to contribute to the achievement of economic growth and social development goals aimed at supporting and developing the work skills base. Pivotal to the success of the training strategy, and to the facilitation of the employment equity process, is the introduction of learnerships. Learnership programmes are structured career development initiatives, consisting of workplace and academic inputs that result in a qualification that is registered with the NQF and SAQA. Equally, learnerships are seen as a vehicle for providing workplace skills to the unemployed and the achievement of employment equity targets for 2010. Linked to learnership initiative is another area requiring sustainability, namely the black communities of the Western Cape. These communities are largely excluded from the associated lifestyle benefits that accrue to individuals involved in mainstream economic activities.

Those particularly affected by this exclusion include the youth, women and people with disabilities; the latter two being categories targeted for empowerment according to the **Employment Equity Act** (No 55 0f 1998) (Bendix, 2000:73; Bendix, 2010:146).

The learnership process is further aimed at promoting broad-based black economic empowerment (BBBEE), especially of the youth, to enable them to acquire the skills that they need to become economically independent. The learnership initiative can help curb the high levels of unemployment and assist economic growth for the entire nation. To this end, the Clothing, Textiles, Footwear and Leather Sector Education and Training Authority (CTLF SETA) has certified 1 843 sewing machinist learners in the Western Cape, and has undertaken to register a further 400 for 2010 (Naicker,2010a:29).

This learnership initiative is a portal to future economic sustainability through improved competitiveness, locally and globally. The CTFL SETA intends, through the learnership process, to augment the skills base of all employees in its sector. The promotion and implementation of learnership programmes in South African clothing and textile companies will be achieved. The focus of the learnerships will be unemployed learners, notably in the clothing and textile sub-sectors. Naicker (2010a:40) claims that the learnerships will also enhance employment equity and help to boost our failing economy.

To address this problem through training and development may prove to be a solution. If not a panacea, it is at least a mechanism towards enabling international competitiveness, which is necessary in the light of unfavourable trade tariffs and declining exports. If the Western Cape clothing industry is to develop a productive labour force that can compete against ever increasing competition, training and education will have to be of an international standard. In short, if the South African clothing industry is to survive, international competitiveness must be achieved by the year 2015 and beyond. To achieve this competitiveness, a number of factors must be addressed. Of prime importance is the selection and development of sewing machining personnel, as employment equity reports display an absenteeism level of sixteen percent, coupled with extreme labour turnover, renders this industry unstable (Dixon-Seagers,2008:n.p.).

Furthermore, research conducted by Camp, Blanchard and Huszczo (1986:65), Cascio (1991:79), Meyer and Botha (2004:178), Hellriegel, Jackson, Slocum, Staude, Amos, Klopper, Louw and Oosthuizen (2009:17), Robbins and Judge (2009:157), Aamodt (2010:215) and Cascio (2010:199) advises that – before expending resources on the training and development of employees – it is preferable that the appropriate person is selected for the job.

1.2   SELECTION OF LEARNER SEWING MACHINISTS

Approximately eighty percent of training providers use no objective or scientific selection technique to select potential learner sewing machinists. Yet, it is imperative that the correct people are chosen for development in order to ensure optimal transference of the skills, knowledge and abilities learnt to the sewing production floor (Camp et al, 1986:32). Schmidt and Hunter (1981:1132), Hunter and Hunter (1984:78), Tett, Jackson and Rothstein (1991:721), Irving (1993:33), Tziner, Meir, Dahan and Birati (1994:233), Salgado (1997:33), Scroggins, Thomas and Morris (2008:185), Aamodt (2010:209), and Cascio (2010:239) propose that the use of valid selection tests predicts the overall performance of the workforce.

Thus, if a cost-effective, fair, valid and expedient test battery could supplement available biographical and interview information, organisations may reduce training time and expense and, in turn, increase profit through higher productivity.

1.3   SCRUTINY OF SELECTION TESTS

The traditional testing techniques that were utilised to select incumbents for employment and training have come under close scrutiny in recent years. Cascio (2010:77) mentions that critics, mainly in the United Kingdom and the United States, argue that it has become apparent that certain tests may discriminate against specific groups, and that owing to the bias inherent in these tests, poor test performance may not be reflective of weak ability or reduced job match.

Aamodt (2007:205) cautions that the requirements, particularly in the United States, are exerting a significant influence on the nature of the tests accepted for use in selection procedures. Subsequently, the clothing industry should take cognisance of the validity of any psychometric tests they select, when viewed against the context provided by the NUMSA Code of Practice to End Unfair Discrimination, and Guidelines for the Validation and Use of Personnel Selection Procedures (Eberson,1994:33; Aamodt, 2007:190). The **Employment Equity Act** (No 57 of 1998) adds further impetus as psychometric tests may be viewed as a means of unfair discrimination unless they have direct predictive validity for the position in question (Bendix, 2010:145).

1.4   VALIDITY AND RELIABILITY OF SELECTION TESTS

Pressure from the legal arena is not the only factor forcing psychologists to reassess the validity of traditional testing instruments, as further contention can arise from test validities which are not consistently high, despite decades of research (Robertson & Downs, 1979:47; Blinkhorn & Johnson, 1990:671; Scroggins et al , 2008:185; Aamodt, 2010:204; Cascio, 2010:250). It is an anomaly to find multiple correlation coefficients which are based on the combined value of several predictors in excess of $r = 0,50$. The reliability coefficient may be interpreted as the extent to which individual differences in scores on a measure are due to 'true' differences in the attribute measured.

The reliability of the National Institute of Personnel Research (NIPR) Intermediate Battery has proven to be strong, with reliability levels of $r = 0,98$ being reported (Prinsloo,1992:6). The Sixteen Personality Factor Questionnaire (16PF), by its nature, implies that reliability levels could be as high as $r = 1,00$, but are usually seen between $r=0,95$ and $r=0,98$ (Cattell, Eber & Tatsuoka,1970:30). Cascio (2010:240) further maintains that high reliability is a necessary, but not a sufficient, condition for validity.

Cascio (2010:240) describes validity as the underlying traits or constructs that a test measures, or how well they measure the relationship between scores and the external criteria measured. The process of gathering or evaluating the necessary data is known as validation, and the combined knowledge of reliability and validity makes possible the practical evaluation of predictors in specific situations. Validity levels for the mental alertness sub-test of the NIPR Intermediate Battery have not been reported to date.

Equally, validity findings for the 16PF (Form E) are not recorded due to the fairly recent introduction of the standardised version of the Form E into South Africa. Although research conducted by Abrahams and Mauer (1996: xvi) indicated that 'problems' existed with the construct and item comparability of the 16PF questionnaire, other literature reflects reliability levels of r= 0,40 when used in the United States (Cattell et al,1970:23).

1.5   RESEARCH PROBLEM

At present there is no scientific method to select learnership candidates in the Western Cape clothing industry.

1.6   PURPOSE OF THE RESEARCH

The purpose of this research is to determine whether the use of psychometric testing to select sewing machinist learners will result in the prediction of learner performance and work performance. Camp et al (1986:65), Hunter (1986:112), Cascio (1991:79), Van den Berg (1992:10), Van den Bergh and Feij (1993:9), Meyer and Botha (2004:178), Hellriegel et al (2009:17), Robbins and Judge (2009:157), Cascio (2010:248) and Aamodt (2010:194) found that the psychometric assessment of the constructs personality traits, mental alertness, and co-ordination can predict work performance.

Cascio (1991:279) emphasises that organisations need to scientifically select incumbents for training and development if optimal learner performance is to be achieved. It can be tentatively expected that the introduction of a scientific assessment battery, aligned to the fundamentals of the learnership, will help to reduce learner failure rates.

Camp et al (1986:58), McCormick and Ilgen (1989:27), Cascio (1991:128), Erasmus and Van Dyk (2003:127), Aamodt (2007:179), Hellriegel et al (2009:256) and Robbins and Judge (2009:80), highlight that the selection of learners is a key aspect in the quality assurance process applicable to training and development. If the learners' individual characteristics are not aligned to the learning programme, the chances of success are severely limited.

The use of a cost effective, fair, valid and expedient method for the selection of sewing machine learners in the clothing industry is of paramount importance if the rigours of international competitiveness are to be withstood. Although the use of personality as a predictor in selection has not met with substantial success in the past, recent research suggest that personality traits are related to performance criteria (Henney, 1975:66; Batlis & Green, 1979:558; Barrick & Mount, 1991:15; van den Bergh,1992:3; Irving, 1993:211; Robertson,1993:78; Van den Bergh & Feij, 1993:339; Aamodt, 2007:171).

Research by Ghiselli (1973:471), Schmidt and Hunter (1981;1136), Hunter and Hunter (1984:82), Schmidt, Gooding, Noe and Kirsch (1984:415), Muchinsky (1993:380), Rossini, Wygonik, Barret and Friedman, (1994:2), Cook (2004:99), Robbins and Judge (2009:138), Aamodt (2010:205), and Cascio (2010: 248) report that tests of cognitive ability are strong predictors of work performance, and hence these authors show increasing optimism concerning the use of personality measures in employee selection (c/f Figure 3.9).

This study intends to explore this relationship and to add to the body of research, in an attempt to further the discipline of human resource management. Furthermore, scrutiny by legal and ethical antagonists in South Africa is forcing psychologists to take a more focused and reasoned view of the use and validity of selection tests regarding their equity and predictive power (Bendix, 2000:89; Bendix, 2010:145). Equally, the introduction of a scientific assessment battery which is aligned to the fundamentals of the learnership will help to reduce learner failure rates by identifying individuals who exhibit a collection of individual characteristics that lead to the successful completion of a sewing machine learnership in the clothing industry.

1.7 GENERAL AIM OF THE RESEARCH

The general aim of the research is the identification of a psychometric test battery to predict learner sewing machinist performance in the clothing industry of the Western Cape.

1.7.1 Specific theoretical aim

The specific theoretical aim of the research is to theoretically investigate and measure the predictive relationship between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance.

1.7.2 Specific empirical aim

The specific empirical aim of the research is to empirically measure the predictive relationship between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance, and quantify the theoretical relationship between the variables.

1.8   PROPOSED RESEARCH DESIGN AND METHOD

The research is an empirical study that uses quantitative measures to predict the relationship between the independent and dependent variables (Welman, Kruger, & Mitchell, 2005:98). The research model as described by Mouton and Marais (1994:20) will be used as a framework.

The model includes the most important insights that have been gained from developments in the philosophy and methodology of social science (Mouton & Marais, 1994:20).

1.9   RESEARCH HYPOTHESIS

Is there a predictive relationship between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance?

(statistical significance > ,05 ; two tailed)

H_1 = a predictive relationship exists between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance.

H_o = no predictive relationship exists between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance.

1.10 DESIGN OF THE RESEARCH

The relationship between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance will be investigated by the following steps:

Step 1 Determine the population and sample

A randomly representative sample of n = 200 learners will be selected from the Western Cape sewing learnership population of N = 1 842 learners undertaking the qualification National Certificate in Clothing Manufacture NQF 2 (Machine Garment Constructor).

Step 2 Test battery

The test battery, conducted by a registered industrial psychologist, will include the measurement of:

- The independent variable personality traits using the 16 Personality Factor Questionnaire (Form E for people with educational levels between Grade 5 and Grade 11);

- The independent variable mental alertness using the mental alertness sub-test of the intermediate battery of the National Institute of Personnel Research (NIPR);

- The independent variable psychomotor ability using a work-sample based sewing trainability test;

- The independent variables learner performance will be measured using the CTLF SETA summative assessments for the core and sewing elective modules of the NQF level 2 learnerships, code 04Q040078151202 (see Appendix 7 and 8);

- The dependent variable learner work performance will be measured using production supervisors performance ratings of learner work-quality and work-quantity; and

- The moderator variables of race, gender, language, educational level and age will be entered into the multiple regression equation to investigate if these variables have any relationship with the independent and dependent variables

Step 3 Data gathering

The Seardel Group has agreed to allow the researcher to psychometrically assess their learnership candidates and gather learner data.

Step 4 Inform participants

Inform participants about the purpose of the study and request their permission to use the data and assure their anonymity.

Step 5 Data processing

The following statistical methods to determine the relationships between the independent variables and the dependent variables learner performance and the predictor:

- Measures of central tendency, including the mean, median, mode and standard deviation;

- Partial correlation to measure the size of the relationship between the independent and the dependent variables;

- Multiple regression analysis to measure the coefficients between the independent and the dependent variables; and

- Kruskall-Wallis one-way analysis and Tukey's confidence intervals to measure the significance of the moderator variables

Step 6   Comparison of the research findings and the statistical hypotheses

The statistical results will be compared to the proffered hypotheses to determine if a relationships exists.

Step 7   Reporting and interpretation of statistical results

Results will be reported in tables and figures to display the data in an organised and compressed format that permits interpretation.

Step 8 Formulation of the conclusions

This will be done according to the specific aims and research hypotheses.

Step 9 Formulation of the limits of the research

This will be done according to the literature and empirical study.

Step 10 Formulation of the recommendations

This will be done for the purpose of future research and development in the field of human resource management.

1.11 SIGNIFICANCE OF THE RESEARCH

The learnership process is a relatively new initiative for South Africa and hence the body of research is lean. This research will add to the theoretical base and improve human resource practice in this area of training and development. The research study will also have significance for the clothing industry, the Clothing, Textile, Footwear and Leather SETA, the national economy of South Africa, and the disciplines of human resource management and industrial and organisational psychology.

Furthermore, the study will promote the sustainability of previously disadvantaged groups and the development of black communities in the Western Cape. As a result of the success of the learnership initiative to date, the Department of Trade and Industry (DTI) is in discussion with the CTFL SETA to facilitate the development of 23 000 learners as part of the African National Congress's (ANC) distressed industry recovery programme. This gives new impetus to the need to scientifically select sewing machine learnership candidates.

1.12 OUTLINE OF THE CHAPTERS

The study will be reported in a two-fold manner, namely a literature survey and an empirical investigation. The literature survey will incorporate the following chapters:

Chapter One: Introduction and aim of the study

Chapter Two: An evaluation of selection techniques that assess mental alertness, personality traits, psychomotor ability and learner performance

Chapter Three: Mental alertness, personality traits, psychomotor ability and learner performance in the selection of learners

The empirical study will incorporate the following chapters:

Chapter Four: Research method

Chapter Five: Results

Chapter Six: Discussion and conclusion

The following chapter will now address the evaluation of selection techniques that assess mental alertness, personality traits and psychomotor ability.

CHAPTER TWO

AN EVALUATION OF SELECTION TECHNIQUES THAT ASSESS MENTAL ALERTNESS, PERSONALITY TRAITS AND PSYCHOMOTOR ABILITY

In this chapter, a critical investigation will be undertaken of the selection techniques available to assess learner potential. The investigation will focus on three specific constructs and their measurement, namely the individual's level of mental alertness, personality traits, and degree of psychomotor ability.

To begin with, a definition of selection and its role will be presented, accompanied by an overview of test validity and reliability and their role in the testing process. During the discussion, emphasis will be placed on the value of selection and its contribution to organisational success.

2.1 DEFINITION OF SELECTION

The definition of selection as given by Cascio (2010:691) is the process of choosing among candidates for employment. Edenborough (2008:2) speaks of choosing one or more candidates over others, for one or more jobs. Nel, Werner, Hasbroek, Poisat, Sono and Schultz (2008:239) go further to state that selection is 'the process of screening and hiring the best-qualified applicants with the greatest performance potential'.

The Society for Industrial Psychology (1992:1) describes selection as:

> 'Procedures or actions used in obtaining and integrating information in order to make a recommendation or a final personnel decision which may influence the job status of an individual or an evaluated person.'

Wiggins (1973:23), defines selection as a two-step procedure that incorporates measurement and prediction. Measurement implies a collection of data in the form of tests or any other procedures used to reap empirical measures; by 'prediction' the author implies manipulation of the data to culminate in a decision which offers the most valid predictive ability when forecasting job performance. Prediction is an essential ingredient of selection involving a type of clairvoyance where the psychologist is required to see into the future and then use scientific method to assess the behaviour of an applicant in terms of the identified performance criteria. Aamodt (2010:158) is of the opinion that to accurately select requires looking into the past, stating:

> 'In psychology, a common belief is that the best predictor of future performance is past performance.'

A comprehensive and actionable definition is given by Swanepoel, Erasmus, van Wyk and Schenk (2003:280) who state that 'Selection can be defined as the process of trying to determine which individuals will best match the particular jobs in the organisational context, taking into account individual differences, the requirements of the job in the organisational context, taking into account individual differences, the requirements of the job and the origination's internal and external environments.'

The crux of selection lies in the fact that people differ, particularly in the realms of interpersonal ability, and physical and psychological characteristics. If differences regarding abilities, aptitudes, interests and personality traits did not exist, there would be no need for scientific selection, and the practitioner would be able to predict similar performance levels for job applicants, because variables (such as intellectual level, personality traits, innate abilities and personal interests) would be static or equal. Therefore, selection only becomes necessary when there are more qualified applicants than there are available positions. This claim hinges on the premise that choice is the fundamental motivation behind the selection process. This, in turn, implies exclusion (Smith & Robertson, 1986:56; Cascio, 1991:21; Cook, 2004:19; Nel et al, 2008:242).

The above discussion culminates in 'selection' being explained as those decisions concerned with the assignment of individuals to courses of action, the outcomes of which are important to both the individuals and the organisations involved. The inability to estimate the applicant's future performance levels could result in the wrong candidate being selected and productivity levels suffering (Cascio, 1991:23).

Thus, the aim of selection is to systematically identify the most suitable applicant for a job, with the needs of the organisation and of the individual being satisfied (Guion, 1976:53; Cook, 2004:163; Nel et al, 2008:241).

2.2 THE PROCESS OF SELECTION

The process of selection implies exclusion and the most recognised method is known as the traditional method of selection.

2.2.1 The traditional process of selection

The rationale behind the traditional selection model is that selection involves individual differences, and that prediction is an essential ingredient of selection and it must be examined before being discarded (Lewis, 1992:76; Bergh & Theron, 2003:452; Scroggins et al, 2008:194; Cascio, 2010:105). The approach is outlined below:

The first step in the traditional process involves the generation of a job analysis. This implies the gathering of information about a job to ascertain the knowledge, skills and abilities needed for job success.

On the basis of the job analysis, hypotheses are derived concerning the worker characteristics necessary to perform the job successfully (Cascio, 1991:43; Swanepoel et al, 2003:282; Cascio, 2010:104).

The second step involves the choice and development of criterion and predictors, and this requires two procedures. A criterion is the standard by which we judge the value, success or failure of a given activity. The results of the job analysis are invaluable as they summarise the criteria which represent successful on-the-job performance. Once the criteria for the job success have been chosen and developed, the next task is to select those measures that best predict whether the candidate can meet the criteria. Predictors should be chosen on the basis of competent job analysis information, which would provide clues about the type(s) of predictor(s) most likely to forecast criterion performance accurately (Cascio, 1991:43; Cook, 2004:243; Edenborough, 2008:9).

The third step involves ensuring that the job applicants are measured on both variables. One method for enacting this is to include every job applicant in the measuring process, and then to employ all the applicants irrespective of success or failure on the selection instrument (Cascio, 1991:43; Swanepoel et al, 2003:281).

The fourth step is hypothesis testing, which is the establishment of predictor-criterion relationships. This translates into the question of whether the predictor has validity. The answer to this question is achieved through the use of a variety of statistical techniques, which, in many cases, results in computing a correlation coefficient (Cascio, 1991:43).

The final step is the implementation of the selection procedure in the organisation, should the predictor hold statistical validity. If, however, a predictor cannot be shown to be job-related, it must be discarded (Cascio, 1991:43).

Recent literature (Swanepoel et al, 2003:281; Cook, 2004:10; Scroggins et al, 2008:194; Casio, 2010:267) on selection advocates a move away from the traditional selection process previously expounded by early writers such as Guion (1976); Ribeaux and Poppleton (1978) and Muchinsky (1983).

Difficulties are highlighted with the traditional selection model, as it ignores certain external parameters that may influence the overall worth of a selection instrument. The traditional model of personnel selection emphasises measurement accuracy and predictive efficiency as final goals. In the contemporary view, these conditions merely set the stage for the decision problem. Researchers have therefore turned their attention to the 'Decision Theory', which acknowledges the importance of psychometric criteria in evaluating measurement and prediction. In addition, it recognises that the outcomes of prediction are of primary importance to individuals and organisations. It would seem, therefore, that one way to evaluate the usefulness of any predictor is in terms of the proportion of correct decisions made when the predictor is used as the basis for decision-making (Cascio, 1991:280; Scroggins et al, 2008:194).

2.3 IMPORTANCE AND VALUE OF SELECTION

To emphasise the importance of scientific selection, Cook (2004:1) returns to work conducted in 1928 that illustrated workers differ so significantly in terms of productivity that '…the best is twice as good as the worst'. Cook (2004:10) then discusses techniques surrounding *rationale estimation* that allow human resource managers to measure the value of scientific selection in monetary terms. The posing of questions regarding the economic viability and performance value of valid selection procedures has been debated for years (Edenborough, 2008:77; Scroggins et al, 2008:185; Aamodt, 2010:209; and Cascio, 2010:190).

Although certain literature (Hunter, 1982; Hunter & Hunter, 1984; Irving, 1993; Tziner et al, 1994) proposes that the use of valid selection tests substantially reduces the risk of new incumbents performing their duties ineffectively, section 3 (1) of **Constitution Of The Republic Of South Africa** (No 108 of 1996), and parts of the **Employment Equity Act** (No 55 of 1998), stipulate that discrimination against disadvantaged job applicants is illegal in the workplace (Bendix, 2010:145).

Irving (1993); Rossini, et al (1994); Tziner, et al (1994) and Scroggins et al (2008) once again illustrate the economic utility implications of a valid selection procedure to be irrefutable. The research further highlights that selecting high performers is more important for sustaining the organisation than was originally thought. It is argued that the removal of valid selection techniques will, in turn, result in an increase in the recruitment of candidates who fail to succeed in their jobs. This could lead to a serious decline in productivity within the organisation, the industry that it represents, and the economy in general.

2.4   EVALUATION OF SELECTION METHODS

The on-going debate concerning the ethical and legal ramifications of psychometric testing has made it necessary to distinguish between test and non-test techniques during the discussion, because contemporary practice often advocates non-test alternatives where possible. This exercise will enable the researcher to objectively compile the most suitable test battery for the research in order to yield the desired profile (Cascio, 1991:201; Eberson, 1994:78; O'Meara, 1994:145; and Aamodt, 2010:77).

Aamodt (2010:194) stipulates that the most objective manner in which to evaluate a psychological test would be to determine the reliability and validity statistics of the test specific to job situations, and then to standardise these statistics. Huysamen (1988:9) defines a test as 'a standardised procedure for quantifying a person's responses to a sample of tasks', and standardisation as 'the uniformity of the test material, administration and scoring procedure of the instrument'. By standardisation, Bouchard (1971:90) means that each applicant receives the same instruction under analogous conditions and is scored by an identical scoring system to their protocol. The evaluation should provide the tester with a reliable measure of a clearly defined type of behaviour or performance that is a valid and fair predictor of job success.

2.4.1   Reliability

A measurement procedure is considered to be reliable if it is '…consistent and stable…'. (Cascio, 2010:239).   Swanepoel et al (2003:282) state that '…reliability can be defined as the consistency of a measure'. Reliability refers to the consistency of performance either of an item of measurement or of an individual.   Within the realm of person-job matching, the reliability of criteria, the reliability of judgments of personnel specifications, and the reliability of measurements of individuals should be carefully considered.

According to Edenborough (2008:48), reliability refers to the consistency and stability of the measurements or scores that are being assessed. The concept of reliability in the context of human resource selection may be described as the degree of dependability, consistency, or stability of measurement of a variable(s) being investigated in selection research. This concurs with the definition given by Welman et al (2005:145) that reliability is concerned with credibility of the findings of the research. A number of methods to assess the reliability of a selection method have been described in literature. Parallel form reliability is included which involves the use of two equivalent forms of a test-retest reliability. This is the repeating of an identical test at different time periods and split-half reliability which involves the dividing of the measure into two equivalent halves to ascertain the correlation (Bouchard,1971:78; Anastasi, 1982:22; Smith & Robertson,1986:34; Gatewood & Field,1987:76; Cascio,1991:56; Vos, Strydom, Fouche & Delport, 2002:145).

2.1.4.1 *The reliability of tests and questionnaires*

An overview has been given of reliability and its application in selection. However, there is a need for the study to examine reliability and, specifically, its role in the construction of tests and questionnaires. Within this ambit, reliability refers to the consistency and accuracy of measurement of the factors or traits that the tests are addressing.

Therefore, one may also express reliability as the ratio of the true-score variance to the observed-score variance. It is important to note that there are a number of sources of measurement error:

- Fluctuations of attributes other than those being measured, and fluctuations in respect of ability measured;
- Changes in the external environment of the individual;
- Error scores arising from the administration, scoring, and assessment; or error scores given rise to by the content of the test or measurement instrument (Vos, et al, 2002:145)

What is confirmed throughout literature is that high reliability is a necessary but not a sufficient condition for high validity and a combined knowledge of high reliability and validity makes possible a practical evaluation of predictors in specific situations (Cascio, 1991:14; Swanepoel et al, 2003: 281; Aamodt, 2007:190).

2.1.4.2 *Types of reliability in tests and questionnaires*

The *American Psychological Association Standards* accredits three classes of reliability which they express in terms of different types of coefficient, namely:

- Stability
- Equivalence
- Internal consistency

2.1.4.2.1   Coefficient of stability (test-retest)

The coefficient is based on the same type of measurement instrument administered at two points in time to the same sample of people. The results of the two test activities are then correlated and the resulting correlation is termed a coefficient of stability (Bless & Higson-Smith, 2000:68).

The type of coefficient is commonly used to estimate the reliability of various types of ratings, for example performance evaluations or ratings of job requirements (McCormick & Ilgen, 1989:37; Muchinsky, Kriek and Schreuder,1998:69).

2.1.4.2.2   Coefficient of equivalence (parallel forms)

This is based on data from two 'samples of the universe' that are being measured. The idea is that the two samples are matched in style, content and statistical characteristic. The result will be the same number of items, the same kind of items, and hence the means and standard deviations of the scores of the two forms should be almost parallel. The coefficient of equivalence may be used with ratings made by learners or interviewers, where two 'equivalent' rating forms that represent a number of different items are drawn up (McCormick & Ilgen, 1989:38; Muchinsky et al, 1998:69; Cook, 2004:105).

2.1.4.2.3   Coefficient of internal consistency (split-half)

There are two methods to derive coefficients of internal consistency. In both methods, data obtained from one administration of the measuring instrument is used. One method is known as the 'split-half' method and involves the scores being achieved through the use of two scoring keys. Each key covers half of the items included in the measuring instrument. The two halves are then correlated and computed, providing a reliability measure of a test that is half as long as the original test. The Spearman-Brown Prophecy Formula, which provides an estimate of the reliability of the whole test, then corrects this correlation.

This type of coefficient is ideal for use in many measuring situations, but it is not applicable in the case of speed tests where all of the items would usually be similar. To estimate the correlation between the tests and hypothetical equivalent tests, a variety of formulas, which includes the Kurder-Richardson, are used to measure internal consistency (Muchinsky et al,1998:70; Howell, 2008:281).

In the case of internal consistency, the reliability coefficient and its strength may be affected by the following factors: the method used to determine the reliability index; the range of individual differences; the characteristics of the item or measurement according to the total performance; the length of the test and its construction; the administrative procedures used; the degree of difficulty of the test items; the effect of subjects guessing; and the speed of test completion (Bergh, Wolfaardt, Cilliers, Flowers & Kriek,1989:15). It is commonly accepted that tests or questionnaires used in research should have reliability coefficients that range between $r=$ 0,80 and $r=$ 0,90 (Huysamen, 1988:18).

The appropriateness of the coefficients depends upon the circumstances in question and therefore there is no clear cut reasoning as to which would be the best or more correct of the three approaches outlined above. The reliability of any test, or any other measurement instrument is, to a degree, a function of the individuals or events (McCormick & Ilgen, 1989:56; Muchinsky et al,1998:69).

2.4.2   Validity

Validity has traditionally been viewed as the extent to which a measurement procedure actually measures what it is designed to measure (Kerlinger, 1986:76). It is claimed that validity is difficult to define in a single statement. Yet, Swanepoel et al (2003:283) achieve this by stating 'A valid measure is one that yields correct estimates of what is being assessed.' Muchinsky et al, (1998:70) define it succinctly as '…validity refers to accuracy and precision…' and claim that a valid measure yields accurate estimates of the construct that is being measured.

The American Psychology Association claims that questions of validity are actually questions of what may properly be inferred from test scores, and that validity really refers to the appropriateness of the deductions and inferences made from test scores or measurements.

Scroggins et al (2008:188) state that 'The most important issue in HR selection testing is determining a test's validity.' According to Cascio (1991:145), these attempts to define validity are inadequate, as they imply that a procedure has only one validity measure which may be determined by a single study. Cascio (1991:147) maintains that numerous investigations are required if a thorough knowledge of the interrelationships between scores is to be achieved.

Muchinsky et al (1998:70) illustrate this by stating that a test may be highly valid for assessing employee productivity but yield unscientific predictive value for employee absenteeism. Furthermore, scores from measures of individual differences derived meaning only insofar as they can be related to other psychologically meaningful characteristics of behaviour. The process of gathering and evaluating the necessary data is called validation (Cascio, 1991:148). Cascio (1991:145) also highlights two issues concerning the various strategies of validation: (i) what is measured by the test, and (ii) how well it measures the relationship between scores from the procedure, and external criterion measure.

Binning and Barrett (1989:45) reiterate that the demonstration of the validity of selection decisions is of paramount importance to personnel, and to industrial psychologists. They argue that validity is a complex process that has evolved over the years and has resulted in viewing validity uniquely. This, Binning and Barrett (1989:45) say, has resulted in the prevailing confusion. They further proclaim that validity is a unitary concept, and that there are not different kinds of validity, merely different kinds of evidence for analysing validity.

Binning and Barrett (1989:45) argue for the single overriding inference that if a selection decision has to be made from currently available information about some future aspect of job performance, then content-construct and criterion-related considerations are all relevant when justifying validity.

Cascio (1991:67) concurs, stating that while validity may be obtained in different ways, it always refers to the degree to which the evidence supports inferences that are made from the scores. Cascio (1991:67) maintains that it is the inferences made from tests that are validated, not the procedure.

2.4.2.1 *Types of validity in tests and questionnaires*

The above discussion leads to the introduction of the three principle strategies for obtaining validity: content-related validity, construct validity, and criterion-related validity. The American Society of Industrial Organisational Psychology, as referred to by the Society of Industrial Psychology (1992), claims that these three strategies cannot be logically separated. Indeed, they are referred to as strategies to imply the interrelatedness of the approaches. Cascio (1991:151) agrees, saying that although the strategies can be discussed independently, they remain interdependent.

2.4.2.1.1   Content-related validity

'The test looks plausible to experts' (Cook, 2004:206)

Guion (1974:287) defines content validity as the use of the test scores to infer the levels of achievement that the persons, organisations or objects will exhibit in the total domain. This traditional view also probes the issue of whether or not the inferences are based on a measurement procedure that has a fair sample of the universe of situations it is supposed to represent (Cascio, 1991:280; Cook, 2004:207).

Edenborough (2008:50) says that the content validity refers to how the items in the test represent the aspects of the role or job.   Concern with the extrapolation of inferences from a sample to the population content-related measures, hinges on the adequacy of the sampling and thus implies a rational judgemental process (Cascio, 1991:279).

2.4.2.1.2 Construct validity

'The test measures something feasible' (Cook, 2004:212)

Muchinsky et al (1998:72) believe construct validity to be the most theoretical and complex as it is associated with the design of theoretical abstractions that we propose to measure behaviour. Edenborough (2008:51) states that the construct validity is concerned with the extent to which a test measures a particular construct or characteristic. The underlying phenomenon, known as a construct, is designed to exist within the items (Cook, 2004:212).

Cronbach and Meehl (1955:285) originally offered a definition of a construct to be, 'a postulated or hypothetical attribute of people that underlies and determines their overt behaviour'. The construct is not observable but is inferred from the subjects' behaviour and responses to situations or tests. Welman et al (2005:142) edify by stating that construct validity aims to ensure that the psychological instrument measures the intended construct and not irrelevant constructs or measurement error. Therefore, the construct validity of a test can be described as the extent to which a test is able to fit the pattern of relationships generated by other tests and measurements of behaviour according to the way that the construct dictates. Cascio (1991:162) explains the concept of construct validity as being the conceptual framework that specifies the meaning of a construct, distinguishing it from other constructs and indicates how measures of the construct should be related to other variables. Two methods have been used in research to establish the construct-related validity of a test or questionnaire. They are namely, the intratest method and the intertest method. The principles of these are outlined below:

Intratest method
This involves the examination of the internal structure of the test to determine its contents, the anticipated response pattern, and the relationship between items or sub-tests.

Intertest method

This involves the simultaneous assessment of the inter-correlations of a number of tests to establish whether or not the tests all measure the same construct.

To do this, three techniques have been used for the research, namely congruent validity, factor analysis, and convergent and divergent validity. The strength of the validity coefficient could be influenced by the following five factors:

- The reliability of the test.
- Contamination of criterion.
- The stability and accuracy of the calculation of the validity coefficient.
- Whether the range of distribution regarding individual differences in performance has been standardised within the sample.
- The length of the test (Bergh, Wolfaardt, Cilliers, Flowers & Kriek,1992:55).

Binning and Barrett (1989:481) purport that a single study cannot accomplish construct validity, and that it requires an accumulation of evidence derived from many different sources. This view is shared by the Society for Industrial Psychology (1992:22).

The society claims that two aspects are involved in construct-related strategies that have been created to determine the job-relatedness of a selection procedure. The first one is that evidence be built from sound job analysis. The second aspect, that there be evidence that the selection instrumentation is valid in terms of its ability to measure the construct.

2.4.2.1.3   Criterion-related validity

'The test predicts productivity' (Cook, 2004:208)

Criterion-related validity is defined as the extent to which scores on one variable, usually the predictor, may be used to infer performance on a different and operationally independent variable for the criterion (Cook, 2004:208; Aamodt, 2010:194). Muchinsky et al (1998:70) describe this form of validity as '…how much a predictor relates to a criterion' and identify two forms of criterion related validity, namely criterion related and concurrent. Moreover, there are three possible designs: the *predictive design,* the *concurrent design,* and the *retrospective design*.

All three designs involve similar paradigms where a relationship is established between the predictor performance and the criterion performance.   In a predictive study the work is future-orientated, involving a time interval within which the events can take place or how well a predictor can predict a criterion at the same time (Muchinsky et al, 1998:70). Welman et al (2005:144) explain that in a study of this nature the measurement of criterion-related validly is critical as it determines the degree to which selection tests correctly predict the relevant criterion.

These results in the criterion data become available only after the predictive scores have been obtained. A concurrent study is orientated toward the present, and reflects only the *status quo* at that time.   The criterion measure is, therefore, available at the same time as scores on the predictor (Cascio, 1991:161). Finally, the retrospective design is often referred to as shelf research because the data is taken from old records housed on the office shelf as the work has been conducted in the past. This data is then used to retrospectively assess the validity of the tests used in the study. Criterion-related evidence is required whenever measures of individual differences are used to predict behaviour. The outcome is that the researcher is able to test the hypothesis that test scores are related to performance on some criterion measure.

The focus of this study is on concurrent validity and predictive validity. The predictive validity of a test or questionnaire can be determined by three different methods validity coefficients, contrast groups and selection efficiencies.

Validity coefficients

The correlation is calculated between the test score and the criterion score and is generally interpreted in five different ways: in numerical size of the coefficient; the coefficient of determination; the standard error of estimate; the coefficient of alienation; and the index of predictive efficiency (Bergh et al,1992:51).

Contract groups

The purpose is to decide whether or not the predictor discriminates between contrast groups, which have been selected on the basis on the criterion (Bergh et al, 1992:51).

Selection efficiency

The predictive efficiency of a test for selection purposes is estimated. The aim is to determine the degree of success of the criterion on the basis of psychological test results. The most commonly used method is the Taylor-Russell Table (Bergh et al, 1992:52).

2.4.2.1.4   Rational validity

'Experts can make a fairly accurate estimate of what the test's predictive validity will be' (Cook, 2004:211)

Schmidt, Hunter and Pearlman (1983:166) requested twenty psychologists to examine six sub-tests from a Navy Basic Test Battery and, using their knowledge and experience, predict the estimated validity of each sub-test. They then compared the estimated with the actual measures based on a sample ranging from 3 000 to 14 000.

The psychologists' estimates proved to be fairly accurate, showing that by examining the items there is potential to predict validity based on experience and prior knowledge.

2.4.2.1.5   Faith validity

'The person who sold me the test was very pleasant' (Cook, 2004:207)

Often the lay person will be taken in by smooth talk, professional and glossy printing and presentation, and by psycho-babble used by test sales personnel.   These factors will, however, not necessarily indicate solid research and development (Cook, 2004:206).

2.4.2.1.6   Face validity

'The test looks plausible' (Cook, 2004:206)

On occasion a person can be persuaded to believe that the test measures what it purports to because it is labelled in a manner that indicates such. Or, the items include the construct in their questions. For example, people will believe the test measures dominance because it is called the dominance test or because the question posed include the word.

Face validity is not acceptable by itself, but has value in that it will make the test more desirable to employee and employer (Cook, 2004:206).   Edenborough (2008:50) shows concern in that if the face validity of the assessment is not solid, its credibility will come into question owing to the respondents finding the items bizarre and, therefore, not taking the process seriously.

2.4.2.1.7   Factorial validity

'The test measures two things but gives the 16 different labels' (Cook, 2004:213)

In this type of validity, the factorial analysis is useful but it is insufficient to measure what is the nature of the variables or their predictive power (Cook, 2004:213).

2.4.2.1.8   Synthetic validity

'The test measures component traits and abilities that predict productivity' (Cook, 2004:213)

This design will include a battery of tests, each measuring different aptitudes, which have been given separate validity measures. The tests are then administered independently, but compound validity for the grouped test is synthesised.

Synthetic validity is based on two principles: one being the need for job analysis to be conducted in order to identify underlying themes in the diverse jobs being assessed and therefore it assists in test selection. The other being that the validity, once determined for the theme tests across the workforce, can then extended to sub-sets of workers (Cook, 2004:213). Each type of validity design is appropriate under different circumstances. The concurrent study applies to the description of present status, not the prediction of future outcomes.

Furthermore, predictive studies are the cornerstone of individual difference measurement, and demonstrate objectively – through a statistical medium – the actual relationship between predictors and criteria in a given situation. Scroggins et al (2008:187) claim'…the most important property of a personnel selection test is the predictive validity or the ability to predict job performance, learning, and success.' The researcher who seeks to use a concurrent design is required to infer future job performance by inkling or calculated decision (Cascio, 1991:157).

2.4.2.1.8   Predictive validity

Often tests are used to predict the success of a candidate in a particular role or job with the rationale being that they will predict future behaviour and job performance. Understandably, Edenborough (2008:48) writes that this requires, 'effective, controlled research over a period of time', and will usually benefit from a fairly large sample size.

