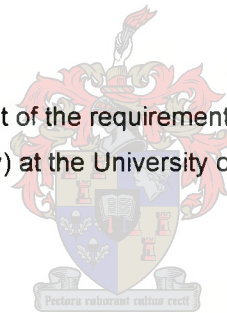


THE RELATIONSHIP BETWEEN PERSONALITY TYPE AND CREATIVE PREFERENCE

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Assignment presented in partial fulfilment of the requirements for the degree of Master of Arts (Industrial Psychology) at the University of Stellenbosch



Study Leader: Mr C.J. Calitz

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Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: _____

Date: _____

ABSTRACT

THE RELATIONSHIP BETWEEN PERSONALITY TYPE AND CREATIVE PREFERENCE

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Degree: Magister Artium (Industrial Psychology)

ABSTRACT

As the human race enters the new millennium it is challenged by factors such as continuous change, demand for improved quality and increased competition of global proportions. This requires of organisations to be more responsive to change as well as that individuals will need to position themselves to meet the challenges of the knowledge era. These challenges demand creativity in order to meet the demands for value adding contributions to the organisation. The above mentioned situation gives rise to a number of questions: Firstly, how can the creative processes of an individual be assessed? Secondly, what role does personality play as an indicator of creativity? Lastly, can the knowledge concerning the relationship between creativity and personality be applied to enhance the expression of creativity in the working environment?

This research is aimed at investigating the relationship between personality dimensions and creative thinking preferences. 305 managers from the 1st, 2nd and 3rd reporting levels of an organisation in the aviation maintenance and manufacturing industry took part in the study. Two instruments were used namely the Myers-Briggs Type Indicator Step II, to assess the personality dimensions and the Neethling Brain Instrument (NBI) to assess the subjects creative thinking preference.

A Pearson Product Moment analysis was conducted to determine the correlation between the subscales of the MBTI Step II personality dimensions and the NBI. Next a Principal Component analysis was

conducted to determine if any of the NBI thinking style preferences measure the same factor as the sub-scales of the MBTI Step II, as well as to reduce the number of variables used to determine if a significant relationship exists between the principle dimensions of the MBTI and thinking styles of the NBI. Finally, a regression analysis was performed to determine if the principle dimensions of the MBTI Step II are significantly related to the thinking style dimensions of the NBI.

The results of the Pearson Product Moment correlation indicated that significant correlations exist between the sub-scales of the MBTI Step II and the NBI thinking preferences. However, the significance of these correlations range from weak to strong, posing a challenge with regard to determining which of these correlations have any practical value.

The results of the Principle Component analysis indicated the existence of four distinct factors, which are common to both the MBTI Step II, and the NBI. However, it was of interest to note that two of the dimensions of the NBI each loaded on two of the factors leading to the conclusion that these two dimensions each measure two unique factors.

The results of the Regression analysis provided evidence that the NBI measures two dimensions of the MBTI Step II. Firstly, a preference for thinking is measured by the L1, Upper Left quadrant scale of the NBI and a preference for feeling is measured by the R2, Right Lower quadrant scale of the NBI. Secondly, that a combination of the Judging/Perceiving and Sensing/Intuition preferences are related as follows. The R1, Right Upper quadrant preference scale measures a combination of Perceiving and Intuition. The L2, Left Lower quadrant scale appears to measure a combination of Judging and Sensing.

An obvious question that arises is, which personality type is more creative? The process perspective on creativity would appear to indicate that certain personality types have a preference for contributing more effectively to specific parts of the creative process. Thus it can be concluded that no single personality type is more creative than the other is, but that creativity requires the use of all the functions of Personality Type. The key to creativity is the integration of all the Type functions both preferred and not preferred in a synergistic manner. This requires recognition that creativity will require the expenditure of significant amounts of psychic energy to apply non-preferred functions in the process of being creative.

OPSOMMING

DIE VERBAND TUSSEN PERSOONLIKHEIDSTIPE EN KREATIEWE VOORKEUR

deur

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OPSOMMING

Organisasies wat die nuwe millennium betree het, staan toenemende uitdagings in die gesig. Faktore soos konstante verandering, toenemende eise vir die verbetering van kwaliteit en die verhoging in kompetisie wêreldwyd, stel aan organisasies hoër eise om vinniger te reageer op verandering. Dit verg ook van individue om hulself te posisioneer ten einde die uitdagings van die kennis-era aan te durf. Dié uitdagings vereis kreatiwiteit om aan die eise van waarde-toevoeging in die organisasie by te dra. Die voorafgenoemde situasie laat 'n paar vrae ontstaan. Eerstens, hoe 'n individu se kreatiewe prosesse geëvalueer kan word, tweedens watter rol persoonlikheid speel as 'n aanduiding van kreatiwiteit en laastens of kennis van die verband tussen kreatiwiteit en persoonlikheid prakties toegepas kan word om die uitdrukking van kreatiwiteit in die werksomgewing te verhoog.

Hierdie navorsing is daarop gemik om die verband tussen persoonlikheidsdimensies en kreatiewe denkvoreure te ondersoek. 305 bestuurders in die eerste, tweede en derde rapporteringsvlak van 'n lugvaart vervaardiging en onderhoud organisasie het aan die navorsing deelgeneem. Twee meetinstrumente is gebruik in die navorsing naamlik die Myers-Briggs Type Indicator Step II, om die persoonlikheidsdimensies te meet en die Neethling Brein Instrument (NBI) om die individue se kreatiewe denkvoreure te meet.

Die Pearson Produk Moment ontleding is gebruik om die korrelasie tussen die persoonlikheidsdimensie sub-skale van die MBTI Step II en die NBI te bepaal. Daarna is 'n Hoofkomponent ontleding uitgevoer

om te bepaal of enige van die NBI denk voorkeurstype dieselfde faktor as die MBTI Step II subskale meet, asook om die aantal veranderlikes te verminder om sodoende te bepaal of daar 'n betekenisvolle verband bestaan tussen die hoofdimensies van die MBTI Step II en die denkstipe van die NBI. Laastens is 'n Regressie ontleding gebruik om te bepaal of die hoofdimensies van die MBTI Step II 'n betekenisvolle verband toon met die denkstipe dimensies van die NBI.

Die resultate van die Pearson Produk Moment ontleding het daarop gedui dat daar 'n betekenisvolle korrelasie bestaan tussen die sub-skale van die MBTI Step II en die NBI denk voorkeure. Die betekenisvolheid van die korrelasies wissel egter van swak tot sterk korrelasies, wat 'n uitdaging skep in terme van die bepaling van die korrelasies wat enige praktiese waarde inhou.

Die resultate van die Hoofkomponent ontleding het die bestaan van vier kenmerkende faktore aangedui wat beide algemeen is in die MBTI Step II, en die NBI. Dit was egter interessant om te merk dat twee van die NBI se dimensies op twee verskillende faktore gelaai het. Die gevolgtrekking wat gemaak word is dat die twee dimensies elk twee afsonderlike faktore meet.

Die resultate van die Regressie Ontleding het aangedui dat die NBI twee dimensies van die MBTI Step II meet. Eerstens, word 'n voorkeur vir "Thinking" gemeet deur die L1, Linker Bokantste kwadrant op die NBI en 'n voorkeur vir "Feeling" word gemeet deur die R2, Regter Onderkantste kwadrant van die NBI. Tweedens, dat 'n kombinasie van "Judging/Perceiving" en "Sensing/Intuition" voorkeure die volgende verband toon. Die R1 Regter Bokantste kwadrant meet 'n voorkeur vir 'n kombinasie van "Intuition" en "Perceiving". Die L2 Linker Onderkantste kwadrant meet 'n voorkeur vir 'n kombinasie van "Sensing" en "Judging".

'n Ooglopende vraag wat gevra word is die van watter persoonlikheidstipe meer kreatief is? Uit die proses perspektief wat geneem is in die studie, wil dit voorkom dat sekere persoonlikheidstipes 'n voorkeur het om meer effektief te kan bydra tot spesifieke gedeeltes van die kreatiewe proses. Die afleiding kan dus gevorm word dat geen enkele persoonlikheidstipe meer kreatief is as die ander nie, maar eerder dat die gebruik van al die funksies van persoonlikheidstipe nodig is om kreatiwiteit te ontsluit. Die sleutel tot kreatiwiteit is dus die sinergistiese integrasie van al die Tipe funksies, beide die waarvoor 'n voorkeur bestaan en die waarvoor daar nie 'n voorkeur is nie. Dit verg ook die besef dat kreatiwiteit die spandering van groot hoeveelhede psigiese energie benodig, om funksies waarvoor daar nie 'n voorkeur is nie, toe te pas om die kreatiewe proses te volbring.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND PROBLEM STATEMENT

1.1.1 General

As we humans enter the new millennium, supervisors, managers and leaders face the challenges of rapidly changing technologies, faster turnaround times of production and service delivery, as well as providing the highest quality products in an ever increasingly competitive world economy (Bass & Avolio, 1990). According to Roux & Van Vuuren (1999), a global process of change, generated by information and telecommunication technologies and globalisation is transforming the world of work. Not only will organisations need to become more responsive to change, but individuals will also need to position themselves to meet the challenges of the knowledge era. These challenges demand creativity and future employment will depend on the potential employees ability to add value to an organisation through the generation and implementation of creative ways, to operate at higher levels of effectiveness and efficiency.