Equally, there are often problems with the performance criteria which are undefined, change over time, and are not supported by records. The obtained results of a psychological test are only useful if the test meets the validity requirements as described above. It should be noted that the development of a valid test will also require multiple procedures, used sequentially at different states of test construction (Anastasi, 1982:358).

The above statement emphasises the fact that validity should be built into a test from the start of construction and not merely in the final stages. It is generally accepted that tests and questionnaires used for selection purposes will hold validity coefficients that range between $r = 0,30$ and $r = 0,40$.

Criterion validity, however, has disadvantages in that the predictor and criterion information needs to be reaped from a large number of people who are presently doing the job, and in some cases this sample may need to be larger than the number of people actually in existence. This may result in sampling error and render the results inconclusive (Cook, 2004:209).

2.4.3   Criterion problem

Traditionally, personnel decisions have been concerned with the extent to which assessment information accurately predicts job performance, a process known as criterion-related evidence. Contemporary research (Swanepoel et al, 2003:281; Aamodt, 2007:191; Scroggins et al, 2008:185;) contends that evidence must be reaped to prove that the predictor is related to the criterion measure, as well as evidence that the operational criterion measure should be rated to the performance domain from which it originates.

Binning and Barrett (1989:484) have provided a framework for the identification of the postulated 'criterion-problem'. They propose that the 'criterion-problem' has resulted from the tendency to neglect the development of adequate support of inferences between the operational criterion measure and the performance domain it represents; between the performance domain and the underlying psychological constructs; and between the performance domain and the actual job.

The criterion-problem leads to the development of criterion measures that are less rigorous than predictor measures, and performance criteria that are less deeply embedded in networks of theoretical relationships than are constructs on the predictor side. Cascio (1991:158) cautions that any predictor measure would be no better than the criterion used to establish its validity, and that mostly, criterion measures are only assumed to be relevant and valid.

The accurate identification and description of the job criteria that ensures success is paramount, but not tantamount, to validity. Nevertheless, the scientific value of a study is threatened if the predictor measure is statistically weak, making the choice of predictor measure(s) equally important, as will now be discussed.

2.5   SELECTION TECHNIQUES TO ASSESS MENTAL ALERTNESS,
        PERSONALITY TRAITS, PSYCHOMOTOR ABILITY AND WORK
        PERFORMANCE

Against the backdrop of the growing demand for affirmative action and accelerated managerial development programmes, there has been a rekindling of interest, and circumspect, regarding the role of psychometrics in personnel selection and assessment (Magwaza,1995:13; Edenborough, 2008:1; Scroggins et al, 2008:185; Aamodt, 2010:203; Cascio, 2010:239).

In keeping within the parameters of the study, the next section will examine the various techniques that can be used to measure an individual's mental alertness, personality traits and psychomotor ability potentials. A description of each construct will precede the discussion.

2.5.1   Selection techniques that assess mental alertness

2.5.1.1 *What is mental alertness?*

In 1890 an American psychologist, Cattell, introduced the term 'mental test' into research and focused his work on sensory discrimination and candidate reaction time (Muchinsky et al,1998:75).   Sternberg (1982:225) highlights that there are seven components that comprise intelligence; these components are the 'primary mental abilities' of an individual.   These include verbal comprehension, verbal fluency, numeracy, spatial visualisation, memory, perceptual space, and reasoning. Cascio (2010:248) simplifies this by claiming there are three core domains of mental ability: verbal, non-verbal, and numerical skills.   Thus, mental alertness is not a recognised component of intelligence (Sternberg, 1982:235).   To be more specific, mental alertness is the lay term for reasoning potential. Therefore, the true question revolves around what is reasoning?

Reasoning is defined by Sternberg (1982:235) as a set of thought processes that concentrate on the structure, rather than the content of organised memory during the process of information or retrieval, and the subject's ability to answer a number of different types of items (Cook, 2004:92). Of equal importance, is the distinction between the various descriptions of higher level mental processes encountered in the discussion, namely reasoning, problem solving, and intellect.   Reasoning research makes use of problems in logic, where the logicality or otherwise is of prime importance when assessing the subject, whereas problem solving involves activities that are goal directed, sequenced and discernibly cognitive.

Finally, research into intellect has centred on the difference between individuals, and the nature and number of the components that make up those individuals' intelligence. Earlier work in the area of reasoning led theorists to distinguish between two different types of reasoning, namely inductive reasoning and deductive reasoning:

'In inductive reasoning, the information contained in the premises of a problem is insufficient to reach a conclusion' (Sternberg,1982:235)

Inductive reasoning involves the individual in the cognitive process of reasoning from part to whole or from specific to global.   The most common kind of inductive reasoning problem is that of inducing structure, for example series completion, classifications, and analogies. These abilities are usually referred to as 'fluid' abilities as they resemble problem solving behaviours and form an integral part of intelligence from a lay point of view, for example reasoning logically and well:

'In deductive reasoning the information contained in the premises of a problem is logically (although not necessarily) sufficient to reach a valid conclusion'. (Sternberg, 1982:254)

Deductive reasoning problems have not been used in psychometrics as widely as inductive ones. A definition of deductive reasoning reads as a problem situation where subjects – being influenced sufficiently by their experience – decide, when presented with two premises, whether a given conclusion follows logically from those premises, i.e. a syllogism (Eysenck, 1984:54).

Any number of problems may be approached from a deductive standpoint, but three major types are generally addressed through deductive reasoning, namely linear, categorical and conditional syllogisms. In linear syllogisms an overlap is seen between two premises, each describing the relationship between two items.

The individual is tasked with deducing a relationship between items not occurring in the same relationship, whereas categorical syllogisms contain three declarative statements, each describing a relationship between two sets of items. Here, the individual is tasked with deducing, from the given relationship, an unknown relationship. Finally, the conditional syllogism holds three declarations, and the individual's task is to determine truth or falseness of either of the antecedents.

The forms of reasoning may be accounted for by two theories, firstly, the explicit theory of intelligence, and secondly, the implicit theory. Explicit theories of intelligence are tested on data collected while people are performing tasks that are considered to measure intelligence.

This category of explicit theory of intelligence is further split into the differential theories and cognitive theories. The differential theories apply to inductive and deductive reasoning in that they attempt to determine individual differences in terms of a set of underlying abilities or components, as previously listed (Sternberg, 1982:255).

In the componential analysis of intelligence, differences in intellects are attributed to the effectiveness with which general components are used e.g. reasoning (Eysenck, 1984:22). Since these components are a common denominator in all human tasks, the measurement of the use of these components may predict universal task completion. To enact these tasks, the individual must decompose reasoning into 'inferring' the relationship between the variables, 'mapping' the higher-order relationships between the components of the variables and 'applying' the inferred relationships as mapped. This process has been shown to be general across various kinds of task problems. This commonality has been instrumental in the formulation of the general factor '*g*' of intelligence (Anastasi, 1983:347; Cook, 2004:10).

The above argument leads to the conclusion that it is scientifically sound to claim that the measuring of inductive and deductive reasoning has pertinence when attempting to determine an individual's ability to complete tasks.

2.5.1.2 *Non-test techniques that assess mental alertness*

(a)   Business games

Cascio (1991:325) describes this method of selection as a 'live' case. In this method candidates are required to simulate a business exchange under circumstances as parallel to actuality as possible. Business games appear to have utility for assessment purposes although they seem less valuable as training devices. For example, Wolfe (1976:49) as stated in Cascio (1991:326) argues that the business game is effective in creating understanding regarding basic strategy, goal setting and the management of behaviour within the organisational context. Business games do not, however, initiate any form of deliberate or objective strategic thought, nor do they generate an experiential handle for candidates in the domain of systematic control or the management of information systems.

It has been suggested that the business game sometimes generates masses of data from which no inferences can logically be drawn, and hence no predictions can be made concerning future job performance. Variations of this method have attempted to measure the cognitive base of managerial performance, in other words the 'how' of thinking and behaving. The research undertaken indicates validities as high as r= 0,50 to r= 0,67 between performance and self-report scales of success after the use of business games as a selection method. However, further research indicates that when the business game score is added as an additional predictor, the multiple of R increased from a predictive validity of r= 0,28 to r= 0,39.

In conclusion, it would appear that the appropriate manner in which to use the business game is to present simulations that involve a managerial task environment and to also include a diverse activity schedule, for example, strategising, planning, timeliness of response, pro-active decision-making, information search and the use of Strengths, Weaknesses, Opportunities and Threats (S.W.O.T) analyses (Cascio, 1991:325.

2.5.1.3   *Test techniques that assess mental alertness*

(a)   Cognitive ability tests

After examining three large data bases for evidence Ghiselli (1973:469) and Hunter (1986:345) conclude that general cognitive ability predicts performance ratings in all lines of work, although validity is much higher for complex jobs than for simple jobs. Furthermore, they report that general cognitive ability predicts training success at a uniformly high level for all jobs. Schmidt and Hunter (1981:1131), Hunter (1986:345) and Aamodt (2007:158) go further still, and present evidence that cognitive ability tests are valid predictors of successful performance for all jobs in all settings.

Moreover, these authors maintain there is no other predictor as reliable as general cognitive ability for selection in all jobs where training follows hiring. Therefore, if general cognitive ability alone is used as a predictor, the average validity across all jobs would be *r*= *0,54* for a training success criterion. Muchinsky et al (1998:81) caution that specific measures of ability are useful but also advise the assessment of general ability. Schmidt and Hunter (1981:171) conclude that, contrary to popular belief, aptitude tests are valid across jobs, and that the moderating effect of tasks is negligible, even when tasks differ markedly, and non-existent if task differences are less extreme.

In the United States Employment Service study, where the General Aptitude Test Battery was used, Hunter and Hunter (1984:75) and Hunter (1986:343) referred to the validations findings. The principal finding for the prediction of job proficiency was that although the validity of the general aptitude tests varies across job families, it never approaches zero. The validity of cognitive ability as a predictor decreases as job complexity decreases, and the validity of psychomotor ability as a predictor increases as job complexity decreases.

(b)   Achievement tests

These are also known as trade or job knowledge tests and are comprised of short occupational based tests that are predictive of an applicant's ability to successfully pursue a career in a particular job field. These tests are widely used in the assessment of apprenticeship candidates.

(c)   Aptitude tests

These tests are commonly used to assess latent potential in candidates and will focus on mechanical, clerical, computer programming and dexterity aptitude in order to predict job success.

(d)   Creativity or divergent thinking

The candidate's ability to think in creative and divergent ways is assessed to determine their potential to perform in jobs that demand such acumen. The belief is that many problems can be solved better by viewing them from different angles.

(e)   Social intelligence

The ability to get along with others is viewed as a vital component of competent staff members and attempts to measure this have been in existence since as early as 1926 (Cook, 2004,94). These tests include using photos, written descriptions and drawings to describe interpersonal problems, and then assess how the candidate solves them.   Once again, however, when correlated with tests of general intelligence the findings were not strong.

(f)   Emotional intelligence

Emotional intelligence is defined as the ability to perceive, appraise and express emotion within a given context. Research has proven that employees, especially managers, need to display empathy, self-awareness, self-motivation and sociability to function well in their positions (Goleman,1998:9; Cook, 2004:94; Cascio, 2010:52).

Emotional intelligence has become a fashionable topic in the popular press, and has been heralded as an effective predictor of successful performance. However, little empirical evidence has borne out these claims. A study was conducted in order to determine the relationship of emotional intelligence, cognitive ability, and personality with academic achievement. Both cognitive ability and personality were significantly associated with academic achievement (Newsome, Day, & Catano, 2000:1110).

(g)   Situation judgement

This type of testing refers to the ability of a person to exercise rational judgment or common sense in a situation. These tests have proven to correlate well with measures of work performance $r= 0,34$ and general mental ability $r= 0,39$ (Cook, 2004:95).

(h)   Computerised testing

These tests are usually variants of paper-and-pencil tests which have been adapted and formulated into computer based versions. All the necessary instructions on how to undertake the test are included and the designers usually build in software to score the test, thus resulting in instantaneous feedback for the respondent (Cook, 2004:95; Aamodt, 2007:196).

(i)   Internet testing

Here the tests are completed over the internet and they usually include on-line assessment of respondents' personality or their ability to perform specific tasks. Although these tests are growing in popularity, they pose a number of problems as the control over the process is weak (Cook, 2004:96; Aamodt, 2010:127).

(j)   Video-based testing

This method of testing allows more richness as it enables the tester to include sound and moving pictures, which is ideal for assessing social skills and emotional maturity (Cook, 2004:96).

(k)   Biological testing

Testing of this nature falls into the arena of psychophysiology and uses speed of reaction and multiple-choice reaction time to assess respondent mental alertness levels. It is claimed that this form of testing holds promise as it may assist in the future to avoid cultural bias on tests (Cook, 2004:96; Kronenberg, Lange & Toland, 2010:1).

(l)   DNA testing

Research has already identified genes that are associated with a candidate's mental ability. This type of testing is likely to remove bias, test anxiety and many problems associated with measurement because the psychologist will be able to measure mental ability from a cheek swab (Cook, 2004:96).

2.5.2   Selection techniques that assess personality traits

Carson and Butcher (1992:265), turn to the DSM-IIIR to define personality traits as 'enduring patterns of perceiving, relating to, and thinking about the environment and oneself, and are exhibited in a wide range of social and personal contexts'. This definition is reflected by various classical theorists who have undertaken work within the realm of personality (Cattell et al,1970:10).

These classical theorists have put their theories into practice through the measurement of these personality traits. One of the most widely used measures is the 16 Personality Factor Questionnaire designed by Raymond Cattell in 1947. The researcher has, therefore, chosen to discuss personality traits from a factor analytic viewpoint. This decision was made because the instrument used to measure personality traits in the empirical phase of the study is Cattell's 16PF, and partly because Cattell, together with Eysenck (1970) is regarded as the foremost advocate of the development of a factor analytic theory.

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This approach is not intended to detract from the value or importance of the other paradigms, e.g. phenomenological and psychodynamic, from which personality may be measured. Cattell's aim was to be able to predict human behaviour by considering all the factors or traits that influence it. Cattell (1965:389) states that 'The personality of an individual is that which enables us to predict what he will do in a given situation'.

Furthermore, Cattell (ibid) believes that these traits are the foundation of personality, describing a trait as a reasonably stable and wide ranging behavioural tendency which can be deduced from an individual's behaviour. He splits these personality traits into two groups, the surface traits and the sources' traits.

Surface traits are unstable, apt to change, and occur due to circumstance. They are usually observable behaviour characteristics such as kindness or aggressiveness, and are not considered to have a causal basis in genetic determination.

The source traits are the building blocks of personality. They are the traits which surface and express themselves as personality manifestations, and are the factors that are determined by factor analysis, which shows them to be the determinants of an individual's personality.

It is hypothesised that these factors have a causal basis in biological and genetic determination (Meyer, Moore & Viljoen,1997:411). Although the temperament and stylistic traits of an individual are indicated by the surface and source traits, it is also important to consider the motivational traits in order to understand why the individual behaves in a manner that they do. Cattell et al (1970:5) generated a theory of motivation as 'dynamic calculus'.

The basic traits observed in this theory are the individual's attitudes and interests as prescribed in the paradigm:

> In these circumstances (stimulus) I (organism) want (need) so much (intensity) to do this (direction) with that (object).

This paradigm applies that attitude is a primary motivator in a basic form, i.e. a wish or desire. The attitude is, in turn, seen as quantifiable and measurable. The need for measurement is not isolated to the motivational traits, namely, interests and attitudes, but is extended to include the surface and source traits which measure the individual's temperament and style (Meyer et al, 1997: 118).

2.5.2.1 *Nontest techniques that assess personality traits*

(a)   Interviews

Although structured interviews prove to be superior, the tool remains a poor predictor of job performance (Aamodt, 2010:134). Reilly and Chao (1982:43) show that 12 validity studies had validity ratings on average of $r = 0,19$; and Hunter and Hunter (1984:72) conducted a meta-analysis which yielded a validity of $r = 0,14$ when the interview process was used as a technique to predict supervisory ratings.

Further research reported validity coefficients of less than $r = 0,50$ for interviews were the rule, and validities of less than $r = 0,30$ were common. They concluded that the interview technique was deficient in terms of both reliability and validity.

Various protagonists have argued that restriction of range has caused poor validity coefficients. This restriction is caused by the validity being calculated from a sample of successful applicants only. For this reason, Hunter and Hunter (1984:72) conducted a meta-analysis to correct the restriction of range and increase the estimate of the mean validity.

The results indicated a shift from $r= 0,14$ to $r= 0,22$. For a number of decades industrial and organisation psychologists have been studying the employment interview in an attempt to warrant its use. They found reliability to be dubious and disappointing especially considering that employment interviews are directed towards obtaining information and impressions about the candidate that serve as a predictive base for employment decisions (McCormick & Ilgen, 1989:107).

Magwaza (1995:14) queries that interview practices persist in the face of this evidence, and offers two reasons for their inclusion into the selection process. The first is that interviewers rarely receive feedback and so overestimate the effectiveness of their judgements. The second is that interviewers may feel more confident to use the easier interview, rather than apply more difficult techniques such as psychometric testing.

 (b)   Leaderless group discussion

The method used in this selection technique is to allow a group of participants to carry on a discussion about some topic for a period of time. There is no leader, as implied by the title, and assessors or raters sit outside the group and do not participate within the discussion. The reasoning is that by remaining free to observe and rate performance they are more able to execute these duties with accuracy and efficacy.

Face validity is enhanced if the discussion revolves around job-related topics and each participant's role is defined and structured. Usually, characteristics are rated on a five-point scale that illustrates effective, as opposed to ineffective, leadership behaviour (Cascio,1991:323).

Encouraging inter-rater reliabilities have been achieved, averaging $r= 0,83$. Test-retest reliabilities of $r= 0,72$ and $r= 0,62$ have been reported by studies conducted by other researchers, where behaviours are described rather than evaluated in terms of presumed underlying personality characteristics (Cascio,1991:323).

Validity measures in terms of training performance and job performance have been disappointing, with training performance validities of $r= 0,24$, indicating a medium correlation of $r= 0,38$ for job performance. One of the benefits of the leaderless group discussion is that large groups of candidates may be split into smaller groups, who rate each other. This is particularly effective when dealing with military trainees or job incumbents in vast organisations. In these cases, reliability and validity levels were considerable – peer ratings yielded a correlate close to $r= 0,90$ or higher when compared to ratings conducted by trained observers.

2.5.2.2 *Test techniques that assess personality traits*

(a)   Personality questionnaires

While results obtained from the use of personality measures in forecasting supervisory effectiveness have generally been negative, with their recent research yielding a validity of $r= 0,14$, other studies have proven more worthwhile (Cascio, 1991:313). Grimsley and Jarnett (1973:45) achieved higher validity coefficients by combining tests into a battery for verbal reasoning, numerical ability, general activity, and personality. The validity coefficient of the personality measure was $r= 0,52$ and, when combined with the other scores, it rose to $r= 0,61$ (Cascio, 1991:313).

Much of the success was attributed to the test designs, equally valuable were the findings of the Standard Oil Company's project, where the study was conducted under production conditions rather than research conditions.

Recent research has lead to the inclusion of the big five personality dimensions in personality inventory design as a means of predicting career success. According to Cook (2004:153) 'Career success is measured by salary level or status…' and is a better long term predictor of job proficiency than conventional indices. Proponents of this thinking claim that there are not 16 factors, but rather five, which include neuroticism, extraversion, openness, agreeableness and contentiousness (Cook, 2004:139).

These research findings agree with earlier research that has shown that people in particular occupations tend to have certain personality characteristics that lead them to choose similar jobs (Lancaster, Colarelli, King and Beehr, 1994:310). Borman, Rosse and Abrahams (1980:665) identified certain personality 'constructs' of job incumbents that could serve as links with 'criterion constructs', and thus paved the way for the use of construct-validity in this arena. Criterion-related validity also has a role to play within this ambit.

McCormick and Ilgen (1989:110) describe a study that utilised two inventories on a group of managers and non-managers which showed that the basic personality and interest test results did predict group membership in 74% of cases. Ghiselli's (1966, 1973) work on the validity of various types of tests for a collection of jobs indicated mean validity coefficients of $r = 0,35$ for sales clerks and sales personnel, and $r = 0,30$ for executives and administrators.

Despite this encouraging research, personality variables are not always related to job performance and their use may prove confounding and impractical. It seems that the only statement that can be made based on knowledge regarding the use of personality inventories is that their validity has been clearly demonstrated (McCormick & Ilgen, 1989:98; Muchinsky et al, 1998:83).

(b)   Projective techniques

The concept of projection testing is rooted in the work of Freud and other nineteenth century psychoanalysts (Edenborough, 2008:32). Validity and reliability measures for the use of projective tests have yielded averages of only $r= 0,18$, and would therefore appear to be of little predictive use to the psychologist.

General thinking, however, dictates that these tests do have a role to play in selection if incorporated into a battery and not used as a stand alone measure. The Rorschach Test has been reported as yielding reliabilities 'in the order of r=$0,83$ and higher, and validity coefficients of $r= 0,45$ or $r= 0,50$' (Parker,1983:227). The Minor Sentence Completion Scale is used extensively to measure the motivational levels of potential managers.

 The test is made up of 40 items, of which 35 may be scored and these have yielded inter-correlations that range from $r= 0,11$ to $r= 0,15$, and reliabilities that measure $r= 0,90$ and above. Validity coefficients for this test have measured as high as $r= 0,69$ and have afforded significant results in over 25 studies (Cascio,1991:56).

The Thematic Apperception Test (TAT) has predicted managerial progress over a sixteen year period and has reported correlations of $r= 0,75$ and, when combined with leadership ability assessment techniques, correlations of $r= 0,33$ have been measured, which is impressive (Cascio,1991:127). In view of the results discussed above, projective tests merit closer attention and further research with regard to their role and capacity to assist in selection.

(c)   Behavioural assessment techniques

Leadership ability tests

Ohio State University was at the cutting edge of the establishment of instrumentation to measure, and therefore predict, leader behaviour. They compiled the Leader Behaviour Description Questionnaire and the Leader Opinion Questionnaire, which were used to assess present leader behaviour, and to predict future leader behaviour on the job (McCormick & Ilgen,1989:67).

Later, they added the Supervisory Description Questionnaire, and by 1974 research indicated that the relationships of leader behaviour to leader effectiveness were less than clear (McCormick & Ilgen,1989:67; Cascio,1991:25). Although the instruments have been utilised for twenty five years, no conclusive validity or reliability statistics concerning their predictive value have been established. When researchers began studying leader behaviour, certain reservations developed about the predictive ability of this construct in relation to job success.

These reservations included the realisation that no simple relationship exists between leader behaviour and effectiveness, and inconsistent findings relating to leader behaviour measurement may have been caused by inconsistency within the questionnaires.

Finally, the directional causality between leader behaviour and effectiveness is not as closely related to group response as previously posited. For example, assume that consideration behaviour correlates positively with group performance in some settings, whereas at the time of the tests, the leader may have decided to show more considerate behaviour than normal. Therefore, it is not possible to tell from field research whether there is a positive correlation between consideration behaviour and group performance, because leader behaviour may give rise to performance, or vice versa (McCormick & Ilgen,1989:318).

Future research will probably continue to build on situational moderator theories, and perhaps in time the discipline will see the yielding of scientific validity and reliability predictive values for leadership ability tests.

Observation

The root of this method is primarily the behaviouristic perspective where the scientific observation of behaviour that takes place in real life situations. The method differs from casual observation in that the behaviour is recorded, and in time compared to other behaviours in order to draw conclusions or hypothesises about the causes of the behaviour. The observation may be unobtrusive, as in the use of one-way mirrors, or obtrusive where the participants are fully aware of the process taking place, for example a group discussion.

Observation lends itself to a number of people being involved in the work and these assessors can be trained to use an intervention known as critical incident technique to list recurring behaviours. These behaviours are then used to identify certain traits, dispositions, or patterns of behaviour that can be described and culminate in the measurement of personality (Bergh & Theron, 2006:458).

Biographical ratings

The underlying rationale in this method of personality assessment is that past events and behaviour can be used to predict future events and behaviour. The biographical information of the person is reaped via questionnaires and then this information is rated using a scoring process. The scores given to each item are based on the belief that personality can be explained in terms of what people have learned and experienced in their lives, and more importantly how they managed these experiences.

Interestingly, research suggests that this method of measuring personality is more powerful than personality questionnaires, thus indicating that this method should be used more extensively. Understandably, for the scientist, the main concern with this method is the authenticity of the data provided (Cascio,1991:319).

(e)   DNA

There is growing scientific evidence that personality as measured by inventories has a substantial heritable element (Cook, 2004:205). This means that, in time, skin and saliva samples will be able to yield personality traits through the identification of certain genes. It is claimed that personality assessment of this nature will revolutionise genetic research on personality as it measures genetic links between personality traits and between biological mechanisms, and identifies correlations between genes and environment.

With regard to training people the belief is that one set of genes establishes the brain's ability to train itself to 'recognise' certain aspects of the environment. Then, another set of genes develops the brain's circuitry to exploit this recognition ability, to predispose our reaction when the situation is detected (Hawkins, 2010:1).

2.5.3   Selection techniques that assess psychomotor ability

What is psychomotor ability?

The psychomotor domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practise and is measured in terms of speed, precision, distance, procedures, or techniques in execution, and includes the interaction of the cognitive and psychical ability. The seven major categories are listed from the simplest behaviour to the most complex.

These include finger dexterity, manual dexterity and control precision, multilimb coordination, response control and reaction time, arm-hand steadiness, wrist-finger speed, and speed-of-limb movement Aamodt (2010:172). Research has indicated that the assessment of psychomotor ability is considered to be predictive for certain jobs such as sewing machinist, post office clerk or truck driver (Aamodt, 2007:158).

Furthermore, meta-analysis studies conducted in Europe noted a coefficient of $r = 0.40$ (Aamodt, 2007:179). In a study conducted for the US Department of Labour, Hunter (1986:359) found that, on re-analysis of the data, two scores predicted job performance, namely general intelligence and psychomotor ability. This mirrors other research findings where the average co-efficient measured $r = 0.51$ for cognitive ability and r = 0.39 for psychomotor ability. According to Bloom (1956:n.p.) there are seven categories into which the psychomotor domain can be divided. These categories are listed below:

> *(i) Perception* refers to the ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation. This is where the brain detects non-verbal communication cues.

> *(ii) Set (or mindset)* refers to the readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a person's response to different situations.

> *(iii) Guided response* is the early stages in learning a complex skill which includes imitation and trial and error. Adequacy of performance is achieved by practising.

> *(iv) Mechanism* is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency, for example driving a car.

(v) Complex overt response involves the skilful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance.

(vi) Adaptation is where the skills are well developed and the individual can modify movement patterns to fit special requirements.

(vii) Origination requires creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasise creativity based upon highly developed skills.

Research conducted at the Human Resources Research Centre in San Antonio, Texas, has identified five factors that account for an individual's performance in tasks that are related to that of a machinist. These factors include finger dexterity, manual dexterity, wrist-finger speed, aiming, and positioning (Dominic & Brandy, 1995:313). Tests are constructed to assess an individual's psychomotor ability. These tests are very important for assessment of basic psychomotor skills in order to be a successful operator. These tests of an individual's psychomotor ability include:

(a)   O'Conner's Tweezer Dexterity Test

The O'Conner Tweezer Dexterity Test, which accurately determines whether an individual will be able to perform the task of hair graft placement with speed and precision. Since utilising this test during the interview process they have been found to be an invaluable screening tool (Dominic & Brandy, 1995:313) .The early norms of this test were based for the most part on the performance of factory employees and applicants.

Dominic & Brandy (1995:315) claim that higher levels of dexterity may belong to persons who are successfully engaged in doing intricate assembly work. The test measures the speed with which an individual can pick up pins or similar small items with tweezers, one at a time and place them into holes. This requires an individual to have fine hand-eye coordination.

The O'Conner Tweezer Dexterity Test has been found to be an extremely useful tool for indentifying less-able job seekers applying for positions as surgical assistant in a hair surgery practice. By using the O'Conner Tweezer Dexterity Test as a screening tool, the hair restoration surgeon can reduce the incidence of hiring the incorrect individuals who are not able to perform this very fine and tedious work. He or she will also reduce the incidents of assistants quitting because of frustration. Because this work requires such a high level of dexterity, it is the surgeon's responsibility to find individuals with the highest level of skill possible (Dominic & Brandy, 1995:315). In terms of the sewing machine operator, the same concept would then suitably apply.

(b)   Purdue Pegboard Manual Dexterity Test

The original application for the test was for testing the dexterity of industrial assembly line workers. The procedure measures dexterity for two types of activity: one, involving the gross movement of arms, hands, and fingers; and the other in primarily fingertip dexterity.

The reliability of the Purdue Pegboard test is high and is considered a standard test, against which other dexterity tests can be measured to determine their reliability. It was standardised after extensive experimentation in a variety of industrial settings and jobs using thousands of employees as subjects.

(c)   Pin Board Test (PBT)

In these assessments, one is able to assess the ability to do fine work with the fingers. It tests the ability to make rapid finger movements, neatly, accurately and with sensitivity. It tests both right and left hand ability.

(d)   Ball and Tube Test

By simply using a ball tube stand, boxes and balls, this test assesses an individual's main manual psychomotor ability together with finger dexterity. The individual being assessed would need to throw as many balls in the box within the stipulated time-frame. This would need to be done with both hands.

(e)   Visual Accuracy Test

This test measures the visual accuracy as well as the speed at which an individual performs. There are many versions of this test, however the aim essentially is to test how quickly and accurately the individual can visually determine things.

(f)   Colour Perception Test

This test is conducted to analyse the colour sensitivity of the applicant. In this test machinists are asked to differentiate and rank different shades of the same colour in ascending order. Another way of conducting this assessment could be to give the individual cones of thread of different colours as well as blocks with the same colours and ask the individual to match the thread to the block of colour.

(g)   Minnesota Rate of Manipulation Test

The Minnesota Rate of Manipulation Test or Minnesota Manual Dexterity Test is a series of tests of eye-hand coordination and motor abilities.

The test package is commonly used in the evaluation of occupational fitness, disability evaluation and in rehabilitation. This test is applicable for workers in occupations requiring quick movement in handling simple tools and production materials without differentiating between size and shape.

The Minnesota Rate of Manipulation Test measures the speed of gross arm and hand movements during rapid eye-hand coordination tasks. The testing kit includes two folding boards and sixty blocks. The complete test consists of a battery of five sub-tests: Placing, Turning, Displacing, One-Hand Turning and Placing, and Two-Hand Turning and Placing. The tests are performed while standing, and each candidate is given a practice session. Then each test is conducted three to five times. Both hands can be tested and compared. There are several variations of the tests, you could test eye-foot dexterity for those with no upper limbs and it is also possible to use it with blind people.

(h)   Sew-a-bag Test

The test measures the ability of the candidate to use their eyes, hands, feet and knees to operate a sewing machine. The aim of the test is to predict the candidate's ability to successful complete a training programme regarding how to sew garments using a lockstitch machine. The test takes approximately one hour, allowing the candidate time to settle on the machine.

In the first thirty minutes the candidates is allowed to 'practise sew' on a circular piece of fabric without a needle being inserted in the needle bar. Then, once the candidate is comfortable with operating the treadle the test commences using pieces of fabric cut into the shape of a bag.

The applicant is required to align two pieces and then sew them together with a one-centimetre seam on three sides. The instructor follows a standard set of procedures, instructions and demonstrations during which the applicant is free to ask questions.

The applicant is asked to perform the task unaided. The instructor records the errors on a standardised error checklist (Downs, 1973:56). On completion, the sewn bags are examined against a quality standard and then rated according to an A to E scale (Downs, 1977:23). Later research conducted by Robertson and Downs (1979:44) and Robertson and Downs (1989:404) showed promising results with correlations and validity coefficients as high as $r = 0,50$.

(i) Work sampling

One of the most common methods of assessing candidates' potential performance in a job is work sampling, also known as situational testing. The motor-skills test measures the applicant's ability to psychically manipulate and control objects to evaluate the applicant's ability to perform actual job-related tasks. A sewing machinist may need to sew a seam on a skirt; or a brick layer may be requested to lay a series of bricks. As work sample tests are accurate simulations of the actual job, it means that these test are difficult to fake (Cascio, 2010:255).

Work sampling is so effective at predicting job success that Cascio (2010:255) reports that a study that used it as a selection tool for government jobs saw labour turnover reduced from forty percent to three percent within 26 months. Work samples are excellent methods of selection as they are directly related to the job and therefore possess high content validity.

Furthermore, excellent criterion related validity is achieved because the scores are predictive of actual work; research has shown high face validity because the applicant can see the link between the intended job and the test. This has led to work sampling being challenged less frequently in court cases because the applicants felt more comfortable with their scores. Work sampling has attracted less court attention in the US as work sampling tests have lower racial differences in test scores (Aamodt, 2010:165).

The perceived fairness and criterion-related validity of work sample tests has contributed to them becoming paramount in South Africa owing to the racial mix of its workforce and the need to not discriminate based on racial grouping (Bendix, 2010:146).

(j) Trainability testing

Work sampling is usually used to predict work performance in people who know how to perform the job. When the assessment of psychomotor ability using work sampling is used to predict the candidate's potential to be trained, researchers refer to the process as trainability testing (Cook, 2004:194). Trainability tests are a sub-test of work sample testing and measure the ability of an applicant to learn a new job, and as such they are extensively used in skills training centres to predict trainability. The instructor uses standardised instructions, which they demonstrate, and then rate the trainee's performance using a behavioural checklist.

Research has found that the most effective way to predict trainability is to include some method of teaching and learning into the predictor measures to observe training behaviour as a further predictor of future work performance (Robertson & Downs,1979:43). Work done in the field of sewing machinist selection by Downs (1973:27) produced good correlations using trainability testing with correlations measuring r= 0, 39 on the lockstitch machine, r= 0, 48 on the overlock and r= 0, 78 on the linking machine.

Meta-analysis studies predicted training success r= 0,39 - 0,57 better than it predicted job performance r= 0, 20 - 0,24. Overall, the studies proved that psychomotor ability, measured by trainability tests, reflected a high correlation between test and criterion. Furthermore, the research showed that high scorers on the trainability test were more likely to accept sewing machinist positions than the low scorers, as people undergoing trainability testing assess their own performance even if they are not given their scores (Cook, 2004:195).

In fact, in Downs's 1970 study, 76.9% of applicants who were offered positions despite having performed poorly on the trainability test failed to report for duty (Downs, 1970:27). Moreover, Muchinsky (1993:379) reported a concurrent criterion-related validity coefficient of 0,27 when using a mechanical comprehension test to predict employee performance in a manufacturing environment.

2.5.4 Selection techniques that assess work performance

(a) Work sample tests

Over the past twenty-five years, researchers have attempted to produce valid predictors that are as similar as possible to the desired correlation behaviours. Rather than making use of psychological tests, this research has explored the extent to which realistic 'samples' of work behaviour can be used as predictors of subsequent job performance.

This approach, work sampling, involves identifying a task or set of tasks that are representative of the job in question, and then using these tasks for pre-employment testing (Robertson and Downs,1979:42; Cook, 2004:192; Aamodt, 2010:178). Within the area of supervisory selection, situational tests are designed that assess two types of criteria. Firstly, group exercises are used to assess the successful completion of a task that requires interaction between group members, and secondly, individual exercises are used where completion of a task assesses initiative and planning (Cascio,1991:322). Validity coefficients were obtained from a total of sixty validation studies.

Research by Cascio (1991:322) showed that work sampling indicated validity coefficients in relation to psychomotor (mean validity of $r= 0, 39$) and job-related information (mean validity of $r = 0,40$). More recent work has yielded a similar co-efficient of as $r= 0,41$ (Aamodt, 2010:195).

An unresolved question is the extent to which work sample tests and pencil-and-paper tests predict overlapping or independent aspects of criteria and performance. In essence, if work sample tests and pencil-and-paper tests predict overlapping aspects of criterion space, it seems pointless to use both in a selection procedure. If, however, they predict independent aspects of criterion space, they could produce significant improvements in predictive validity when used together.

2.5.5   Selection techniques that assess mental alertness, personality traits, psychomotor ability and work performance

2.5.4.1   *Individual assessments*

This involves a psychologist being employed to evaluate an individual in an attempt to make a personnel decision. This is a common activity for industrial psychologists, especially in the areas of recruitment and selection, promotion or demotion, and training and development. The techniques incorporated will include biographical data, ability tests, personality and interest inventories, and interviews (Edenborough, 2008:125).

Regarding the predictive strategies used, pure statistical assessment is not common. Instead, a clinical approach where feedback is given in oral form is favoured, which includes a narrative description of the candidates' strengths and weaknesses, training and development needs, and, possibly, projected career pathing. Studies to date have yielded no empirical measures for validity and reliability. However, the coefficients that have been recorded for the various techniques that are used for example, biodata, cognitive ability test, work sample tests, etc. would offer a guideline for composite reliability and validity coefficients (Cascio,2010:245).

5.4.2   Assessment centres

'An assessment centre is a procedure that uses multiple assessment techniques to evaluate employees for a variety of manpower purposes and decisions' (Thornton & Byham,1982:3) As noted by Cascio (1991:327) it 'brings together many of the instruments and techniques of managerial selection.' The rationale behind an assessment centre is that exercises are designed that simulate workplace situations that the candidate is likely to encounter when doing their job.

The individual's behaviour is observed and measured and is seen as a predictor of actual job performance (Edenborough,2008:41). World War Two saw the German military psychologists introducing the concept of multiple assessment procedures for groups of individuals. Their belief was that to merely expose candidates to paper-and-pencil tests neglected the holistic nature of human beings, so they decided to use a method where the entire complex of human behaviour may be measured (Aamodt, 2010:179).

In 1956, American Telephone and Telegraph (AT&T) pioneered the use of this method in industry. Since then, its use has spread across the globe and it is considered to be at the cutting edge of managerial selection; albeit costly. The technique brings together a blend of instrumentation and techniques which are commonly used to select managers (Cascio,1991:328). Predictive validities measured in projects, such as the selection of college entrants, is as high as $r = 0,44$, and substantial increases in reliabilities can be achieved through training of observers or assessors. For example, mean inter-rater reliabilities for untrained observers were 46 on a human relations dimension, and for trained observers it rose to $r = 0,78$. Meta-analysis showed on average validity of $r = 0,37$ for assessment centres across the types of criteria during fifty studies which contained 107 validity coefficients, however, research indicates that this degree of success for predicting effective performance is not applicable for all criteria (Cascio, 1991:328).

Gaugler, Rosenthal, Thornton and Bentson (1987:509) found that median corrected correlations are $r=0,53$ for predicting job potential, but only $r=0,36$ for predicting learners' ratings of performance. It is also important to note that, due to the multi-technique or method nature of this process, individual results may be achieved that are more predictive, particularly in the assessment of 'higher level management where it outperforms traditional methods' (Tziner et al,1994:240).

2.6 SUMMARY AND APPLICATION TO THE RESEARCH

As illustrated by this discussion and literature survey, a number of selection techniques are available to the applied personnel worker. The 'menu' of techniques that has been displayed encompasses test-based and non-test based techniques to measure the constructs of mental alertness, personality traits and work performance, as can be viewed in Table 2.1. For an instrument to be considered to be scientific, and therefore useful for research, it should have a validity coefficient between $r=0,30$ and $r=0,40$. Equally, the instrument requires a reliability coefficient between $r=0,80$ and $r=0,90$ to ensure its feasibility for selection purposes. The researcher, however, must remain ever mindful that high reliability is a necessary requirement but not a substitute for high validity (Aamodt, 2010:194; Cascio,1991:141).

To determine the mental alertness of an individual using non-test techniques, the business game and variations thereof, are promising ($r=0,50$ - $r=0,67$). Equally promising coefficients may be seen when the test-based techniques, such as Cognitive Ability Tests ($r=0,54$) and Figure Classification Tests, are used. The construct of personality traits may be subjectively assessed by observers in an interview. This method has yielded disappointing coefficients, usually around $r=0,30$. Furthermore, there is growing evidence that the coefficients are not as weak as previously believed, and that the use of personality testing is on the increase worldwide (Aamodt, 2010:186).

Table 2.1: Summary and evaluation of techniques to assess mental alertness, personality traits, psychomotor ability and work performance

ASSESSMENT TECHNIQUE	VALIDITY & RELIABILITY	COST	PRACTICALITY & TIME
MENTAL ALERTNESS			
Business games	good	high	reasonable
Cognitive ability tests	good	low	good
PERSONALITY TRAITS			
Interviews	low	average	good
Projective techniques	low	low	average
Leaderless group discussions	average	average	average
Personality questionnaires	low – average	low	good
WORK PERFORMANCE			
Biodata	good	low	very good
Peer ratings	average	low	good
References	low	low	very good
Work sample tests	average	high	low

PSYCHOMOTOR ABILITY			
O'Conner's Tweezer Dexterity Test	good	average	average
Purdue Pegboard Manual Dexterity Test	good	average	average
Pin Board Test (PBT)	good	average	average
Ball and Tube Test	good	average	average
Visual Accuracy Test	good	average	average
Colour Perception Test	good	average	average
Minnesota Rate of Manipulation Test	good	average	average
Sew-a-bag Test	good	high	average

MENTAL ALERTNESS, PERSONALITY TRAITS, PSYCHOMOTOR ABILITY
& WORK PERFORMANCE

Individual assessment	good	high	low
Assessment Centres	very good	very high	very low

On the other hand, biographical data has displayed solid coefficients when used to predict job performance ratings *(r=* 0,46) and productivity measures (mean *r=* 0,46). Meta-analytical studies conducted by Hunter and Hunter (1984:74) showed a validity of r= 0,37 as a job performance predictor. The use of peer ratings has been recorded in literature (Cook,2004:56) to have validity of *r=* 0,31 to *r=* 0,57. These findings lend considerable gravity to the use of peer ratings in selection batteries.

Finally, it is also interesting to note that despite the damning commentary, researchers and academics continue to use references as a tool to predict work performance. Within the realm of test-based techniques, work sample tests and trainability tests are widely used as a method for predicting job performance. The non-test technique known as the in-basket has high face validity and displays strong coefficients when used as a measure for career performance $(r= 0,24)$. The mean validity coefficients of $r= 0,35$ to $r= 0,40$ have assisted in this usage. The only reported negative being that these tests can be lengthy and require a subject expert to implement them. Nevertheless, their validity measures advocate their inclusion into a selection battery (Edenborough, 2008:125).

The above discussion illustrates that the most promising combination is possibly a test battery that incorporates the multiple domains of biographical data, trainability tests and individual assessment. Therefore, this combination has been used in this research to determine the relationship between mental alertness, personality traits and work performance. This statement is made in the belief that the use of assessment centres, which are the most valid and reliable method by which to select people, are out of reach of the majority of organisations owing to their cost.

The chapter has aided the researcher in the compilation of the test battery, and assisted in the generation of a theoretical base from which to draw conclusions and recommendations regarding the empirical findings of the study. It has also fulfilled the first theoretical aim of research by evaluating the selection techniques available to measure the constructs under discussion.

The following chapter will now address the selection of learners specifically through the assessment of mental alertness, personality traits, psychomotor ability and work performance potential.

CHAPTER THREE

MENTAL ALERTNESS, PERSONALITY TRAITS, PSYCHOMOTOR ABILITY AND WORK PERFORMANCE IN THE SELECTION OF LEARNERS

This chapter will look more specifically at the theoretical literature available on the relationship between mental alertness, personality traits, psychomotor ability and work performance in the selection of learners. To date, the selection of learners in the clothing industry has been lacking in empirical and scientific foundation. This has led to a paucity of information and research available on learner selection specific to this industry. An abundance of information is, however, available on the selection of candidates for other training initiatives using the same individual measures. The writer will review this information and use it as a theoretical base from which to draw conclusions concerning the empirical findings of this research.

To combat the threats of international competitiveness, learners in the sewn products industry need to improve their skills in order to make production more efficient and cost effective. To achieve this, learners should be concerned with quality, production, people, and cost. According to the International Labour Office (ILO), learners should maintain quality standards within the 2% reject rate considered within tolerance for human error, allowing continuous and steady production flow (International Labour Office, 1979:102). Equally, they should see that completed jobs comply with the delineated quality specifications. The learnership initiative in South Africa is intended to partly achieve this through the recruitment, selection and development of talented people who have the potential to add value to industry by producing high quality goods in the most efficient manner.

3.1   WHAT IS A LEARNERSHIP?

A learnership can be defined as a structured learning programme that combines learning at a training institution with practical work-based learning in an integrated programme.

The **Skills Development Act** (No 97 of 1998) saw the introduction of this new approach to the promotion and development of work-related skills development in South Africa. Moreover, the Skills **Development Act** (No 97 of 1998) states that the 'learnership consists of a structured learning component and … includes practical work experience of a specified nature and duration' (South Africa,1198:14). Learnerships are tools that align education and training initiatives and have an integrated vision of promoting employment, social development and economic growth. They establish a relationship between structured learning and structured work experience (Pugin,2008:3). Learnerships are primarily workplace learning programmes supported by structured institutional learning and structured workplace learning. It is critical that both theoretical knowledge and practical skills are assessed.

3.1.1   The purpose of a learnership

Learnerships were introduced to address the massive skills shortage and high unemployment levels that currently face South Africa. The learnership initiative enables people to achieve registered qualification that are portable across industries. They also serve as an entry point for people into industry, and a support in terms of professionalising industrial sectors.

Furthermore, learners benefit from access to national qualifications, practical and theoretical learning, and recognition of prior learning (RPL) – a process that takes cognisance of on-the-job learning and experience and equates this to the national Qualifications Framework (NQF). A further purpose of learnerships is to afford South African employers well-trained and skilled employees who increase productivity, which will ultimately lead to higher profitability. The learnership process also allows increased access to discretionary grants and tax incentives. Finally, the national sector benefits from the creation of an on-going learning culture, increased global competitiveness, and economic growth and development.

3.1.2 Key features of learnerships

Learnerships are similar to apprenticeships, since they both combine practical function and theoretical learning for the learner. Apprenticeships are limited to blue-collar workers and the qualification gained will not be higher than a level 4, whereas learnerships lead to a nationally recognised qualification by the South African Qualifications Authority (SAQA). These learnerships are aimed at giving learners a greater opportunity to gain employment, whether it is with an employer, self-employment or temporary employment.

Learnerships have the following features:

- They are a work-based route for learning and gaining a qualification within the National Qualifications Framework (NQF).

- Qualifications are based on unit standards. Learnerships include both structured work experience and structural learning. Learnerships relate to an occupation.

- Learnerships must be a planned and appropriate combination of learning outcomes with a defined purpose(s).

- They provide qualifying learners with applied competence and basis for further learning.

- They are made up of at least three components: fundamental, core, and elective unit standards.

- They have specified outcomes.

- Learners achieve the required credits within a range of 30% to 70% at the workplace.

3.1.3 Types of learnership

Two types of learnership exist namely, 18.1 learnerships where the learners are currently employed by an organisation, and 18.2 learnerships where learners are unemployed. These unemployed learners sign a fixed term training contract with the SETA and the participating company for the duration of the learnership.

Once the learner has achieved competence, the participating company may offer employment to the learners, however this is not mandatory. The average learnership programme takes between eight and eighteen months to complete.

3.1.4 Role players in the learnership

A number of role players exist in the field of learnerships in South Africa. These include the South African Qualifications Authority (SAQA), National Skills Authority (NSA), National Standards Bodies (NSBs), Standards Generating Bodies (SGBs), Education and Training Quality Assurance Bodies (ETQAs), Sector Education and Training Authority (SETA), Department of Higher Education (DOHE), and participating companies and learners.

(a)   South African Qualifications Authority (SAQA)

SAQA is tasked with the establishment and implementation of the National Qualifications Framework (NQF). It registers qualifications and standards on the NQF and ensures that all education and training is linked to exit-level outcomes and full qualifications. SAQA's role in the leanership process is crucial as the leanership is a full qualification and the exit-level outcomes are registered on the NQF (Pugin, 2008:7).

(b)   National Skills Authority (NSA)

This national body was created in 1999 to advise the Minister of Labour on policies, strategies, and the regulation of the new skills development system which includes learnerships.   The process invites comment from organised business, the community, government, education and training providers, organised labour, and SAQA. The objectives and targets set by the National Skills Development Strategy (NSDS) are agreed by the National Skills Authority, thus making them a key role player in the enormity and execution of the learnership process (Pugin,2008:7).

(c)   National Standards Bodies (NSBs)

The role of the twelve NSBs is to ensure that all standards and qualifications fit into the framework created by the NQF. The NSBs covers every aspect of training and development in South Africa including the 06: Manufacturing, engineering and technology NSB which pertains to the learnership researched in this study.

(d)   Standards Generating Bodies (SGBs)

The role of this body is to develop the standards that are to be registered on the NQF by SAQA. The process is democratic and involves stakeholders for industry, organised labour, and academia. On achieving agreement on the standards, the SGB will send the standards to the NSB who will, after inspection, arrange for the standards to be registered on the NQF.

(e)   Education and Training Quality Assurance Bodies (ETQAs)

The ETQA's function is to monitor that the standards that have been agreed by the SGB are being achieved. The ETQA institutions are approved by SAQA and they are empowered to accredit training providers against the standards that they choose to present.

The ETQA is also responsible for certifying learners on the completion of a standard or qualification. To achieve this, ETQA liaises with assessors who measure learner competence until the final standards, known as exit-level outcomes, are achieved (Pugin,2008:8).

(f)   Sector Education and Training Authority (SETA)

Sector Education and Training Authorities were established by the Minister of Labour on 20 March 2000. Currently, there are twenty three SETAs, however, the Higher Education and Training Minister, the Honourable Dr Blade Nzimande gazetted that the CTFL SETA will be one of the five that will merge to form 21 SETAs as of the 1st April 2011. This amalgamation will include the CTFL (clothing, textiles, footwear and leather) SETA, the FIETA (forestry industries) SETA and the of the printing, packaging and publishing MAPPP SETA and will created the FPM (fibre-processing and manufacturing) Seta (Naicker,2010b:n.p.).

The main function of SETAs is to contribute to the raising of skills and to bring skills to the employed or those wanting to be employed in their sector. SETAs do this by helping to implement the National Skills Development Strategy and by ensuring that training and education are meeting the needs of industry in South Africa.

The duties of a SETA include the development of a Sector Skills Plan within the framework of the National Skills Development Strategy and the implementation of the Sector Skills Plan. SETAs' are required to establish learnerships, approve workplace skills plans, allocate grants and monitoring education and training in the sector. In addition, the duties include collecting and disbursement of skills levies in the sector, liaison with the National Skills Authority and any other duties imposed by the **Skills Development Act** (No 97 of 1998) or the **Skills Development Levies Act** (No 9 of 1999).

(g)   Department of Higher Education (DOHE)

In 2008, the South African government split the education portfolio into two under two separate ministries.   One portfolio addresses basic education, and the other portfolio addresses higher education.   Until 2009, the SETA function fell under the auspices of the Department of Labour, but is now the responsibility of the minister of Higher Education and Training Minister, the Honourable Dr Blade Nzimande.

(h)   Participating companies

The companies which register as Further Education and Training colleges are permitted to apply for learnership funding from the SETA and to establish themselves as training providers.   This funding is in the form of a discretionary funding grant to the amount of R20 000 per learner.

The participating company uses these funds to recruit trainers, assessors and moderators, establish the psychical training facility and necessary machinery, purchase or design training material, and select the learnership candidates. The participating company is responsible for ensuring that the training is undertaken and the necessary administrative records are kept.

(i)   Learners

The learner completes three components of the learnership: the fundamentals of reading, writing and arithmetic as determined by the NQF level at which the learnership is registered. The core or theoretical modules support the practical training that is covered on the learnership; and the elective or job specific practical training associated with the qualification.

3.1.5 Clothing, Textile, Footwear and Leather (CTFL) SETA

The Clothing, Textile, Footwear and Leather (CTFL) SETA was established in 1999 under the leadership of Mr David Bowen, previously the regional manager of the Durban branch of the Clothing Industry Training Board (CITB) (Clothing Industry Training Board:1992:2). The SETA is presently led by Mr P. K. Naicker who, in his role as CEO, oversees the administrative support of training and development for staff at all levels in the leather, footwear, textile and clothing companies of South Africa. The CTFL SETA has three operational branches in the Western Cape, Kwazulu-Natal and Gauteng.

The CTFL SETA serves four manufacturing sub-sectors, namely clothing, textiles, footwear and leather manufacturing companies. The clothing sector represents companies that manufacture products such as men's, ladies' and children's wear, underwear, sportswear, outerwear, and millinery items such as hats and caps. The textiles sector consists of companies that manufacture textile products through various processes, for example, the spinning of yarn from natural or man-made fibres, the weaving/knitting of fabrics from spun yarn, the dyeing and printing of fabrics, the manufacture of textile floor coverings (carpets), the manufacture of flock and felt products and the manufacture of industrial (performance) textiles (Naicker,2010a:n.p.).

The footwear and leather sector comprises of three distinct sub-sectors, namely, tanners and dressers of leather, manufacturers of footwear (from leather or other products), and manufacturers of general goods and handbags. These goods include luggage and travel goods from leather or other products. The members of the CTFL SETA are mainly concentrated in Kwazulu-Natal, Eastern Cape, Western Cape, and Gauteng. They are diverse in both their composition and manufacturing processes and vary in size from large international companies to medium-sized factories, small family businesses and one-man operations. The training needs of the SETA members are therefore wide-ranging and diverse.

Accreditation is an ETQA process through which providers are invited to apply to be evaluated and registered in the scope of learning. This process invites scrutiny of all resources required to offer training and education programmes that lead to learners being able to earn credits or full qualifications through successful providers. Detailed evidence must be produced to substantiate the application to become an accredited provider.

Any learnership that is registered with SAQA must be channelled through the relevant SETA, in this case the Clothing, Textiles, Footwear and Leather and SETA. SETAs will register all learnership agreements between learner, workplace providers and training as a mandatory requirement. In the clothing industry, as from 31 December 2008, only training providers who are registered as Further Education and Training (FET) Colleges with the Director of Further Education and Training can provide learnerships in South Africa.

This amendment to the **Skills Development Act 1998** took place to ensure training providers are financially strong enough to sustain themselves for the period of training, and to ensure the quality and quantity of instructional staff in relation the specified NQF exit levels (Buthelezi,2009: n.p.).

Registration as an FET requires for further accreditation and is sought through Umalusi, the Council for Quality Assurance in General and Further Education and Training that functions as the accreditation body of the Department of Education. Umalusi is a statutory organisation that sets and monitors standards for general and further education and training in South Africa with the purpose of continually enhancing the quality of education and training. Umalusi fulfils five key functions in its quality assurance role:

- Evaluating qualifications and curricula to ensure that they are of the expected standard
- Moderating assessment to ensure that it is fair, valid and reliable
- Conducting research to ensure educational quality

- Accrediting educational and assessment providers
- Certifying learner attainments

Encouragingly, Umalusi recognises the work done by the CTFL SETA and merely endorses their accreditation certificate provided it has been awarded in the category, "full accreditation'.

The following learnerships are registered with the CTFL SETA:

Textiles

- Yarn production (preparation, yarn manufacturer)
- Fabric production (weaving, knitting, carpeting)
- Wet processes (dyeing, printing, finishing)
- Textile testing (laboratory testing, inspection and grading)

Footwear

- Design, making, clicking process, closing process, finishing process and bottom stock process

Leather

- Curing, tanning, re-tanning, finishing, leather cutting
- Pattern making, cutting, finishing

Clothing

- Mechanics, cutting, finishing and the focus of this research the Machinist Garment Constructor (Clothing, Textile, Footwear and Leather Sector Education and Training Authority, 2010:n.p.).

3.2   THE THEORETICAL RELATIONSHIP BETWEEN MENTAL ALERTNESS
       AND WORK PERFORMANCE IN THE SELECTION OF LEARNERS

In his classical work, Ghiselli (1973:471) mapped the trends in the validity of aptitude tests from 1920 to 1971. The study examined numerous job categories, including trainees. The study grouped together all the semi-skilled and unskilled occupations which were found in industrial organisations. He found that measures of mental abilities and of spatial and mechanical abilities were significant predictors of aptitude for training and future work performance. The uses of tests for motor abilities were less reliable, but they also added pertinence to the study. Tests for intellectual abilities, spatial and mechanical abilities, perceptual accuracy and motor abilities shared the same validity for proficiency criteria *(r* = 0,12 to *r* = 0,27), but fell short of the recommended level (Schmidt et al,1984:411).

This concurs with Ghiselli (1973:469), who found that grand average validity for all tests and for all jobs is *r* = 0,39 for training criteria and *r* = 0,22 for work performance criteria. However, the author noted that certain factors, like restriction of range and the use of global criteria, cause these values to be conservative. Schmidt et al (1984:419) note that most of the significant research has been generated by Hunter, Schmidt and their colleagues. Schmidt et al (1984:421) refer to Hunter and Hunter (1981) who found that for entry level jobs there is no predictor with higher validity than cognitive ability tests.

This was illustrated when Hunter and Hunter (1984:81) re-analysed Ghiselli's (1973) data and showed that, except for the job of a sales clerk where the multiple correlation is *r* = 0,28, the multiple correlations for ability range from *r* = 0,43 and *r* = 0,62 (see Table 3.1). They also describe how the use of cognitive ability tests presents a serious problem in the USA, as differences in the mean ability scores for different racial and ethnic groups are large enough to affect selection outcomes, as displayed in Table 3.1.

Table 3.1: Re-analysis by Hunter and Hunter (1984) of Ghiselli's (1966) summary of estimated true validity coefficients for nine broad classes of job and three ability factors

Job type	General ability	Perceptual speed	Psychomotor	All three combined
Manager	0.53	0.43	0.26	0.53
Clerk	0.54	0.46	0.29	0.55
Salesperson	0.61	0.40	0.29	0.62
Protective professional	0.42	0.37	0.26	0.43
Service job	0.48	0.20	0.27	0.49
Trades and crafts	0.46	0.43	0.34	0.50
Elementary industrial	0.37	0.37	0.40	0.47
Vehicle operator	0.28	0.31	0.44	0.46
Sales assistant	0.27	0.22	0.17	0.28

Source: Cook, M. (2004) (*Personnel Selection adding value through people.* 4th edition. John Wiley and Sons, p.108.)

Schmidt et al (1984:418) conducted a meta-analysis on the validation studies published in the *Journal of Applied Psychology and Personnel Psychology* between 1964 and 1982. The results indicate that the average validities for work samples *(r =* 0,38), assessment centres *(r = 0,41)* and learners and peer evaluations (*r* = 0,48), are the most highly correlated with criteria. The average validities for special aptitudes and mental alertness were shown to be r = 0,27 and *r* = 0,25 respectively. The study concluded that research appears to be inconsistent with respect to validities for cognitive ability tests, as their data were not consistent with previous research as illustrated in Table 3.2.

Cook (2004:114) therefore questions, 'Do meta-analyses push up average validities by leaving out studies which find that selection methods do not work? However, it is argued that the best approach to reduce adverse impact is to discover how to use alternative measures in conjunction with cognitive ability tests.

Rossini et al (1994:67) carried out work on the concurrent validity of mental alertness as a predictor of work performance. They used the Thurstone Test of Mental Alertness as a brief intelligence test, and the Wecshler Adult Intelligence Scale-Revised (WAIS-R) as the criterion of adult intellectual achievement. The results indicated that the total score on Thurstone's test was significantly correlated with the standard summary scores, and with the WAIS-R factor scores as displayed in Table 3.3.

There was no significant difference between the WAIS-R Full Scale IQ (M=101.31), and the estimated Full IQ, derived by using a simple regression equation on the mental alertness score (T= 0,67, P> 0,05). These consistent and equivalent patterns of correlations indicate that the Thurstone test is a measure of global intellectual achievement. With its measure of sustained concentration, the Thurstone test shows concurrent validity as a measure of mental alertness, and appears to reflect an adequate measure of intelligence for vocational and industrial-organisational settings (Rossini et al*,*1994:66).

Table 3.2: Validity generalisation analysis of the data given by Hunter and Schmidt (1997)

Job	Mechanical repairman	Bench worker	Clerk	Machine tender
Test	Mechanical principles	Finger dexterity	General mental ability	Spatial relations
Number of validity coefficients	114	191	72	99
Raw mean validity	0.39	0.25	0.36	0.11
Observed variance of validity	0.21	0.26	0.26	0.22
Estimated variance of validity	0.19	0.14	0.17	0.12
Observed minimum estimated variance	0.02	0.12	0.09	0.10
Percentage of observed variance accounted for	90%	54%	65%	54%
Estimated mean true validity	0.78	0.39	0.67	0.05
90% credibility value	0.75	0.24	0.50	-0.03

Source: Cook, M. (2004) *Personnel Selection adding value through people. 4th edition.* John Wiley and Sons. p.106.

Table 3.3: Means, standard deviations, and Pearson correlation coefficients between the WAIS-R and the Thurstone test of mental alertness (N=32)

Scale	M	SD	Correlations 7	8	9
1. Full scale IQ	101.31	10.85	.70	.63	.74
2. Verbal IQ	101.15	9.92	.66	.57	.69
3. Performance IQ	101.31	12.24	.59	.57	.65
4. Verbal comprehension	102.68	10.31	.62	.38	.56
5. Perceptual organisation	101.81	12.33	.54	.44	.55
6. Memory/Distractibility	100.18	12.59	.43	.57	.55
7. TMA verbal score	39.65	10.86			
8. TMA quantitative score	28.34	10.48			
9. TMA total score	68.00	19.20			

Source: Rossini, E.D., Wygonik, E.J., Barrett, D.E., & Friedman, B. (1994) WAIS-R validation of the Thurstone Test of Mental Alertness. *Psychological Reports, 74 (3)*, 2.

Previous to the above study, Muchinsky (1993:54) conducted a concurrent criterion-related validity study on 193 manufacturers using the Thurstone test of Mental Alertness, the Flanagan Aptitude Classification Test and the Bennett Mechanical Comprehension Test.

Job performance was measured by learners rating their employees on fifteen dimensions, and was assessed twice over a sixty day period. Correlational and multiple regression analyses showed that all of the validity coefficients were positive.

The Bennett Mechanical Comprehension Test was the best single predictor of job performance (uncorrected r = 0,38), together with the Thurstone Quantitative Test which produced a multiple correlation coefficient of r = 0,40. Although the more recent researchers do not mirror Schmidt and Hunter's (1981:1131) claims that:

- No type II errors should arise if samples are large enough;

- Professionally developed cognitive ability tests are valid predictors of all job performance;

- Cognitive ability tests are equally valid for all minority and majority applicants;

- Use of cognitive ability tests in selection can reduce labour costs and predict on-the- job performance.

3.3 THEORETICAL RELATIONSHIP BETWEEN PERSONALITY TRAITS AND WORK PERFORMANCE IN THE SELECTION OF LEARNERS

The requirements of the **Employment Equity Act** (No 57 of 1998) to ensure a spread of racial groups, reflective of their region, within the organisational structures, has led to the need for the swift development of black staff. The learnership initiative identifies and develops raw talent for fast-tracking into supervisory and managerial positions.

Therefore, this theoretical investigation will explore the use of the 16PF to predict managerial talent and academic performance. Although early meta-analytic research on personality as a predictor of work performance yielded criterion-related validity coefficients of less than $r = 0,20$, Robertson (1993:189) claims that these are misleadingly low. In recent research, where specific links between personality constructs and job related behaviours were hypothesised, encouraging coefficients of $r = 0,37$ and higher were achieved.

Tett et al (1991:711) used meta-analysis to assess the overall validity of personality measures as predictors of work performance. They investigated the moderating effects of several study characteristics of personality scale validity, and appraised the predictability of job performance as a function of eight specific categories of personality: neuroticism, extroversion, openness, agreeableness, conscientiousness, locus of control, Type A, and miscellaneous. The research was based on 494 study reviews and yielded useable results as identified by 97 independent samples (N = 13,521).

Consistent with predictions, studies using confirmatory research strategies produced corrected mean personality validities more than twice $r = 0,34$, and studies based on exploratory strategies measured $r = 0,11$. An even higher mean validity was achieved when the research was based on studies using job analysis, explicitly in selection procedures where personality measures were used as predictors.

Cook (2004:144) outlines a very early meta-analysis by Ghiselli and Barthol (1953:19) to determine whether personality inventories can select people who perform well in their jobs. The findings were moderately favourable, reporting average coefficients of up to $r = 0.36$ as shown Table 3.4. Cook (2004:144) states that a more recent meta-analysis study conducted by Barrick, Mount and Judge (2001:15) on the validity of the big five personality dimension coefficients ranged between $r = -0.06$ and $r = 0,23$.

Table 3.4: Validity for personality test for eight types of work

Type of work	Number of correlations	Total sample	Correlations
Supervision	8	518	0.14
Foreman	44	6433	0.18
Clerical	22	1069	0.25
Sales assistant	8	1120	0.36
Salesperson	12	927	0.36
Protective	5	536	0.24
Service	6	385	0.16
Trades and crafts	8	511	0.29

Source: Cook, M. (2004) *Personnel Selection adding value through people. 4th edition.* John Wiley and Sons. p.144. reproduced from Ghiselli and Barthol (1953).

Yet, Robertson (1994:189) argues that many human resource practitioners believe that personality traits have a role to play in determining job success. Earlier research by Robertson (1993:190) showed personality traits are important in determining work behaviour, and should therefore be taken into account in personnel selection.

When the personality constructs involved are clear, and thought is given to the expected link between the constructs and work behaviour, it is likely that worthwhile information may be derived from personality measurement. Van den Berg (1992:156) explains the shift in research findings regarding the use of personality questionnaires in selection through an examination of the work undertaken by Schmidt et al (1984:416).

Schmidt et al (1984:417), between 1964 and 1982, reviewed a number of studies that used meta-analysis to validate personality questionnaires. They concluded that 'personality variables' were weakly correlated with work criteria and performance ratings.

Van den Berg (1992:34) claims that the meta-analyses conducted were inadequate. In his opinion, one inadequacy stems from the inability to form firm conclusions about the validity of personality questionnaires, as the results are not specified for separate specific personality dimensions, occupations and work outcome criteria. A second inadequacy arises in that the validity studies ignored situational characteristics, as categories of occupations vary from company to company owing to organisational climate, management style and external conditions. A third is found in the work performance criteria chosen to validate the questionnaires.

The final criticism raised by Van den Berg (1992:88) is that the use of composite criteria involves ratings on different behavioural aspects. A better approach seems to be that of multiple criteria, as introduced by Guion (1965), where personality is studied in relation to various criteria, for example labour turnover and training success. More impetus is given to the present reasoning through further research conducted by Van den Bergh and Feij (1993:337). They investigated the relationships of personality traits and job characteristics (the predictors) with job experiences (the criteria), using 181 job applicants who participated in a personnel selection procedure.

The subjects completed the 16 Personality Factor Questionnaires (16PF) as part of the procedure, and the scores were factor analysed, with four orthogonal traits being identified: emotional stability, extraversion, sensation seeking, and achievement motivation. The subjects were then visited in their current jobs between one and a half and two years after the selection intervention. Their current jobs were rated on four characteristics, namely dynamicity, autonomy, external, and internal structure. The subjects were also required to complete a questionnaire measuring work performance. Personality traits had several effects on the work performance criteria and showed that personality contributed to the prediction of the criteria even when the effects of job characteristics were taken into account.

Two years previous to the above study, Wisniewski (1990:18) describes how objective personality assessment surveys are improving decisions regarding staff selection in the Credit Boat Community Federal Credit Union. The specific instrument used was the Predictive Index System. The Credit Union found that, if properly applied, the instrument helped both to determine the strengths and weaknesses of potential managers and learners, and to identify appropriate career paths to ensure the alignment of organisational and individual goals.

There was growing evidence that the 16PF is limited in its reliability. Abrahams and Mauer (1996:219) conducted research in South Africa to validate the use of standardised SA16PF in the selection of students for study at the University of the Western Cape, and found the stability of the new instrument to be lacking. Saville and Munro (1986:32) argued that the Occupational Personality Questionnaire (OPQ) is more reliable through its Concept, Factor, Octagon, and Pentagon versions. Their findings in a comparative study involving a group of 230 individuals showed that the OPQ factor version is more reliable than the 16PF scales B, G, L, M, N, Q and Q_2, which do not measure up to conventional reliability standards. The standard error of measurement is used to display the difference in reliabilities for example, factor N *(r = 0,25)* requires a tolerance of $\pm$ 3,46 stens, at 95% confidence, to be as reliable or equivalent in measure to its OPQ counterpart *(r = 0,79)*.

They concluded that the OPQ Factor version more effectively measures the 16PF reliability variance than the 16PF measures that of the OPQ. Further, they found that the OPQ Factor version's scales of Empathy, Active, Playful, and Contesting are not well represented in the 16PF, whilst most of the 16PF factors are well represented in the OPQ. Recent work has dispelled much of the controversy discussed above. Bartram (1992:161) states that the use of the 16PF to determine on-the-job success of United Kingdom managers has had pertinence. The results of data reaped from 1,796 short-listed managers showed low primary reliabilities but encouraging secondary reliabilities, when internal inconsistencies of primary and secondary scales were used.

Factor analysis, in turn, produced five core second-order factors that matched the 16PF second-order factors. This work was an extension of the research conducted in 1958 by Karson and Pool, where factorial analysis reflected increased stability when the second-order factors were entered into the regression equation as can be seen in Figure 3.1.

These findings were achieved by establishing a general population sample and a management sample. Differences between the mean general population raw scores and the Management Sample's raw scores were statistically significant for all sixteen scales (absolute t (4014) = > 13 in all cases, p < 0,001) (c/f Table 3.2). Distinct gender differences were found, while factors A, F, L and Q_2 did not show gender related differences. The means for females and males showed differences (absolute t (1794) = < 4,63, p < ,001) in all cases (Bartram,1992:163).

The result is an average management profile that includes the characteristics of an independent, stable extravert, who is neither particularly tough-minded nor tender-minded, but who is somewhat more controlled and conventional than the average member of the general population (Bartram,1992:169) as described in Table 3.5.

Figure 3.1: 16PF second-order scale sten scores for management sample

16PF SECOND ORDER SCALE STEN SCORES
for
MANAGEMENT SAMPLE

STEN SCORES

SECOND ORDER FACTORS

All n = 1796   Male n = 1441   Female n = 355
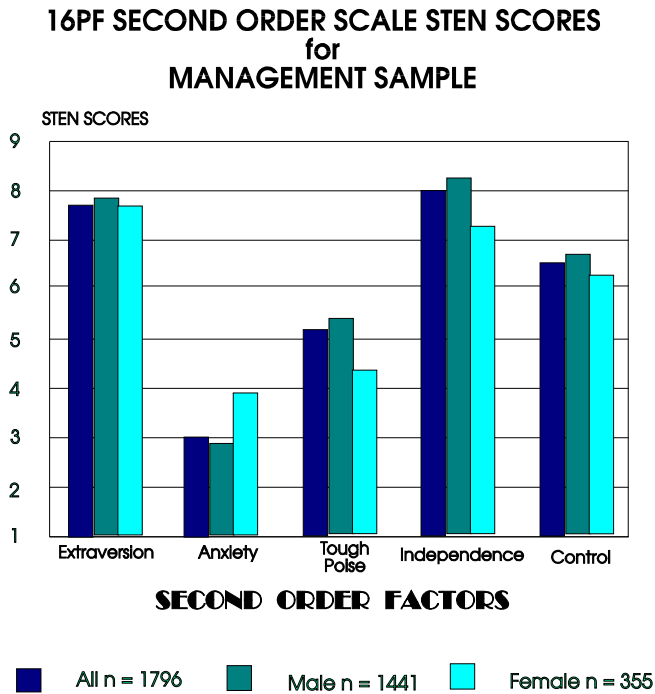
Source: Bartram, D. (1992) The Personality of UK Managers: 16PF Norms for Short-listed Applicants. *Journal of Occupational and Organizational Psychology, 65 (2), 159 - 172.*

In an investigation to predict the validity of assessment centres for the selection and development of senior management, Tziner et al (1994:241) found personality measures to be predictive of job success. In the research, twenty five assessment dimensions scored on a scale of 1 (poor) to 6 (excellent) were clustered into six measures: general intellect, personality, work values, communication skills, interpersonal interaction abilities, and managerial performance abilities. This research showed, in three of the four years during which tests were conducted, that general intelligence ratings were predicatively invalid whereas personality measures were valid, ranging from $r = 0,15$ to $r = 0,20$.

Table 3.5: Raw score means and SDS for the management sample and the UK general population (the latter are from Saville, 1972)

Variable 16PF - A	General population (2220) M	SD	All (1796) M	SD	MaleE (1441) M	SD	Female (355) M	SD
A	10.2	3.06	11.85	3.30	11.79	3.36	12.08	3.0
B	27.01	2.13	9.43	1.88	9.54	1.82	8.95	2.0
C	14.	3.90	17.88	3.70	18.03	3.67	17.27	3.7
E	10.8	4.38	15.98	3.87	16.24	3.75	14.90	4.1
F	12.3	4.99	16.88	4.20	16.79	4.14	17.22	4.
G	12.2	3.56	14.09	3.42	14.26	3.36	13.39	3.5
H	12.4	5.46	19.37	4.93	19.62	4.78	18.37	5.3
I	11.2	3.75	9.38	4.06	8.58	3.79	12.66	3.4
L	8.25	3.44	6.84	3.24	6.90	3.23	6.60	3.2
M	12.0	3.55	14.69	3.30	4.83	3.26	14.11	3.4
N	11.1	3.18	7.89	2.97	7.75	2.86	8.46	3.3
O	11.4	4.30	6.78	3.81	6.29	3.56	8.78	4.
Q1	9.11	3.31	11.31	3.25	1.61	3.13	10.08	3.4
Q2	11.5	3.51	8.99	3.42	8.96	3.36	9.14	3.6
Q3	12.3	3.23	13.80	3.04	13.94	2.96	13.24	3.2
Q4	13.3	4.92	8.16	4.86	7.71	4.59	9.96	5.4

The personality measures were achieved by using the 16PF, MMPI and Bender and Rozentweig Frustration Test.   All of the measures generated, except for that of general intelligence, proved valid with respect to learners' ratings.

Classical work undertaken by Eysenck (1967) and Lynn (1969) in Henney (1975) showed that the dimensions of stability and introversion were major personality traits in successful managers as measured by the Eysenck Personality Inventory (see Table 3.3). This work led Henney (1975) to attempt to generate an average profile for successful learners at the Longbridge Factory of British Leyland. A group of 36 learners, between the ages of 29 to 64 years were tested. The profile obtained suggested that outgoing, assertive, balanced characteristics were the most prominent traits held by learners.

These results seem logical, as the work is pressurised and only the emotionally stable would be able to tolerate the stress for lengthy periods of time. A need for a great deal of personal contact was identified, as an introverted person may find this environment inhibiting. However, there is no research to prove that the stable introvert will not prove equally effective. The research conducted by Henney at Longbridge does indicate that the introverted manager might be more content in large, labour intensive, production line-dominated factories such as the motor industry.

Research by Batlis and Green (1979:590) sought to determine whether a link exists between personality variables and leadership style. They administered the Leadership Opinion Questionnaire (LOQ) and the 16PF and found significant interaction between leadership-style dimensions of the LOQ and the 16PF second-order score, Anxiety. Subjects who preferred a more balanced leadership approach, between task orientation and people orientation, were more tough-minded, more practical, more conservative, and more group dependent.

Table 3.6: Comparion of scores on 16PF for two types of managers

Factor	Low score description	USA (N=178) Mean	S.D.	UK (N=36) Mean	S.D.	High score description
A	Reserved	7.8	2.5	6.7	1.7	Outgoing
B	Less intelligent	7.5	1.6	7.3	1.6	More intelligent
C	Unstable	5.7	2.1	5.4	1.5	Emotionally
E	Humble	5.8	2.6	6.9	1.5	Stable
F	Sober	5.3	2.1	6.4	1.5	Assertive
G	Expedient	5.5	2.1	7.1	1.6	Happy-go-lucky
H	Shy	6.6	1.9	6.5	1.6	Conscientious
I	Tough-minded	5.6	2.1	4.2	2.0	Venturesome
L	Trusting	5.4	2.1	5.0	1.7	Tender-minded
M	Practical	5.7	2.1	5.9	1.8	Suspicious
N	Forthright	6.2	2.1	5.8	1.7	Imaginative
O	Self-assured	5.5	2.0	4.8	2.0	Shrewd
Q_1	Conservative	6.4	1.9	5.9	2.0	Apprehensive
Q_2	Group-dependent	5.5	2.6	3.7	1.8	Experimenting
Q_3	Self-conflict	5.8	2.3	5.9	2.2	Self-sufficient
Q_4	Relaxed	5.3	2.0	4.7	2.1	Controlled Tense

Source: Henney, A.S. (1975) Personality characteristics of a group of industrial managers. *Journal of Occupational Psychology, 48 (1), 65 - 67.*

Barrick and Mount (1991:22) drew up a hypothesis which indicated conscientiousness to be a valid predictor for the occupational groups of professionals, police, managers, sales, and skilled and semi-skilled personnel. It revealed that conscientiousness resulted in consistent true score correlations (p ranges from $r = 0,20$ to $r = 0,23$) across these occupations mentioned. The model used to determine the above was the 'Big Five' personality dimensions of extroversion, emotional stability, agreeableness, conscientiousness, and openness to experience. The 5-factor Model originated in 1932 when efforts were made to generate a taxonomy of personality. The past decade has accumulated strong evidence concerning the robustness of the 5-factor model, despite claims that five factors are insufficient to cover the domain of personality, and that it ignores the measure of cognitive ability (Barrick & Mount, 1991:16).

Finally, the Sears Roebuck studies, where multiple-correlations resulted in validity studies of $r = 0,80$, lend further credibility to the use of pencil and paper personality measures. Here, situational and individual differences made it imperative that the job behaviours which result in effectiveness are identified and clearly demarcated (Cascio,1991:313). Although researchers have established links between criterion measures of work behaviour and work constructs, more research is needed before sufficient evidence is available to support wide-range use of personality measures as predictors of managerial talent. Regarding the use of the 16PF in the prediction of academic performance, the study undertaken by Duff, Boyle, Dunleavy and Ferguson (2003:1914) produced more encouraging results. The research considers the relationship between students' approaches to learning and the Big Five personality dimensions, as measured by Cattell's 16PFi. The moderator variables of age, gender and academic performance were included in the study.