In order to meet the challenges posed by a world characterised by knowledge management philosophies, leaders will have to provide their followers with more responsibility and autonomy to use their creative talents under ever decreasing levels of supervision. Employees will need to be challenged intellectually. They will need to have their creative skills developed in order to take charge of the total spectrum of their job and in so doing, release those at a higher level to focus their attention on anticipating and meeting the next challenges to come along (Bass & Avolio, 1990; Roux & Van Vuuren, 1999). All members of an organisation will have to apply their creativity to ensure the organisation's survival. This implies that each individual's skills may be stretched to the maximum and even developed to previously unthinkable heights (Sternberg & Lubart, 1996).

The key to developing and stimulating an individual's skills lies in the ability of the leader to identify and unleash the creative potential of every employee. According to Amabile (1983) individuals only display their creativity if they really love their work and are focused on getting the job done instead of on the rewards for doing the job. Leaders thus have the responsibility firstly of identifying the intrinsic factors, which motivate their subordinates, and finding the association with the task at hand in order to unlock their creativity. Secondly an environment needs to be created in which the display of creativity is supported and rewarded (Sternberg & Lubart, 1996).

1.1.2 The role of personality in behaviour

Briefly personality can be defined as that which makes an individual a person. It is the sum of physiological, psychological and spiritual characteristics that influence behaviour and is of primary importance as a determinant of an individual's behaviour when interacting with his environment (Meyer, Moore & Viljoen, 1988). However, it is important to keep in mind that, in some ways an individual's

personality remains stable, but in others instances it is constantly changing. Secondly, the elements of an individual's personality do not exist in isolation, but are interconnected in a complex manner that are in constant interaction with each other. Thirdly a person's behaviour is also influenced by the physical and social characteristics of the environment (Meyer *et al.*, 1988). Is it thus possible that personality influences an individual's creativity?

One of the ways of measuring personality is by means of the Myers Briggs Type Indicator (MBTI) based on Jung's theory of psychological type. The theory of psychological type was developed, to explain some of the random differences in people's behaviour. This theory developed through the observations of clients and others and resulted in an explanation for differing and predictable patterns of normal behaviour. The theory of psychological type recognises the existence of patterns of behaviour and provides an explanation of how these types develop. Jung believed that the predictable differences in individuals are caused by the way people prefer to use their minds. The central premise is that when the mind is active, it is involved in one of two mental activities i.e. 'perceiving' or taking in information and 'judging' or organising that information and coming to conclusions. Jung observed that there are two opposite ways to perceive, which he called 'sensing' and 'intuition', and two ways of reaching decisions which he called 'thinking' and 'feeling' (Briggs & Myers, 1993; Platania, 1997). These four functions can possibly shed light on the relationship between creativity and personality.

Further components of the theory of psychological type are the attitudes of 'introversion' and 'extroversion'. These two attitudes provide an indication of the source of an individual's energy. Introverts obtain their energy from internal sources in contrast with extroverts who gain their energy from external sources. Although individuals can be classified as introverts and extroverts, it is in effect each of their functions that are either introverted or extroverted with one of the functions being dominant. Individuals are thus both introverted and extroverted with a preference for one of the attitudes above the other (Jung, 1971; Briggs & Myers, 1993; Platania, 1997). These preferences could thus have a profound impact on the way an individual's creative processes are activated and executed.

1.1.3 Defining Creativity

A study of the literature has led to the conclusion that defining creativity is very difficult. Bayley (as quoted by Grant, 1994) views creativity as being far easier to detect than to define. Ebert (1994) is of the opinion that the emphasis is often placed on the characteristics of creativity in terms of the product produced, in stead of the process used. Creative thinking is also often defined quite broadly; resulting in no generally accepted definition of creative thinking (Guilford, 1959; Mednick, 1962; Leary, 1964; McCormack, 1984; Ebert & Ebert, 1989). According to Neethling & Rutherford (1996), there are over 400 definitions of creativity. Neethling *et al* (1996), regard creativity as an experience, making it difficult to put any boundaries around the concept. They see creativity as an ability, which if it is nurtured, will grow and flourish. As stated earlier, supervisors and managers will play an ever-increasing role in stimulating individual employees' creativity (Bass & Avolio, 1990).

The breadth of the term varies from author to author, encompassing a variety of characteristics and processes that overlap with other constructs (e.g. problem solving), making it difficult to identify behaviour

that is particularly reflective of creative behaviour. Ebert (1994), whose view supports the above, sees creative thinking as having a similar nature to problem solving, which in turn is similar to cognitive processing. Sternberg (as quoted by Ebert, 1994) also regards creative thinking as a function of interrelated intellectual abilities which indicate that it is an attribute of cognitive processing.

According to Ebert (1994) when creative thinking is viewed as a process, the creative process is presented as a model of creative thinking, rather than a model of thinking which includes a creative component. All thinking can thus be creative, but creativity *per se* needs to be positively reinforced in order for it to be nurtured and developed. For this reason it is important to study the relationship between personality and creativity. If the results of the study indicate a positive relationship, light can be cast on the ways in which creativity can be developed and reinforced by focusing on individual needs arising out of individual personalities. The more creativity is enhanced the more people may tend to enjoy their day-to-day routine, work, hobbies and relationships (Grant, 1994).

Neethling's theory of creativity, which will form a central theme in this study, is derived from research into the functions of the different brain hemispheres. A preference for the use of one hemisphere results in this hemisphere being dominant over the others. This in turn impact on the individual's creative thinking processes (Neethling & Rutherford, 1996). Herrmann (1995) a leader in the field of brain dominance theory writes about the duality of the creative brain. Herrmann postulates that the hemispheres of the brain control different functions and that one of these hemispheres will be dominant. Herrmann's theory is supported by the work of the neuro-surgeon Sperry. Sperry was able to show that a human being's characteristics, physical and mental ability, their ability to solve problems and their approaches to people and things are very strongly influenced by the tendency to use one part of the brain more than the other ((Herrmann, 1995; Neethling *et al* 1996). Herrmann (1995) goes further to say, that brain dominance is expressed in terms of how we prefer to learn, understand and express something. He calls these cognitive preferences or preferred modes of knowing. The preferred mode of knowing is the one the individual is most likely to use when faced with the need to solve a problem or select a learning experience (Herrmann, 1995). Herrmann's use of the term duality alludes to the same basic premise that Jung used in formulating his theory of personality type (Herrmann, 1995; Neethling *et al* 1996).

A study of the literature alludes to the possibility that personality influences behaviour and that creativity is seen or expressed through behaviour. Thus it should be meaningful to research the influence of personality on creativity. Furthermore, it seems that the mechanisms in the brain that guide creativity could possibly be similar to those that determine aspects of an individual's personality (Ford, 1988; Leonard & Straus, 1997). It could thus be stated that if a relationship exists between creativity and personality, personality might be the key to unlocking the creativity of subordinates.

1.2 MOTIVATION FOR THE STUDY

A study of the literature (Torrance, 1966; Amabile, 1983; Saracho, 1992; Eysenck, 1993) indicates that there is a definite interest in the relationship between creativity and personality. A reasonably large amount of research has been done to support the relationship between the two concepts (Davis, 1991; Ford, 1988; DuFault, 1990; Bunderson *et al*, 1981). A review of the literature in South Africa indicates

that very little research has been done on the MBTI, personality type and creativity. The studies that have been conducted (Sen & Hagtvet, 1993) on the relationship between personality and creativity, have taken place abroad.

The MBTI is one of the most widely used psychological instruments in South African organisations today (Spangenberg; 1990). This emphasises the need for South African research to be conducted on the MBTI. The Neethling Brain Profile Instrument is a locally developed instrument that has been administered to more than 200 000 individuals in a number of countries (Neethling *et al*, 1996). The instruments provide a unique research opportunity to investigate the manner in which personality influences the creative potential of individuals, especially in the South African context. Similar studies on the relationship between personality type and creativity have all been conducted abroad. The proposed research will be aimed at investigating the relationship between personality type and creative potential within a South African context.