A linear regression analysis using academic performance as the dependent variable, and age, prior educational attainment and conscientiousness as independent variables, accounted for 24.1% of the variance in performance.

This research suggests that the approach to learning is a subset of personality and supports the inclusion of the 16PF into the design of the predictive battery. Further work disputed the value of the 16PF when it investigated the instrument's use in the selection of medical students. The study examined whether personality profiles, using personality factors, or clusters of personality factors, are associated with academic success. The study divided the students into four groups according to their academic performance. There was no relationship found between the A-Level scores and their subsequent medical school academic performance. Furthermore, academic success was not associated with any of Cattell's personality factors. Green, Peters and Webster (1991:346) conclude that this personality profile is unlikely to be helpful in selecting future intakes of students.

However, the findings in a study to predict adolescent academic performance showed a stronger correlation between personality and academic performance. The work used the Big Five, including agreeableness, conscientiousness, emotional stability, extraversion, and openness, plus four narrow traits, aggression, optimism, tough-mindedness and work, drive to predict academic performance. The results of the study showed that all the traits correlated significantly ($P<.01$). Consistent with prior research, the narrow traits accounted for 8% and 12% of the variance. According to Lounsbury, Sundstrom, Loveland and Gibson (2003:70), these results provide clear evidence of a relationship between personality and academic success among adolescents, and carry practical as well as theoretical implications.

Louria (2005:64) used the 16PF to assess the role of personality and study habits in relation to academic achievement in emergency services students enrolled at a South Africa of University of Technology. The sample included 53 students and the findings showed four factors to be predictive of the learners' success: abstract, verbal reasoning, levels of anxiety, and levels of extraversion. The multiple regression stepwise multiple regression analysis yielded a combined R = 0.42 for Factor Q_1 and R = 0,23 for factor Q_2. Once again, the results of this research are indicative of the 16PF's value in predicting academic performance.

3.4 THE THEORETICAL RELATIONSHIP BETWEEN PSYCHOMOTOR ABILITY AND WORK PERFORMANCE IN THE SELECTION OF LEARNERS

Most of the work done on selection using work-sampling has focused on psychomotor skills. Work-sampling involves identifying a task, or set of tasks, that represent the job in question and then using these tasks for pre-employment testing (Smith & Robertson,1986:23).

Researchers have expressed concern over the impact of legal requirements in the USA, where it has been ruled that pre-employment tests that are not clearly and directly job-related are illegal. They suggest that one approach, namely work-sample testing, appears to have the potential to produce similar, or perhaps better, validity coefficient than normal while also satisfying legal requirements. Verbal work-sample tests are not as high a predictor of work performance as motor ability tests (Cascio:2010:255). Research suggests that it would be more fruitful to focus instead on samples of work behaviour. It is argued that for effective selection, it would be more appropriate to make use of predictions that are realistic samples of behaviour and are actually as similar to criteria as possible.

This is termed 'behavioural consistency', which implies that the best predictor of future performance is past performance. Similarly, it has been argued that there is a point-to-point correspondence between predictor and criteria. In simple words, the behaviour that a predictor requires of the candidate and the conditions under which the candidate is expected to display this behaviour should be as similar as possible to the criteria. Over the past twenty five years, researchers have attempted to produce valid predictors that are extremely aligned to the desired criterion behaviours. Rather than using psychological test batteries or other indicators of behaviour, research is now advocating the use of realistic samples of work behaviour that can predict future work performance.

Robertson and Kandola (1982:172) propose comprehensive categories of work-sample tests: psychomotor, individual situational decision-making, job related information, and group discussions. Using 60 validity studies, validity coefficients were found in our categories. The results showed that psychomotor ability displayed R = 0,39, job-related information $r = 0, 40$ were the highest whereas situational decision-making was the weakest at $r = 0,28$. Hence, owing to their encouraging results, psychomotor work-sampling test have been the main focus for researchers.

Smith and Robertson (1986:46) went further to highlight that unless a work-sample test measures criteria that are not measured by a paper-and-pencil test, it is best to use only work-sampling to predict job performance. If, however, the two tests measure independent and not overlapping items, then the combination will yield higher validity coefficients and therefore be more predictive.

Mount, Muchinsky and Hanser (1977:643) conducted research using a battery of tests that included work-sampling and two paper-and-pencil tests; the data, when computed using a regression model, reported an R-squared of 0.55 for the predictive group. This finding showed that 55% of their sample was correctly predicted to perform on-the-job. Interestingly, the squared multiple correlations represented only a slight improvement over test squared validity coefficient obtained for the work-sample model alone.

These findings indicate that the single predictor model (work-sample) is nearly as good a predictor of on-the-job performance as a combination of the three predictors using a multiple regression model. Laboratory based work done in 1997 indicated that the concurrent and predictive validity for work-sample $r = 0,78$ versus two pencil-and-paper tests $r = 0.55$ to be much higher. The predictive validity study of the coefficients obtained for the work- sample measured $r = 0,67$ and was once again higher than the pencil-and-paper tests $r = 0,62$ ad $r = 0,42$.

The combination of the three tests into a multiple regression middle yielded a multiple correlation of $r = 0,67$ for the concurrent validity group and a multiple correlation of $r = 0,55$ for the predictive validly group. These squared multiple correlations represent only a slight improvement over the squared validity coefficients for the work-sample alone. This indicates that the single predictor is nearly as good a predictor as the combination in the multiple regression model.

3.4.1 Trainability tests

Often the problem is not to select from a group of applicants who are already trained but to choose candidates who are untrained. Early identification of individuals who will profit from a particular learning experience has meaningful implications, not least being the reduction in training costs. Therefore, the prediction of trainability has been an important area of personnel research for a number of years and a great deal of scientific work was done more than forty years ago (Ghiselli, 1966; Downs 1970,1973; Mount et al,1977; Robertson & Downs, 1979).

Modest success, however, has been recorded in the use of standard psychometric tests to predict trainability. Ghiselli (1966:56) reported the predictive power of these tests to be far from impressive, describing general validly to be $r= 0,30$ against training criteria. The conclusion drawn was that samples of behaviour should rather be utilised to predict future training performance.

Trainability testing is based on the conjecture that if an applicant can demonstrate the ability to learn and perform on a job sample, it is likely that they will perform on the total job, given the appropriate training. Based on this assumption, the careful observation and measurement of the applicant's progress during the work-sample should yield useful predictors of their eventual success or failure on the actual job (Cook, 2004:195).

Downs et al (1978:273) maintain that an advantage of trainability assessments is that they allow for an element of self-selection by the trainee as they will not commence training if they feel their performance on the trainability test was poor. Similarly, Cascio (1991:373) illustrates that trainability testing as a selection device provides applicants with an opportunity to assess their own potential for the job, which reduces turnover rates.

Robertson and Downs (1989:406) highlighted that there are limitations associated with using work-sampling as a selection method. They are often more time-consuming to administer than traditional psychometric tests and are more demanding in terms of resources. It is difficult for one person to administer the tests simultaneously, whereas traditional tests can be administered to groups.

Furthermore, work-samples are related to specific jobs and, as such, need to be designed and validated for each specific job. Downs (1977:89) notes the importance of the quality of the instructor-assessor. The instructor needs to be highly skilled and experienced and people with these talents are not always available.

Finally, if the content of the job changes through modernisation or new methods of work, then the whole test needs to be shifted. Finally, research (Downs, 1977:55; Robertson & Kandola, 1982:179; Robertson & Downs,1989:406) suggests that the predictive validity of work-sample testing attenuates over time. Robertson and Kandola (1982:180) found that intelligence and personality attenuate less over time, motivating for their inclusion into the test battery for this research. Therefore, work-samples and trainability tests can often be more costly to organisations.

3.5 THE THEORETICAL RELATIONSHIP BETWEEN MENTAL ALERTNESS, PERSONALITY TRAITS, PSYCHOMOTOR ABILITY AND WORK PERFORMANCE IN THE SELECTION OF LEARNERS

Hakstian, Woolley, Woolsey and Kryger (1991:889), during their concurrent validity study conducted in the clothing industry, used the domains of mental alertness, personality traits, administrative skills, biodata and learners' judgement to predict work performance. An independent assessment of twelve work performance appraisal dimensions was performed on 165 of the 321 participating learners, using a combination of behavioural anchored rating scales and behavioural observation scales. The assessment domains were examined individually as to their predictive efficacy and several domains were correlated with the criterion appraisal dimension scores. The concurrent validity coefficients obtained for the criterion dimensions and the managerial performance criterion range from $r = 0,36$ to $r = ,56$ for women and from $r= ,33$ to $r= ,55$ for men.

The measures of cognitive ability and administrative skills showed the highest validities, with promising concurrent validities from the biodata and judgment inventories. In the personality domain, the criteria validities were recorded from r= 0,22 to r= 0,36, with a mean of 6,29. An overview of the research findings may be seen in Table 3.7.

The assessment domains were examined individually as to their predictive efficacy and several domains were correlated with the criterion appraisal dimension scores. The concurrent validity coefficients obtained for the criterion dimensions and the managerial performance criterion range from $r = 0,36$ to $r = ,56$ for women and from $r= ,33$ to $r= ,55$ for men. The measures of cognitive ability and administrative skills showed the highest validities, with promising concurrent validities from the biodata and judgment inventories. In the personality domain, the criteria validities were recorded from r= 0,22 to r= 0,36, with a mean of 6,29.

Furthermore it has been proven that turnover may be controlled by selecting the candidates most likely to succeed at their jobs. Niculescu (1989:27) reveals that the use of the Personnel Evaluation Profile has assisted in stemming turnover by identifying five predictive dimensions. These dimensions included mental alertness, mechanical interest and ten personality dimensions. Successful learners were found to share average mental alertness, high numerical ability, an inclination to sedentary work, a preference for working with rules and regulations, and an ability to manage environmental and situational stress.

Taking this concept further, Lee (1991:31), investigated the use of self-assessment instruments to assist in the selection of staff for training purposes. The primary rationale was that these instruments make information available concerning personal managerial style, strengths and weaknesses and unique differences. One problem was that the enthusiasm of the trainer exceeded the validity of certain of the instruments, but when used intelligently, personality assessment instruments proved valuable. Similar findings were recorded in 1993 by Ardelean (1993:162) when he developed an assessment battery for the selection of foremen for use in the footwear industry.

The battery included instruments to measure intellect, personality and job performance. Seventy-four foremen produced scores that correlated significantly with job performance, although, the correlation applied to aptitude test results, rather than the results yielded by personality assessment. The armed forces yielded the next study that furthered the argument for the use of personality traits and mental alertness as predictors of work performance. McHenry, Hough and Toquam (1990:210) administered a predictor battery comprised of mental alertness, perceptual-psychomotor ability, personality, interest and job outcome measures to 4,039 enlisted soldiers in nine professions. The predictor measures were derived from the US army selection and classification project, and the relationships between predictor composite scores and five components of job performance were analysed and are displayed in Table 3.8.

Table 3.7: Composition and validity of unit-weighted predictor composites from the various assessment domains for the overall management performance (OMP) criterion

Domain	Measures in composite	Bivariate correlation with OMP
1. Cognitive ability		
(a) Men	CAB-Fs, Reading comprehension, Arithmetic	.28
(b) Women	CAB-Fs, CAB-Fi, Reading comprehension	.32
2. Personality and Motivation		
(a) Men	CPI-Do, Sa, In; 16PF-Qii (-), Qiii	.20
(b) Women	CPI-Do, In; 16PF-E, O (-), Qiv	.24
3. Administrative skills		
(a) Men	Quality of judgment, Managing personnel	.37
(b) Women	Quality of judgment, Managing personnel	.36
4. Biodata		
(a) Men	10 items from the PDQ	.35
(b) Women	14 items from the PDQ	.36
5. Learners' judgment		
(a) Men	17 items from the SPI	.40
(b) Women	30 items from the SPI	.40

Source: Hakstian, A., Ralph, W., Ross, M., Woolsey, L.K. & Kryger, B.R. (1991) Management selection by multiple domain assessment: I. concurrent validity. *Educational and Psychological Measurement, 51 (4), 883 - 898.*

Table 3.8: Mean with-in job corrected and uncorrected validities for the composite scores within each predictor domain

	Predictor domain					
Job performance factor	General cognitive ability (K=4)[b]	Spatial ability (K=1)	Perceptual-psychomotor ability (K=6)	Temperament/ Personality (K=4)	Vocational interest (K=6)	Job reward preference (K=3)
Core technical proficiency	.63 (.43)	.56 (.38)	.53 (.32)	.26 (.15)	.35 (.24)	.29 (.13)
General soldiering proficiency	.65 (.47)	.63 (.47)	.57 (.37)	.25 (.15)	.34 (.25)	.30 (.14)
Effort and leadership	.31 (.22)	.25 (.14)	.26 (.15)	.33 (.30)	.24 (.20)	.19 (.12)
Personal discipline	.16 (.11)	.12 (.08)	.12 (.07)	.32 (.31)	.13 (.11)	.11 (.09)
Physical fitness and military bearing	.20 (.16)	.10 (.08)	.11 (.08)	.37 (.36)	.12 (.13)	.11 (.10)

Source: McHenry, J.J., Hough, L.M., Toquam, J.L. & Hanson, M.A. (1990) Project A validity results: The relationship between predictor and criterion domains. Special Issue: Project A: The US Army Selection and Classification Project. *Personnel Psychology, 43 (2)*, 335-354.

The scores from the cognitive (r = 0,63 and r = 0,65) and perceptual-psychomotor ability $(r$ = 0,53 and r = 0,57) tests provided the best prediction of job specific and general task proficiency, while the personality traits indicated that the strongest predictor of on-the-job success were effort and leadership (r = 0,33), and physical fitness and bearing $(r$ = 0,37)

A study combining personality, cognitive ability and psychomotor ability predictors in the selection of personnel was conducted by Rosse, Miller, Howard and Barnes (1991:433). The research focused on the hiring of service orientated employees and incorporated the use of personality, cognitive and perceptual ability tests in a concurrent validation study of 202 clerical personnel between the ages of nineteen and sixty five years. The personality instruments selected came from the Hogan Personnel Selection Series and they accounted for 5 to 8% of the criterion variance in the study, whereas the two ability tests explained 5% of the criterion variance table. Rosse et al (1991:443) claimed that these results are interpretable as tentative support for broadening the use of personality measurements in the selection of personnel, despite the disappointing contribution of the measure of cognitive ability.

The use of personality as a predictor in personnel selection has also been investigated by Irving (1993:211). He describes how recent data suggests that personality measures are related to performance criteria, and that they are unrelated to cognitive ability when the traits measured are conceptually related to these criteria. It seems that personality measures may predict job performance dimensions that cannot be predicted by cognitive ability measures. The use of personality measures in personnel selection is therefore warranted when a careful job analysis is undertaken to determine which performance dimensions may be related to personality traits. He concludes by stating that, 'well-defined constructs are potentially valid predictors of job performance when the personality constructs are theoretically linked to performance criteria derived from job analysis' (Irving, 1993: 213).

Rosse, Miller and Stecher, (1994:989) after screening eighty job applicants, concluded that those applicants' reactions to personality and mental alertness testing were favourable, whilst their reactions to interviews were generally less favourable. This suggests that personality inventories can be included in employee selection procedures without creating adverse reactions amongst job applicants, provided they are used in conjunction with cognitive ability tests.

Other researchers hold a more sceptical outlook concerning the use of personality tests in selection. Blinkhorn and Johnson (1990:669) claim that an informal survey on the California Psychological Inventory, the Occupational Personality Questionnaire and the 16PF suggests that the evidence for the predictive value of personality testing in recruitment and selection is frequently 'overstated and wrongly assessed'. They suggested that, with the correct massaging, a single correlation can simply be manipulated until a 'significant' result is obtained, and that large numbers of predictors, when combined with small samples, give strong multiple correlations.

Finally, Blinkhorn and Johnson (1990:670) point out that results often ignore the option to cross-validate, for fear of weak composite coefficients. Based on the above, Blinkhorn and Johnson (1990:670) feel 'precious little' evidence exists that personality assessment techniques predict on- the- job performance.

However, despite the lack of predictive value demonstrated by Blinkhorn and Johnson (1990:670), the majority of research illustrates that the use of mental alertness (cognitive ability), personality and psychomotor ability scores can be predictive of work performance. These findings are illustrated in Table 3.9.

Table 3.9: Validity of selection techniques

Criterion/ Selection technique	Validity observed	Validity corrected	k	N	Meta- analysis
Cognitive ability (US)	.39	.51	-	-	Schmidt and Hunter (1998)
Cognitive ability (Europe)	.29	.62	93	9,554	Salgado et al (2003)
Cognitive ability	-	.56	-	-	Hunter and Hunter (1984)
Cognitive ability (Europe)	.28	.54	97	16.065	Salgado et al (2003)
Work samples	.26	.39	54	10.469	Roth et al (1996)
Work samples (motor)	.31	.43	32	2..256	Hardison et al (2005)
Work samples (motor)	.36	.41	38	7.086	Hardison et al (2005)
Spatial mechanical ability (Europe)	.20	.40	84	15.834	Salgado et al (2003)
Personality (overall)	.12	.17	97	13.521	Tett et al (1994)
Personality (extraversion)	.15	.26	17	3.101	Barrick and Mount (1991)
Personality (openness)	.14	.25	14	2.700	Barrick and Mount (1991)
Personality (conscientiousness)	.13	.23	17	3.585	Barrick and Mount (1991)
Personality (emotional stability)	.04	.07	19	3.283	Barrick and Mount (1991)
Personality (agreeableness)	.04	.06	19	3.685	Barrick and Mount (1991)
Personality (self-efficacy)	.19	.23	10	1.122	Judge and Bono (2001)
Personality (self-esteem)	.18	.26	40	5.145	Judge and Bono (2001)

Source: Adapted from Aamodt, M.G. (2010) *Industrial/Organsitional Psychology: An Applied Approach.* Belmont: Wadsworth, 216.

3.6   RESEARCH IN SOUTH AFRICA

Other than the work by Altman (1993:65) which reported correlations, post correction for sample size of r = 0.53 for trainability error and r = 0.035 for on-the-job performance, little research has been undertaken in South Africa on the selection of sewing machinists. Students of the University of Cape Town, where the focus was not on recruitment, conducted similar research under the supervision of the writer. The study was intended to address the identification of training needs, so it did not investigate selection to a great degree, although it did show interviews, trial periods and mentoring to be most common techniques used to select candidates (White, Palmer & Runge, 1992:66).

In this research study, the interviews are generally of a half-hour length and involve no measuring instruments to assess personality, interests, aptitudes or cognitive abilities.   Successful applicants, usually, are those whose personalities have subjectively been assessed as non-assertive.   Non-assertiveness is seen to be important, as it can reduce conflict between the new incumbent and the production/factory manager who is usually assertive to the point of aggression, even although it may stifle the use of initiative or decision-making potential in the learners (White et al,1992:93). The most common method of assessment, the trial period, involves the employment of the learners for a period of four to ten weeks, during which time he or she is observed regarding behaviour and performance.

Finally, the mentoring technique, where understudies or learner apprentices are promoted to positions of learners, revolves around the newly appointed learners working closer with the production manager, with the intention that they gain proficiency in routine and non-routine problem solving. According to the survey, no formal psychometric techniques were being used in the industry (White et al, 1992:101).

3.7 SUMMARY AND APPLICATION TO THIS RESEARCH

A modicum of research has been conducted regarding the relationship between mental alertness, personality traits and work performance as predictors of on-the-job success. Most of the studies have been predictive validity studies, where some form of training intervention has taken place prior to on-the-job performance assessment (Lee, 1991; van den Berg, 1992; Ardelean, 1993; Lancaster et al,1994; Tziner et al,1994). The research has indicated that validity coefficients, ranging between $r = 0,27$ and $r = 0,62$, may be expected when personality questionnaires and tests of mental alertness are used together in a selection procedure to predict work performance.

Furthermore, over the past two decades, research findings have been inconclusive regarding the validity of the personality questionnaire in the selection process, with some researchers claiming its effectiveness in predicting future work performance (Niculescu,1989; McHenry et al,1990; Rosse et al,1991; Tett et al,1991; Irving, 1993; Robertson,1993), and yet others refuting this (Guion & Gottier,1965; Blinkhorn & Johnson,1990; Ardelean,1993).

Similar controversy regarding the use of mental alertness in the selection process continues, with some researchers (Ghiselli,1973; Niculescu,1989; McHenry et al, 1990*;* Muchinsky,1993; Rossini et al,1994) arguing its applicability, and others illustrating its restrictions (Rosse et al,1991; Bartram,1992; Irving,1993).

Work-sampling and trainability testing appear to represent a feasible alternative selection method in terms of reported validities. They provide the applicant with a realistic job preview and therefore improve self-selection (Downs,1973; Cook, 2004). Some researchers argue that work-sample tests and trainability assessments reduce the adverse impact of cultural or racial bias, however, not all studies support this (Blood,1974; Cook, 2004:244; Aamodt, 2010:82).

Furthermore, whilst studies confirm that they are a feasible alternative to traditional psychometric measures, there is evidence that they possess limitations and should be used in conjunction with the traditional tests.

One of the most important findings for this research is that a job analysis procedure should be used in order to ensure congruence between the selection techniques chosen to measure the individual differences, and the job criteria. Also, a clearly hypothesised relationship should be established between the factors involved in the test or instrument, and the job criteria.

There is evidence that the use of multiple criteria yields a more valid predictor of future work performance. Studies where the assessment of personality, cognitive ability, biodata, mechanical abilities, administrative skills, interviews and learners rating have been combined together, have shown encouraging coefficients (McHenry et al,1990; Hakstian et al,1991; Rosse et al,1991). This concurs with the findings of the previous chapter with regard to the design of the test battery for their research.

This chapter has, apart from furthering the theoretical foundation of the research, also fulfilled the second theoretical aim of the research by ascertaining the relationship between mental alertness, personality traits and work performance. The next chapter will address the procedure identified to measure the relationship between mental alertness, personality traits and work performance, and will offer hypotheses that test this relationship.

CHAPTER FOUR

RESEARCH METHOD

This chapter will describe the research method used to empirically investigate the relationship between mental alertness, personality traits, psychomotor ability and work performance. To achieve this, a number of hypotheses are presented and the sample that was drawn is described. The instruments used to measure the relationship will be discussed. Finally, the statistical techniques selected to determine the relationship are outlined.

SPECIFIC EMPIRICAL AIM OF THE RESEARCH

The specific empirical aim of the research is to determine the empirical relationship between mental alertness, personality traits, psychomotor ability and work performance in order to test the theoretical relationship. The following null hypothesis has been formulated from the findings of the literature survey in Chapters Two and Three:

H_o: no predictive relationship exists between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance.

A number of sub-hypotheses have been derived from this hypothesis:

Sub-hypothesis 1

No predictive relationship exists between mental alertness, personality traits, psychomotor ability and learner performance.

Sub-hypothesis 2

No predictive relationship exists between core-module performance and sewing-elective performance and work performance.

Sub-hypothesis 3

No predictive relationship exists between mental alertness, personality traits, psychomotor ability and work performance.

The method of testing the hypothesis and the sub-hypotheses is outlined in this chapter.

4.1   SAMPLE AND SETTING

The research was undertaken in four clothing manufacturers in the Western Cape. The companies were: Bibette Manufacturers, a high fashion ladies' outerwear manufacturer situated in Lansdowne and employing 1 500 staff; Bonwit, also a high-fashion ladies' outerwear manufacturer situated in Athlone and employing 1 200 people; Intimate Apparel (Pty) Ltd, the holder of the Triumph label in South Africa and situated in Epping with a staff complement of 2 000, and; Monviso Knitwear, a high fashion knitwear and sportswear manufacturer also situated in Epping, with 1500 employees.

The measuring instruments were administered to 213 learners during the period May 2007 to August 2010. The sample of 213 learners included 212 females and 1 male. The median age of the sample was 23 years (SD = 4.83) and median educational level was Grade 9 (SD = 0.74) as displayed in Table 4.1.

Table 4.1: Topography of the research sample

N	=	213
Females	=	212 (99.5% of sample)
Males	=	1 (0.46.% of sample)
Racial split	=	119 so-called coloured 94 African
Median Age	=	23 years (SD= 4.83)
Mean educational level	=	Grade 9 (SD = 0.74)
Language	=	Xhosa = 62% Afrikaans = 28% English = 10%

The sample was determined by the learner's performance on the selection test battery.

4.2   MEASURING INSTRUMENTS

4.2.1   Independent variables

4.2.1.1 *NIPR Intermediate Battery B/77 (Mental Alertness Sub-test)*

4.2.1.1.1 Description of the instrument

The mental alertness sub-test of the National Institute for Personnel Research (NIPR) *Intermediate* Battery is a pencil-and-paper test that measures testees' ability to reason deductively and inductively. The test comprises thirty questions, each consisting of five possible answers. It is the testees' task to select the correct answer from the list. The chosen response is then recorded on a separate answer sheet. The testee is allowed thirty minutes to complete the test.

4.2.1.1.2   Rationale of the test

As in the case of the Wonderlic or the Wechsler Adult Intelligence Scale (WAIS), the mental alertness sub-test is based upon the theory that intellect is measured by, or consists largely of, a general or *g*-factor. This is a reflection of Dalton's theory, which stresses intelligence as a general intellectual ability, and he believes, together with Cattel, that intelligence is associated with sensory and motor functions, and that individual performances must be viewed in the light of results on the issues that are reflective of intelligence. Sternberg (1982:262) believes that the *g*-factor translates into the ability to think, to reason (inductively and deductively), and to recognise the relationship between objects and issues. Sternberg (1982:262) maintains that the test items should be selected so that they include those factors with the highest *g*-values. The more unique features, according to Sternberg (1982:262), can be explained on the basis of a specific or *s*-factor, as opposed to the general or *g*-factor (Bergh et al,1992:35).

The entire NIPR Intermediate Battery functions on the line of Thurstone and Guilford's multiple or *G*-factor theory, which stipulates that intelligence also consists of group abilities, for example, verbal ability consists of a number of specific abilities. Seven primary group abilities have been identified, namely verbal comprehension, word fluency, numerical ability, spatial visualisation, memory, perceptual speed and reasoning. These abilities play an important role in the construction of the entire Intermediate Battery, and in other tests, such as the Senior Aptitude Test (SAT) by the Human Sciences Research Council (HSRC), (Bergh et al,1989:12).

4.2.1.1.3   The aim of the test

The aim of the mental alertness sub-test is to determine the subject's level of deductive and inductive reasoning, which in turn may be interpreted as a score for mental alertness.

4.2.1.1.4   The scales of the test

The test incorporates scales which measure the individual's ability to do mental arithmetic and to use vocabulary to solve problems. These scales measure the deductive and inductive reasoning powers of the individual.

4.2.1.1.5   The administration of the test

The test is given to the subject under strict time constraints. This time excludes the explanation concerning the completion of the test. The thirty questions must be answered in thirty minutes; no scrap paper is supplied as all calculations must be mental. The answer sheet is marked using a mask – the number of correct responses is used to derive a stanine or sten score from the norm table appropriate to the testee.

4.2.1.1.6 The psychometric value of the test

Reliability

The HSRC has, after extensive test-retest studies, reported reliability coefficients of between $r= 0,92$ and $r= 0,95$. The Kurder-Richardson formula was used to establish these coefficients for each of the norm groups described in the test manual. These coefficients fall within the accepted level of $r= 0,80$ to $r= 0,90$ as described in Chapter Two.

Validity

There are no reported validity measures for the Intermediate Battery, or for the mental alertness sub-test of the Intermediate Battery, available in South Africa.

4.2.1.1.7 Motivation for the inclusion of the test

The fundamental reason for the inclusion of the mental alertness sub-test of the NIPR Intermediate Battery arises from a weakness in the other measuring instrument used in this study, namely the 16PF. Factor B of the 16PF is neither a valid ($r= 0, 35$) nor reliable ($r= 0, 54$) measure of intellect (Bergh et al,1989:15). As displayed by the PAQ, intelligence, divergent and convergent thinking, numerical computation and arithmetic reasoning are all necessary qualities in effective learners (See Table 8). The mental alertness sub-test has been included to offer a more valid and reliable assessment of these qualities. Although the Figure Classification Test (A121) designed by the NIPR is an effective and culturally fair method of measuring problem solving and reasoning abilities, the test duration (ninety minutes) proved too lengthy for its inclusion into the research battery.

What must be kept in mind is that the study examined learners from all departments, for example, despatch, receiving, and finishing. In most of these departments there is a need to react to the written word, and to interpret and work with figures. The mental alertness sub-test assesses reasoning potential through items based on both numerical and verbal problems. The test is expedient to administer and score, which complies with the requirements for an efficient method for selecting learners. The clothing industry runs on the concept of a standard minute on which garment costing is drawn and wages paid, therefore 'time is precious' in this industry. Finally, many clothing industry learners hold between Grade 8 and Grade 10 certificate. The Intermediate Battery is designed to measure the potential of people whose educational standards fall within these parameters.

4.2.1.2 *The 16 Personality Factor Questionnaire (Form E)*

4.2.1.2.1 Description of the questionnaire

The 16 Personality Factor Questionnaire (Form E) is a paper-and-pencil questionnaire, which comprises a set of selected and structured items. The candidates' responses to these items are used to compile a personality profile (Prinsloo,1992,5). The South African version of the Form E is a standardised version of the test developed in 1949 by R B Cattell under the copyright of the Institute of Personality and Ability Testing (IPAT) (Prinsloo,1992:21).

The questionnaire is a compilation of 128 questions, each of which presents the testees with A or B answer options. Each option is loaded with one or more of the 16 items. The subject's task is to carefully read both options, reflect on their own understanding of their personality, and record their selection of either option A or B on a separate answer sheet. The test has no specified time limit, however, in order to ensure the necessary forced choice and spontaneity that will lead to faith validity, the test should be completed within a 45 to 60 minute period. The test is scored and interpreted as sten scores which are used to form a profile of the individual. This profile includes 16 primary source factors and five second-order factors.

4.2.1.2.2   Rationale of the questionnaire

The underlying assumption of the 16 Personality Factor Questionnaire is that the testees are aware of their own behaviour and know themselves well enough to make valid assessments of themselves in terms of the items presented on the test. The test items are grouped in such a way as to indicate particular personality traits or factors, which reflect overt or covert behaviour patterns.

The personality inventories are generally hedged in the traits, factor, psychometric or statistical approaches to personality and the measure of personality. The majority of studies undertaken within this ambit have been nomothetic, especially those that have been undertaken in the area of factor analysis. This implies that human behaviour may be investigated and compared on the basis of generally valid norms and standards and that people are generally similar, possessing traits that can be compared by means of objective and structured tests (Muchinsky et al, 1998:74; Aamodt, 2010:196; Cascio, 2010:251).

4.2.1.2.3   Aim of the questionnaire

The aim of the 16PF is to identify an individual's personality, through the evaluation of 16 primary or source traits and 5 second-order traits (Aamodt, 2010:186).

4.2.1.2.4   The scales of the questionnaire

Through a vast factor analytic project, Cattell et al (1970:1) arrived at the 16 Personality Factors or scales which the test measures and these have since been replicated in the Guilford-Zimmerman scales, Eysenck's scales and Minnesota Multiphasic Personality Inventory. They form a broad sampling of personality responses, and yield independent true simple structures that show functionally unitary traits.

There has been continual work done on the scales over the years to ensure good suppressor action and a wide sampling of behaviour consistent with a broad personality factor. The work has ensured the streamlining of specifics that would lead to high homogeneity coefficients (Cattell et al,1970:44).

The 16PF has two additional scales that are not as widely recognised as the 16 primary scales described above. The first set of scales is that of the broader second-order factor scales, which were revealed by factor analysis. They measure introversion-extroversion, anxiety-dynamic integration, tough-poise, independence and sociopathy, and determine faked answers to the items in the questionnaire. The second-order factors, and the scales to determine faked answers (also known as the validity scales) afford the researcher with information on test attitude and so they are important in the area of selection (Owen & Taljaardt,1988:211).

4.2.1.2.5   Administration of the questionnaire

The respondents are requested to encode their responses entering a mark in either of the two spaces labelled A or B. These correspond with the question posed in the questionnaire, and the respondent is tasked with reading both the A and B questions or scenarios described, and considering their personality and the manner in which they response to life, record either A or B on the answer sheet.

The administrative procedures are clearly outlined in the 16PF record. The scoring involves the use of three stencils, with the raw scores being converted to standard scores with the aid of a norm table.

4.2.1.2.6   Psychometric properties of the questionnaire

Validity

Research on the validity of the 16PF has been extensively carried out in the United States. Owing to a paucity of research in the South African context, especially in the case of the Form E, it is generally accepted that the American research is applicable to local populations.

Factor analysis allows the concept validity of the test to be measured by correlating the scale with the pure factor which it purports to measure. Concept validity indicates how well a scale correlates with the concept or construct found in the source trait which is intended to measure. In the case of Form A, this validity measures on the lowest, $r= 035$ in the case of factor B, and on the highest $r= 0,83$ with regard to factor F. In Form B, the lowest reading of $r= 0,44$ is received for factor B and the highest $r= 0,87$ is indicated for factor H, whereas, in factor C the lowest is r= 0,46 and the highest for factor I.

Finally, in Form D the lowest validity is found for factor E of $r= 0,54$ and the highest for factor H $r= 0,82$ (Cattell et al,1970:35). Equally encouraging validity coefficients have been reported in factor analytical studies where the five second-order factors of the 16PF were examined, as can be seen in Table 4.2.

Table 4.2 describes the direct concept validity; however, it is of importance to also consider the indirect validity.   Here, the correlations of the test with the representative sample of concrete natural criteria are assessed to determine whether this agrees with those which the conceptual criteria itself is expected to share with these variables.   Here, the lowest factor recorded is that for N and it reflects a measure of $r= 0,63$ and the highest is that for factor F which measures $r= 0,82$.

Table 4.2 Correlations between second-order factors

	Q1 Extraversion	QII Anxiety	QIII Tough poise	QIV Independence	QVIII Compulsivity
Extrav./Q1	1,00000				
Anxiety/QII	-0.40906	1,00000			
Tough P/QIII	-0.40973	-0.02723	1,00000		
Indep./QIV	0.24436	0.29456	0.29799	1,00000	
Comp./QVIII	0.00260	-0.49060	0.02182	-0.53327	1,00000

Source: Prinsloo, C.H. (1992) *Manual for the use of the Sixteen Personality Factor Questionnaire, Form E (16PF, Form E)*. Human Sciences Research Council, 22.

Concrete validity is an indication of the correlations of the scale with any concrete measure of performance. This could include measures such as school achievement, clinical diagnosis, pilot success, or selection success. The issue of content of faith validity is meaningless in the case of the 16PF, as the concept of personality is beyond intuition and therefore it has no application in this case (Cattell et al, 1970:34).

The psychometric properties reported by Cattell et al, (1970:35) on the Form A, still hold today. Research by Saville and Munro (1986), Van den Berg (1992), and Bartram (1992) indicates encouraging coefficients during validity studies including meta-analytic work, where criterion-related validity coefficients were as high as $r = 0,42$. These findings are supported by Bull (1974:14), whose research determined the relationship between the 16PF factors and behaviour ratings of learners to measure $r = 0,37$.

What is debatable is the use of the second-order factors to determine validity. Second-order dimensions are more reliable but offer less predictive than the primary dimensions according to certain research. However, work continues in an attempt to determine this.

Reliability

The largest factor that will affect the reliability of the 16PF is the number of forms of the test that are used. Time constraints often lead to the researcher using only one form of the option A to E, however, it is strongly urged that all five forms are used. The 16PF measures 16 different dimensions with approximately 6 items in one scale, each taking two minutes of testing time, and this is scarcely a reasonable reflection of the whole personality dimension. The construction of the test is of equal importance in determining the degree of the reliability of the test; more specifically the way it is administered and the manner in which it is scored. The latter is measured by the concept reliability coefficient, and owing to the fact that the 16PF is objectively scored by computer or by mask, it is potentially possible for the coefficient to be perfect (Cattell et al,1970:29).

Equally, there is no account taken of the extremely high validities achieved by computer assistance, and finally, they do not understand the concept of one test being suitable for research and another for individual case work as in the case, for example, of the clinical form of this test. There is a continual graduation of reliability in tests and a corresponding graduation in the standard error of measurement within these tests (Cattell *et al*,1970:40). Specific to the Form E, Prinsloo (1992:5) reports that the Kurder-Richardson 8 coefficient is above ,450 in 75% of the factors. Furthermore, work on the test-retest reliabilities found that the lowest factor measured, 0,150 and the highest 0,712 as seen in Table 4.3.

Cattell et al (1970:31) considers the term reliability as a misnomer and he claims that the word equivalence is a more apt description of a test's ability to continually measure the same constructs over repeated applications. Further, he claims that many tests stipulate an equivalence level of 0,95 whereas in reality this figure is far from the truth. Instead, in the case of the 16PF he chooses to play down the equivalence figures and states that many researchers interpret this incorrectly, seeing it as a weakness within the test. Cattell et al (1970:32) go further to describe that if one had an extremely limited time and a limited length, it would be difficult to prove the equivalence of any test, equally if these were as long as one wanted, it would be easy to prove equivalence.

Table 4.3: Test-retest reliablitly coefficients (1988) (N=66)

FACTOR	COEFFICIENT
A	0,473
B	0,712
C	0,550
E	0,310
F	0,680
G	0,451
H	0,569
I	0,517
L	0,353
M	0,150
N	0,191
O	0,463
Q_1	0,412
Q_2	0,494
Q_3	0,231
Q_4	0,705

Source: Prinsloo, C.H. (1992) *Manual for the use of the Sixteen Personality Factor Questionnaire, Form E (16PF, Form E).* Human Sciences Research Council, 22.

4.2.1.2.7   Motivation for the inclusion of the 16PF

In the job description certain personality traits are claimed as requirements for effective duty, for example assertiveness, boldness, patience. On these grounds, it was decided that some form of personality measure need to be included in the test battery (c/f Rosse et al, 1991). The information yielded by the PAQ has been used as a foundation for the job description generated for this research (See Appendix 1).

Although stronger validity coefficients regarding the prediction of work performance have been reaped from the OPQ (c/f Saville and Munro, 1986), the cost factor was too prohibitive for its inclusion into the study. Equally, the OPQ does not have the added advantage of the motivational distortion scales – faking good and faking bad – of the 16PF which offers an indication of the truthfulness of the individual's responsiveness.

The 16PF is the second most widely used personality test in the world, after the MMPI, and its success as a psychometric tool is well documented. Therefore, owing to availability, cost, ease of administration and a dire need for research to be conducted in South Africa on the Form E version of the test, the 16PF was chosen to measure the second independent variable of personality traits.