Knowledge with regard to an individual's preference of creative processes holds practical and theoretical value for research in the behavioural science in general. Specifically knowledge of personality type (as expressed using the MBTI) and creative processes (as expressed through the Neethling Brain Profile) would be most useful. Knowledge regarding this relationship can be meaningfully utilised in the development of organisational development interventions, which can be aimed at identifying, understanding and optimally harnessing the creative potential of employees. The results of these interventions would lead to employees being optimally utilised in coping with rapidly changing work environments and increased global competitiveness.

This study will thus be aimed at conducting research on the relationship between creativity and personality within the South African context.

1.3 RESEARCH QUESTIONS

Based on the content of the problem statement the following research questions come to light:

- To what extent does the scientific literature contain reference to the relationship between creative processes and personality dimensions?
- How is personality conceptualised according to the theory of Jung and the Type theorists?
- How is the creative process conceptualised according to the theory of Neethling?
- What is the statistical relationship between personality type and creative potential?

1.4 RESEARCH GOALS

1.4.1 General aim

The general aim of this study is to determine if personality type can be used as an indicator of an individual's creative processes.

1.4.2 Specific goals

The specific goals of this study are:

- To determine what relationship exists between personality type and the Neethling Brain Instrument (NBI).
- To investigate the relationship between “brain dominance” and personality type.
- To investigate the influence of the sub-scales of the MBTI Step II, on the determination of creative preferences.
- To investigate the relationship between the principle dimensions of the MBTI Step II, and creative preferences.
- To investigate the influence of biographical factors as covariates influencing the relationship between personality type and creative preferences.

1.5 PERSPECTIVE OF THE RESEARCH PARADIGM

1.5.1 Demarcation of the field of study

The research project falls within the broad field of the social sciences and specifically within the field of psychology. A number of sub-fields can be found within the subject field of psychology. Examples of these fields are research psychology, counselling psychology, clinical psychology and industrial psychology (Papalia & Olds, 1988). The research will be conducted from an industrial psychological perspective. Papalia & Olds (1988) define industrial psychology as follows: “...focus on making the workplace more fulfilling and more productive, for both workers and their employees.” Industrial psychology can thus be seen as the application of methods and findings from the field of psychology to organisational problems. The research will thus be aimed at finding meaningful tendencies and relationships that can be used to explain behaviour in the workplace.

The applicable sub-field for this study in industrial psychology is that of organisational psychology. Organisational psychology focuses on individual dimensions of organisational behaviour as well as interpersonal and group processes.

1.5.2 Applicable theoretical models and theories

Reference will be made to the relevant theories of personality that fall within the paradigm of psychology. The research will focus specifically on the paradigms of depth psychology and positivism. More specifically reference will be made to the theory of Carl Jung and his conceptualisation of personality. The Jungian paradigm has been selected due to the use of the Myers Briggs Type Indicator (MBTI), which is based on Jung's depth psychology and type approach to personality.

Furthermore the research will focus on the field of organisational psychology. Specific emphasis will be paid to Neethling's conceptualisation of creative preference based on brain dominance as well as Sperry's theories of brain hemisphere lateralisation. The Neethling Brain Instrument (NBI) will be used in the research to measure creative preference.

1.6 DEPLOYMENT OF THE STUDY

The theoretical investigation of the research will focus on the concepts of "personality" in Chapter 2 and "creativity" in Chapter 3. The investigation will be presented in terms of theoretical perspectives, definitions of constructs and processes involved with the concepts.

In Chapter 4 a comprehensive exhibit of the research methodology will be presented, which will include an explanation of the measurement instruments used during the research. The findings of the statistical analysis of the research results will be presented in Chapter 5. The final chapter will be devoted to the conclusions and recommendations for further research.

CHAPTER 2

PERSONALITY

2.1 INTRODUCTION

A study of the literature relating to personality indicates clearly that personality significantly influences an individual's behaviour. According to Gordon (1991) personality refers to a set of personality characteristics which are unique to an individual. These include motives, emotions, values, interests, attitudes and competencies. These personality characteristics are organised into patterns through the individual's heredity as well as social, cultural and family environment. Furthermore, personality plays an important role in influencing the manner in which an individual will react in various situations.

Gordon (1991) goes on to say that a description of an individual's personality or personality style casts more light on the manner in which an individual will react in an organisational setting. Care must be taken not to label or stereotype an individual based on a certain collection of traits. However, knowledge regarding the composition of an individual's traits provides understanding and confidence to predict how the individual will react in certain circumstances (Romney & Bynner, 1992). A study of personality can thus be regarded as an important variable in the current research. It could also shed light on the analyses of how an individual's creative expressions, which is the second variable in this study, are formulated and manifested. By focussing on certain aspects of an individual's personality, explanations can be found as to why their creative expression takes on a specific form.

With due regard for the above, this chapter will focus on the description of personality as well as how it can be classified. Attention will also be paid to the various theories of personality and lastly a comprehensive discussion of Carl Jung's theory of personality, as used in the Myers-Briggs system, will follow, with specific attention being given to personality type theory.

2.2 DESCRIPTION OF PERSONALITY

Liebert and Spiegler (1982) draw an analogy that personality is like a fingerprint. They regard each individual as being a unique and distinctive combination that will never occur again. In their study of human behaviour they found both personal consistency and situational variability. They see the real challenge facing personality theorists as being the ability to specify precisely how personal characteristics and life circumstances influence one another to determine how a person thinks, feels and what he does. Although general agreement exists among theorists that each individual is unique in some way, controversy exists regarding the implication of this fact for the study of personality as well as the exact structure of personality (Liebert and Spiegler, 1982).

2.2.1 Related terminology

In layman's terms personality is seen as being synonymous with concepts such as temperament and character. In order to prevent confusion it would be prudent to put these concepts into perspective, as

being part of personality and not personality per se. To differentiate these two concepts from personality each will subsequently be defined:

2.2.1.1 Temperament

Temperament refers to a person's moods and emotions, and can be related to the physiological functioning of the glands and nervous system (Cartwright, 1979; Meyer *et al*, 1988). Temperament thus has a narrower meaning than personality.

2.2.1.2 Character

Character is assumed to be developed through social training and by individual will power; it manifests in the individuals consistency in following certain rules of life, especially moral and disciplinary rules (Cartwright, 1979). Character is concerned primarily with the person's spirituality (Meyer *et al* 1988).

Thus the difference between character a temperament is that the latter is indicative of an individual's inherited, biological aspects, while character is determined by those aspects which are instilled through socialisation and upbringing i.e. moral viewpoints and values.

2.2.2 General description of personality

At present the field of psychology is extremely broad. It includes such diverse fields as psychotherapy through to organisational behaviour. However, personality psychology lies at the crossroads of all these branches of psychology (Liebert & Spiegler, 1982). Personality psychologists are concerned with the whole person, the sum product of all physiological, perceptual, memory, social interaction, clinical history and development trends (Cartwright, 1979). No agreement has been reached as to what is an all-encompassing definition of personality (Liebert & Spiegler, 1982; Meyer *et al*, 1988).

A number of diverse views are listed below:

- Eysenck sees personality as "the more or less stable and enduring organisation of a person's character, temperament, intellect and physique, which determines his unique adjustment to his environment." (Liebert & Spiegler, 1982:8)
- Mischel defines personality as " the distinctive patterns of behaviour (including thoughts and emotions) that characterise each individual's adaptation to the situations of his her life." (Liebert & Spiegler, 1982:8).
- Cattell regards personality as "that which permits a prediction of what a person will do in a given situation." (Liebert & Spiegler, 1982:8)
- Freud regarded personality as being made up of the id, ego and super ego, three agencies of the psyche, and that it is their interaction, which determines behaviour, (Liebert & Spiegler, 1982; Papalia & Olds, 1988; Osborne, 1993)

From the above definitions it can be concluded that the concept of personality can be divided into three broad categories, these broad categories are strongly influenced by the approach that the respective

theorists took in studying personality (Liebert & Spiegler, 1982). A more comprehensive discussion of personality will thus follow.