The use of personality questionnaires still continues despite the dubious validity and reliability coefficient yielded. Van der Flier (1992:n.p.) explains that there are a number of reasons why the questionnaires continue to be used. One of the reasons is that personality questionnaires contribute unique measures that the other instruments used in selection battery neglect, for example introversion-extroversion. Another advantage is that the information gathered from a personality questionnaire is a reliable and norm referenced measure.

This information may be used to validate or refute subjective opinions formed in the interview process concerning a candidate's personality. The expedience and cost-effectiveness of the questionnaires is another contributing factor to their continued usage. This becomes evident when compared against the cost and time involved in assessment centres.

Furthermore, moderate to good reliability rating have been reported for the 16PF in a study based on samples of 10,261 individuals. Internal consistency reliabilities were on average 0.76 for the primary scales and a range of 0.68 to 0.87 for all 16 scales. The test-reliabilities over a two week period showed scores of 0.69-0.87 for all scales and a two month interval showed scores ranging from 0.56-0.79. These findings illustrate that the 16PF attenuates less over time than other predictive measures (Saville & Blinkhorn, 2002:212).

Finally, the design of job requirements or person specifications often includes personality factors, and the matching of personality traits yielded by questionnaires to the described factor is considered desirable (van den Berg,1993:339).

4.2.3   Dependent variables

4.2.3.1 *Choice and evaluation of criteria*

A number of principles have been used to evaluate the criteria chosen, the first being *relevance*. It is believed that the relevance of the criteria is the most important requirement. This means that it must be logically related to the conceptual criteria or 'ultimate goal'. The conceptual criteria could, therefore, be restated as the 'performance proficiency'.

In this research, the criteria of work-quality and work behaviour are directly and logically related to the performance proficiency of learners. These are also the criteria that are specific to the measurement of work performance.

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The next principle, as outlined by Guion (1965), Manese (1986), and Cascio (1991), is that the criteria measures must be *sensitive or capable of discriminating between effective and ineffective* performance. The criteria of work behaviour and work-quality are directly sensitive and indicative of differences in the learner's ability to perform on the job.

Finally, Thorndike (1949), Guion (1965), Manese (1986), and Cascio (1991) all highlight the importance of the principle of *practicality*. Both work behaviour and work-quality meet the requirements of practicality, as data collection for these measures is practical, and does not interfere with the learner's on-line sewing performance. Therefore, all the criteria, as stipulated, have been evaluated and proven to be in accordance with the principles described.

4.2.4   Psychomotor ability assessment (trainability test)

4.2.4.1 *Description of the instrument*

The sewing trainability test measures the potential of learnership applicants to learn to sew using a single needle lockstitch sewing machine. The lockstitch machine does not have a quick release function and is prepared by the assessor (threaded, needle ready but not yet inserted, bobbin inserted) prior to the test beginning. The applicants are given 30 minutes to acquaint themselves with the functions of the machine (treadle, knee-lifter, garment release lever, feeddog, and hand wheel) by being allowed to sew on a circular piece of fabric that is attached around the machine bed. For safety reasons there is no needle inserted into the machine during the trial stage of the test. The instructor then places twenty cut pieces of cut fabric in two piles of ten pieces, side-by-side, on the left of the machine table. The cut pieces measure 20 cm centimetres in length and 5 cm in width. One pile has the fabric right side up (warp), and the other pile has the fabric the wrong side up (weft).

The instructor demonstrates the picking up of two pieces of cut work from either pile, the aligning of the two left-hand sides and the presentation of the cut work to the machine needle. The treadle is then used to slowly sew a 1 cm wide seam along the edge of the cut piece. The knee-lifter is used to release the fabric, scissors cut the cotton, and the sewn piece is disposed of on the right-hand side of the machine table. The instructor demonstrates this operation three times, always highlighting the quality points that they will look for when scoring the test and cautioning the applicant about the danger of the needle. The applicants are given twenty minutes to sew the seams to the highest quality standard. The instructor observes the applicants' machine control, the manner in which they handle the cut work, and how they ensure safety.

The test measures the ability of the candidate to use their eyes, hands, feet and knee to operate a sewing machine. The aim of the test is to predict the candidate's ability to successfully complete a training programme on how to sew garments using a lockstitch machine. The test takes approximately one hour, allowing the candidate time to settle on the machine. In the first thirty minutes, the candidate is allowed to 'practise sew' or trial the machine on a circular piece of fabric without a needle inserted in the needle bar. Then, once the candidate is comfortable with the treadle operation, the test is conducted using twenty pieces of fabric cut into the shape of a bag. The candidate is required to align two pieces and then sew them together with a 1 cm seam on three sides.

When conducting the test, the instructor follows set standard procedures and instructions. On completion, the ten bags are then examined against quality standard and rated according to an A to E scale. Research conducted by Downs (1973) and Robertson and Downs (1979) showed promising correlations as high as $r = 0,32$.

4.2.3.2.2   Rationale of the test

The test measures the ability of the candidate to use their eyes, hands, feet and knee to operate a sewing machine. The aim of the test is to predict the candidate's ability to successful complete a training programme on how to sew garments using a lockstitch machine.

4.2.3.2.3   The aim of the test

The aim of the trainability test is to measure the candidate's psychomotor ability to operate a lockstitch sewing machine, which in turn may be interpreted as a predictive score.

4.2.3.2.4   The scales of the test

The test incorporates scales which measure the number of errors and the quantity of sewn seams.   The test measures the psychomotor ability of the applicant to control a lockstitch sewing machine. Through the scoring of the quality level produced by the applicants, the test also assesses their ability to listen and follow instructions in English.

4.2.3.2.5   The administration of the test

The test is given to the applicant under strict time constraints.   This time excludes the explanation concerning the completion of the test. The actual test to sew twenty seams must be completed in twenty minutes.

On completion of the test, the instructor examines the quality of the seams and then counts the number of seams sewn. The applicant's performance is rated from 'A' which is excellent to 'E' which is regarded as weak.

4.2.3.2.6   The psychometric value of the test

Reliability

Downs (1977:409) refers to Downs (1973), who conducted research for the 'sew-a-bag' trainability test to establish reliability using two trainability assessments with two different machines, namely the overlock and the lockstitch, both involving the same critical skills. For trainability error score, the correlation between the lockstitch and the overlock was r= 0,64 (p<0,0001); and for the trainability rating score the correlation between the two assessments was r= 0,89 (p<0,001).

Validity

Robertson and Downs (1989:410) conducted a meta-analysis study of work-sample trainability tests and found the mean validity coefficient to measure r= 0,48. Unfortunately, few studies are available with work performance. The highest mean validity coefficient, r= 0.48 is obtained for error scores as the predictor and training success as the criterion. Research suggests those work-sample trainability tests are better at predicting training success than the measures of work performance.

Again, Robertson and Downs (1989:414) refer to Downs (1970) who found a correlation between training success and error score of r= 0,31 (p<0.01) and between training success and rating score of r= 0,51 (p>0,001). Further correlations were found between on-the-job success after thirteen weeks and an error rating score of r= 0,36 (p< 0,001); and the correlation between the on-the-job success and error score (r=0,21) after twenty six weeks was r = 0,45 (p< 0.001).

4.2.3.2.7   Motivation for the inclusion of the test

The fundamental reason for the inclusion of the trainability test was to assess candidates in a culturally fair manner that is as closely aligned to the actual job as possible. Furthermore, Cook (2004:195) claims that people doing trainability tests can assess their own performance and 'Applicants for sewing machining jobs in effect select themselves for the job.' It was found that candidates who scored highly on the trainability test were inclined to accept the job offers and remain in employment, thereby reducing turnover.

4.2.5   Work performance

The sewing line supervisor appraising the learners' on-line work performance achieved quantitative measures of work performance. For the purpose of research, work performance has been divided into two specific criteria, namely work-quality and work-quantity. This design is illustrated in Figure 4.1.

Thus w*ork-quality* refers specifically to the accuracy with which the learners perform their duties and *work-quantity* refers to the amount of work they produce. The result is a quantitative and a qualitative measure of work performance for the purpose of the research. The two separate criteria and their measurement will now be discussed.

4.2.5.1   *Work-quality*

The sample specification sheet that stipulates the retailer's quality standards for that specific garment sets the work-quality measure. A quality rating is allocated per line by the on-line garment examiners who conduct hourly inspections on the sewn work. This rating is expressed in the form of a percentage score. The instrument is included in Appendix 4.

Figure 4.1: The components of work performance

WORK PERFORMANCE	
SEWING LINE SUPERVISOR APPRAISED WORK-QUALITY Counting the amount of relevant job behaviours that take place. These are: * inferred / observable * covert / overt * measurable	SEWING LINE SUPERVISOR APPRAISED WORK-QUANTITY Measured in terms of the errors made that deviate from a standard. These are: * inferred / observable * covert / overt * measurable

4.2.5.2   *Work- quantity*

The work-quantity sewn by the learner is calculated by the work study department, according to the number of completed operations recorded by the on-line sewing supervisor. This rating is expressed in the form of percentage score (c/f Appendix 4).

(i)   Description of the instruments

The supervisor appraisal questionnaires were made up of ten domains which rated the learner's work performance over the duration of the training programme. These questions are presented in a behavioural checklist rating scale of 1–10. A rating of 1 represents poor work-quality/work-quantity and a rating of 10 represents outstanding work-quality/work-quantity.

After reviewing the learner's performance on the sewing line the supervisor is tasked with rating the learner's work-quality and work-quantity on the specified criteria.

(ii)　　　　Rationale of the instruments

The underlying rationale of the instrument is that an external observer can objectively evaluate the work performance of another individual, and capture it on a rating scale (Latham & Wexley,1981:80).

(iii)　　　　Aim of the instruments

The instrument's aim is to evaluate the work-quality and work-quantity of work undertaken by learners during the training.

(iv)　　　Scales involved in the instruments

The instruments included the following scales: 1 represents poor work-quality/work-quantity, and 10 represents outstanding work-quality/work-quantity. The instrument includes five work-quality related questions and five work-quantity related questions.

(v)　　　Administration of the instruments

The supervisor was tasked with rating the learners from 1 to 10 in relation to the ten questions posed. The supervisor was given instructions on how to complete the scale and was asked to complete it without a time limit. The supervisor was not trained in observation of performance rating.

(vi)   Psychometric properties of the instruments

According to Latham and Wexley (1981:65), there are three characteristics of a performance appraisal which must be met if that appraisal is to be considered scientifically adequate. These are:

- The performance appraisal instrument must be based on a recognised job analysis system
- The appraisal instrument must have internal consistency, i.e. reliability
- The appraisal system must be valid.

To achieve these three characteristics, the researcher conducted a job analysis using the Critical Incidence Technique, i.e. observers who were experts in the field described to him the effective and ineffective tasks involved in a learner's job. After these critical incidents were collected, they were split into two scales, namely quality and quantity.

The appraisal instrument was developed by giving an equal rating to each of the criteria identified, and it assumes that each criteria is equally important for defining overall work-quality success. Latham and Wexley (1981:100) state that this assumption may be erroneous and they argue that, in the long term, one can only guess the actual rating of each criterion. Therefore, if all criteria are treated equally, fewer errors are likely to occur in the final data analysis.

(vii)   Psychometric properties of rating scales

Reliability

The prime issue in relation to rating scales is the consistency with which ratings are done. According to Latham and Wexley (1981:99) three methods exist by which reliability rating scales may be measured. To illustrate the degree of reliability, each will be briefly discussed.

Comparison over time

Latham and Wexley (1981:64) report reliability levels of r = 0,70 or higher when a scale is completed by a manager over a period of several days.

Inter-rater reliability

If a subordinate is rated independently by two raters, Latham and Wexley (1981:64) report reliability levels of at least r = 0,60.

Internal consistency

To achieve this, a number of items must measure a single factor. If this is accomplished an r = 0,80 should be achieved, according to Latham and Wexley (1981:81).

Validity

There is a need for the existence of content validity and criteria validity in a rating scale, as both of these relate to some aspect of job performance as determined by some form of job analysis.

(vii)   Motivation for the inclusion of the instrument

Rating scale-based performance appraisals have limitations when used for research purposes. They are, however, a method of measuring work that is efficient, practical and, to a degree, objective. The performance appraisal, or rating scale, is practical because of its ease of design, in that the constructs were determined by the Critical Incidence Technique. The instrument is efficient, as it is not time-consuming to complete, and, when consideration is given to the time constraints that apply to clothing production managers, this is a major factor in its favour.

Finally, the instruments are described as 'reasonably' objective as they may suffer from contamination due to rater bias, halo effect, central tendency, or attribution error (Watkins, Cilliers, Coster & Theron, 1984:214). Meta-analytical studies have been conducted to investigate the use of learners' ratings in the measurement of job performance. Schmidt et al (1984:411), Nathan and Alexander (1988:519) and Barrick and Mount (1991:203) conclude that performance ratings are suitable as objective measures of on-the-job performance.

Further credence concerning the suitability of the appraisal scale is given by Landy and Farr (1980:63) who state that appraisal:

- Reduces the halo effect as the person considers their overall performance;
- Reduces bias, for example sex and race;
- May negate the effect of age and education, but further research is necessary.

To ensure that the instrument can withstand academic scrutiny, the performance criteria were aligned with the performance methods. The criteria selected to determine learner success are categorised by Aamodt (2007:223) as competency-focused performance dimensions.

These dimensions measure the skill, knowledge and abilities of the learner and made use of a fit for purpose behavioural checklist. This performance rating method consists of a list of relevant behaviours that measure skills and competencies. Finally, this domain of work performance has been included in this research as previous studies has neglected to measure the trainees' on-the-job performance (Robertson & Downs,1979:48; Robertson & Downs,1989:406).

4.3   PROCEDURE

The present study is a concurrent criterion-related validity design as illustrated in Figure 4.2. The independent variables in the study are the mental alertness scores as measured by the mental alertness sub-test of the NIPR Intermediate Battery, and the personality trait scores, by the 16 primary or 5 second-order factors, as measured by the 16 Personality Factor Questionnaire (16PF) and the learners' scores on the core and sewing elective modules of the learnership.

The dependent variable in the study is work performance. For the purpose of the study, work performance has been divided into a qualitative measure, namely *work-quality* and a quantitative measure, namely *work-quantity.* The biographical variables, race, gender, language, educational level and age, have been included in the research design as moderator variables, as can be seen in Figure 4.2.

The research included three phases: each phase measured the effect of different independent variables on differing dependent variables. Phase I is a battery of psychometric tests which measure the learner's mental alertness, personality and psychomotor ability. Only on successful completion of the psychometric battery is the candidate registered onto the data base and allowed to begin the learning programme. If the applicant does not achieve the minimum scores they are disqualified. Phase II measures the core and the sewing-elective modules. Phase III measures sewing floor work-quality and work-quantity.

Figure 4.2: Research design

Phase I and Phase III: variables

Phase II and III: Independent Dependent variables

16 primary personality trait scores	Phase II: Dependent variables Phase III: Independent variables		Supervisor-appraised work-quality	W O R K
5 second-order personality trait scores	Core-module performance			P E R F O R M A N C E
	Sewing-elective performance			
Mental alertness score			Supervisor-appraised work-quantity	
Psychomotor ability score				
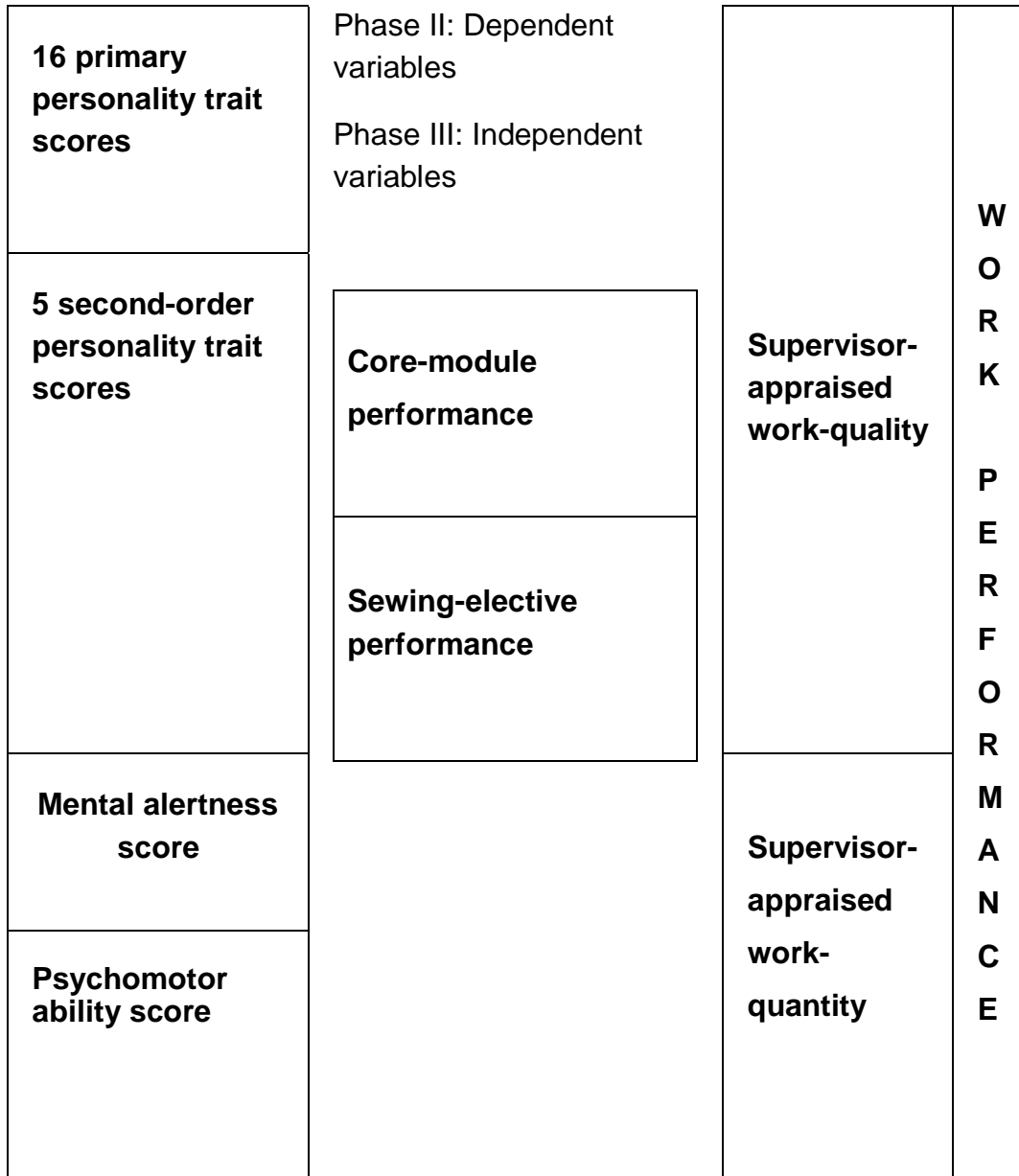
Moderator variables: race, gender, language, educational level and age.

To determine the relationship between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance, the procedure is outlined below in a step-by-step manner.

Step one

The Position Analysis Question (PAQ) was used to analyse the job of clothing industry learners. To achieve this, two production managers, each with approximately fifteen years of experience in the selection, recruitment, development and management of clothing industry learners, acted as raters A and B for the questionnaire.

On completion of the necessary computer-based processing, the first 15 z-scores and the first 15 attribute scores were identified and used for the purpose of the research. These scores indicated the constructs to be measured by the test battery, and thereby determined the type of test to be selected.

McCormick, Jeanneret and Mecham developed the PAQ in 1977. The reliability and validity of the PAQ was established by having 26 pairs of individuals independently analyse 62 jobs. When all possible pairs were averaged together, the overall reliability coefficient was $r = 0,79$. When the reliability of each of the individual job elements was computed across the 26 pairs of individuals, the average item reliability coefficient was $r = 0,80$. Similar results were obtained with a German form of the PAQ (Cascio,1991:206)

The PAQ is, therefore, considered to have, 'respectable reliability when used by trained job analysts' (Gregory,1996:214).   Inter-rater reliability is often seen to measure $r = 0,80$ for the measuring instrument. Validity is less well established, although it has been noted that PAQ results are unaffected by the sex of the analyst, the interest of the incumbent, or the amount of job information provided.

Step two

The top 15 z-scores and attribute scores from the PAQ were identified. The z-scores were compared against a data bank which consisted of the z-scores of the jobs that had already been analysed by the PAQ. The ranking of the z-scores may sometimes be inappropriate, as the jobs in the data bank may not correspond directly to the job being analysed.

To offset the possibility of the z-scores being inappropriate, and to get the relevant situational attributes, the researcher also used a ranking of the attribute scores (the sum of the weight of the question, multiplied by the rating of the question as illustrated in Table 4.4.

The 15 z-scores below were based on aptitude-based attributes used in the person specification, and did not give any situational attribute used in the job description. However, they contained both situational and aptitude-based attributes. Only the top 15 scores from both the z-scores and attribute rankings were taken into account. Although this could be considered a relatively arbitrary cut-off point, they were chosen because they represented the top 20% of the rankings of the 68 attributes. These top 15 z-scores and attribute scores represent both the manager and the learners' scores, and have been tabulated for comparison.

Step three

A job specification was generated from the attribute scores and z-scores (Appendix 2).

Step four

A job description was generated from the attribute scores (Appendix 1).

Table 4.4: Attribute scores from the PAQ

	PAQ attributes	Production managers	Learners
1	Near visual acuity	638,25	663,50
2	Sensory or judgment criteria	621,25	640,75
3	Attainment of set standards	576,50	594,50
4	Repetitive short cycle activities	523,00	535,00
	Intelligence	520,50	540,50
6	Perceptual speed	507.75	521,75
7	Short term memory	488,25	511,75
8	Variety of duties	467,25	502,00
9	Measurable or verifiable criteria	457,25	489,50
10	Conflict/ambiguous Information	448,00	479,25
11	Convergent thinking	442,75	461,50
12	Susceptibility to fatigue	436,75	463,75
13	Creative activities	436,75	462,00
14	Sensory alertness	430,25	463,50
15	Long term memory	430,25	442,00

Step five

Using the top 10 *z*-scores given by the PAQ, a psychometric instrument was selected to measure the mental alertness of the individuals who made up the research sample. The mental alertness sub-test of the NIPR Intermediate Battery was selected. The score yielded by this test became the first independent variable in the study.

Step six

Using the top 10 attribute scores given by the PAQ, a psychometric instrument was selected to measure the personality traits of the individuals comprising the research sample. The 16PF was the instrument that was selected. These scores yielded the second independent variable in the study.

Step seven

Using the top 10 attribute scores given by the PAQ, a psychometric instrument was selected to measure the psychomotor ability of the individuals comprising the research sample. The sew-a-bag test was the instrument selected and the individual scores were recorded on a rating sheet as outlined in Appendix 3. These scores yielded the third independent variable in the study.

Step eight

A performance appraisal instrument, using behavioural checklist scales, was designed for completion by the learners' supervisor. The scales in the instrument included work-quality and work-quantity measures. The instrument was designed with the aid of a job analysis technique known as Critical Incidence Technique.

The scores of the performance appraisal instrument inventory yielded the components of the dependent variable of work performance, namely work-quality and work-quantity (Appendix 4).

Step nine

The relationship between mental alertness, personality traits, psychomotor, work-quality and work-quantity was measured, using the statistical techniques known as Pearson's Product Moment Correlation Coefficient and Stepwise Regression. The influence of the moderator variables of race, gender, language, educational level and age was assessed using the Kruskall-Wallis nonparametric test and, to identify which means differ, the Tukey's confidence intervals were used.

Step ten

These empirical findings were used to draw conclusions and make recommendations based on the theoretical study previously conducted.

4.4   STATISTICAL ANALYSIS

The statistical analysis was used to test the null hypothesis: no significant relationship exists between mental alertness, personality traits and work performance in the selection of clothing industry learners.

4.4.1   Correlation coefficients

Initially, the relationship between the variables was calculated by means of the correlation coefficients. The technique used was Pearson's Product Moment Correlation Coefficient, r and it determined the magnitude of the linear relationship between the variables.

Direct range restriction has occurred because only learners who passed the test battery were selected. Therefore, the correlation coefficient will be correct for range restriction.

4.4.2 Multiple regressions

Although the correlation coefficient tells the researcher about the degree of relationship between the variables, it does not allow one set of scores (criterion) to predict another (predictor).

As it is the aim of this research to determine the relationship between mental alertness, personality traits, and work performance in order to assess the viability of the test battery to predict work performance, the ability to predict is necessary. The statistical technique that allows the prediction of one score from another is known as regression analysis. When the regression equation allows for a number of criterion scores to predict a number of predictor scores, the technique which results is multiple regression (Cascio,1991:347). A permutation of the multiple regression technique is known as backward elimination multiple regression. Through the regression of the independent variables on the dependent variable(s), this statically calculates the coefficient of multiple determination, R-squared, or R^2. This R^2 measure indicates the proportion of criterion variable that may be explained by more than one predictor.

Backward elimination multiple regression seeks to fulfil the researcher's ideal of obtaining the highest R-squared possible. This is achieved by determining the inter-correlation between variables, and then reducing the pool of variables by selecting a smaller set of variables that will yield an R-squared of approximately the same magnitude as the one originally obtained. The highest R-squared with the smallest number of variables may be obtained by conducting a forward stepwise regression. In a stepwise regression manner, each variable is examined for its contribution to the regression equation, and, should the contribution be poor in relation to the contributions of the other variables, that variable is disregarded.

In the backward elimination multiple regression formula, the interactions between the independent and the dependent variable are selected by a computer programme. The programme, rather than the researcher, indicates the variables which are to be introduced into the formula, and their order; hence the term 'elimination'. The result is a regression equation which predicts various points within a scatter plot through the method of multiple linear regression, in a stepwise manner (Kerlinger,1986:550).

The technique of conanical correlation was initially considered for the empirical analysis of the results as it examines the interaction of many independent variables on many dependent variables. Although this technique was viable as the research design incorporated three dependent variable scores which could have been interacted with the three independent variable scores, this option was not pursued because of the possibility of introducing noise or nuisance variables. Over and above this, the danger of introducing multicollinearity, owing to the correlation that exists between the 16 primary factors and the 5 second-order scores, was also a persuading factor. This may, in turn, have reduced the design elegance and efficacy through a loss of variance control.

Nevertheless, multiple regression analysis is considered to be an 'effective and powerful hypothesis testing and inference-making technique' (Kerlinger,1986:550), and the stepwise form of this technique has, therefore, been chosen to test the research hypothesis: no significant relationship exists between mental alertness, personality traits and work performance.

4.4.3 Kruskall-Wallis one-way analysis of variance

Kruskall-Wallis one-way analysis of variance was used because of non-normality of the data. Howell (2008:405) describes the Kruskall-Wallis test as a direct generalisation of the Mann-Whitney test; it tests for an overall pattern among the group means where there are three or more independent variables.

Kruskall-Wallis one-way analysis of variance is the distribution free analogue of the one-way analysis of variance. The non-normality of the data demanded the use of nonparametric tests instead of the analysis of variance (ANOVA). If H_0 is rejected we do not know which mean or means are not equal.

4.4.4   Tukey's confidence interval

To identify which means differ the researcher uses Tukey's confidence interval, which tests the difference of all combinations of two means.

4.5   SUMMARY AND VALUE OF THIS CHAPTER

This chapter outlined the research design intended to investigate the relationship between the predictors, namely mental alertness and personality traits, psychomotor ability and the criterion, and learner's scores and work performance. The design incorporates a main hypothesis as stated, and a step-by-step procedure was discussed to test this hypothesis and the sub-hypotheses formed from it.

Finally, the chapter introduced the statistical techniques selected to empirically investigate the relationship, and offered a short explanation of the functioning of each of the techniques and their scientific value.

CHAPTER FIVE

RESULTS

5.1   INTRODUCTION

Through the use of the statistical techniques outlined in Chapter Four, the hypotheses of the research were tested. The results of this investigation will be presented in this chapter. To achieve these results, multiple regression models were developed to establish if it is possible to identify successful learnership candidates and successful on-line sewing machinists.

5.2   MULTIPLE REGRESSIONS

The backward stepwise multiple regression procedure was used to fit four different models on the data. In all models the p-values for the coefficient of correlation proved significant at the 1% significance, showing that a causal relationship exists between the independent and dependent variables in all models. The discussion of the results will adopt the same format, with the dependent variable work performance being discussed, followed by a commentary on the unique findings applicable to the two components of work performance: supervisor-appraised work-quality and work-quantity. This process can be classified into three different phases (c/f Table 4.2).

5.2.1 Phase I

Before applicants can be registered for the learnership, they must achieve set minimum scores on psychometric tests that measure their mental alertness and psychomotor ability, and they must complete the 16 personality questionnaire. On successful completion of the psychometric battery, the candidate will be registered onto the data base and begin the learning programme. If the applicant does not achieve the minimum scores they are disqualified.

5.2.2   Phase II

Phase II takes place in the classroom and in the sewing school. In the classroom, the theoretical modules, known as the core are presented, and then in the sewing school, sewing-elective modules are demonstrated. The learners have to achieve competence on each module to proceed to Phase II.

5.2.3   Phase III

In this phase the learners are deployed to the sewing floor where their work-quality and work-quantity are measured against quality assurance and work-study standards.   These scores are used to establish the learners' standard of work performance. The work performance is a combination of the quality of work delivered and also the quantity achieved. The candidates are assessed by their supervisors (c/f Table 4.2).

5.3   METHODOLOGY

The following statistical procedures were use:

The first step was to develop different multiple regression models.
In each case the model is indicated as:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots\ldots + \beta_n x_n$$

where Y indicates the dependent variable, β_0 the constant of the equation, β_1 , β_2 ,........, β_n the regression coefficients and x_1, x_2, ...,x_n the different independent variables for each phase.

Firstly, models were developed where the dependent variables of Phase II were regressed on the independent variables of Phase I. Secondly, the dependent variables of Phase III are regressed on the independent variables of Phase II.As a third step, the independent variables from Phase I and Phase II were regressed against the Phase III dependent variable, namely work performance, to determine if the psychometric test scores and the learnership summative scores can predict on-floor sewing performance. This phase is the most critical as the aim of the training is to create internationally competitive sewing machinists for the Western Cape clothing industry. An additional model was created to establish if unsuccessful candidates can be identified at an early stage, Phase I, the dependent variable of Phase III was regressed on the independent variables of Phase I and Phase II.

Only one variable, level of education, referred to as GRADE in the model, proved significant. There is a perception that only candidates with a minimum qualification can apply to attend the course. During the period of four years, people of different qualifications were included. Grade 8 and 9 applicants were excluded as there were only four in total in the sample for the period. For this reason tests were conducted to accept or reject such a perception. The process is discussed in Section 5.6. All calculations were performed with the SIMSTAT statistical program.

5.4   MULTIPLE REGRESSION MODELS

Multi co-linearity

Multi co-linearity, as a rule, is always to some extent present in multiple regression models. As a result of co-linearity the residue of the predictors cannot be separated from the total error; co-linearity is when some of the independent variables are highly correlated with each other. In an attempt to identify if co-linearity was present the correlation matrix was calculated. Please see Table 5.1 below where potential candidates for co-linearity are pointed out.

Table 5.1: Correlation matrix

	T3	T4	T5	T6	T7	ELECTIVE	WORKPERF
T3	1	0.3565 P= 0.000	0.2668 P= 0.000	0.5345 P= 0.000	0.6115 P= 0.000	0.3002 P= 0.000	0.265 P= 0.000
T4	0.3565 P= 0.000	1	0.2699 P= 0.000	0.6439 P= 0.000	0.456 P= 0.000	0.3617 P= 0.000	0.35 P= 0.000
T5	0.2668 P= 0.000	0.2699 P= 0.000	1	0.2345 P=0 .001	0.2393 P= 0.000	0.249 P= 0.000	-0.0645 P= 0.349
T6	0.5345 P= 0.000	0.6439 P= 0.000	0.2345 P= 0.001	1	0.6954 P= 0.000	0.3528 P= 0.000	0.4466 P= 0.000
T7	0.6115 P= 0.000	0.456 P= 0.000	0.2393 P= 0.000	0.6954 P= 0.000	1	0.2554 P= 0.000	0.3839 P= 0.000
ELECTIVE	0.3002 P= 0.000	0.3617 P= 0.000	0.249 P= 0.000	0.3528 P= 0.000	0.2554 P= 0.000	1	0.1314 P=0 .056
WORKPERF	0.265 P=0 .000	0.35 P= 0.000	-0.0645 P=0 .349	0.4466 P=0 .000	0.3839 P=0 .000	0.1314 P= 0.056	1

If co-linearity is present, some of the variables that are highly correlated must be removed from the model. From the table above there exists moderate correlation between variable core-module T3, T4, T6 and T7. Five independent tests were written on these aspects, and in an attempt to reduce co-linearity an average for these tests was used instead of the original scores. The correlation between core-module T6 and T7 for example is 0.6954 (p= 0.0000). The average of T3 to T7 is called CORE.

In all models the quantitative variables, qualification, language and race were introduced by the use of dummy variables. Dummy or indicator variables indicate the presence or absence of a characteristic in the model. In the analysis, four dummy variables was used to code the five qualification levels. The dummy variables are defined as follows:

$$Grade1 = \begin{cases} 1 \ if \ grade \ 10 \\ 0 \ otherwise \end{cases} \quad Grade2 = \begin{cases} 1 \ if \ grade \ 11 \\ 0 \ otherwise \end{cases} \quad Grade3 = \begin{cases} 1 \ if \ grade \ 12 \\ 0 \ otherwise \end{cases}$$

$$Grade4 = \begin{cases} 1 \ if \ grade \ 8 \\ 0 \ otherwise \end{cases}$$

Through elimination; if Grade1 = Grade2 =Grade3 =Grade4 =0 it represents Grade 9

5.4.1   Phase I models

In Models I and II, Phase II is regressed on Phase I. Two models were developed namely:

- The CORE dependent variable regressed on the independent variable in Phase I.

- The ELECTIVE dependent variable regressed on the independent variables in Phase I.

The backward elimination method was used to estimate all models. In such a model the regression process starts with all independent variables in the model. Variables that have no or little influence as predictors are removed one at a time. Tables 5.2 to 5.5 represent the results. The dummy variables GRADE1 and GRADE2, representing Grade 10 and Grade 11 respectively, have negative coefficients. Five out of the twenty-three independent variables in Phase I are retained in MODEL I and seven in MODEL II.

The variables not in the equation do not have any predictive power or a significant influence on the outcomes of Phase II. Further, note that the mental alertness section does not appear in estimating the outcome of the sewing-elective. In addition, the psychomotor ability test was found to be not important in estimating CORE. Table 5.2 represents the two multiple correlation models or equations.

Table 5.2: Statistical models

Model 1	ELECTIVE = 89.3931 + (7.3403 * T2) + (-2.2766 * L) + (-1.6544 * Q1) + (2.3016 * ANXIETY) + (-13.9541 * GRADE1)
Model II	CORE = 100.0696 + (-.2160 * T1) + (1.3954 * F) + (-1.4534 * L) + (-.8762 * O) + (.9753 * Q4)+ (-6.2406 * GRADE1) + (-3.6545 * GRADE2)

If, for example, we know the results for trainability score, primary personality Factor L, primary personality Factor Q1, second-order personality factor High Anxiety versus Low Anxiety and the qualification level, then we can predict the score for the ELECTIVE outcome. If a candidate obtains zero for each of the above mentioned factors, his or her score will be 89.

Table 5.3: Correlation and coefficient of determination

	R	p-value	R^2
MODEL I	0.3325	0.0004	0.1040
MODEL II	0.5328	0.0000	0.2839

As shown in Table 5.3, for MODEL I the coefficient of determination (R^2) is equal to 0.1040 while this is 0.2839 for MODEL II. In Phase II, students obtained different marks, indicating variation in the outcomes.

This variation can be equated to 100% as the purpose of any regression model is to minimize this variation by fitting a line with the smallest possible error.

MODEL II illustrates that using the mental alertness scores, primary personality Factor F, primary personality Factor L, primary personality Factor O, primary personality factor Q4, and Grade 10 and 11, then   the regression line explains 28.39% of the total variation.

The 100% total variation is lessened or reduced to 71.61%.   The individual coefficients are displayed in Table 5.4 and Table 5.5.

Table 5.4: Analysis of variance

	Source	D.F.	F Ratio	F Prob
MODEL I	Regression	5	4.8060	0.0094
MODEL II	Regression	7	11.6120	0.0000

Both models are significant at the 2.5% level of significance, as shown in Table 5.5. In MODEL I the p-value column indicates less than 5% significance for the second-order personality factor, High Anxiety versus Low Anxiety.

This explains approximately 30% of the variation in the independent variable. If H_0 is rejected it means that the coefficient of the individual variable is not zero. These results are indicated in Table 5.5.

Table 5.5 indicates the significance of the entire model that is the combined effect of all the variables in the final equation. To test the significance of the individual coefficients the t-test is used. The following hypothesis is tested:

$H_0: \beta_i = 0$
$H_a: \beta_i \neq 0$

If H_0 is rejected it means that that the coefficient of the individual variable is unequal to zero. The results are indicated in Table 5.5.

Table 5.5: Significance of individual independent variables

	Independent variable	t-value	p-value
MODEL I	T2	2.197	0. 0291
	L	2.493	0. 0135
	Q1	2.091	0.0377
	ANXIETY	2.053	0.0413
	GRADE1	3.021	0.0028
MODEL II	T1	3.179	0.0017
	F	4.672	0. 0000
	L	3.485	0. 0006
	O	2.117	0.0355
	Q4	2.990	0. 0031
	GRADE1	2.749	0. 0065
	GRADE2	2.211	0. 0282

The null hypothesis is rejected in all cases at the 5% level of significance (p-values are small). The variable that performs the poorest is the second-order personality factor, High Anxiety versus Low Anxiety in Model 1. We, therefore, conclude that all individual coefficients are different from zero and must be retained in the final model.

5.4.2   Phase II models

The variables of Phase III (dependent) were regressed on the independent variables of Phase II. As pointed out in section 5.3, co-linearity exists for the variables core-module T3 to T7 and therefore it is combined into one score called CORE. The findings are displayed in Tables 5.6, 5.7, 5.8 and 5.9.

This model is given by the following equation:

MODEL OF WORK PERFORMANCE AND CORE

Model	WORK PERFORMANCE = 41.1978 + (.3226 * CORE)

Table 5.6: Correlation and coefficient of determination

Variable	R	p-value	R^2
MODEL	0.3438	0.0000	0.1182

Table 5.7: Analysis of variance

	Source	D.F.	F Ratio	F Prob
MODEL	Regression	1	28.286	0.0000

Table 5.8: Significance of individual independent variables

	Independent variable	t-value	p-value
MODEL I	CORE	5.319	0.0000

Only one variable is included in the model namely, the aggregate score for the five core-modules known as CORE. The sewing-elective variable has no significant prediction power and was therefore removed automatically from the equation.

Furthermore, CORE explains only 11.82 % of the total variation in work-performance. The model is significant at all significance levels compared with the F-value of 28.286 (p=0.0000), as shown in Tables 5.7 and 5.8 above.