2.2.3 Specific descriptions of personality

According to Cartwright (1979) the majority of the definitions of personality can be classified into three main groups, namely:

- Those that define personality as an organisation of systems, within the individual that causally determine that person's behaviour and experience. Hogan, Johnson & Briggs (1997) describe this view as being based on the assumption that a person may be seen from many different perspectives and on many different levels.
- Those that focus upon the behaviours only and seek for the causes within the environment. Hogan *et al* (1997), are of the opinion that this form of personality development stems from learning in society or socialisation.
- Those that focus on the inner experience it self, emphasising a subjective awareness and sense of personal ability. Hogan *et al* (1997) regard this description as being locked up in human motivation, which influences behaviours that are aimed at tension reduction.

A short discussion of each will follow.

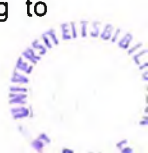
2.2.3.1 Personality as an organisation of systems within the individual

After conducting a comprehensive study of 50 definitions of personality, spanning centuries, the following definition of personality was formulated by Allport. "Personality is the dynamic organisation within the individual of those psychophysical systems that determine one's characteristic behaviour and thought." (Allport, 1961:28)

According to Allport the inner organisation of psychophysical systems is the essence of personality. These systems determine behaviour, thought or unique adjustment to the environment. They are thus causally related to the thoughts and actions of the individual. Allport is adamant that personality is not synonymous with behaviour or activity, but that it is that which lies behind specific acts and within the individual (Cartwright, 1979:29). According to Hogan *et al* (1997), the systems approach to personality is either explicitly or implicitly organismic in that the emphasis is on consistency and coherence of a normal personality in which the individual organism is viewed as an organised and complexly structured whole.

In support of Allport, Maddi provides the following definition of personality. "Personality is a stable set of characteristics and tendencies that determine those commonalties and differences in the psychological behaviour (thoughts, feelings and actions) of people that have continuity in time and that may not be easily understood as the sole result of the social and biological pressure of the moment." (Maddi, 1976:9) Authors such as Previn (1970) and Stagner (1974) have also compiled definitions that support this approach.

In summary this group of definitions all stress the inner organisation of causal systems. These systems determine not only the behaviours but also the inner experiences of the individual. According to



Cartwright (1979) the following two groups of definitions are in sharp contrast as they focus on behaviours and thoughts and not upon the underlying causal systems.

2.2.3.2 Personality as Behaviour

The protagonists of this approach emphasise that observable behaviours are the only evidence upon which scientific theories of personality can be based (Cartwright, 1979). The behavioural approach also rejects the notion that there are any causal personality systems or structures at work within the person. An individual is simply a sum of his behaviours (Cartwright, 1979).

In this regard Liebert & Spiegler (1974:9) state that. "Personality is an abstraction and is not observed directly; instead, it is inferred from behaviour which is observed. 'Personality' is a theoretical construct. Theoretical constructs do not actually exist, nor can they be seen or touched." Liebert & Spiegler thus viewed personality as an abstraction. When using the term abstraction they meant that direct knowledge of others is limited to what we can see of their behaviour (Liebert & Spiegler, 1974:9).

According to Cartwright (1979), a more radical definition of personality is that postulated by Skinner, who proposed that the individual has no need to rely on underlying structures and processes within. Furthermore that it would be sufficient if laws could be established, which relate behaviours to contingencies in the environment. Thus behaviour is seen as being determined by environmental stimuli, and not by any structures or systems assumed to be operating within the individual.

In summary the behavioural point of view, defines personality as behaviour and searches for its causes in the environment. They reject the notion of an internal system regulating personality. Their view is that personality can only be inferred from behaviour (Cartwright, 1979).

2.2.3.3 Personality as inner experience and sense of inner identity

According to Cartwright (1979) one of the earliest proponents of this orientation was James, who saw personality as a personal stream of consciousness and a feeling of inner assurance that the stream was "our" stream and not somebody else's. A strong movement exists in modern psychology in favour of defining personality solely in terms of the self, conscious striving for an ideal. Rogers who supports this approach, sees the individual as the central figure in the actualisation of his/her potential and that the environment plays only a facilitative role (Meyer *et al*, 1988). Kelly as quoted by Cartwright (1979), theorised that personality is explicitly based upon inner thoughts. Hogan *et al* (1997) are of the opinion that organisms seek some sort of equilibrium that drives needs which increase tension and that the organism is thus motivated to act upon these drives or needs in order to reduce tension, which is ultimately satisfying or reinforcing.

In conclusion this group emphasised that personality is a subjective experience. In order to understand a person, one would have to understand how that person experiences the world and how that person sees their own identity (Cartwright 1979).

2.2.4 An integrated definition of personality

The formulation of an integrated definition of personality is complicated due to the differing emphasis that the previous three groups have placed on their definitions of personality. Cartwright (1979) regards these differences in emphasis as having their origin in the varied conditions that the theorists conducted their research. The behavioural orientation arose out of laboratory experiments, while those who formulated the theory of a feeling of inner identity were active in the counselling field.

All three of the above groupings are actively employed in the study of personality at present. Therefore it is important that all three are incorporated into the definition of personality. For the purpose of this research personality will be defined as the dynamic integration of a person's inner identity, attitude cognition and affect in interaction with the social environment and other individuals. It is the individual's interaction with the environment and others, characterised by certain behaviours that make individuals unique. This leads to the next challenge regarding research into personality, the classification of personality.

2.3 CLASSIFICATION OF PERSONALITY

2.3.1 Introduction

When faced with the challenge of explaining individual differences and with personality in general, Eysenck & Eysenck (1985) are of the opinion that two types of questions are usually encountered. The first of these questions is static, descriptive and non-causal and concerns the descriptive analysis of those types of behaviour included under terms such as personality, character and temperament. The second question focuses on the more dynamic causal nature of behaviour and seeks to explain the reason why an individual acts in a certain way or shows certain traits of behaviour rather than others. The first question leads to the investigation of the taxonomy of human behaviour whereas the second leads to an explanation of the dynamics of human behaviour.

According to Eysenck & Eysenck (1985) taxonomy precedes dynamics. Taxonomy refers in essence to classification, which is a pre-requisite for any field of scientific study in order to classify the multitude of information being presented. Two groups namely the idiographic and experimental psychologists hold opposing views regarding the classification of personality. Those of the idiographic orientation argue that in essence all human beings are unique and can thus not be placed on any particular point on a trait continuum. Furthermore, traits are artificial abstractions of reality and thus do not singly or in combination reproduce the unique living reality that characterises a particular person's existence (Eysenck & Eysenck, 1985).

The experimental psychologists are of the opinion that all human beings are essentially identical and that general laws can be found by studying small and unrepresentative samples of the population, and that individual differences may be safely discarded. This argument has drawn strong criticism from authors such as Eysenck (1967) and Cronbach (1957) who quote a rich body of evidence which indicates that a large proportion of total variance evident in most psychological experiments is due to individual differences.

However, one of the major arguments against the hypothesis that all organisms are unique and hence incapable of being studied by ordinary methods of science is that the existence of differences implies the existence of similarities and that both must be measurable along a certain dimension. According to Eysenck & Eysenck (1985) it is not possible to say people differ if that difference cannot be quantified. In order to make a factual statement about similarities and differences among individuals a measure is required of the particular dimensions in question.

2.3.2 The history of the classification problem

The science of psychology has a short history, but a long past. Psychology as an independent field of study is only just more than a century old, due to the application of scientific research methods. However, many of the underlying conceptions upon which modern psychology has been built can be traced back 2000 years to the ancient Greeks (Eysenck & Eysenck, 1985, Meyer *et al.*, 1988, Widiger & Frances, 1985). The origins of personality taxonomies, categories, prototypes and dimensions will be discussed in the following sections.

2.3.2.1 Personality Typologies

The earliest classification of personality can be traced back to the ancient Greek philosopher, Hippocrates who proposed the doctrine of the four temperaments, or what he referred to as the four humours. The Roman physician Galen later expanded upon this theory. Galen proposed that the manifestation of a particular temperament could be explained in terms of a preponderance of a particular bodily fluid. A **sanguine** person was characterised by enthusiasm that was a result of strong blood. The **melancholic** person's sadness was due to an excessive amount black bile. The **choleric** person was characterised as irritable due to excessive amounts of yellow bile. The **phlegmatic** person was seen as slow and apathetic due to the influence of phlegm in the body (Eysenck & Eysenck, 1985).

The notions of the ancient Greeks may seem farfetched, but they do contain three important elements that characterise modern approaches to personality research. Eysenck & Eysenck (1985: 42-43) suggest the following: "Firstly, behaviour is to be described in terms of traits that characterise given individuals in varying degrees. Secondly, these traits cohere or correlate and define certain more fundamental and all-embracing types. Thirdly, these types are essentially based on constitutional, genetic or inborn factors, which are to be discovered in the physiological, neurological and biochemical structure of the individual."

The doctrine of the four temperaments influenced the theory of personality for hundreds of years. In the 18th century Kant expanded on the temperament theory in his book *Anthropologie*. He provided a categorical description of behaviour for each of the temperaments. A limitation of this categorical approach was however that it did not make allowance for compound temperaments. It was inconceivable that a human being could combine them in any way (Eysenck & Eysenck, 1985). A more sophisticated application of the categorisation approach can still be found today in the field of psychiatry for use in the diagnosis of personality disorders (Widiger & Frances, 1985).

Wundt was among the first psychologists to challenge the categorical type descriptions of the Ancient Greeks and Kant. Wundt proposed a dimensional approach. This approach would shift the emphasis

away from a typological view, towards a two dimensional system. The dimensional approach proposed that the temperaments could be arranged as points on two continuums. People could occupy any position, and any combination of positions along the two continuums. The ideas proposed by Wundt signified the birth of the modern approach to the classification of personality (Eysenck & Eysenck, 1985).

2.3.2.2 Categories, dimensions and prototypes

Wundt regarded the distribution along his two dimensions to be normal for the population. As the field of psychology developed, data gathering methods became more scientific. Data collected was subjected to statistical analysis, which resulted in the discovery that very few people obtained extreme scores and that the majority of people were found to be average on the dimensions measured (Eysenck & Eysenck, 1985). The categorical approach was found wanting. This created the need for the development of a new taxonomy for the classification of personality. The challenge to produce a taxonomy based on the dimensions of personality was taken up by researchers such as: Cattell who developed the 16 Personality Factor questionnaire. Eysenck who developed the Eysenck Personality Questionnaire (EPQ). Costa and McCrae who proposed the five factor model of personality. Myers and Briggs who developed the Myers Briggs Type Indicator (MBTI) (Hogan, Johnson & Briggs, 1997; Van Rooyen & De beer, 1995).

Although the categorical taxonomy as proposed by Kant be deemed to be limited in its usefulness as a model for representing personality, categorical taxonomies have progressed and have been refined. This refinement was particularly pertinent in the field of psychiatry. The creation of the initial Diagnostic and Statistical Manual (DSM) classification of mental disorders was the result of a compilation of categorical taxonomies, which set a standard for the diagnosis of mental illness. The categorical approach to classifying personality disorders was consistent with the nomenclatures of the medical profession, which attempted to establish set criteria for the classification of people into homogenous groups of sufferers of a particular disorder (Hogan *et al*, 1997, Widiger & Kelso, 1983).

Both the dimensional and categorical taxonomies have received criticism. The classical categorical approach is regarded as being too rigid for defining membership of a category (Hogan *et al*, 1997, Widiger *et al.*, 1983,1985). Each member of the category is required to possess all the definitional features of the category. In reality this is rarely the case, members of a category do not form a homogenous group. In fact most members do not share all the diagnostic criteria, making the identification of borderline cases extremely difficult. The dimensional approach is criticised for being unable to discriminate with any clarity the boundaries between personality styles or between adaptive and maladaptive individuals because of the normal distribution of measurement results. The dimensional approach is thus ineffective in indicating distinctive syndromes or specific causes of personality disorders in particular (Hogan *et al*, 1997, Widiger *et al.*, 1983,1985).

Widiger *et al.* (1983,1985) proposed a prototypic taxonomy for classifying personality. The prototype represents a further refinement of the categorical approach. In terms of the prototypic taxonomy all the definitional criteria are not considered to be necessary or jointly sufficient to indicate membership of the class. To the contrary membership is heterogeneous and boundaries overlap. The prototype is regarded as the epitome of the class. The definitional criteria are used to determine class membership, but

inclusion into the class does not indicate being a good example of the class. This view is supported by Hogan *et al* (1997) and is currently used in the Diagnostic and Statistical Manual IV (DSM IV). The incorporation of a dimensional approach can cast light on the degree to which a personality trait is manifested (Widiger *et al* 1985).

An example of the categorical approach is the research of Jung into personality type. Jung's typology is essentially a categorical taxonomy. The MBTI instrument, which was based on Jung's typology, is used to categorise individuals into sixteen distinct personality types. The instrument is based on what Jung referred to as an individual's psychic energy and how individuals use this energy to habitually orient themselves to the world. Jung's research found that although the symptoms presented by his patients varied widely, a relatively small number of typical forms of behaviour could be found. According to Jung (1971) these psychic functions could be used to clarify the basic differences between people. A person's habitual mode of reaction is normally characterised by making use of the most reliable or dominant function. However this does not prevent a person from occasionally acting in a manner which reveals a less effective way of functioning. The reason for this is that although a habitual type exists an individual is also endowed with all the dimensions contained in Type theory and thus has access to these functions if needed. This can be illustrated with an analogy to a person who is naturally right handed being able to write with their left hand, although it does take some extra effort and energy draining (Van Rooyen & De beer, 1995).

According to Quenk (1997b). "Unlike trait measures, MBTI scores do not give information about 'how much' of a type category a person has." However, the instrument used in this study, the MBTI STEP II, comprises subscales that identify component parts of each of the four type dimensions. These subscales of the MBTI STEP II are a refinement of the Type categorisation. The distribution of the scores on the MBTI STEP II subscales are normally distributed and would appear to bear strong resemblance to personality traits. Therefore, an individual, assessed using the MBTI STEP II, could be placed on a specific point along a continuum instead of being grouped into a type category as is normally the case with Type theory. Empirical support does however exist that type and trait classification are equally valid (Newman, 1996). According to Hammer (1996) significant correlations have been found between the MBTI type dimensions and the traits on the Neuroticism, Extroversion and Openness Personality Inventory (NEO-PI) five-factor personality questionnaire. Johnson (1986) concludes in his research that there seems to be a great deal of overlap between what the NEO-PI and MBTI items are measuring and that the inventories are measuring similar concepts.

The major area of contention that separates the type from trait classification is that most trait theories don't indicate the high and low ends of their measures as psychologically opposite poles that are equally neutral or positive in nature (Quenk, 1997b). Type theory refers to qualitatively distinct in-born preferences that are arranged dichotomously, whereas trait theory indicates that people are more similar than different and the only extremes will be found at the poles of a distribution of trait scores. In other words 68% of the population would fall within the middle range of normal distribution (Newman, 1997). Research by Harvey & Murray (1994) has found that the MBTI scores for a sample of 1500 have a distinct bimodal distribution on all four dimensions of the indicator. These results appear to indicate an anomaly in the measurement of personality in that two distinctively different paradigms produce

remarkably similar results. Newman (1986) ascribes these results as being due to the complementary nature of the type and trait approach. However, disagreement exists between type theorist and trait theorists. Trait theorists believe that too much or too little of a trait is an indication of dysfunction. In contrast, Type theorists who attempt to avoid labelling people into good or bad, but rather attempt to find value in all people reject this idea. All though schools are examining what seems to be the same constructs, they would appear to be incompatible, much of which stems from the broader personality research community i.e. trait theorists rejection of the MBTI as a significant tool that can be used in personality research (Newman 1996).

According to Quenk (1997b) all the MBTI STEP II subscales are bipolar regardless of their distribution. Thus the major stumbling blocks in uniting the type and trait classification is the disagreement on the dichotomous representation of factors and the resulting bimodal versus unimodal distribution of results. Both approaches seem to be measuring the same thing, but are looking at it using different approaches. Newman (1996) equates it to the particle and wave theory of light found in quantum physics. In support of a categorical type approach to the classification of personality, Johnson (1996) has argued that it is more favourable to use an approach that operationalises an accepted theory of human behaviour than to use one that groups together a number of unrelated constructs.

2.3.3 Conclusion

In summary it can be said that mankind has wrestled with the quandary of finding an acceptable classification of personality. The common understanding is that people differ from one another. It should therefore be possible to quantify these differences and similarities. Researchers have identified traits, which are used in the quantification of differences. The measurement of these traits and abilities has led to the development of "type" constructs such as introversion-extraversion. This implies that people can be grouped according to their traits and compared to other groups who don't share the same traits (Eysenck & Eysenck, 1985). The preceding discussion indicates that theorists have diverse opinions regarding the explanations for human behaviour, which is understandable, taking into account the limited amount of knowledge available on the forces that control a person's behaviour. However, in order to understand the characteristics that differentiate people, it is necessary to identify those characteristics that are shared by individuals. Furthermore, to study the differences between individuals with any measure of success, a general model of the functioning of personality should be used. The development of models of personality theory, are thus an important aspect of the study of personality and play an important role in providing an understanding of the differences between people.