5.4.3 Phase III models

A model was developed where the variables of Phase I and Phase II are treated as independent variables to predict the outcome of Phase III. This model is given by the following equation:

WORK PERFORMANCE = 56.0170 + (1.9816 * G) + (1.3381 * H) + (-1.2797 * I) + (-.9873 * L) + (-.9310 * M) + (1.8165 * Q3) + (1.7186 * ANXIETY) + (-2.4739 * TOUGH) + (-2.7529 * SELF) + (.2582 * CORE)

WORK-QUALITY = 34.2288 + (.2283 T1) + (-.1083 * T5) + (-3094 * T6) + -1.2871 * F) + (2.7744 * EXTROVERSION)

WORK-QUANTITY = 19.4169 + (.1348 * T4) + (-.1260 * T5) + (.2645* T6) + (.1964 * T7)+ (1.1269 * EXTROVERSION)

Firstly, note that no moderator or categorical variables were included, meaning that educational level, language and race have no predictive power. Secondly, only the CORE component of PHASE II is included implying that the practical section of Phase II has no influence on the final outcome as explained in Table 5.9.

Table 5.9: Correlation and coefficient of determination

Variable	R	p-value	R^2
Work Performance	0.5715	0.0000	0.3266
Supervised Work-Quality	0.4764	0.0000	0.2269
Supervised Work-Quantity	0.6247	0.0000	0.3903

As shown in Table 5.9, the coefficient of determination for work performance is equal to R^2 = 0,3266, supervisor rated work-quality is R^2 = 0,2269, and work-quantity is R^2 = 0,3903. This explains 32% of the variance in work performance, 22% in work-quality and 39% in work-quantity.

Table 5.10: Analysis of variance

MODEL	Source	D.F.	F Ratio	F Prob
Work performance	Regression	6	16.653	0.0000
Supervised work-quality	Regression	5	12.152	0.0000
Supervised work-quantity	Regression	5	26.502	0.0000

The model in Table 5.10 explains 32.66 % of the unexplained variation in the composite dependent variable work performance, and its components supervised work-quality and supervised work-quantity.

The model is significant at all levels of significance (p=0.0000). All ten variables included have a significant predictive power at the 5% significance level (see Appendices 9, 10,11,12,13 and 14).

5.4.4   An additional model

An additional model was developed where the variables of Phase I are treated as independent variables to predict the outcome of Phase III.

This model is given by the following equation:

WORK PERFORMANCE = 62.0414 + (1.3455 * H)

One of the twenty-three variables from Phase I was found to be significant in the final regression equation, meaning that no other variable has any influence on the final result of Phase III.

Table 5.11: Correlation and coefficient of determination

	R	p-value	R^2
MODEL	0.3138	0.0000	0.0985

Table 5.12: Analysis of variance

	Source	D.F.	F Ratio	F Prob
MODEL	Regression	21	23.0440	0.0000

Table 5.13: Significance of individual independent variables

	Independent variable	t-value	p-value
MODEL	Primary personality factor H	4.8000	0.0000

The above model explains 9.85% of the unexplained variation in the 'work performance' variable and the model is significant at all levels of significance (p=0.0000). From Table 5.12, we notice that the H variable included has a significant predictive power at the 1% significance level.

5.5   Educational level and work performance

In Chapter Four it was stated that a person can only register for the learnership if they have a minimum qualification of Grade 10. As the level of education was the only moderator variable to show significance, it was decided to test if there is a difference between the educational level of a person and their work performance scores to assess the assumption.

This type of test is usually conducted by using the One-way Analysis of Variance procedure. To conduct One-way Analysis of Variance (ANOVA), the following three assumptions must be met:

- Randomness
- Normality
- Homogeneity of variance

Of the three assumptions above, the ANOVA is sensitive if the normality assumption is violated. It is, therefore, necessary to establish if normality exists. For a normal distribution the skewness coefficient is 0 and the coefficient of kurtosis is equal to 3.

If we investigate the descriptive statistics of the different variables under discussion namely Core, Elective and Work performance split into the different qualification levels, we notice that some of the skewness coefficients, as well as kurtosis, suggest non-normality. The skewness coefficient for Grade 12 (ELECTIVE) is equal to -3.323 with a coefficient of kurtosis equal to 13.793; both these values imply that the distribution is not normally distributed as illustrated in Table 5.14.

Table 5.14: Descriptive statistics

		Skewness	Kurtosis	Mean	Median
Core	Grade 10	-0.603	-0.232	83.493	84.200
	Grade 11	0.313	-0.231	84.025	82.700
	Grade 12	-0.039	-1.385	89.457	87.300
Elective	Grade 10	-1.823	1.387	77.333	90.000
	Grade 11	-0.237	-1.408	87.906	90.000
	Grade 12	-3.323	13.739	91.988	100.000
Work performance	Grade 10	1.179	1.416	69.333	70.000
	Grade 11	-0.386	1.298	67.500	65.000
	Grade 12	-0.675	1.165	70.154	70.000

The Kruskall-Wallis nonparametric test was used instead of the ANOVA because of non-normality of the data. The general hypothesis for the Kruskall-Wallis test is given by:

H_0: The distributions are identical; have equal means

H_a: The distributions differ in location

The test is based on ranks and does not have to support the assumption of normality. Under the null-hypothesis, the Kruskall-Wallis distribution follows the Chi-Square distribution with (k-1) degrees of freedom, with k the number of groups of the categorical variable. The test statistic is given by:

$$H = \frac{12}{n(n+1)} \Sigma \frac{T^2_j}{n_j} - 3(n+1)$$

Where:

H = the statistic

n_j=sample size of group j, (j = 1,2,…,k)

n= the total of all samples combined

T_j = sum of the combined ranks of the k groups

The following hypotheses are tested:

Test 1:
- H_o: The distributions for the different education levels when compared with the CORE variable is identical
- H_a: The distributions are different

Test2:
- H_o: The distributions for the different education levels when compared with the ELECTIVE variable is identical
- H_a: The distributions are different

Test 3:

- H_o: The distributions for the different education levels when compared with WORK PERFORMANCE variable is identical
- H_a: The distributions are different

The results are summarised in Table 5.15.

Table 5.15: Results of the Kruskall-Wallis nonparametric test

	Cases	Chi-Square	p-value
Test 1	209	9.9026	0.0070
Test 2	209	11.0960	0.0039
Test 3	209	4.1811	0.1236

Chi-Square corrected for ties

5.5.1 Results of the Kruskall-Wallis test

Judged on the p-values, 0.0070 (Test 1) and 0.0039 (Test 2), we conclude that there is a significant difference between educational level for the CORE variable and second ELECTIVE (Test 2) at the 1% level of significance. There is, however, no evidence that the null hypothesis of identical distributions can be rejected for Test 3 (WORK PERFORMANCE). Therefore there is no difference between educational level and work performance.

5.5.2 Tukey's confidence intervals

The Kruskall-Wallis test only tests for an overall pattern among the group means. If H_0 is rejected we do not know which mean or means are not equal. To identify which means differ we use Tukey's confidence intervals.

Tukey's method tests the difference of all combination of two means. As there are three qualification levels there will be $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ = 3 combinations for each level namely:

- Mean of Grade 10 compare with the mean of Grade 11
- Mean of Grade 10 compare with the mean of Grade 12
- Mean of Grade 11 compare with mean of Grade 12

The results are indicated in Table 5.16. A 95% interval for the difference between Grade 10 and Grade 11 is given by - 6.3370 to 7.4004. As zero falls in the interval we can say that for the CORE variable there is no difference between the performance of Grades 10 and 11. We are 98% confident that the difference between the two means will be zero.

Table 5.16: Tukey's HSD multiple comparisons for differences between means

	Grade		95% confidence	interval	Significance
	10	11	-6.3370 to	7.4004	0.9820
Test 1	10	12	0.0392 to	11.8877	0.0480
CORE	11	12	1.1854 to	9.6781	0.0076
	10	11	-2.4490 to	23.5948	0.1377
Test 2	10	12	3.4230 to	25.8856	0.0063
ELECTIVE	11	12	-3.9690 to	12.1318	0.4601
Test 3	11	10	-4.8231 to	8.4898	0.7949
WORK	11	12	-1.4608 to	6.7694	0.2852
PERFORMANCE	10	12	-4.9201 to	6.5621	0.9399

Test 1

If we compare Grade 10 with 12, and Grade 11 with 12, we see that the lower limit of the two intervals is larger than zero that is 0.0392 and 1.1854 respectively. In both cases zero is not included in the interval and therefore we can say that the mean mark for Grade 12 candidates differs from the mean mark of the Grade 10 and Grade 11 students. The difference between Grade 10 and Grade 12 is significant at the 5% (p=0.0480) level of significance while Grade 10 and Grade 12 differ at the 1% (p = 0.0076) level.

Test 2

For the second test (Table 16), there is no difference in the performance of Grade 10 compared with Grade 11 (significance 0.1377) and Grade 11 compared with Grade 12 (significance = 0.4601). There is however, a significant difference if Grade 10 is compared with Grade 12 (significance = 0.0063).

Test 3

In Test 3 all lower limits are smaller than zero and therefore zero is included in the interval. This is where the dependent variables from Phase III (work performance) were compared. We can therefore conclude that educational level has no influence on the output of work performance.

5.6   SUMMARY

Although most psychologists use the linear multiple regression equation to predict relationships, it is possible that a non-linear relationship exists. Cattell (1970:135) advises '…that a non-linear function for "fitness" can be also be used – when it is known that a factor better predicts a criterion by a nonlinear relationship.' Therefore, an analysis of the non-linear multiple regression equation can be future research.

CHAPTER SIX

DISCUSSION AND CONCLUSION

The aim of the research was to investigate the relationship between mental alertness, personality traits, psychomotor ability and learner performance in the selection of clothing industry learners. A detailed discussion will describe the relationship between the predictors – mental alertness and personality traits, psychomotor ability, core-module performance, sewing-elective performance – and the criterion, work performance. Work performance is the composite domain of supervised-appraised work-quality and supervised-appraised work-quantity. Furthermore, the effect of the core-module performance and sewing-elective performance as dependent variables in Phase II, and as independent variables in Phase III will be discussed (c/f Figure 4.2). The effects of the biographical or moderators will also be examined. As per scientific protocol, only the variables that prove significant and unique in the regression models will be discussed.

6.1   WORK PERFORMANCE (Phase III)

It was hypothesised that no significant relationship exists between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance.

The results do not support the null hypothesis, and indicate that a relationship exists between mental alertness, personality traits, psychomotor ability, core-module performance, sewing-elective performance and work performance in the selection of clothing industry learners (R = 0,5715). Equally, a relationship does exist between mental alertness, personality traits, psychomotor ability and supervisor-appraised work-quality in the selection of clothing industry learners (R = 0,4764).

Furthermore, a relationship does exist between mental alertness, personality traits, psychomotor ability and supervisor-appraised work-quantity in the selection of clothing industry learners ($R^2 = 0,6247$). The significant variables are now discussed and the rationale behind why they are significant is proffered (c/f Appendices 9-14).

6.1.1   The significance of mental alertness

The predictor, mental alertness, proved to be highly significant when introduced into the regression equation together with the 16 primary personality traits as described by Cattell et al (1970:205). These findings refute the work of Bartram (1992) and Irving (1993), where cognitive ability proved invalid as a predictor of work performance and personality traits were predictive ($r = ,15$ to $r = ,20$). The significant correlation between mental alertness and the dependent variable work performance concurs with the findings reported by Ghiselli (1973), Hunter and Hunter (1984), Hakstian et al (1991), Muchinksy (1993) and Rossini et al (1994), where cognitive ability was found to be predictive. It is also in agreement with Anastasi (1983:175) who states that 'all intellectual activities share a common g factor ....Positive correlation between any two tests was attributed to this factor.'

However, the value in the regression equation is negative. This indicates that the lower mental alertness scorer performed best in the workplace. This agrees with the opinion held by Mr Anthony Dixon-Seagers, Executive General Manager of the Seardel Clothing Division, who claims that 'the best machinists hold a lower educational level' (Dixon-Seagers,2008).

The job is highly repetitive and strenuous, requiring people who are good at working with their hands and feet, rather than intellectually. Intellectual demands do exist in terms of the need to measure quality standards and calculate performance percentage, but these tasks can be performed by people with lower intellects. The practical implication of this finding is that the mental alertness component of the test battery must not be discarded if the highest R^2 is sought.

Furthermore, the concurrent validity coefficient achieved by this research (*R* =0,3266) is comparable to any findings reported in current literature (c/f Table 3.9). Therefore, the inclusion of mental alertness as a predictor within the assessment domain is substantiated.

6.1.2   The significant of the 16 primary personality traits

Although literature (Karson & Pool,1958:208; Bartram,1992:170; Abrahams & Mauer, 1996:358) reports that the stability of the 16PF second-order factors renders them more apt for research purposes, the results of this research indicate otherwise. The coefficient of multiple determination achieved by the regression model that incorporated the second-order factors measured, R^2 = 0,09, whereas the model with the 16 primary traits reflected R2 = 0,09. Owing to a lack of significant difference of,R^2 = 0,0042, both the 16 primary factor and the second-order factor models were reported on. The statistical model indicated the following variable to have significance in the regression equation:

PERFORMANCE = 56.0170 + (1.9816 * G) + (1.3381 * H) + (-1.2797 * I) + (-.9873 * L)+ (-.9310 * M) + (1.8165 * Q3) + (1.7186 * ANXIETY) + (-2.4739 * TOUGH) + (-2.7529 * SELF)+ (.2582 * CORE)

Of the 16 primary personality traits entered into the regression model, six primary personality factors and three second-order personality factors showed significance. These included the primary personality factor of Factor G (Low Superego and Superego Strength), Factor H+ (Threctic and Parmic), Factor I+ (Premsic and Harric), Factor L- (Protensive and Alaxia) and Factor M+ (Autious and Praxernic). The second-order factors were High Anxiety versus Low Anxiety, Tough Poise versus Emotionality and High Control versuss Low Control. These findings have been incorporated in the "ideal sewing machinist learner profile". (See Appendices 5 & 6).

- Factor G (Low Superego and Superego Strength)

The primary personality trait Factor G (Superego Strength and Low Superego) resembles Factor C, ego strength, in its emphasis on self-controlled behaviour, but it differs as G+ also focuses on persistence.

Factor G focuses on the moral concerns of what is right and wrong, and is related to the psychoanalytic concept super-ego strength. Krug (1981:49) feels 'anyone answering the questions…to obtain a maximum score would be a stick-in-the-mud', as the questions are about ideal virtues in culture. A person who scores high on G+ is persevering, very conventional and moral in their outlook on life. They analyse people and are cautious about what they say (Cattell,1989:116; Abrahams and Mauer,1996:145).

Karson and O'Dell (1976:208) caution that there is potential for faking on this factor and extremely high scores should be considered carefully. They further state that people who are high scorers on Factor G+ are pretending to accept the external trappings of conventionality and morality, without having internalised societal standards. This factor is prevalent amongst airline pilots and airline cabin crew and low amongst criminals and other individuals who disregard conventional norms and standards of behaviour.

This finding is in alignment with much of the research cited (c/f Table 3.6) and expert opinion. Industry experts believe that the sewing machinist learner must be a compliant person if the garments are to leave the production floor. There are hundreds of machinists on a floor and they are all competing for the resources and the attention of management, and if the sewing machinists do not follow instructions there could be chaos.

If sewing machinists do not possess a sense of duty they could be sidelined and therefore not able to function optimally in the work environment. Interestingly, the nature of the Western Cape clothing worker is not one of high compliance as is reported in disciplinary statistics drawn for the employment equity EEA2 forms for the participating companies. One company reported that 1 032 employees were issued with warnings in a twelve month period. The total workforce complement of this company is 2 000. Furthermore, Robbins and Judge (2009:64) highlight that deviant workplace behaviour can sometimes be a coping mechanism, and on occasion, a means to act out against management's authority.

Possibly, the sewing machinist would consider using deviant workplace behaviour to release the stress created by the production environment. However, if deviant behaviour was rife the small profit margins presently being achieved by manufacturers would dwindle further, resulting in closure. According to the findings of this study, successful sewing machinist learners score high on the primary personality trait Factor G+ (Superego Strength and Low Superego) when it is entered into the regression equation with sewing-elective performance.

- Factor H (Threctic and Parmic)

The findings of this study further indicate that Factor H (Threctia and Parmia) is a predictor of work performance. H (Threctia and Parmia), like the other 15 primary factors specified by Cattell et al (1970:140), is a bi-polar measure with H- scores indicating shy, withdrawn people, and H+ scores being reflective of adventurous, impulsive people. Krug (1981:51) describes this factor as, 'daring venturesomeness, spontaneity, and summing it best of all, risk-taker…'. A person with low H- is intensely emotionally cautious and will prefer fewer close friends and not stray beyond familiar boundaries. Low H- applicants may suffer from an inferiority complex and may find difficulty expressing themselves. Equally, they prefer occupations with reduced personal contact and find difficulty keeping in contact with their surroundings.

The H+ is bold and gregarious, willing to accept challenges and has a high interest in the opposite sex. This factor is an inherited personality factor and increases with age as people tend to become less shy as they age. The effective clothing industry learner possesses H+, or is more adventurous and bold.

This finding is in alignment with much of the research cited (c/f Ghiselli, 1973; Schmidt & Hunter,1981; Hunter & Hunter,1984; Hakstian et al, 1991:207; Rosse et al,1991; Muchinsky,1993; Rossini et al,1994;) and expert opinion. Industry experts believe that the sewing machinist learners have to adapt to working in a variety of environments.

These environments include the classroom, sewing skills centre and production floor. Therefore, successful incumbents are fairly robust, enjoy challenges, adapt quickly and stay present within time and space. Furthermore, the majority of the learners in this sample are young and, like any other sewing machinists, need to be bold if they are to succeed in the Western Cape clothing industry.

- Factor I (Premsic and Harric)

People who score high on Permsia are more refined and sophisticated, disliking crude people, enjoying travel and new intellectual experiences. They are creative and imaginative and, in certain individuals, this creativity may lead to them being impractical and inefficient in general affairs. They may appear somewhat uncontrolled and have a tendency for theatrics. Individuals with high Factor I+ scores are often found in careers that require artistic talent such as musicians, artists, actors and writers (Abrahams & Mauer,1996:149).

Krug (1981:55) alludes to William James' description of people as 'tough-minded' or 'tender-minded', as high Factor I+ scorers are associated with neurotic and psychotic disorders and often complain of 'nerves'.

People who are low scorers on Factor I- are usually practical, down-to-earth, grounded and masculine. They gravitate towards careers in the armed forces, or they become artisans.

The multiple regression equation indicates that low scorers on Factor I- are more productive sewing machinists. This concurs with industry experts who believe that the successful sewing machinist must be tough and robust, in order to face the physical and mental demands of a production line. Sewing machinists sit for an average of seven and a half hours behind the sewing machine. Therefore, they need to develop powerful shoulder, neck and back muscles to be able to maintain the speed at which they must operate the sewing machine and move the cut bundles.

The working environment is either very hot or very cold depending on the Western Cape season. The noise levels are extreme: management uses music – which is usually played at a very high volume – to keep up the tempo in the factory, and the hundreds of sewing, cutting, ironing and finishing machines add to the cacophony. Furthermore, the job requires people who are good at working with their hands and feet, therefore people who are impractical are less likely to perform their tasks optimally. Low scorers on this Factor I- (Premsic and Harric) perform better on the clothing industry learnership.

- L (Protensive and Alaxic)

The findings of this study further indicate that Factor L is a predictor of work performance. Factor L, like the other 15 primary factors specified by Cattell (1965:410), is a bi-polar measure with L- scores indicating pliant, unsuspecting and tolerant people, and L+ scores being jealous, dogmatic, suspicious and demanding people. According to Cattell (1989:171), people with high scores on Factor L+ are jealous, and may even border on paranoid. This originates from the levels of suspicion inherent in high scorers on Factor L+. Cattell (1989:174) believes that suspicion is the artery from which Factor L stems. This trait, in turn, leads to a defensive projection and the high scorer is likely to easily feel victimised.

Low scorers usually come from homes that are admired, they have lively intellectual pursuits and are irritated by people who act in a superior manner, and they have high inner tension. The effective clothing industry learner scores high on factor L+, they are suspicious and dogmatic. Krug (1981:56) describes people with high scores on L as difficult to get along with and compares them to the hostile high E+ scorers. Whereas, Krug (1981:58) believes low scorers, even if they are extreme, must be considered as healthy. This finding is in alignment with much of the research cited (c/f Table 3.6) and expert opinion. Industry experts believe that the successful sewing machinist must query and question the construction of the garment in order to find the most effective and efficient method to make it.

Too often a mistake in the construction of the garment leads to a drop in quality and the sewing machinist is held responsible. This results in the loss of a bonus and the machinist suffers financially. The actual cause of the drop in production is often caused by poor planning, which is the supervisor's responsibility. This lack of trust results in the machinist being circumspect with regard to the instructions given by the production supervisor and not trusting authority structures. Low scorers on this Factor L- (Alaxia and Protension) perform better on the clothing industry learnership.

- Factor F (Surgency and Desurgency)

The research findings indicate that the personality trait measured by F (Surgency and Desurgency) proves to be significant. People with high scores on factor F have an easier, less burdened up-bringing, resulting in them being more optimistic, happy-go-lucky and creative. In neurotic individuals, high Factor F+ individuals show hysterical symptoms and sexual abnormalities, while low Factor F- people are worriers, prone to headaches, phobias and nightmares (Cattell, 1989:116; Abrahams & Mauer,1996:144).

According to Karson and O'Dell (1976:159) the inclusion of Factor F makes it more challenging to distinguish between the other primary factors as this factor is similar to Factor A.

This is largely due to the factor analysis method allowing factors to be related despite there being distinct differences between the two. So people high on Factor A+ are warm and helpful, whereas a person high on factor F+ is flighty, unrestrained and not helpful. Krug (1981:46) advises that a high A+ scorer is more likely to be a Good Samaritan than a high F+ scorer, but both characters will be very personable. People who score high on Factor F+ may display depression according to Cattell et al (1970:101) however, Karson and O'Dell (1976:159) warn not to confuse depression with surgency. Moreover, Karson and O'Dell (1976:159) point out that low Factor F- score accompanied by high Factor O scores signify depression.

Surgency decreases rapidly from the age of seventeen to thirty-five, and more slowly thereafter. A person with low surgency is sober and morose and possesses less zest for life. They approach all aspects of life in a serious manner, granting gravity to each issue; whereas people with high surgency are enthusiastic, heedless and happy-go-lucky, and enjoy life and its permutations. In terms of occupational groups advertising agents and flight crew are high on this factor and physicists and administrators are low.

The significance of Factor F agrees with the findings reported by Robertson (1994:78) who identified eight specific personality traits that were predictive of job success. The presence of this factor adds a specific dimension to the findings of this study. This dimension revolves around the degree of supervisor involvement that the F+ learner receives, as opposed to the F- learner.

The enthusiastic learner is more likely to volunteer for inclusion into work groups and represent the other learners on committees, and the like. They often enjoy mixing with people and are inclined to take part in company-organised events, for example fun runs and sports days. It may be argued that this quality leads to the selection of certain people for the position of learnership candidates because they are perceived to be active and to display leadership qualities, such as organising and being involved. This personality factor is valued for future development as a supervisor, or further growth within the organisation.

Equally, high Factor F+ learners display strong emotional bonds with the instructor and proffer gifts.   This claim is not scientifically founded or supported by literature, but the phenomenon of halo effect is. The halo effect arises when a rater reflects an individual's overall performance in a positive light based on one or two isolated events (Landy & Farr,1980:67).

This is feasible when a supervisor is presented with 200 rating forms that must be completed in a short period of time, as they may be influenced by specific interactions or series of interactions that stand out in their minds, for example, the fun run last weekend. This clouds their objectivity, and permeates the entire rating exercise.

Hence, the higher supervisor ratings received by the outgoing learners may be the result of bias rather than measurable productivity differences. The researcher must not lose sight of the possibility that the higher ratings may be reflective of the reactions of the manager to whom the supervisor reports. In short, they may, as stated by the Managing Director of Monviso Knitwear, Mr Ian Stein, 'prefer working with enthusiastic, outgoing people' (Stein, 2010).

- Factor M (Autious and Praxernic)

The personality trait measured by Factor M proves to be significant. High scores on this measure indicate that the person is intense, overwrought, fanciful and disregards practical matters, whereas low scorers are thoroughly practical persons, similar to the 'tough-minded' person found in low I- (Krug, 1981:60). They are more concrete, masculine and tough-minded and refute the far-fetched. The findings show the effective learner to be M-, practical. Initially, this finding is logical as the job of a clothing industry sewing machinist requires a down-to-earth, hands-on approach. It would follow that this would necessitate a more practical orientation. Research, however, highlights this through the correlation between M and Factor B (Abstract Thinking and Concrete Thinking).

Personality traits have been segregated, 'on the basis of a century old division into the instrumental, effective and cognitive' (Buss & Finn, 1987:434). The instrumental traits refer to those that impact on the environment; effective traits to emotional behaviour; and cognitive traits to those that have a component of thought, information processing or imagination. The work by Cattell et al (1970:121) bore these classifications in mind, and therefore, the presence of Factor M may be justified by its relationship to Factor I- (Buss & Finn,1987:439).

Discussion with industry experts also illustrates the need for sewing machinists to be creative problem-solvers, a quality inherent in M+ individuals (Cattell,1989:193). However, the successful learner is M-, the job of a sewing machinist is practical and hands-on, demanding a down-to-earth approach.

Cattell (1989:198) states that a strong correlation exists between Factor M- and Factor Q_2. These two factors in combination imply, 'a progressive orientation, coupled, at least intellectually, with a willingness to depart from tradition' (Cattell, 1989:199). Individuals who are imbued with this quality often have the intellectual scope, practical judgement and motivation to be creative problem solvers and therefore become valuable employees. This value arises from a fundamental shift over the past five years in the production process. Prior to 1989, the fashion trends in South Africa were relatively staid and stable. The clothing consumer was comfortable with a limited range of good quality garments to choose from. This is illustrated by the Woolworths domination of the South African underwear market (36%) during this period.

However, better media coverage through advanced technology, the accessibility of the overseas markets, and the penetration of the South African economic frontline by international manufacturers have resulted in the South African consumer becoming more fastidious.

This has impacted on the number of styles being run on the production line and on the number of units in a style. The consumer is demanding more variety, greater fashion detail and more accessibility. This, in turn, complicates the production process, as more styles are being loaded in shorter periods, with fewer units in a style. This requires employees to be more flexible, and this flexibility means a quicker response to change, and stronger technical skills. Add to this the constraints of poor work supply caused by unreliable fabric delivery, and it becomes evident that contemporary sewing machinists need to possess practical, problem-solving skills if they intend to remain internationally competitive.

- Factor Q_3 (High Self-Sentiment and Low Self-Sentiment)

The primary personality trait factor Q_3 represents the person's concern about their self-image and social image. It measures self-control or the care a person places on their life and image. People who score high on factor Q_{3+} are considerate of others, keep their emotions in check, and show concern for etiquette and protocol and social reputation (Cattel,1989:275; Abrahams & Mauer,1996:162).

Karson and O'Dell (1976:149) feel that this factor usually indicates how successfully a person is able to bind their anxiety. High scorers usually lack creativity and flexibility and therefore job performance may suffer. On the other hand, people with low scores find it difficult to perform in large organisations where restraint and social etiquette are rewarded. Individuals with high scores are more successful in groups and are often chosen as leaders.

This agrees with industry experts who feel that the more outgoing and participative the learner, Q_{3+} are more likely to perform well on the sewing elective and, eventually, on the sewing line.

6.1.3   The significance of second-order personality traits

- **High Anxiety versus Low Anxiety**

The second-order factor, Anxiety, displays a significant relationship with the dependent variable of work behaviour. This second-order factor incorporates in its equation the two second-order factors discussed above: Factor L- and Factor Q_3 + (Krug,1981:79).   Although it seems logical that this second-order factor showed significance, this finding is not in agreement with the findings of Karson and Pool (1958) and Bartram (1992), who report that extraversion and independence are the two most predictive second-order factors (c/f Figure 3.1). Krug (1981:79) states that anxiety is the principle indicator of pathology on the 16PF and high scores should always be taken seriously and he links the seriousness to ego strength Factor C.

The position of the clothing industry learner is a stress laden one. The working environment is stress inducing: it is hot, crowded, noisy, and requires the sewing machinist to be on their toes for eight hours or more. A large number of cut panels and trims need to be attached for the garment to leave despatch, and further complication is added to this by the inconsistent quality levels in locally produced fabrics. This demands high emotional control if the sewing machinist is to prove productive. Possibly effective clothing industry learners need the ergic potential, offered by high anxiety levels, to cope with the physical demands of their job.

This concurs with the general opinion held by industry experts that the machinist has to possess the emotional stamina to remain constantly aware of the flow of work and the quality being created at needlepoint. It is interesting to note that the findings did not show significance with Factor Q_4, as Cattell (1989:312) describes the low Q_4 scorer, who shows high anxiety, as being tense, overwrought and driven: words experts feel best describe sewing machinists.

- Tough Poise versus Emotionality

Tough Poise was the only factor that proved significant when the regression model was comprised of mental alertness and the second-order personality traits. This finding is in contradiction of the work by Karson and Pool (1958:302) who claim that, 'encouraging findings concerning the stability and reality of factorial solutions in relation to the second-order factors.'

Krug (1981:88), however, cautions that the clinical implications of the second-order factor referred to as Pathemia versus Cortertia are, to date, not well documented. The personality trait of Tough Poise is calculated through an equation that incorporates three of the primary traits as specified by Cattell et al (1970:122). These include Factors A-, I- and M-, and the presence of Factor M and I- in the findings of this research could explain the significance of this second-order factor.

People who score high on this second-order factor are considered to be aloof, not prone to fantasy and tough-minded. Low scorers are thought to be less likely to be controlled by their intellect and lack control over their feelings (Krug, 1981:90). This concurs with findings of the regression equation regarding the independent variable, mental alertness and with the behaviour control seen in sewing machinist strikes and disciplinary statistics.

- High Control versus Low Control

The second-order personality trait High Control versus Low Control proves to be predictive when entered into the regression equation with sewing-elective performance. Karson and O'Dell (1976:126) describe high scorers as individuals who are conforming, rigid and lack spontaneity, whereas low scorers are lax, disregard rules, and are careless of social rules.

The ideal personality profile generated by this research shows the successful learner to have low control. This correlates with characteristic moral immaturity described by Cattell (1989:123) for Factor G.

Krug (1981:100) shed more light as to why this factor proves significant for the learner sewing machinist by describing low scores as feeling free and not constrained. The study reported that low scorers on this second-order personality trait perform better on the clothing industry learnership (c/f Appendices 5 & 6). This concurs with industry experts who claim that to be effective, a machinist must use the initiative when joining the parts of a garment and not feel totally restricted by the supervisor's instructions as regards garment construction.

6.1.4   The significance of psychomotor ability

When entered into the linear multiple regression equation, the independent variable psychomotor ability did not show predictive significance with the dependent variable work performance. Blood (1974:219) and Robertson and Downs (1989:406) provide some explanation as to why trainability tests do not predict all the dimensions of the job of a clothing machinist. They argue that a trainability test cannot capture the totality of the job, and aspects such as motivation and ability factors cannot be ignored.

Blood (1974:219) purports that there is more to effective performance than the possession of the correct skills and proposes that consistently good performance is aided by predictors that do not look like a sample of the job, especially in highly skilled jobs. This argument contradicts Wernimont and Campbell (1968:374) and Asher and Sciarrino (1974:574) who state that the best predictor of future performance is past performance.

6.1.5   The significance of core-module performance

The composite variable CORE consists of five separate modules. These modules include the following topics and content (c/f Appendix 6):

Core-module 1 allows the trainee to understand the structure of the CTFL industries and the structural composition of the CTFL sector. It also examines work organisation within a typical manufacturing facility. Industry experts are of the opinion that the broad knowledge base created by this core-module allows the learner to adapt more quickly to their environment and function more efficiently. The learner who scores high on this core-module is able to identify the correct documents to use to record their production, follow the correct practices and obey protocol more easily. For example, to recognise the shop stewards and what their function is. This knowledge allows the learners to perform better on the job than those who do not score high on this module.

Core-module 2 creates an understanding of the regulatory occupational safety, health and environmental practices that help learners understand safe work requirements in the workplace, including inspecting machines and equipment for safety compliance, understanding fire protection, prevention, fire fighting practices and emergency procedures, and recording and reporting unsafe acts and conditions. Experts from the industry claim that this module is significant as it allows learners to be more productive by giving them peace of mind by knowing that they are safe and work in a healthy environment.

Core-module 3 demonstrates an understanding of productivity requirements and assists learners by describing productivity principles as applied to manufacturing processes, and describing productivity practices in the workplace and affording them an understanding of the importance of productivity improvement practices in the workplace. According to industry experts, the knowledge of production processes and functions covered by this core-module allows the learner to work efficiently and effectively on the production floor. This higher standard of work performance is due to the learner being familiar with the purpose and function of the production data collection documents, waste reduction procedures and productivity measures used by management.

The learner who scores high on this core-module is able to work more effectively on the production floor, for example they can complete a gum-sheet and understand its importance.

Core-module 4 addresses an understanding of the materials used and produced in CTFL manufacturing processes by identifying key/primary raw materials, identifying the processed (end) products and their uses and describing the handling and storage of materials.   To construct the garment correctly, the learner needs to have a comprehensive knowledge of the trims and fabric components that make up the finished garment. This module allows the learner to be more efficient as they are able to identify and know how to align the trims and fabric components quicker.

Core-module 5 affords the learner an understanding of the quality procedures and practices by creating an awareness of quality in manufacturing processes and products, the implementation of specifications and instructions in manufacturing processes, and a description of quality control procedures in the workplace. Much of the focus of internal competitiveness in the clothing industry revolves around quality.

Therefore, if the learner is quality aware and self-correcting when creating her seams she will be more efficient and more effective on the machine; leading to better work performance.

The contents of the five core modules and their value to the learner makes it is apparent why a high scorer of the composite CORE is likely to perform well in the workplace. This explains the significant relationship displayed in the model between the core-module performance and work performance.

6.1.6 The significance of sewing-elective performance

When entered into the linear multiple regression equation, the variable sewing elective performance did not show predictive significance with the dependent variable work performance. Trainability testing is based on the conjecture that if an applicant can demonstrate the ability to learn and perform on a job sample, given the appropriate training, they will perform on the total job (Cook, 2004:195). Furthermore, Robertson and Kandola (1982:179), and Robertson and Downs (1989:406) suggest that the predictive validity of work-sample testing attenuates over time. These are possible reasons for the lack of predictive ability in the equation with work performance.

6.2 CORE-MODULE PERFORMANCE AND SEWING-ELECTIVE PERFORMANCE (Phase II)

It was hypothesised that no significant relationship exists between core-module and sewing-elective performance and work performance. The results do not support the hypothesis, and indicate that a relationship exists between core-module and work performance when predicting learner performance (R^2= 0.1182). No significant relationship exists between sewing-elective performance and work performance. The significance of the variable CORE is now discussed and the rationale behind why it is significant is proffered. The statistical model indicates the following variable to have significance in the regression equation:

Model	WORK PERFORMANCE = 41.1978 + (.3226 * CORE)

6.2.1   The significance of core module performance

The learner who scores high on this core-module is able to describe the industry structure and their function, follow health and safety procedures, identify and follow production protocols, identify and attach sewn panels and trims, and ensure quality standards are sewn into their seams. This knowledge gained by the learner explains the predictive ability of the composite CORE against the dependent variable, work performance.

6.3   MENTAL ALERTNESS, PERSONALITY TRAITS, PSYCHOMOTOR ABILITY AND LEARNER PERFORMANCE (Phase I)

It was hypothesised that no significant relationship exists between mental alertness, personality traits, psychomotor ability and learner performance (core-module performance and sewing-elective performance).

The results do not support the hypothesis, and indicate that a relationship exists between mental alertness, personality traits, psychomotor ability and sewing-elective performance in the selection of learner sewing machinists ($R^2 = 0,10$). The results do not support the hypothesis, and indicate that a relationship exists between mental alertness, personality traits, psychomotor ability and core-module performance ($R^2 = 0,28$). The significant variables are now discussed and the rationale behind why they are significant is proffered. The statistical model indicates the following variable to have significance in the regression equation:

Model 1	ELECTIVE = 89.3931 + (7.3403 * T2) + (-2.2766 * L) + (-1.6544 * Q1) + (2.3016 * ANXIETY) + (-13.9541 * GRADE1)
Model II	CORE = 100.0696 + (-.2160 * T1) + (1.3954 * F) + (-1.4534 * L) + (-.8762 * O) + (.9753 * Q4)+ (-6.2406 * GRADE1) + (-3.6545 * GRADE2)

6.3.1 Sewing-elective performance (Model 1)

6.3.1.1 Significance of psychomotor ability

When entered into the linear multiple regression equation, the independent variable psychomotor ability shows predictive significance with the dependent variable, sewing-elective performance. This finding supports the work by Wernimont and Campbell (1968:374), Asher and Sciarrino (1974:574), McHenry et al (1990:237) and Rosse et al (1991:437). Equally, Robertson and Kandola (1982:179); Downs (1977:21) and Robertson and Downs (1989:406) state that the best predictor of future performance is past performance.

6.3.1.2 Significance of personality traits

- Factor L (Protensive and Alaxia)

The findings of this study further indicate that Factor L is a predictor of sewing-elective performance. Low L- scores indicate pliant, unsuspecting and tolerant people and high L+ scores indicate dogmatic, suspicious and demanding people. This finding is in alignment with the research cited (c/f Table 3.6) and expert opinion. Industry experts believe that the successful sewing machinist must be tolerant of change and adapt to differing styles, fashions and varying quality standards, depending on the retailer. According to findings in this model, low scorers on this Factor L- perform better in the clothing industry learnership.

- Factor Q_1 (Radical and Conservative)

The effective clothing industry learner is an individual whose responses on the 16PF measure below average (sten 4) on Factor Q_1, which measures rebelliousness, as described by Cattell (1998:238). People who are Q_1+ are analytical and free-thinking, whereas Q_1- individuals are assertive and respect tradition.

The presence of Factor Q_1 in the regression equation is an intriguing one, as clothing industry managers are notorious for their autocratic management style. The average clothing company is mechanistic. The hierarchical structure is developed and rigid, and communication usually flows from the top down. As a result, the opportunity for sewing machinists to exercise opinion is slight, and managers and executives view critical thought and experimentation with suspicion.

In support of the above, the research shows effective learners to score low on Q_{1-}, indicating that tolerant and respecting individuals make the best sewing machinists. On occasion, when working on the sewing-line, supervisors report that ingenious methods of garment construction have been devised and implemented by sewing machinists. Through discussion with supervisors and their subordinates, the researcher learnt that these new methods stem mostly from trial and error, namely where the supervisor and sewing machinist tackled the problem together.

This concurs with the earlier statement that the machinist is invested with responsibility, but no authority, and is left to her own devices to ensure that the work gets out on time. However, experts in the industry are of the opinion that a good machinist follows instructions given by the supervisor.

- Second-order factor High Anxiety versus Low Anxiety

Anxiety displays a significant relationship with the dependent variable of sewing-elective performance. As previously explained, the effective sewing machinist needs high anxiety levels to cope with the continual changes on the sewing line, and the physical and emotional demands of their job. This concurs with the general opinion held by industry experts and medical experts, who describe sewing machinists as stressed people.