For the aim of this study the use of an instrument that can highlight the dynamics of behaviour by categorising common elements, in stead of just measuring a number of traits would seem prudent. The choice of the MBTI STEP II can thus be regarded as an adequate inventory to satisfy the aims of the study. The MBTI STEP II would appear to encompass both a type and trait approach. The instrument categorises individuals into distinct types, but then goes further to indicate the underlying traits associated with each of the type categories (Johnson & Saunders, 1990). The next section will be aimed at examining the personality theories from which the models of personality theory originated.

2.4 PERSONALITY THEORIES AND SCHOOLS OF THOUGHT

The study of personality seems central to all other branches in the field of psychology. Liebert & Spiegler (1982) view personality as the study of the functioning of the individual person in all its aspects. It would seem that in order to understand human behaviour a thorough understanding of personality is important. To grasp the concept of personality, a review of the various theories of personality as well as the schools of thought that exist regarding the subject, needs to be conducted.

2.4.1 The aim and nature of personality theories

According to Möller (1995:4): "In layman's terms, personality is usually described in one of two ways, either on the basis of a particular characteristic of a person (for example, he has an aggressive personality, he is a very friendly an, he is a sensitive person), or on the basis of certain social skills a person possesses and the effectiveness with which he elicits favourable responses from others (e.g. he has a strong personality, he gets on easily with people)." Plug *et al.* (1988) regard a personality theory as being a system that consists of a comprehensive frame of reference for describing and explaining human behaviour and experience. This view is supported by Meyer *et al.* (1988) who see personality theories as being the result of a conscious and persistent effort to produce a model that provides a logical, concurrent conceptual system that can be utilised to describe, explain and predict human behaviour.

Liebert & Spiegler (1982) state that a psychological theory as with any other scientific theory serves to satisfy three general goals, namely:

- "To organise and clarify observations.
- To explain causes of past events in such a way that future events can be predicted from the same causes.
- To provide a sense of understanding of the subject matter" (Liebert & Spiegler, 1982:11).

If a review were to be done of all the textbooks, books and journal publications that deal with the subject of personality theory, it is astounding to find the existence of some thirty different theories, each with its own supporters (Liebert *et al.*, 1982, Meyer *et al.*, 1988; Möller, 1995). This is an indication that a large measure of interest exists in the field, but conversely that the students of the field of personality are nowhere near a correct and generally accepted theory of personality. The reason for the large number of theories can be ascribed to any number of reasons. Firstly, the complexity of human beings which requires that the personality theorist is dependent on advances in other sciences in order to integrate and prove theories in a convincing manner. Secondly, the person-situation debate, which is concerned with the extent to which individuals rely on inherent personal characteristics which influence behaviour, or the influence of the situation on the choice of behaviour displayed. It would appear that totally contrasting ideas exist in this regard. Lastly, the practical and ethical challenges facing researchers in gathering samples large enough and manipulating the conditions they function in (Liebert & Spiegler, 1982; Meyer *et al.*, 1988; Möller, 1995).

The following section of this chapter will be aimed at providing a short description of the most important schools of thought in the study of personality.

2.4.1.1 Depth Psychology

Proponents of depth psychology are of the opinion that individual forces acting unconsciously within an individual determine behaviour. The emphasis of this approach is on studying the subconscious and non-observable conscious contents. The field of depth psychology thus includes conscious thought as well as the deeper seated unconscious layers. The assumption is that an individual's internal subjective consciousness is comprised of different levels that differ in depth and degrees of consciousness and sub-consciousness (Meyer *et al.*, 1988).

The surface layer of the personality is regarded as being conscious, while the other deeper layers are sub-conscious. The deeper layers are regarded as having their own nature, which is governed by unique laws, from where they exercise an important influence on human functioning. In most cases the assumption is that the deeper layers create and maintain a dynamic tension with the layers of consciousness on the surface (Meyer *et al.*, 1988).

Sigmund Freud is regarded as the father of psychoanalysis. He regarded personality as comprising three distinctive elements that operate at various levels of consciousness namely, the id, ego and super ego. He also emphasised the role of sexuality as the major influence on the formation of personality and the influencing of human behaviour. Other prominent psychoanalysts include Carl Jung, Alfred Adler and Erik Erikson. Although they also agreed that human behaviour is a result of internal drives they disagreed with Freud regarding the sexual origins of those drives and urges (Meyer *et al.*, 1988, Papalia & Oldes, 1988, Möller, 1995). Due to the fact that MBTI is based on Jung's theory of personality type it can be concluded that the content of the depth psychology school of thought should have an impact on the study being conducted.

2.4.1.2 Behaviourist theory

According to the behaviourist theory, human behaviour is a result of learning and environmental influences. However, behavioural theorists have differences of opinion regarding the explanation of the principles of learning and environmental influences. Some theorists believe that the individual possesses certain biological impulses that need to be satisfied, and that an individual learns to repeat that behaviour that leads towards need gratification. Dollard and Miller are proponents of this approach. They regard humans as being the same as other living organisms whose behaviour is aimed at the reduction of tension created by the desire for need gratification (Meyer *et al.*, 1988; Papalia & Oldes, 1988).

The more extreme behaviourists believe that all behaviour and learning processes can be explained without reference to needs and conscious experiences. An early scholar of behaviourist theory, John Lock, called the human spirit a *tabula rasa* or blank slate, possessing neither knowledge or other contents. B.F. Skinner is probably the best-known extreme behaviourist (Meyer *et al.*, 1988, Papalia *et al.*, 1988).

A third group of behavioural theorists believes that individuals learn by imitating others. The social learning theory of Albert Bandura is an example of this approach. Bandura believed that humans learn through observation, or by a process that he called vicarious learning. Thus according to social learning

the behaviour of others is imitated or modelled. Furthermore, if the behaviour of the observed person is rewarded the more chance there would be for the behaviour to be modelled. Vicarious learning is seen to consist of three factors namely, the person, the situation and the behaviour that manifests in the situation. Bandura was of the opinion that if individuals had to learn everything through trial and error then the human capacity for learning would be severely restricted (Meyer *et al.*, 1988, Papalia *et al.*, 1988). The behaviourist school of thought will not be explored further because it does not contribute further to the aims of the study.

2.4.1.3 Humanistic theory

The humanistic approach does not represent a single organised system, but can be regarded more as a movement, which houses a number of opinions. However, this approach does share a number of common assumptions that are in contrast with the psychoanalytic and behaviourist schools of thought. The humanists regard psychoanalysis and behaviourism as incomplete because they focus only on parts of human personality. The psychoanalytic and humanistic schools of thought are however in agreement as regards to the belief that human behaviour has its origins in internal motivators, but they differ in viewpoints as to the nature of human beings. The humanists are characterised by optimistic confidence in the positive nature of man, which is in contrast too the psychoanalytic thinking that people are captives struggling to set themselves free of dark and dangerous instinctual urges (Meyer *et al.*, 1988, Papalia *et al.*, 1988).

The humanistic approach emphasises self-determination and free will. They criticise the behaviourists because of their focus on only a small number of behavioural elements and not on the human being as a whole. Further criticism is that the behaviourists equated humans to animals, by proposing that the learning principles of behaviour were the same. The humanistic approach found it impossible to accept the behaviourists' suggestion that humans are mere passive entities at the mercy of environmental influences (Meyer *et al.*, 1988; Papalia & Oldes, 1988).

The basic model of the humanistic approach is that a responsible person will select the possibilities at their disposal using their free will. Furthermore, an emphasis is placed on the individual as a constantly developing entity, which is growing in an attempt to reach the full potential of their true self. Two categories can be found within the humanistic approach, namely, the phenomenology and existentialism. These categories are not discussed further, because of irrelevance to the focus of this study.

2.4.1.4 Dimensional theory

The point of departure for the dimensional theory is that every person possesses many different characteristics or behavioural tendencies. Thus in order to describe a person it is necessary to find the most appropriate dimensions. Great differences exist between the various dimensional theorists as to the nature of their basic dimensions as well as the methods that are used to discover these dimensions. Three of the best known of the dimensional theories, are the constitutional, the factor analytic and the need theory. Each will now be expanded upon (Meyer *et al.*, 1988).

2.4.1.4.1 The Constitutional approach

Sheldon's constitutional approach is based on the assumption that there is a close relationship between total body structure and an individual's personality and that both body and personality can be described in terms of a few dimensions (Meyer *et al.*, 1988).