6.3.1.3 Significance of level of education

When the variable, level of education, was entered into the regression equation in relation to the dependent variable, sewing-elective performance, the p value equalled 0.0028 showing significance at 1% significance. However, the coefficient is negative, indicating that the lower the educational level the higher the score on the sewing elective. This finding supports earlier statements that the job of a sewing machinist does not necessitate a high intellect.

6.3.2 Core-module performance (Model II)

6.3.2.1 *Significance of mental alertness*

When entered into the linear multiple regression equation, the independent variable mental alertness shows predictive significance with the variable supervisor-appraised work-quantity. The assumption is that the ability to efficiently sew the panels of cut work together within the time standards does not necessitate high intellect, as this coefficient is negative. These results do not support the work by Hakstian et al (1991:889). During their concurrent validity study conducted in the clothing industry, the measures of cognitive ability and administrative skills showed the highest validities, with promising concurrent validities from the biodata and judgment inventories (c/f Table 3.4). This finding needs to be further researched.

6.3.1.2 Significance of primary personality traits

- F (Surgency and Desurgency)

The research findings indicate that the personality trait measured by F (Surgency and Desurgency) proves to be significant when entered into the equation with core-module performance. As reported earlier in this chapter, people with high scores on factor F+ are more enthusiastic and optimistic while low Factor F- people are prone to worry.

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According to Karson and O'Dell (1976:159) Factor F is closely aligned to Factor A+ (warm and friendly). The enthusiastic learner is more likely to volunteer answers in class and fully participate in group activities and assignments. They often enjoy mixing with people, and this gregariousness is rewarded by the instructor. Hence, the high F+ scorer is likely to perform well on the core modules of the learnership.

- Factor L (Protensive and Alaxia)

As with findings of the sewing-elective performance, the study indicates that successful sewing machinists must tolerate continuous change and be complaint. According to findings of this model, low scorers on this Factor L- perform better on the core modules of the learnership.

- Factor 0 (Guilt Proneness and Untroubled)

Factor 0 measures the feelings people have about their own self-worth (Cattell, 1989:222). An O- score reflects a person who is placid and self-assured, whereas an individual who scores high on Factor O+ is apprehensive, worrying and depressed. The effective clothing industry learner, according to the findings of this research, is an O- individual. The research findings are supported by other research where similar findings on this factor are reported. The work by Henney (1975:66) displays Factor 0 remaining within the parameters of sten 4,5 to 5,5 the portion deemed average.

A possible reason why the findings support the literature is that the job of a sewing machinist in the clothing industry requires the individual to cope with high stress levels. It has been stated that 80% of the patients who are treated for stress-related high blood pressure at Groote Schuur Hospital's outpatient unit are employed in the clothing industry (personal conversation, 16 June, 2010).

This stress factor may explain the fact that successful sewing machinists are Factor O- as the stressful demands of their job, coupled with the meagre wages, would make them depressed if they did not possess the psychological traits associated with stress management. As explained in the first chapter, the costs involved in rejected garments and the myriad of variables that need to be controlled in order for the finished products to hang in stores leads most clothing industry workers to suffer from some form of anxiety disorder.

In short, to survive in the clothing industry an individual needs to possess the trait of hardiness, as described by Kobasa (1979:839) and incorporated in the salutogenic model by Strümpfer (1995:213).

- Factor Q_4 (Low Ergic Tension and High Ergic Tension)

People with high scores on the primary personality trait Factor Q_{4+} are highly tensed, find it difficult to calm down and are often irrationally worried. They often suffer from insomnia and have a tendency to be extremely blunt. It is important to note however, that this factor can be easily faked. High scorers on this factor rarely achieve management positions as they suffer from burn-out owing to the extreme tension created by their leadership role (Carson,1989:231). The need to perform to standard performance creates a great deal of tension for the sewing machinist. They have one short tea break and a half hour for lunch, the rest of the day is spent behind the machine.

The sewing machinist is exposed to harsh criticism if they do not achieve the performance standards, and the resultant drop in weekly wages through lost bonus monies can be distressing. The South African clothing industry is governed by a bargaining council agreement that prescribes wage levels for sewing machinists. After deductions, a good machinist will earn under R2 000 a month.

Furthermore, many of the sewing machinists are bread winners. Spiralling food, utility and transport costs, coupled with lower negotiated wage increases, make every cent valuable. Poor planning by the supervisors is often the cause of the drop in production yet the sewing machinist suffers economically.

Therefore, the sewing machinist is continually open to a barrage of complaints by supervisors, quality controllers and managers which results in high levels of tension. The findings of this research support this thinking as they indicate that the successful learners are high on Q_4, a finding that needs to be further researched.

6.3.1.3 *Significance of level of education*

When the variable, level of education, was entered into the regression equation in relation to the dependent variable, sewing-elective performance the p value equalled 0,0065 for Grade 10, and 0,022 for Grade 11, both significant at 5% level of significance. However, the coefficient is negative indicating that the lower the educational level the higher the score on the sewing elective. This finding, once again, supports earlier findings that the job of a sewing machinist does not necessitate a high intellect.

6.4 MENTAL ALERTNESS, PERSONALITY TRAITS, PSYCHOMOTOR ABILITY AND WORK PERFORMANCE

It was hypothesised that no significant relationship exists between mental alertness, personality traits, psychomotor ability and work performance. The results do not support the hypothesis, and indicate that a highly significant relationship exists between a personality trait factor H+ and work performance in the selection of clothing industry learners p= 0,0000 at 1% level of significance.

The statistical model indicates the following variable to have significance in the regression equation:

Model	WORK PERFORMANCE = 62.0414 + (1.3455 * H)

- Factor H (Threctic and Parmic)

The successful sewing machinist needs to be bold if they are to survive the rigours of production. The clothing production environment is internationally recognised as a highly tensed one.

Therefore, when the supervisor is demanding the quantity of units required by the line manager, it requires a very robust and bold demeanour to prevail. High scorers on this Factor H+ (Threctia and Parmia) perform better on the clothing industry learnership and become effective production floor sewing machinists.

The other personality factors do not show significance in the equation, nor do the independent variables mental alertness and psychomotor ability. These findings do not support the use of the psychometric battery to predict candidate success in Phase I.

6.5   MODERATOR VARIABLES

The biographical or moderator variable, level of education, was the only moderator variable that showed significance when introduced into the regression model with the dependent variables, core-module performance and sewing-elective performance (Phase II).

6.5.1 Level of education

When the variable, level of education, was entered into the regression equation in relation to the dependent variables, core-module performance $R^2 = 0,28$, and the sewing-elective performance $R^2 = 0,10$. The coefficient for the sewing-elective performance (-13.9541) and for core-module performance (-3.6545) are both negative. This indicates that higher core-module scores are generated by learners who have lower standards of education.

Cattell (1989:31) states that higher scores correlate with Factor B+ (general intellect) and Q_{2+} (group adherence) as they are both reflective of the individual's level of self esteem. Equally, society has conditioned most people into believing that a low level of education is indicative of low intellectual and decision-making abilities. The person who possesses a higher level of education has a more positive self-perception, which is reflected during the self-rating exercise (Hoffman, Nathan and Holden,1991:611).

The finding of this study do not support this thinking, and show that the job of a sewing machinist does not require a high level of education as stated in the discussion on the significance of mental alertness. The job demands involve body strength, good eye-hand-foot and knee coordination, and a robust demeanour. If the rationale behind the learnership initiative is to uplift learnership graduates to the role of sewing-line supervisors then it justifies SACTWU's claim that four percent of the industry wage bill should be spent annually on training and development, and that a fair portion of this amount should be used for Basic Adult Education.

6.5.2 Language

The learners' mother-tongue showed no effect on the predictive value in relation to their core-module performance and sewing-elective performance. This finding does not support the opinion of various industry experts.

The learnership study material is only available in English, and to have English as mother-tongue is preferable: the richness of the message is enhanced, as is speed of reading. This preference is stated in the CTFL SETA learnership guidelines.

6.5.3   Race

In this study, the learners' racial grouping was found to have no significant effect on core-module performance and sewing-elective performance and therefore it has no predictive value.

This finding is in line with industry expert opinion and reinforces the spirit of the **Employment Equity Act** (No 55 of 1998) (Bendix, 2000:73; Bendix, 2010:146).

6.5.4   Age

The findings indicated that age had no significant effect on learner performance and therefore no predictive value. This finding is in line with beliefs of industry experts as some of the best machinists are over fifty years of age. The age spread in this study was limited and further research needs to be undertaken to measure the significance of age on learner performance in the Western Cape clothing industry.

6.5.5   Gender

Despite the Western Cape clothing industry being the domain of women, the findings of the study reported no significant difference in core-module performance and sewing-elective performance between female and male learners. It must be noted that the data only included one male learner and further research is needed.

6.6   IMPLICATIONS OF THIS RESEARCH

The need for greater international competitiveness in the South African clothing industry is paramount. The constant erosion of jobs in the industry will continue unabated if the continued onslaught of Chinese imports and the lack of competitiveness are not addressed. Research (Robertson & Downs,1979; Schmidt & Hunter,1981; Hunter & Hunter,1984; Hunter,1986; Cascio,1991; Tett et al 1994; Tziner et al, 1994, Cascio,2010) suggests that valid selection techniques increase the performance levels of the resultant workforce which has positive productivity implications.   Although the validation of the test battery has not been the main focus of this predictive study, the research has simultaneously validated the selection battery for use in the selection of clothing industry learners.

This could have important productivity implications for the clothing industry, as there is 'less scope for technological intervention in garment making as opposed to other textile industries such as weaving' (Naicker,2010a:n.p.).   Thus, multi-skilling of clothing industry sewing machinists is essential.

Further, it is argued that psychometric assessment affords the applied personnel worker the advantage of reducing the number of unsuitable people selected in the recruitment process. It would appear from the results of this research that the clothing industry is receptive to an intervention of this nature.

This statement is made with two provisos in mind. The first being that psychometrics should be considered by the CTFL SETA to add value to the clothing industry by assisting in the selection of the employees. This may mean that the tests used in the industry will come under close scrutiny and will have to weather the rigours implied. Equally, the tests will need direct validity in relation to the job in question, to avoid creating avenues for criticism.

The second proviso revolves around the Employment Equity Act and its prescription, which continues to create debate within human resource circles. The Employment Equity Act declares 'Psychometric testing and other similar assessments of an employee are prohibited unless the test or assessment being used:

a.   has been scientifically shown to be valid and reliable;

b.   can be applied fairly to employees; and

c.   is not biased against any employee or group.' (South Africa, 1998:10)

The General Secretary of the Congress of South African Trade Unions (COSATU), Zwelinzima Vavi that the country is in crisis, and a new growth path is needed to rescue the 'dysfunctional' economy.

To quote Vavi 'We continue to hang political freedom around our necks, but the reality is we have hardly touched the structural crisis at the economic level. Unemployment has been worsening ... A quarter of the population lives on social grants that the government provides ... we should move out of the situation where most of the people have to rely on government to survive ... it's a crisis pointing to the dysfunctionality at the core of our economy.' (Marrion,2010:1)

This rhetoric may force psychometrics to be geared more towards the issue of cultural fairness than the measurement of the construct that it was designed to address. The use of psychometric tests, in combination with the other recruitment and selection techniques does, however, offer a more objective, empirical and scientific method by which to select future incumbents for training and development.

6.7 LIMITATIONS OF THIS RESEARCH AND THE IMPLICATIONS OF FUTURE RESEARCH

A number of limitations have been identified which may have contributed to the unexplained variance in the research.

The effect of the confounding variable, previous training

The research, through the performance domains, measured the skill, knowledge and ability presently held by the learners, but no cognisance was taken of formal training which the learners may have previously undertaken on sewing. This may mean that the intervention of formal training may have negated or minimised the influence of personality and/or intellect on work performance.

In further research, this may be corrected by the introduction of training of 'base lines' into the research design, where individuals who have undergone formal training or informal training on the sewing machine are introduced into the sample. The researcher must, however, be mindful of the nature of the training interventions as certain interventions, for example T-groups, may result in personality shifts.

The lack of inter-rater reliability

In the research, the supervisors and instructors who rated the sample had undergone no formal training in the area of work-quality or work-quantity rating. This inadequacy was further exacerbated by the need for the supervisor and instructor to rate global performance as opposed to specific quantifiable areas of performance.

These global areas were often nebulous (for example, attitude), and this made the task of rating even more elusive. Future work in this area should attempt to address this limitation by introducing rating clinics, where instructors and supervisors involved in the study may experience 'dummy runs' in the security of a training environment. Further impetus is given to this limitation by the questionable reliability and validity of the rating instrument itself (Latham & Wexley,1981:56).

The absence of peer ratings and subordinate ratings in the research

Peer ratings have proven to be an extremely useful method of assessing an individual's performance with 'mean peer rating reported from r= 0,25 to r= 0,62' (McCrae & Costa, 1989:209). These ratings are often highly correlated with self-ratings and are often seen to be one standard deviation higher than manager ratings and peer ratings (Hoffman *et al*, 1991:611).

Subordinate ratings have proven to be equally valuable in that they afford the researcher insight into the experience of being managed by the individual being rated. This insight can not be achieved through other methods of rating. Future research should bear in mind the information yielded by these methods of ratings, and include them in the research design.

The small sample size (n=213)

An assessment battery's statistical power to predict is linked to the size of the sample drawn from the population (Kerlinger, 1986:213). The reduction in statistical power owing to the size of the research sample may have a bearing on the conclusion that a significant predictor-criterion relationship does exist between mental alertness, personality traits and work performance.

The implication, therefore, is that the results of the research must be viewed with circumspect until additional data may be reaped and added, thus increasing the sample. The increased statistical power, if sufficient, could prove the statistically significance of the relationship between mental alertness, personality traits and work performance.

Moreover, the research was restricted to the region known as Western Cape and it may not prove to be scientific if the findings are applied to the rest of South Africa.

The small number of males in the sample (n=1)

As previously highlighted the reduction in statistical power owing to the number of males in the research sample has precluded prediction of the impact of gender on work performance. It may prove that gender is a significant predictor-criterion and a relationship does exist between gender and work performance.

The implication, therefore, is that the results of the research must be regarded as inconclusive until additional data concerning gender is reaped and added, thus increasing the sample.

The small age range in the sample

The narrow age range in the research sample has prevented scientific prediction of the moderator, age on work performance. It may be that a significant predictor-criterion relationship does exist between age and work performance.

The implication, therefore, is that the results of the research must be held with circumspect regarding the moderator variable, age.

The validity of the 16PF

The 16 PF questionnaire, when combined with other assessment domains, has yielded encouraging coefficients ($r = 0,62$). Even so, the tide of criticism has not been stemmed (Saville & Munro,1986:32; Barrick & Mount, 1991:203), and the questionnaire is still associated with modest predictive validity ($r = 0,20$), even when a number of forms of the questionnaire are used simultaneously.

Future research may therefore benefit from the substitution of the 16PF with a personality assessment tool such as the OPQ. Even though this instrument is costly, recent research has indicated that it is valid and reliable (Saville & Munro,1986:33).

Multiple versions of the 16 PF

Cattell et al (1970:24) states that to achieve optimal validity and reliability at least two versions of the 16 PF should be used to assess the learners. He advises the use of the Form A and the Form B in conjunction, to heighten the test validity and the reliability of the test findings.

The implication being that multiple versions of the 16 PF need to used to ensure valid and reliable measurement of applicants personality traits.

Levels of absence, late-coming, and labour turnover, together with the number of grievances and disciplinary issues, rejects, accidents and final productivity levels are the 'accepted' criteria by which to measure work performance.
Research (Guion,1976; McHenry et al,1990; Furnham,1992; Robertson & Kinder,1993) considered supervisor-appraised work-quality and work-quantity to be two of the criterion measures, and within these measures there were items that assessed the technical skills of the learner.

The research did not use specific instruments to measure the 'accepted criteria', as reliable and accessible records were not available. Future research should attempt to do so, as these may furnish a more reliable, valid and tangible measure of return on investment (Camp et al, 1986:123).

Lack of control over the elapsed time between the test sessions and the measurement of the individual's work performance.
The time lag may have allowed for life circumstances or management interventions to skew performance results. There is also a threat of contamination, in that past testees could have divulged the nature and possibly the answers to certain of the items to future testees.

The research design

As previously stated, the sample sign (N=213) was a limiting factor in this regard, and so the use of the stepwise regression procedure was considered apt. Research of this nature, however, usually involves the highest and lowest 20% of the sample scores being used as a separate set of scores that are regressed and correlated against the remaining 60% to assess the degree of variance.

This procedure was not built into the research design but in future, by adding to the sample generated here, the data base should be increased to a sufficient magnitude to accommodate this.

The cultural fairness of the test battery

Cultural fairness is the most contemporary and controversial limitation of psychometrics. The National Council of Trade Unions criticises psychometric testing, describing it as 'an excuse to avoid hiring or promoting our people' (Eberson,1994:33). He goes further to imply that the testers generally originate from a different cultural base to that of the testees, and so may have inherent biases.

The test used to measure deductive and inductive reason in this research could be open to such criticism. The NIPR Normal Battery uses terminology and symbols in its items that are culture-specific (for example, £), and this may distort the measure of reasoning potential, or intellect.

Future research should use a different intellectual measure, such as the Raven's Progressive Matrices or Cattell's Culture Fair Intelligence Test, in an attempt to remove racial, sexual, cultural, ethnic and religious biases.

6.8   CONCLUSION

The aim of the research was the identification of a psychometric test battery to predict learner sewing machinist performance in the clothing industry of the Western Cape. A relationship was found to exist between the predictors (Welman, et al,2005:98), mental alertness and personality traits, core-module performance, sewing-elective performance and the criterion work performance, with a coefficient of multiple determination of R^2= 0,3266 being reported.

Mental alertness proved predictive when the regression model included the dependent variable, work performance, and the independent variables, personality traits, psychomotor ability, core-module performance and sewing-elective performance. Mental alertness also proved predictive when the regression model included the dependent variable, core-module performance. Therefore, in the context of this research it would appear that the role of the mental alertness subtest is profound and its incorporation into the test battery justified.

The primary personality factor of Factor G (Low Superego and Superego Strength), Factor H (Threctic and Parmic), Factor I (Premsic and Harric), Factor L (Protensive and Alaxia) and Factor M (Autious and Praxernic) proved predictive when the regression model included the dependent variable, work performance and the independent variables, personality traits, psychomotor ability, core-module performance and sewing- elective performance.

Factor L-(Protensive and Alaxia) and Factor Q_{1-} (Radical and Conservative) displayed a predictive relationship with the dependent variable, sewing-elective performance. Factor L-(Protensive and Alaxia), Factor 0 (Guilt Prone and untroubled, Adequate) and Factor $Q4_{+}$ (Low Ergic Tension and High Ergic Tension) displayed a predictive relationship with the dependent variable, sewing-elective performance.

The second order personality traits, High Anxiety vs Low Anxiety, Tough Poise vs Emotionality and High Control vs Low Control proved predictive when the regression model included the dependent variable, work performance and the independent variables, personality traits, psychomotor ability, core-module performance and sewing-elective performance. Furthermore, the second order personality trait, High Anxiety vs Low Anxiety showed a predictive relationship with the dependent variable of sewing-elective performance.

The psychomotor ability score showed predictive significance with the sewing-elective module scores. Finally, a relationship was found between the moderator variable level of educational and when the regression equation included both core-module performance and sewing-elective performance.

This study investigated concurrent validity and for this reason to refer to the independent variables, mental alertness, personality traits and psychomotor ability, as being predictive of work performance is unscientific. Although no intervention or control group (for example, a training programme) was introduced into the research design, the results showed that mental alertness, personality traits and psychomotor ability accounted for 32% of the variance.

It is reasonable to conclude that the test battery, together with learnership scores, may predict future work performance more scientifically than interviews and references (Cascio,1991:188). Until the predictive power of the research is enhanced by increasing the sample size, gender split, geographical spread and population size the findings of this research must be interpreted with caution.

The road to productivity, and thus longevity, for the South African clothing and textile sectors may lie in a move away from the mechanistic, autocratic organisations of the past. Future organisations will enhance productivity through the creation of self-directed and empowered work groups. This change must include multi-skilled, quality conscious, self-managing sewing machinists who will transform the role and function of clothing industry sewing machinist.

Moreover, clothing companies must not enter the learnership arena purely with the aim of capitalising on SETA funding. Instead, they need to create employment opportunities for graduate learners and design career pathways to fast-track previously disadvantaged learners to supervisory and managerial positions.

The CTFL SETA clothing learnerships is a solid vehicle to initiate this metamorphosis. This, in turn, implies more vigorous selection, as measurable individual differences will be indicative of future supervisory success. Further research of this nature needs to be conducted under the auspices the CTFL SETA.

Although this research has argued that the use of a valid selection battery may increase productivity through improved overall work performance, it only focused on the Western Cape. This research needs to be broadened to determine the impact on productivity of a scientific method of selecting learnership candidates in all provinces.

Moreover, as illustrated by Kirkpatrick (1979:550) effective training yields a return-on-investment (R.O.I) and research funded by the CTFL SETA needs to determine whether the South African taxpayer is seeing a return on their investment, namely improved production floor efficiencies and reduced unemployment levels (Kater,2009:21; Phillips,2002:61).

Future research needs to measure the actual improvement in productivity achieved through scientific selection methods and psychometric instruments as opposed to the present methods being used. This measurement will allow human resource specialists to translate the improvement into financial terms (Philips, Stone & Phillips,2001:21).

The researcher is of the opinion that until the benefits of scientific selection, and the use of psychometric techniques, can be expressed in monetary terms their use in the clothing and textile industry will remain circumspect.

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SEWING MACHINIST JOB DESCRIPTION

JOB DESCRIPTION

JOB DESCRIPTION: **SEWING MACHINIST**

The sewing machinist is required to be able to attach cut panels to sew at the standards of performance: quality and quantity.

TASKS:
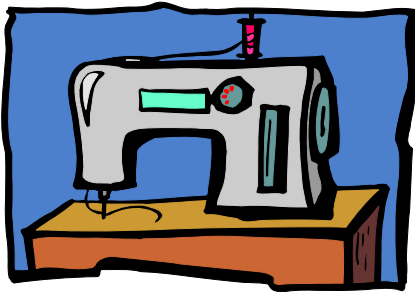
1.   **SEWING**

> Receive cut panels
> Unpack bundle
> Identify cut panels
> Attach cut panels
> Quality assure seams
> Dispose of cut panels

2.   **QUALITY**

> Assess the quality of the seam according to the sample.

3.   **HEALTH AND SAFETTY**

> Ensure that the work table is clean and hygienic
> Ensure that the machine is clean and in good running order.
> Ensure that the workspace and the floor surrounding the sewing machine is clean and unobstructed.
> Ensure that the sewing machine is electrically sound.

APPENDIX 2

SEWING MACHINIST JOB SPECIFICATION

Machinist means an employee who performs by sewing machine any operation in the making of clothing. The person will require the minimum skills, knowledge and abilities as outlined:

(1)   Work experience

The learners are not required to have any work experience.

(2)   Qualifications

The learners should ideally have a Standard ten, however, a grade eight is often considered to be sufficient.

(3)   Competencies

The learner needs to be literate and numerate to a Standard 8 educational level, with mathematics literacy and a first language, preferably English.

(4)   Mental skills

The learners should be literate and numerate commensurate to enable them to do computations of production output and time study.

(4.1)   Judgement and initiative

The learners are required to use their judgement and initiative with regard to planning their work and its layout. Relevant attributes for this would be abilities to perform both divergent and convergent thinking.

(4.2)   Training

The learner is not required to have undergone any training prior to enrolment onto the learnership.

(4.3)   Physical skills

The physical skills required for the job may include those necessary to operate a sewing machine, and the ability to do minor mechanical adjustments to machinery is also required.

(4.4)   Communication skills

Strong communication skills are required in order to effectively communicate problems with a style and its cut, and to verify instructions.   The learners must be able to verbalise instructions clearly and concisely and have good listening skills in order to afford feedback to managers and other operators.

(4.5)   Sensory demands

The learners must be able to differentiate between sounds such as the difference between damaged and correctly functioning machinery. They must have good eyesight for detail, colour and quality discrimination.

APPENDIX 3

LEARNERSHIP TRAINABILITY RATING SCALE

LEARNERSHIP TRAINABILITY RATING SCALE

COMPANY NAME: …………………………...

EMPLOYEE NAME: …………………………

START DATE: …………………………

TYPE OF MACHINE: …………………………

TYPE OF MACHINE: …………………………

INSTRUCTIONS

You are requested to rate the candidate sewing machinist on number of statements about their performance on the trainability test. The trainees test performance needs to be rated according to each statement using a rating scale form A to E, where:

A (100%-90%) - Outstanding performer who followed instructions very accurately

B (89%-70%) - Very good standard of performance and followed instructions accurately

C (69%-60%) - Average standard of performance and followed instructions fairly well.

D (59%-50%) - Below average standard of performance and struggled to follow instructions

E (49%-40%) - Weak standard of performance and poor following of instructions

The form is divided into four sections:

1. Work-quality
2. Efficient
3. Adaptability
4. Ability to follow instructions

KEY PERFORMANCE CRITERIA	INSTRUCTOR'S RATING OF THE LEARNER				
RATING SCALE:	A	B	C	D	E

QUALITY OF SEWING	A	B	C	D	E
The learner listens actively when instructed on the quality standards?					
The learner follows the instruction as per the quality guidelines?					
The learner checks the quality of the seam whilst sewing?					
The learner checks the quality for the seam on completion?					
The learner checks the seam for measurement against the sample specifications?					

Efficiency of sewing	A	B	C	D	E
The learner knows the target required for the test?					
The learner monitors their speed?					
The learner handles the cut work in the designated manner?					
The learner arranges their workplace to ensure expedient pick-up and disposal?					
The learner disposes of work in the most demonstrated manner?					

Adaptability to work	A	B	C	D	E
Tackles work with confidence?					
Operates the machine without fear?					
Requires little assistance after instruction?					
Adapts quickly to changes in the operation?					
Understands the instructor's language?					

Ability to follow instructions	A	B	C	D	E
Able to understand the instructions accurately?					
Able to remember the work instructions?					
Applies the instructions when operating the sewing machine?					
Checks the seams during sewing to ensure instructions are enacted?					
Checks the seams after sewing to ensure instructions are enacted?					

APPENDIX 4

LEARNERSHIP WORK PERFORMANCE SUMMARY SHEET

LEARNERSHIP WORK PERFORMANCE SUMMARY SHEET

Name of learner:	Department:

KEY PERFORMANCE CRITERIA	MANAGER'S RATING OF THE LEARNER									
RATING SCALE: 1 = POOR; 10 = EXCELLENT	1	2	3	4	5	6	7	8	9	10
Produces high quality work?										
Work always neat and well finished off?										
Work completed to exact specifications as per sewn sample?										
The learner checks the quality for the seam on completion?										
Little time spent on repairs?										
Total quality measurement	**%**									
The learner knows the target required for 100% performance on their operation?										
The learner monitors their actual hourly performance?										
Shows determination in achieving targets?										
The learner arranges their workplace to ensure expedient pick-up and disposal?										
The learner passes work in the most expedient manner?										
Total quantity measurement										**%**
Overall work performance rating										**%**

APPENDIX 5

SEWING MACHINIST PERSONALITY PROFILE: PRIMARY FACTORS

GRAPH OF THE 16 PRIMARY FACTORS

CB Personality Profiler 2000 : Scales Report [LEARNERSHIP, T]
Licensed to John Dale at Training and Assessment

Low	1 2 3 4 5 6 7 8 9 10	High	Scale	STEN
Aloof		Warmhearted	A	4
Concrete		Abstract	B	5
Unstable		Stable	C	5
Humble		Assertive	E	6
Serious		Enthusiastic	F	7
Undependable		Conscientious	G	7
Shy		Adventurous	H	7
Tough Minded		Sensitive	I	4
Trusting		Suspicious	L	4
Practical		Imaginitive	M	6
Unpretentious		Shrewd	N	5
Confident		Apprehensive	O	4
Conservative		Liberal	Q1	4
Group dependent		Self-sufficient	Q2	5
Uncontrolled		Self-controlled	Q3	5
Relaxed		Tense	Q4	6

APPENDIX 6

SEWING MACHINIST PERSONALITY PROFILE: SECOND-ORDER
PERSONALITY FACTORS

GRAPH 0F THE SECOND-ORDER FACTORS

CWS | CB Personality Profiler 2000 : High Order Factors [LEARNERSHIP, T]
Licensed to John Dale at Training and Assessment

Low	1 2 3 4 5 6 7 8 9 10	High
Withdrawn Introvert		Sociable Extravert
Calm and Relaxed		Anxiety prone
Intuitive and Emotional		Rational and Unemotional
Subdued and Dependent		Radical and Independent
Impulsive and Unconstrained		Compulsive and Controlled
Confident and Realistic		Insecure and Worried
Prefers to be led		Takes the lead
Lacks imagination		Creative
A poor student		Academic achiever
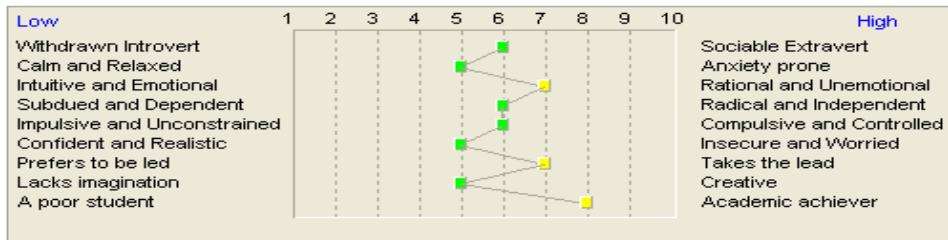
Holland Estimations		Clinical Scales		Vocational Scales	
Analytic-Investigative	4	Neuroticism	5	Leadership	5
Creative-Self expressive	5	Psychoticism	5	Creativity	6
Mechanical-Operative	6	Antisocial	5	Academic achievement	6
Nurturing-Altruistic	5	Impulsive behaviour	6	Accident risk	5
Procedural-Systematic	6	Behaviour control	5	Integrity	10
Venturous-Influential	6				

Enterprising (Venturous-Influential)
This preference indicates an interest in work which involves influencing others, directing their activities or driving them in the attainment of goals. This clearly includes a wide range of managerial and leadership activities.

Enneagram Type Analysis

1	The Perfectionist	62
2	The Giver	53
3	The Performer	50
4	The Tragic Romantic	52
5	The Observer	44
6	The Rebel	40
7	The Hedonist	64
8	The Boss	64
9	The Mediator	59

Dominant type: The Hedonist
Activation point: The Perfectionist
Relaxation point: The Observer
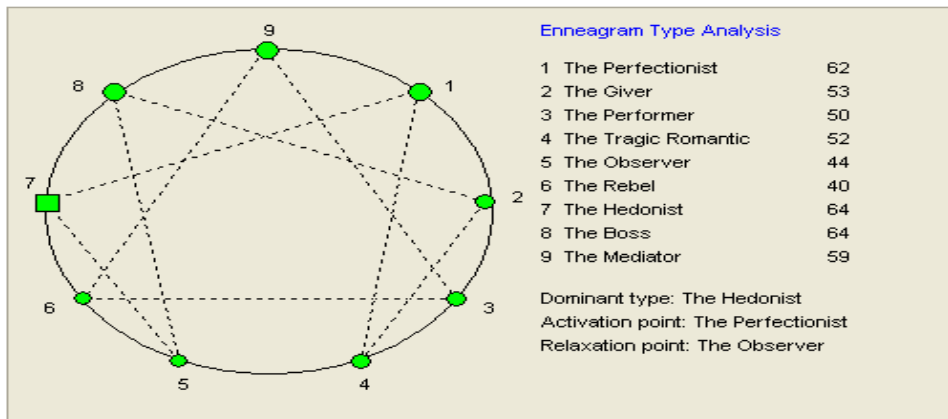
APPENDIX 7

CORE MOUDLE OUTCOMES

	Demonstrate an Understanding of the	Registration Number
SOUTH AFRICAN QUALIFICATIONS AUTHORITY	**Demonstrate an Understanding of the** **Structure of the CTFL Industries**	**Registration Number C/IND/2**

UNIT STANDARD NUMBER: 1

NQF LEVEL: 2

CREDITS: 6

FIELD: Engineering, Manufacturing and

Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This standard is in the Core category of the National Certificate: CTFL Manufacturing processes Level 2.   Learners assessed competent against this standard will be capable of:

- *describing the structural composition of the CTFL sector*
- *understanding the structural composition of a relevant industry within the CTFL sector*
- *describing the work organisation within a typical manufacturing facility.*

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET
Level 4 or NQF 1

Learners must be able to:

- speak, read and write in English
- do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 1.1   Describe the structural composition of the

CTFL sector

Assessment Criteria

1.1.1 The structure of the CTFL sector is described in terms of relevant legislation.
1.1.2 Functions of the components of the CTFL Sector are listed and described in terms of the output of the specific sector.
1.1.3 Interrelationships between components of the sector are explained in relation to trade and other activities between them
1.1.4 Key legislation (Acts) and regulations applicable within the sector are identified and their purpose is described in relation to the requirements of the specific act.

Specific Outcome 1.2   Understand the structural composition of a relevant industry within the CTFL sector

Assessment Criteria

1.2.1   Key stakeholders in a specific industry or organisation within the CTFL sector are identified and their roles described in terms of their relationship with the industry.

1.2.2   Employer, employee and statutory bodies are identified and their role within the industry is explained in terms of the requirements of specific legislation.

1.2.3   Key legislation (Acts) and regulations applicable within the industry are identified and their purpose is described in relation to the requirements of the specific act.

1.2.4   Career opportunities within the industry are identified in line with the requirements of the specific industry.

Specific Outcome 1.3   Describe the work organisation within a typical manufacturing facility

Assessment Criteria

1.3.1   Work organization and job functions, of a typical manufacturing facility in the sector, are explained and illustrated in an organogram applicable to the particular factory.

1.3.2   The pipeline in the specific manufacturing facility is described as related to the output requirements of the facility

1.3.3   Work processes of the specific manufacturing facility are described by means of a process flow chart applicable to the particular factory

1.3.4   Key policies and procedures supporting the implementation of legislation in a typical   manufacturing facility are identified and described in terms of industry standards

ACCREDITATION AND MODERATION

An individual wishing to be assessed (including RPL) against this Unit Standard may apply to an assessment agency, assessor or provider institution accredited by the relevant ETQA, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.Any institution offering learning that will enable the achievement of this Unit Standard or assessing this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA. Learning programmes that will enable the achievement of this unit standard will be accredited by the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Assessors who assess the competency of learners against this standard must be qualified and registered with the appropriate ETQA. Moderators qualified and registered with the appropriate ETQA must conduct moderation.All external moderation will be conducted at the discretion of the relative ETQA.

RANGE STATEMENT

This standard applies to the Clothing, Textile, Footwear, Leather and General Goods sector.
▪ Learners will be required to focus on the sector as a whole, the specific sub-sector or industry and their own company / plant.

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:

• Communicate effectively, using appropriate industry terms and concepts when describing concepts related to the structure if the industry
• Work effectively with others as a member of a team in the manufacturing facility when implementing company procedures
• Organise, analyse and evaluate information related to understanding the sector and the legislation applicable to the industry
• Understand the clothing, textile, footwear and leather sub-sectors as being made up of a set of related systems.

SOUTH AFRICAN QUALIFICATIONS AUTHORITY	**Demonstrate an understanding of the Regulatory Occupational Safety, Health and Environmental practices**	**Registration Number C/SHE/2**

UNIT STANDARD NUMBER: **2**

NQF LEVEL: 2

CREDITS: 12

FIELD: Engineering, Manufacturing and Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This standard is in the Core category of the National Certificate: CTFL Manufacturing processes Level 2. Learners assessed competent against this standard will be capable of:

- *Understand safe work requirements in the workplace*
- *Inspect machines and equipment for safety compliance*
- *understand fire protection and prevention, fire fighting practices and emergency procedures*
- *Record and report unsafe acts and conditions*

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET Level 4 or NQF 1.

Learners must be able to:

- speak, read and write in English

- do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 2.1   **Demonstrate an understanding of safe work requirements in the workplace**

Assessment Criteria

2.1.1 *Rights and duties of employer and employee relating to a safe working environment are explained in terms of relevant legislation and company policies.*

2.1.2 *Practices relating to health of employees are described in terms of relevant legislation and company policies.*

2.1.3 *Safe work practices that prevent injuries, or damage to machinery, are described in terms of relevant legislation and company policies.*

2.1.4 *Safety signage, codes and instructions are interpreted and explained in terms of relevant legislation and company policies.*

2.1.5 *Housekeeping and demarcation practices are identified and described.*

2.1.6 *Health and Safety representatives and First Aid personnel are identified and contact procedure explained in terms of company policies and procedures*

2.1.7 *Relevant rules and regulations designed to protect the environment are identified and described in terms of company policies and procedures.*

2.1.8 *Personal hygiene, protection facilities and procedures relating to industry specific hazardous chemicals and materials are identified described in terms of relevant legislation and company policies.*

Specific Outcome 2.2   **Inspect machines and equipment for safety compliance**

Assessment Criteria

2.2.1 *Safety features, including guarding of machines and equipment are identified and explained in terms of relevant legislation and company policies.*

2.2.2 Operational hazards relating to the workplace, machines and equipment are identified and described in terms of relevant legislation and company policies.

2.2.3 Safety equipment is correctly used as specified and where required or sign posted in terms of company policies and procedures

2.2.4 Maintenance requirements are identified and described in terms of company policies and procedures.

Specific Outcome 2.3   Demonstrate an understanding of fire protection and prevention, fire fighting practices and emergency procedures

Assessment Criteria

2.3.1 Fire protection and fire prevention methods are described as required in terms of relevant legislation and company policies.

2.3.2 Emergency evacuation procedures and personal safety actions are described as required in terms of relevant legislation and company policies.

2.3.3 Classes of fire are explained and appropriate fire-fighting equipment is pointed out in terms of relevant legislation.

2.3.4 Locations of fire fighting equipment, relevant to the class of fire, are identified as required in terms of relevant legislation and company policies.

2.3.5 Workplace trained fire Team is identified and the contact procedure is described as required in terms of relevant legislation and company policies.

2.3.6 Fire extinguishing equipment is used correctly in a simulated practical demonstration under the supervision of a fire team member in terms of company policies.

Assessment Criteria

2.4.1 Unsafe acts and conditions are identified, and reported to appropriate authority as required by company policies and procedures.

2.4.2 Incident and accident reporting documentation is identified and reporting procedure is explained as required by company policies and procedures.

ACCREDITATION AND MODERATION

An individual wishing to be assessed (including RPL) against this Unit Standard may apply to an assessment agency, assessor or provider institution accredited by the relevant ETQA, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Any institution offering learning that will enable the achievement of this Unit Standard or assessing this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Learning programmes that will enable the achievement of this unit standard will be accredited by the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Assessors who assess the competency of learners against this standard must be qualified and registered with the appropriate ETQA.

Moderators qualified and registered with the appropriate ETQA must conduct moderation.

All external moderation will be conducted at the discretion of the relative ETQA.

RANGE STATEMENT

This standard applies to the Clothing, Textile, Footwear, Leather and General Goods sector.

- Machines and equipment include all machines/equipment and processes relating to manufacture of clothing, textiles, footwear and leather and general goods products.
- Legislation refers to The Occupational Health and Safety Act [Act No. 85 0f 1993]

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:

- Identify and solve problems related to eliminating hazards and preventing accidents.
- Communicate effectively, using appropriate industry terms and concepts, when reporting and investigating   hazards and accidents in the workplace and following emergency procedures.
- Work effectively with others when maintaining a healthy and clean work environment
- Organise, analyse and evaluate information when investigating incidents, accidents and hazardous situations
- Use science and technology when using safety equipment, devices and fire extinguishers
- Understand the world as being made up of a set of related systems, realising the importance of using the most appropriate action to rectify a life-threatening situation

EMBEDDED KNOWLEDGE

Learners will engage with the following knowledge components:

- Safety, health and the environment and related elements in the workplace.
- All appropriate sections of the OHS Act as it applies to health and safety in the workplace.
- Causes and types of accidents
- Techniques for identifying hazards and relevant accident prevention
- Procedures related to various emergency requirements.
- Roles and responsibilities of safety representatives and first aiders in the workplace.
- Machines, equipment and the appropriate safety practices required.
- Safety devices and equipment.
- Safety signage.
- Hazardous chemicals and materials, their uses and storage requirements
- Commonly used terms and concepts relevant to industry
- Maintenance concepts

	Demonstrate an understanding of productivity requirements	**Registration Number C/PRO/2**

UNIT STANDARD NUMBER: **3**

NQF LEVEL: 2

CREDITS: 10

FIELD: Engineering, Manufacturing and Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This standard is in the Core category of the National Certificate: CTFL Manufacturing processes Level 2. Learners assessed competent against this standard will be capable of:

- *Describing productivity principles as applied to manufacturing processes*
- *Describing productivity practice in the workplace*
- *Understanding the importance of productivity improvement practices in the workplace*

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET
Level 4 or NQF 1.

235

Learners must be able to:

- speak, read and write in English
- do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 3.1   **Describe productivity principles as applied to manufacturing processes**

Assessment Criteria

3.1.1 The difference between productivity and production is explained in terms of industry norms

3.1.2 Established productivity principles are described as applicable in the workplace

3.1.3 Factors influencing productivity are described in terms of workplace activities.

3.1.4 Utilisation of resources, and efficiency concepts, relating to materials, machinery and labour employed in a manufacturing process are identified and explained in terms of standard operating procedures.

Specific Outcome 3.2   **Describe productivity practice in the workplace**

Assessment Criteria

3.2.1 Productivity requirements are described in terms of input and output in the workplace.

3.2.2 Importance of meeting productivity requirements is described in terms of input and output targets

3.2.3 Production targets are explained in relation to time, quality and output in the workplace

3.2.4 Production procedures / instructions are understood and explained in the context of specific manufacturing industries

3.2.5 Systems required for data collection are explained in the context of workplace requirements.

3.2.6 Procedures are described for the recording collected data in the workplace.

Specific Outcome 3.3   Demonstrate an understanding of the importance of productivity improvement practices in the workplace

Assessment Criteria

3.3.1   All forms of wastage are identified and recorded in a production area.
3.3.2   Idle or downtime, output deficiencies and product non-conformances are identified and recorded in a production area.
3.3.3   Sub-standard performances are identified from output records or relevant production data sheets in a production area.
3.3.4   Waste reduction / elimination activities are applied according to work procedures.

ACCREDITATION AND MODERATION

An individual wishing to be assessed (including RPL) against this Unit Standard may apply to an assessment agency, assessor or provider institution accredited by the relevant ETQA, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Any institution offering learning that will enable the achievement of this Unit Standard or assessing this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Learning programmes that will enable the achievement of this unit standard will be accredited by the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Assessors who assess the competency of learners against this standard must be qualified and registered with the appropriate ETQA.

RANGE STATEMENT

This standard applies to the Clothing, Textile, Footwear, Leather and General Goods sector.

- 'Waste' refers to all forms of waste including; inventory, lead time, defects, over-usage, over-production, material and human movement, idle or downtime, absenteeism and lateness.

- Procedures and practices refer to general and specific production and productivity related practices in the manufacture of clothing, textiles, footwear, leather and related general goods products.

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:

- Identify and solve problems related to ways to improving productivity and production and ways to eliminate waste.
- Communicate effectively with others, using appropriate industry terms and concepts, when describing problems, giving ideas to improve productivity and when interpreting and following work instructions.
- Work effectively with others when identifying and implementing ways to reduce waste in the workplace.
- Organise, analyse and evaluate information when investigating ways to improve productivity
- Use science and technology to improve processes resulting in productivity improvement.
- Understand the world as being made up of a set of related systems when analysing the manufacturing pipeline and processes in order to improve productivity.
- Organise the activities of oneself in order to meet production targets

EMBEDDED KNOWLEDGE

Learners will engage with the following knowledge components

- Principles of productivity and their application in the work environment
- Manufacturing principles, procedures, processes and resources
- Methods and techniques of productivity measurement
- Roles of Standards and Specifications to Production and work measurement
- Benefits of productivity improvement to the company and the individual
- Method study and work measurement techniques
- Types of wastage, causes, costs and techniques to eliminate wastage
- Commonly used terms and concepts relevant to industry

SOUTH AFRICAN QUALIFICATIONS AUTHORITY	**Demonstrate an understanding of materials used and produced in CTFL manufacturing processes**	**Registration Number C/C/MAT/2**

UNIT STANDARD NUMBER: **4**

NQF LEVEL: 2

CREDITS: 10

FIELD: Engineering, Manufacturing and Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This standard is in the Core category of the National Certificate: CTFL Manufacturing processes Level 2. Learners assessed competent against this standard will be capable of:

- *Identifying key/primary raw materials used in manufacturing processes*
- *Identifying the processed (end) product and its uses*
- *Describing the handling and storage of materials*

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET
Level 4 or NQF 1.

Learners must be able to:

- speak, read and write in English
- do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.
.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 4.1   Identify key/primary raw materials used in manufacturing processes

Assessment Criteria

4.1.1 Key /primary raw materials are identified for use in the manufacture of company specific processed (end) products,.

4.1.2 Sources of raw materials are identified for use in the manufacture of company specific end products,

4.1.3 A range of material identification methods, codes, labels and markings is used in relation to workplace requirements.

4.1.4 Characteristics and properties of company specific raw materials are identified and described in terms of relevant specifications.

Specific Outcome 4.2   **Identify the processed (end) products and their uses**

Assessment Criteria

4.2.1 *Processed (end) products are identified and described in terms of company specific manufacturing processes*
4.2.2 *The uses of company specific processed (end) products are described in te3rms of customer requirements*
4.2.3 *Characteristics and properties of processed (end) products are identified and described in relation to relevant specifications.*

Specific Outcome 4.3   **Describe the handling and storage of materials**

Assessment Criteria

4.3.1 Storage methods and facilities for raw and processed materials are identified and
described in terms of company policies and procedures
4.3.2 Care, handling and transporting procedures for raw and processed materials are
described in terms of company policies and procedures.
4.3.3 Specific problems and preventive measures are described in relation to material storage and handling,

ACCREDITATION AND MODERATION

An individual wishing to be assessed (including RPL) against this Unit Standard may apply to an assessment agency, assessor or provider institution accredited by the relevant ETQA, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Any institution offering learning that will enable the achievement of this Unit Standard or assessing this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Learning programmes that will enable the achievement of this unit standard will be accredited by the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Assessors who assess the competency of learners against this standard must be qualified and registered with the appropriate ETQA. Moderators qualified and registered with the appropriate ETQA must conduct moderation.

RANGE STATEMENT

This standard applies to the Clothing, Textile, Footwear, Leather and General Goods sector.

- Materials will include, but not be limited to, raw or processed materials and components and products that are processed in the Clothing, Textile, Footwear and Leather sector.
- Learners will be required to focus on the materials / products relevant to their particular industrial sector

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:
- Identify and solve problems in respect of materials used or produced.
- Communicate effectively, using appropriate industry terms and concepts when   describing concepts related to the materials used and produced in the industry
- Work effectively with others to ensure the correct care and handling of materials.
- Organise, analyse and evaluate information in respect of codes, labels and markings used to identify materials used and produced in the workplace
- Understand the world as being made up of a set of related systems when dealing with raw materials or processed (end) products
- Organise the activities of oneself relative to others in the storage of materials.

EMBEDDED KNOWLEDGE

Learners will engage with the following knowledge components:

- Industry terms and terminology.
- Systems, equipment, regulations and procedures relating to handling, storing and   transporting raw and processed materials
- Procedures relating to documentation and labelling.
- Names, properties and characteristics of the material components of the product.

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	Demonstrate an understanding of Quality Procedures and Practices	Registration Number C/C/QUA/2

UNIT STANDARD NUMBER: 5

NQF LEVEL: 2

CREDITS: 10

FIELD: Engineering, Manufacturing and Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This standard is in the Core category of the National Certificate: CTFL Manufacturing processes Level 2. Learners assessed competent against this standard will be capable of:

- *Demonstrating an awareness of quality in manufacturing processes and products*
- *Understanding the implementation of specifications and instructions in manufacturing processes*
- *Describing Quality Control procedures in the workplace*

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET Level 4 or NQF 1.

Learners must be able to:

- speak, read and write in English
- do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 5.1   **Demonstrate an awareness of quality in manufacturing processes and products**

Assessment Criteria

5.1.1 Quality is defined and its importance is explained in the context of manufacturing processes.
5.1.2 Quality Assurance is described as defined in relevant manuals.
5.1.3 Effects of non-conformance to standards or specifications are identified and described in relation to workplace processes.

5.1.4 Company specific quality control and quality assurance procedures and practices are Identified in terms of workplace requirements.

Specific Outcome 5.2   **Understand the implementation of specifications and instructions in manufacturing processes**

Assessment Criteria

5.2.1 Relevant product specifications, standards and work instructions are identified and described in the context of company and customer quality requirements

5.2.2 Quality standards, methods, procedures are identified and described in the context of company and customer specifications.

5.2.3 Process, product or procedure variations are identified and described in terms of style / product / material changes.

5.2.4 Examples of performance against established standards, specifications, methods and procedures are recorded and explained in terms of workplace activities.

5.2.5 Activities designed to ensure product quality are identified and described in relation to workplace activities.

Specific Outcome 5.3   ***Describe Quality Control procedures in the workplace***

Assessment Criteria

5.3.1 Procedures for the inspection of materials and products against specifications are identified and described in terms of standard operating procedures.

5.3.2 Non-conformance of materials, products or processes are identified, recorded, reported and actioned in terms of standard operating procedures

5.3.3 Causes of faults are identified and appropriate recommended corrective action is implemented in line with company policies and procedures.

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:

- Identify and solve problems related to quality.
- Communicate effectively, using appropriate industry terms and concepts, when recording and reporting quality faults and problems and interpreting product and work specifications
- Work effectively with others to improve quality and implement continuous improvement practices.
- Organise, analyse and evaluate information when identifying areas for quality improvement
- Use science and technology when using appropriate tools to measure or inspect products and when applying continuous improvement to enhance quality.
- Understand the world as a set of related systems in that every individual has a role to play in the achievement of quality standards.
- Organise the activities of oneself when reporting quality matters within specific time frames.

EMBEDDED KNOWLEDGE

Learners will apply the following critical outcomes and will be able to:

- Quality assurance and quality control systems
- Product and work specifications and quality standards
- Inspection techniques and methods
- Measuring and inspecting tools, work aids and equipment
- Principles of quality
- Customer requirements – internal and external
- Cost of quality and effects of poor quality
- Continuous improvement processes
- Commonly used terms and concepts relevant to industry

APPENDIX 8

SEWING ELECTIVE UNIT STANDARDS

SOUTH AFRICAN QUALIFICATIONS AUTHORITY	**Join Component Parts**	**Registration Number C/E/SEW/2**

UNIT STANDARD NUMBER:

NQF LEVEL: 2

CREDITS: 34

FIELD: Engineering, Manufacturing and Technology

SUB FIELD: Manufacturing and Assembly

ISSUE DATE: 4 April 2006

REVIEW DATE: 4 April 2009

PURPOSE

This unit standard forms part of the qualification - CTFL National Certificate in Clothing Manufacturing Processes Level 2. It is specifically for learners working in the Clothing Manufacturing formal sector who are working in, or who wish to work as a sewing machinist in a clothing factory. Learners assessed as competent against this standard will be capable of:

- Preparing and setting sewing machines for specific sewing operations
- Performing basic routine maintenance functions
- Identifying and preparing product parts
- Picking up, aligning and sewing of product parts
- Applying safety standards when operating machines
- Inspecting and disposing of product parts and completing administrative documentation

LEARNING ASSUMED TO BE IN PLACE

Learners are required to demonstrate fundamental competencies, specified below, at ABET
Level 4 or NQF 1.

Learners must be able to:

- *speak, read and write in English*
- *do basic mathematic calculations including addition, subtraction, multiplication, division and the calculation of areas, volumes and quantities.*

SPECIFIC OUTCOMES AND ASSESSMENT CRITERIA

Specific Outcome 1   **Prepare and set sewing machines**

Assessment Criteria

1.1 Appropriate work aids and attachments for specific sewing operations are identified, selected and attached using correct tools according to operation type and quality standards
1.2 Correct needle type/s are selected and inserted according to operations, thread and fabric types
1.3 Correct thread type is selected and machine is treaded according to the machine, operation, needle and fabric being used.
1.4 Tension controls are adjusted according to fabric and thread type
1.5 Stitch width and density is adjusted according to customer specifications

Specific Outcome 2   ***Perform basic routine maintenance functions***

Assessment Criteria

2.1   Machines are cleaned regularly according to standard company practice
2.2   Machine and stitching faults are identified, basic maintenance is performed to rectify faults and major faults are reported according to relevant equipment manuals, standard company practice and reporting procedures

Specific Outcome 3   **Identify and prepare product parts**

Assessment Criteria

3.1 Product parts are identified by colour, size and shape of cut part according to bundle list

3.2 The relationship between parts is demonstrated so that parts fit together according to required operation breakdown

3.3 Product parts are correctly identified according to the ticket information

3.4 Product parts are prepared and placed at work area according to method, quality and time standards

Specific Outcome 4   **Pick up, align and sew parts together**

Assessment Criteria

4.1 Product parts are picked up, aligned and sewed together according to the required method, quality, and time standards

Specific Outcome 5   **Apply safety standards when operating sewing machines**

Assessment Criteria

5.1 Correct safety procedures are demonstrated when operating and controlling sewing machines according to equipment specifications and company safety procedures

5.2 Workplace Health and Safety Rules and procedures are described and adhered to as determined by company health & safety policies and procedures and safety legislation

Specific Outcome 6   **Inspect and dispose of completed product parts and complete administrative documentation**

Assessment Criteria

6.1 Faults are identified and rectified using appropriate methods and tools according to customer quality standards
6.2 Joined parts are disposed according to correct method, quality and time standards
6.3 Documentation is completed and output recorded according to company systems and procedures

ACCREDITATION AND MODERATION

An individual wishing to be assessed (including RPL) against this Unit Standard may apply to an assessment agency, assessor or provider institution accredited by the relevant ETQA, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Any institution offering learning that will enable the achievement of this Unit Standard or assessing this Unit Standard must be accredited as a provider with the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Learning programmes that will enable the achievement of this unit standard will be accredited by the relevant ETQA or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

Assessors who assess the competency of learners against this standard must be qualified and registered with the appropriate ETQA.

Moderators qualified and registered with the appropriate ETQA must conduct moderation.
All external moderation will be conducted at the discretion of the relative ETQA

RANGE STATEMENT

This standard applies to the Clothing sector

- The number of machines on which a learner will be assessed will be **three**, which must include a single needle lockstitch (flat) machine, a safety/overlock machine and one specialised machine

- Basic maintenance and machine set up functions will include, but not be limited to, changing needles, changing pressure feet, adjusting tensions, changing and adjusting attachments, cleaning, checking oil levels etc

- **Four operations** can be selected from any flat and safety / overlock operation, performed on any garment type, manufactured in the company where the learner is employed. **One operation** is to be selected from any one specialised machine

- Work aids, attachments, needles and thread must be appropriate for the selected operations

- The correct method, time and quality standards for cleaning, setting up, threading and adjusting the machine must be applied, as determined by company and recognised industry standards.

- An **efficiency level of 80%** for each of the **five operations** must be achieved and **maintained for one week**

- The efficiency level of 80% may be reduced to 65% in companies producing fashion garments with repeated style changes

- The correct method, time and quality standards for joining component parts must be applied, as determined by company and recognised industry standards.

- Fabric types can include wovens, non-wovens and knits

CRITICAL CROSS FIELD OUTCOMES

Learners will apply the following critical outcomes and will be able to:

- Communicate effectively, both verbally and in writing when receiving instructions and information and asking questions relevant to specific sewing operations
- Identify and solve problems when identifying, analysing and rectifying machine and sewing related faults

- Work as a member of a team when joining component parts so that the production line's quality and time standards are achieved and downtime is minimised
- Understand the world as a set of related systems when considering one's own operation in relation to other sewing and manufacturing operations
- Organise and manage oneself and ones activities whilst planning to meet required method and quality standards and achieving targets
- Use science and technology when selecting adjusting and using equipment and tools
- Organise, analyse and evaluate information and take decisions when selecting appropriate work aids, attachments, needles and thread for specific operations

EMBEDDED KNOWLEDGE

Learners will engage with the following knowledge components:

- Basic machine parts, functions, attachments, work aids and tools
- Machine control methods
- Health and Safety Procedures and housekeeping practices relevant to the workplace and equipment to be used
- Basic machine settings – needles, threading, tension control, stitch width and stitch density
- Basic machine maintenance procedures
- Techniques of using basic tools
- Shapes and sizes of product parts
- Basic sewing methods and time standards
- Quality standards applicable to machine settings and a range of sewing operations
- Basic understanding of material, fusing and trim properties, characteristics and behaviour during sewing operations, including right and wrong side, faults, grain, fusing etc.

APPENDIX 9

MULTIPLE REGRESSION DATA:

WORK PERFORMANCE ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,

PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,

PSYCHOMOTOR ABILITY,

CORE-MODULES AND

SEWING ELECTIVE.

Dependent Variable: WORK PERFORMANCE

Method: Backward elimination
          P to Remove =0.055

Variable(s) entered on Step 1   T1
                        T2
                        T3
                        T4
                        T5
                        T6
                        T7
                     ELECTIVE
                        A
                        B
                        C
                        E
                        F
                        G
                        H
                        I
                        L
                        M
                        N
                        O
                        Q1
                        Q2
                        Q3
                        Q4

EXTROVERSI
ANXIETY
TOUGH
INDEPENDEN
SELF
Variable(s) removed on Step 2   ELECTIVE
Variable(s) removed on Step 3   T3
Variable(s) removed on Step 4   L
Variable(s) removed on Step 5   C
Variable(s) removed on Step 6 INDEPENDEN
Variable(s) removed on Step 7   A
Variable(s) removed on Step 8   Q2
Variable(s) removed on Step 9   O
Variable(s) removed on Step 10   ANXIETY
Variable(s) removed on Step 11   Q4
Variable(s) removed on Step 12   Q1
Variable(s) removed on Step 13   N
Variable(s) removed on Step 14   Q3
Variable(s) removed on Step 15   B
Variable(s) removed on Step 16   SELF
Variable(s) removed on Step 17   H
Variable(s) removed on Step 18   M
Variable(s) removed on Step 19   G
Variable(s) removed on Step 20   I
Variable(s) removed on Step 21   TOUGH
Variable(s) removed on Step 22   E
Variable(s) removed on Step 23   T2
Variable(s) removed on Step 24   T4

Multiple Regression

Multiple R   = .5715   sig. of R = .0000
Multiple R Square = .3266
Adjusted R square = .3070

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Regression	6	5681.3952	946.8992	16.653	.0000
Residual	206	11713.2621	56.8605		

Equation: WORKPERF = 21.8035 + (.1483 * T1) + (-.1120 * T5) + (.3187 * T6) + (.1579 * T7)
        + (-1.0216 * F) + (2.4701 * EXTROVERSI)

Variables in the equation

Variable   B   SE B   95% confidence interval Tolerance

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Intercept     21.8035
      T1      .1483      .06213       .02583 to      .2708      .9338
      T5     -.1120      .03203       -.1751 to     -.04882     .9280
      T6      .3187      .07383        .1731 to      .4642      .4808
      T7      .1579      .06929       .02132 to      .2945      .5076
       F    -1.0216      .4073       -1.8244 to     -.2187      .3907
EXTROVERSI     2.4701      .5634       1.3595 to     3.5807      .3910
```

Variable	Beta	SE Beta	Correl	S-Part	Partial	t	Sig t
T1	.1412	.0592	.0035	.1365	.1640	2.387	.0179
T5	-.2074	.0594	-.0645	-.1998	-.2366	3.495	.0006
T6	.3559	.0825	.4466	.2468	.2880	4.316	.0000
T7	.1829	.0802	.3839	.1303	.1568	2.279	.0237
F	-.2294	.0915	.1724	-.1434	-.1722	2.508	.0129
EXTROVERSI	.4009	.0914	.3071	.2507	.2921	4.384	.0000

Variables not in the equation

Variable	F	Sig F
T2	1.337	.2489
T3	.057	.8122
T4	3.284	.0714
ELECTIVE	.089	.7659
A	.024	.8779
B	1.183	.2781
C	.148	.7012
E	.622	.4312
G	.438	.5090
H	.624	.4304
I	.271	.6033
L	.058	.8106
M	.009	.9228
N	.274	.6013
O	.023	.8785
Q1	.884	.3483
Q2	.405	.5251
Q3	.008	.9280
Q4	.040	.8412
ANXIETY	.036	.8503
TOUGH	.271	.6031
INDEPENDEN	.309	.5787
SELF	.018	.8941

Summary Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
T1	1	323.9395	323.9395	5.697	.0179
T5	1	588.3200	588.3200	10.347	.0015
T6	1	221.8493	221.8493	3.902	.0496
T7	1	-46.8436	-46.8436	-.824	1.0000
F	1	-.4399	-.4399	-.008	1.0000
EXTROVERS	1	-463.5312	-463.5312	-8.152	1.0000
Explained	6	5681.3952	946.8992	16.653	.0000
Residual	206	11713.2621	56.8605		
Total	212	17394.6573	82.0503		

APPENDIX 10

MULTIPLE REGRESSION SCATTER PLOT:

WORK PERFORMANCE ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,
PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,
PSYCHOMOTOR ABILITY,
CORE-MODULES AND
SEWING ELECTIVE.

Normal probability plot of residuals (WORKPERF)
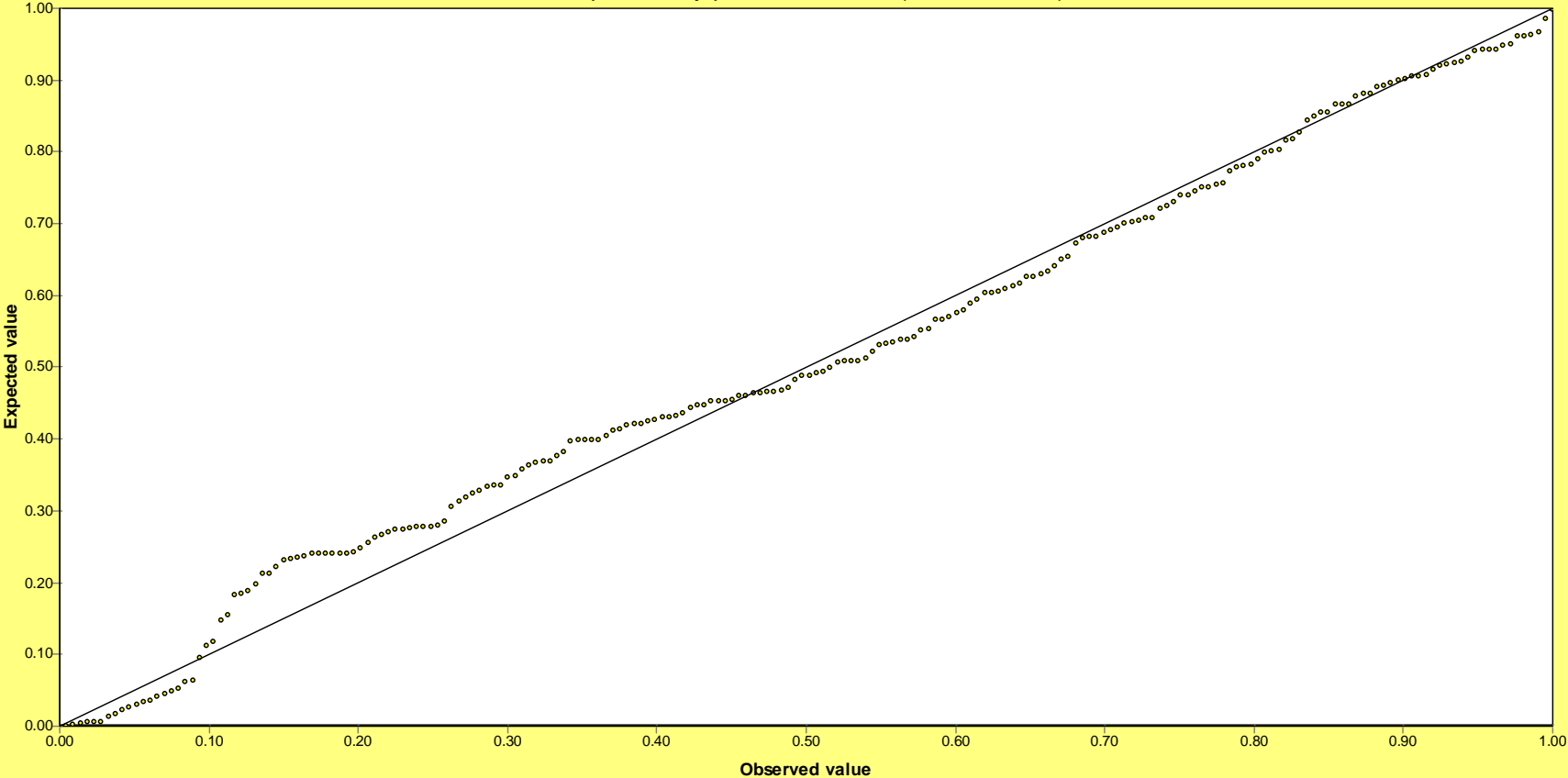
APPENDIX 11

MULTIPLE REGRESSION DATA:

QUALITY ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,

PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,

PSYCHOMOTOR ABILITY,

CORE-MODULES AND

SEWING ELECTIVE.

Dependent Variable: QUALITY

Method: Backward elimination
            P to Remove =0.055

Variable(s) entered on Step 1   T1
                                     T2
                                     T3
                                     T4
                                     T5
                                     T6
                                     T7
                                 ELECTIVE
                                     A
                                     B
                                     C
                                     E
                                     F
                                     G
                                     H
                                     I
                                     L
                                     M
                                     N
                                     O
                                     Q1
                                     Q2
                                     Q3
                                     Q4
                                 EXTROVERSI
                                  ANXIETY
                                  TOUGH
                                 INDEPENDEN
                                    SELF
Variable(s) removed on Step 2   O
Variable(s) removed on Step 3   T4
Variable(s) removed on Step 4   ELECTIVE
Variable(s) removed on Step 5 INDEPENDEN
Variable(s) removed on Step 6   A
Variable(s) removed on Step 7   M
Variable(s) removed on Step 8   T3
Variable(s) removed on Step 9   Q3
Variable(s) removed on Step 10   Q2
Variable(s) removed on Step 11   Q1
Variable(s) removed on Step 12   T2
Variable(s) removed on Step 13   E
Variable(s) removed on Step 14   C
Variable(s) removed on Step 15   G
Variable(s) removed on Step 16   SELF

Variable(s) removed on Step 17   L
Variable(s) removed on Step 18   Q4
Variable(s) removed on Step 19   ANXIETY
Variable(s) removed on Step 20   N
Variable(s) removed on Step 21   H
Variable(s) removed on Step 22   TOUGH
Variable(s) removed on Step 23   I
Variable(s) removed on Step 24   T7
Variable(s) removed on Step 25   B

Multiple Regression

Multiple R   = .4764   sig. of R = .0000
Multiple R Square = .2269
Adjusted R square = .2082

Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
Regression	5	4097.4567	819.4913	12.152	.0000
Residual	207	13959.8203	67.4387		

Equation: QUALITY = 34.2288 + (.2283 * T1) + (-.1083 * T5) + (.3094 * T6) + (-1.2871 * F)
        + (2.7744 * EXTROVERSI)

Variables in the equation

Variable	B	SE B	95% confidence interval		Tolerance
Intercept	34.2288				
T1	.2283	.06767	.09494 to	.3617	.9339
T5	-.1083	.03469	-.1767 to	-.03990	.9385
T6	.3094	.06080	.1895 to	.4293	.8408
F	-1.2871	.4424	-2.1592 to	-.4150	.3927
EXTROVERSI	2.7744	.6127	1.5666 to	3.9823	.3920

Variable	Beta	SE Beta	Correl	S-Part	Partial	t	Sig t
T1	.2134	.0632	.1099	.2062	.2283	3.374	.0009
T5	-.1969	.0631	-.1055	-.1908	-.2120	3.122	.0021
T6	.3391	.0666	.2844	.3110	.3334	5.089	.0000
F	-.2837	.0975	.0963	-.1778	-.1982	2.909	.0040
EXTROVERSI	.4420	.0976	.2570	.2767	.3002	4.528	.0000

Variables not in the equation

Variable	F	Sig F
T2	.546	.4607
T3	1.363	.2444
T4	.034	.8547
T7	2.183	.1410
ELECTIVE	.126	.7227
A	.307	.5801
B	3.259	.0725
C	.105	.7460
E	.287	.5929
G	.226	.6348
H	2.437	.1200
I	1.277	.2597
L	.020	.8887
M	.427	.5142
N	.497	.4817
O	.668	.4148
Q1	.869	.3523
Q2	.149	.7000
Q3	.000	.9883
Q4	.044	.8338
ANXIETY	1.354	.2459
TOUGH	.142	.7071
INDEPENDEN	.282	.5957
SELF	.005	.9416

Summary Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
T1	1	767.8493	767.8493	11.386	.0009
T5	1	622.0909	622.0909	9.225	.0027
T6	1	600.2650	600.2650	8.901	.0032
F	1	24.5997	24.5997	.365	.5465
EXTROVERS	1	-853.6829	-853.6829	-12.659	1.0000
Explained	5	4097.4567	819.4913	12.152	.0000
Residual	207	13959.8203	67.4387		
Total	212	18057.2770	85.1758		

APPENDIX 12

MULTIPLE REGRESSION SCATTER PLOT:

QUALITY ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,
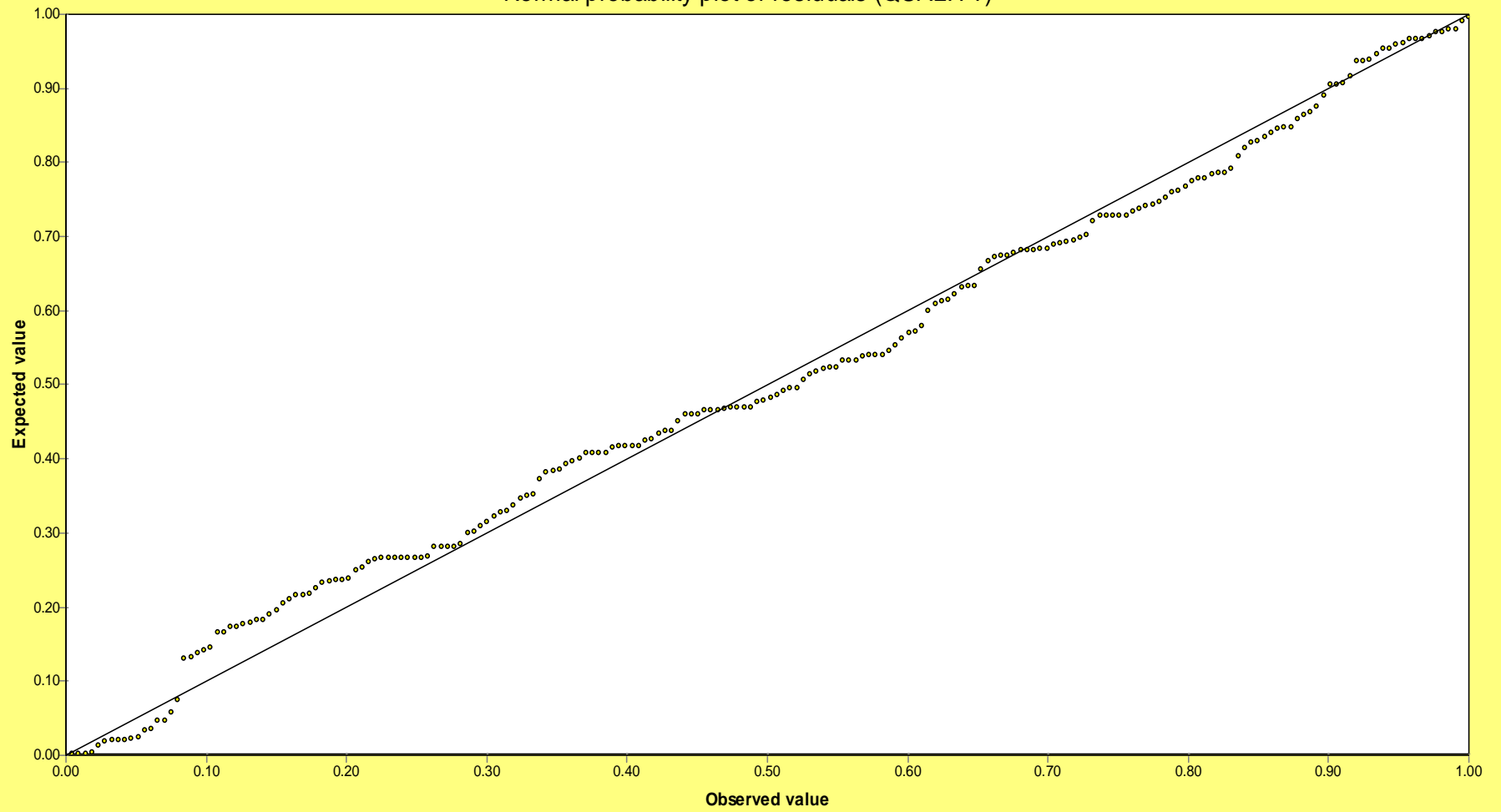PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,
PSYCHOMOTOR ABILITY,
CORE-MODULES AND
SEWING ELECTIVE.

Normal probability plot of residuals (QUALITY)

APPENDIX 13

MULTIPLE REGRESSION DATA:

QUANTITY ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,
PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,
PSYCHOMOTOR ABILITY,
CORE-MODULES AND
SEWING ELECTIVE.

Dependent Variable: QUANTITY

Method: Backward elimination
        P to Remove =0.055

Variable(s) entered on Step 1   T1
                        T2
                        T3
                        T4
                        T5
                        T6
                        T7
                     ELECTIVE
                        A
                        B
                        C
                        E
                        F
                        G
                        H
                        I
                        L
                        M
                        N
                        O
                        Q1
                        Q2
                        Q3
                        Q4
                     EXTROVERSI
                     ANXIETY
                      TOUGH
                    INDEPENDEN
                       SELF
Variable(s) removed on Step 2   ELECTIVE
Variable(s) removed on Step 3   T3
Variable(s) removed on Step 4   N
Variable(s) removed on Step 5   C
Variable(s) removed on Step 6   L
Variable(s) removed on Step 7   H
Variable(s) removed on Step 8   B
Variable(s) removed on Step 9   Q3
Variable(s) removed on Step 10   SELF
Variable(s) removed on Step 11 INDEPENDEN

Variable(s) removed on Step 12   Q1
Variable(s) removed on Step 13   O
Variable(s) removed on Step 14   A
Variable(s) removed on Step 15   I
Variable(s) removed on Step 16   TOUGH
Variable(s) removed on Step 17   M
Variable(s) removed on Step 18   G
Variable(s) removed on Step 19   E
Variable(s) removed on Step 20   Q4
Variable(s) removed on Step 21   ANXIETY
Variable(s) removed on Step 22   T2
Variable(s) removed on Step 23   T1
Variable(s) removed on Step 24   Q2
Variable(s) removed on Step 25   F

Multiple Regression

    Multiple R   = .6247   sig. of R = .0000
    Multiple R Square = .3903
    Adjusted R square = .3756

Analysis of Variance

| | | Sum of | Mean | F | F |
Source	D.F.	Squares	Squares	Ratio	Prob.
Regression	5	8566.7721	1713.3544	26.502	.0000
Residual	207	13382.3922	64.6492		

Equation: QUANTITY = 19.4169 + (.1348 * T4) + (-.1260 * T5) + (.2645 * T6) + (.1964 * T7)
        + (1.1269 * EXTROVERSI)

Variables in the equation

Variable	B	SE B	95% confidence interval		Tolerance
Intercept	19.4169				
T4	.1348	.04617	.04381 to	.2258	.5519
T5	-.1260	.03451	-.1940 to	-.05796	.9090
T6	.2645	.08860	.08984 to	.4392	.3796
T7	.1964	.07370	.05118 to	.3417	.5102
EXTROVERSI	1.1269	.3971	.3441 to	1.9098	.8947

Variable	Beta	SE Beta	Correl	S-Part	Partial	t	Sig t

Variables not in the equation

Variable	F	Sig F
T1	2.453	.1188
T2	1.671	.1976
T3	.090	.7644
ELECTIVE	.129	.7203
A	1.713	.1920
B	.003	.9551
C	.323	.5707
E	.029	.8651
F	3.214	.0745
G	1.677	.1967
H	.039	.8442
I	.197	.6574
L	.221	.6387
M	1.828	.1778
N	.127	.7215
O	.051	.8218
Q1	.643	.4235
Q2	1.649	.2006
Q3	.365	.5462
Q4	.019	.8900
ANXIETY	.054	.8171
TOUGH	.174	.6768
INDEPENDEN	.264	.6078
SELF	.562	.4544

Summary Analysis of Variance

Source	D.F.	Sum of Squares	Mean Squares	F Ratio	F Prob.
T4	1	350.3226	350.3226	5.419	.0209
T5	1	668.5222	668.5222	10.341	.0015
T6	1	329.4536	329.4536	5.096	.0250
T7	1	111.3376	111.3376	1.722	.1909
EXTROVERS	1	-769.6045	-769.6045	-11.904	1.0000
Explained	5	8566.7721	1713.3544	26.502	.0000
Residual	207	13382.3922	64.6492		

APPENDIX 14

MULTIPLE REGRESSION SCATTER PLOT:

QUANTITY ON THE INDEPENDENT VARIABLES:

MENTAL ALERTNESS,
PERSONALITY (PRIMARY AND SECOND-ORDER FACTORS,
PSYCHOMOTOR ABILITY,
CORE-MODULES AND
SEWING ELECTIVE.

Normal probability plot of residuals (QUANTITY)