Other constitutional theorists include; Lavater's physiognomic theory, which proposed that an individual's basic personality, can be deduced from their overall appearance, posture and movements. Gall's phrenology, which proposed that certain areas of a person's brain develop depending on the faculties that the individual was born with and that these can be deduced by studying the shape and protrusions of the skull (Meyer *et al.*, 1988).

In conclusion it can be said that the constitutional theories have been largely debunked as pure speculation and are not considered as a serious contributor to the mainstream study of personality. For this reason these approaches will not be applied further in the study.

2.4.1.4.2 Personology

The concept of personology was proposed by Murray and is based on the assumption that personality is composed of several stratified layers and that an individual's behaviour is determined by the number of motives that are functioning at each level. Murray can be regarded as a dimensional theorist in that he attempted to discover the dimensions of personality using a purely psychological approach. Murray's approach represented at least two different psychological approaches. Firstly, he made use of a stratified model according to which personality consists of a number of layers. Secondly, he stated, that a person's behaviour is determined by motives which are fuelled by urges (Meyer *et al.*, 1988). In his approaches Murray borrowed substantially from the psychoanalytic and trait approaches to personality and tried to formulate a comprehensive synergy between the two. Murray's theories include some of what Jung proposed and is thus relevant, but the current study is predominantly centred around Jung's theories and thus Personology will not be examined further.

2.4.1.4.3 The Factor Analytic approach

The factor analytic approach is based on the assumption that the basic structure of anything can be determined by gathering a large number of measurements on the subject and subjecting these to the factor analysis statistical procedure. Factor analysis consists of determining the correlation between various measurements, which then enables the researcher to sort a large number of variables into a small number of groups based on their common relationship. The assumption is that the relationships can be explained in terms of the common, non-observable variables called factors (Meyer *et al.*, 1988).

The best-known factor analysts are Cattell who proposed sixteen personality factors and developed the 16 Personality Factors (16PF) personality test. Eysenck who argues that personality can be explained according to only three factors. Most recently Costa and McCrae have proposed the "Big Five" model of personality as measured with the NEO PI test (Meyer *et al.*, 1988, Ewen, 1998). According to Hogan *et al.* (1997:758): "...the history of the Big Five dimensions of personality structure suggests a cumulative

convergence of thought that constitutes the longest and quite possibly the most important, chapter to date in the history of personality structure research. Furthermore, Hogan *et al* (1997) state that: "Perhaps the ultimate contribution of the Big Five will be the increased opportunities it affords for communication among investigators of different theoretical persuasion." According to Hammer (1996) a great deal of correlational evidence has been reported that provides proof of convergent validity of the four primary scales of the MBTI and the "Five Factor Model" of personality, of Costa and McCrae. This implies that the use of the MBTI for this study is in keeping with modern trends in personality research. Although as stated earlier the MBTI is not widely accepted as a research instrument in the broader psychological research community. However, the MBTI is recognised as one of the most popular and widely used personality inventories and has been successfully translated into various languages and utilised worldwide. A further motivation for the use of the MBTI in the current study is that it does not measure any form of pathology, in contrast with the NEO-PI which contains a factor which examines emotional stability. This makes the MBTI a non-threatening instrument when used ethically and thus ideally suited for research in an organisational setting (Newman, 1996).

2.4.2 Type and Trait theory

Furthermore, two broad categories of personality theory can be identified, namely; type theory which classifies individuals into a specific personality category and, trait theory which proposes that individuals possess a number of stable personality characteristics that are placed somewhere on a continuum. Type theory perspective can be viewed in contrast to the mainstream approach of factor analysis, which focuses on personality traits. The supporters of the two categories have already been mentioned in the previous sections and are presented here to provide a finer perspective on the actual study at hand.

2.4.2.1 Trait theory

2.4.2.1.1 Description of the concept personality trait

According to Plug *et al.* (1988:80) the trait concept indicates psychic qualities or characteristics of a person; "...psychic characteristics (traits) are tendencies or predispositions of a person to act in certain ways in certain situations." These are attributed to persons on the grounds of observation in various situations where they consistently displayed similar behaviour, or results of psychological tests. Psychological characteristics are determined by the interaction between a person's genetic composition and the environment. "Generally a distinction is made between inherited congenital and learned characteristics. A trait can thus be described as a relatively consistent tendency or characteristic of individuals which is responsible for the consistency in their behaviour" (Plug *et al.* 1988:274).

The father of trait theory was Gordon Allport, who differed from Freud in his approach to personality in that he focused on the surface aspects of personality (Ewen, 1998). Allport contended that traits were not directly observable, but that they make people prone to behave in certain ways (Romney & Bynner, 1992). Furthermore, Allport believed that psychological traits were real attributes of a person, in that they could be used to explain behaviour instead of just describing it (Liebert & Spiegler, 1982).

According to Romney & Bynner (1992), the number of traits that make up personality and the relationship of these traits to each other constitute the structure of personality. The possession of these traits predisposes people to act in certain ways. Traits are possessed to a greater or lesser extent and can be represented by relatively independent dimensions, with a few individuals falling on either end of the scale and the majority of persons in the middle.

A fair amount of criticism has been levelled at the trait approach. It is regarded as simplistic because of its emphasis on concrete, current and conscious aspects of personality. The reasoning in Allport's theory is viewed as being circular in that if a person displays a certain behavioural trait it is used to explain that behaviour (Ewen, 1998; Cook, 1984).

2.4.2.1.2 Characteristics of traits

According to Allport as quoted in Liebert and Spiegel (1982) traits possess the following characteristics:

- Traits have more than a nominal existence and are thus more than summary labels of observed behaviour.
- Traits are more generalised than habits.
- Traits are dynamic in that they direct action and are thus not mere structural artefacts.
- Traits may be established empirically.
- Traits are only relatively independent of other traits.
- Traits are not synonymous with moral or social judgements.
- Traits may be viewed either in the light of the personality (idiographic) or in the light of their distribution in the population (nomothetically).
- Acts and habits that are inconsistent with a trait are not proof that the trait does not exist.

The number of traits that have been postulated is legion and have been around since man has had the gift of language (Cook, 1984). However, it has been argued that many of these traits are related and can thus be clustered together to form broad personality types such as introversion and agreeableness (Romney & Bynner, 1992). Researchers such as Eysenck, Cattell and Costa and McCrae who have applied factor analytic methods to establish the existence of specific traits that make up individual behaviour have researched the clustering of traits.

2.4.2.2 Type theory

2.4.2.2.1 Description of the type concept

Miller (1991:11) defines type as follows: "It's a category of people who exhibit a particular combination of psychological characteristics, the assumption being that this combination is unique and distinguishes the type from others."

In modern personality psychology the term "type" indicates a concept that is secondary to, and is established by the term trait. Traits are often inter-correlated and these inter-correlations give rise to the formation of a type. Type concepts such as extraversion-introversion have been postulated as a result of the correlation of a number of traits that have led to the formation of a higher concept, namely a trait. A

type can thus be described as a pattern of characteristics that usually appear together, that can be distinguished from other types and that serve as a foundation for the classification of individuals (Eysenck & Eysenck 1985). Personality types can thus be regarded as the categories into which individuals are placed according to noticeable personality traits and typical behavioural patterns (Plug *et al.* 1988).

2.4.2.2.2 History of personality types

The modern notion of personality types can be traced back to 1921 when Jung published his book *Psychological Types* (Young-Eisendrath & Dawson 1997). Jung believed that human behaviour is not random, but predictable and thus classifiable. Jung based this belief on results obtained from observing his patients and identifying certain tendencies and patterns in their behaviour. This theory of psychological type recognises the existence of these patterns and provides an explanation for how these types develop from birth through childhood to adult life. According to Jung the predictable differences in people can be ascribed to the manner in which they choose to use their mind (Spoto 1989; Van Rooyen & De Beer 1995).

Jung's typology drew wide spread criticism from his peers because he did not base his categorisation on psychological pathology. Instead he proposed that differences in behaviour would be related to the basic functions that the personality executes throughout the individual's life (Kroeger & Thuesen, 1988). These preferences develop at an early age and form the foundation of an individual's personality. Subsequent events in a person's life can be explained using the basic personality preferences. According to Jung these preferences form the nucleus of our attraction to and rejection of people, tasks and occurrences throughout an individual's life.

According to Jung's theory (1971), each individual is born with a predisposition toward a specific behavioural preference. This preference reflects both a genetic predisposition as well as a product of what happened early in the individual's life. As the individual progresses through life the environment may also influence the direction in which preferences develop (Spoto 1989; Van Rooyen & De Beer 1995; Kroeger & Thuesen, 1988). According to Type theory, all people develop a preference early in life and stick with it. The more the preference is developed, be it conscious or unconscious, the more the individual will rely upon it. However, this does not imply that the individual is unable to use the less preferred dimensions of personality from time to time, but these don't replace the established preferences (Kroeger & Thuesen, 1988). According to Van Rooyen & De Beer (1985), Jung regarded his Type Theory as having value for the objective reason that it provided a system that could be used to compare orientation of personality instead of just a narrow categorisation of traits.

2.4.2.2.3 The development of type theory

A central theme in type theory is that all children are born with a predisposition to choose certain functions above others (Myers & Kirby, 1994; Quenk, 1993; Van Rooyen & De Beer, 1995). Children are more motivated to exercise their preferred dominant function. The more it is exercised the stronger it becomes and the more it influences behaviour. The use of the function leads to surface traits, behaviour and skills, which are associated with that particular function (Quenk, 1993). The development of the preferred function invariably leads to the relative neglect of the opposite pole of the same preference.

This neglected function would appear to recede into the sub-conscious and create an Archetype, which Jung referred to as the Shadow (Myers & McCaully, 1985; Platania, 1997). The Shadow is an inferior, darker side of the personality, which individuals tend to shy away from because of the primitive urges it contains. However, it is part of what makes individuals whole persons and should thus be examined and come to terms with (Jung, 1993).

Environmental influences also play a pertinent role in this model. These environmental factors can either promote or inhibit the development of the inborn preferred function. These factors can even dissuade the natural tendencies and traits through the reinforcement of activities that are less rewarding and motivating, which further frustrate the development of capability. Environmental interference in type development can lead to the falsification of an individual's natural in-born type. Individuals with a falsified type can become proficient in the use of a lesser-preferred function, but may feel less competent and out of touch with their best gifts (Myers & McCaully, 1985).

2.4.2.3 The Type versus Trait debate

According to Eysenck & Eysenck; Ewen (1985; 1998) it is widely accepted by trait theorists that an individual will not behave in the same way on every occasion. One of the major points of criticism levelled at trait theory is that it is too general and that it cannot be utilised effectively to predict behaviour in any specific situation. Furthermore, Ewen (1998) explains that human behaviour is conditional i.e. certain conditions need to be present in the situation for the trait to be displayed. Trait measures do not measure conditional circumstances, but give only a general indication of the individual's possession of a trait. Ewen (1998) suggests the following possibilities for improving the predictive power of traits. Firstly, by identifying those individuals for whom a particular trait is a central disposition. Secondly, by gathering data on both traits and the situations in which they occur. Lastly, the numerous behaviours that are relevant to the trait in question can be studied and the collected data aggregated, instead of relying on isolated incidents.

In contrast to trait theory, type theory does not measure the amount of a trait possessed by a person. Type theory merely sorts individuals into categories of preferred behaviour. The bipolar nature of type classification and the interaction of the various dimensions that make up the type theory provide a more comprehensive explanation of the personality dynamics active inside a person when faced with differing situations. Furthermore type measures are directly linked to a model of personality functioning. Type theory thus implicitly makes provision for the influences that a situation has on individuals. In terms of type theory it is possible for the preferred type to be abandoned in favour of a more appropriate manner of functioning for that situation, but with the price of expending large amounts of psychic energy (Jung, 1971; Jung, 1993, Eysenck & Eysenck, 1985; Johnson, 1996).

It is interesting to note that according to Hogan *et al* (1997) the Big Five model serves as the most modern and widely accepted theory of personality traits. However, Hammer (1996) provides evidence of a strong relationship between the factors in the Big Five model and the dimensions of the MBTI. It could be stated that trait and type researchers are examining the same thing. Although at present such a statement would be highly contentious as it is currently the subject of vigorous debate (Newman, 1996).

2.4.2.4 Conclusions

It can be concluded from the preceding discussion that the difference between types and traits can be found in the broader and larger inclusivity of the type concept. The trait point of view identifies individual differences between people, but pays little attention to the explanation and prediction of an individual's behaviour. It would seem that the trait approach is more focused on explaining typical behaviour by plotting it along certain points on a trait continuum. As with any approach to personality, trait theory has advantages and disadvantages. However, the majority of modern personality measurement is based on the trait approach. Examples of such instruments are the 16PF of Cattell and the Minnesota Multiphasic Personality Inventory (MMPI). Trait measurements are used by organisations for making hiring decisions and educators for career counselling.

Type theory's point of departure is that various traits correlate with one another and thus form a higher order type. These types refer to a specific pattern of characteristics that can be used to classify individuals. The difference between traits and types can be summarised as discussed by Van Rooyen & De Beer (1995) in Table 2.1.

The following section will address Carl Jung's theory of psychological types as a theory based on a typological as well as a depth psychology approach. The instrument used in the study, the MBTI, is based on Jung's type theory and the research is approached from a Jungian paradigm. Other instruments that measure type, such as the Keirsey and Bates measure of temperaments exist, but are not as widely used and researched as the MBTI. Furthermore the Keirsey and Bates instrument does not have an extended analysis report which examines the subscales of the various type dimensions (Keirsey & Bates 1984).

Table 2.1 *DIFFERENCES BETWEEN TRAITS AND TYPES (Van Rooyen & De Beer, 1995)*

TRAITS		TYPES	
1.	Universals possessed in different amounts.	1.	Inborn preferences.
2.	Involves measuring.	2.	Involves sorting.
3.	Extreme scores are important.	3.	Midpoint is crucial for discrimination.
4.	Normally distributed.	4.	Skewed distribution.
5.	Scores indicate the amount of the trait possessed.	5.	Scores indicate confidence in sorting.
6.	Implies competence, health and pathology.	6.	No good or bad types implied.
7.	Too much or too little is diagnostic.	7.	Too much or too little irrelevant.

2.5 CARL JUNG'S THEORY OF PERSONALITY

According to Eysenck & Eysenck (1985), Jung is regarded as one of the most well known type-psychologists. Jung's theory can be grouped under the depth psychology as well as the type theory. Firstly, Jung's theory will be discussed using his theory and views of personality dynamics as backdrop. Due to the nature of the research only the portions of Jung's theory that are relevant to the aim of the study will be examined in detail. The MBTI as an instrument that measures psychological Type is based on the theories of Jung, in particular those that focus on the attitudes and functions of the psyche. The

following discussion will focus on Jung's theory of personality type, the eight personality types he identified and the role of the dominant, auxiliary, tertiary and inferior functions.

2.5.1 Background

The development of the present paradigm for the studying of personality has its origins 2000 years ago when the Greek philosopher, Hypocrites, developed his doctrine of the four temperaments. Eysenck & Eysenck (1985) are of the opinion that theorists such as Kant and Wundt were only interested in the descriptive value of typologies, while other prominent writers such as Gross and Jung were more interested in the casual factors of personality.

Carl Jung, born in 1875, was a Swiss psychiatrist and a protégé of Freud, but their ways parted due to an disagreement regarding the functioning of the human sub-conscious (Platania, 1997). According to Cartwright (1979), Jung's theory of types can be described as a pattern theory of classification, in which one or more classes are described, each with a definitive pattern of characteristics. Jung based his theory on the work of various predecessors and regarded the major difference between the types as a result of the introverted or extroverted tendency of the libido (Eysenck & Eysenck, 1985). Jung described the libido as being all the psychic energy within a person. Furthermore, Jung did not regard a person as being either introverted or extroverted, but rather that most persons possess a combination of both characteristics (Jung, 1971; Platania, 1997). Cartwright (1979) postulates that although individuals may possess both mechanisms, one system (introversion/extroversion) tends to develop more in the consciousness, while the other remains underdeveloped in the unconscious. Jung (1993) refers to this underdeveloped inferior mechanism which is left to develop in the unconscious as the Shadow. The Shadow forms the darker more sinister portion of the personality, but is essentially still an undeniable part of the personality (Jung, 1993).

2.5.2 Personality dynamics

According to Jung (1993), the psyche consists of a constellation of interactive entities and levels of consciousness. Jung identified that the psyche can be separated into three distinctive levels of functioning namely, the conscious, personal unconscious and the collective unconscious. Jung (1993) viewed **consciousness** as the psychic contents that are related to the ego, the ego being an organised collection of conscious observations, feelings and memory. Furthermore the ego forms the centre of awareness and is responsible for the individual's experience of continuity and identity. According to Jung (1993) the **personal unconscious** consists of all things a person knows, but is not thinking of at the moment, all things that were once known, but have now been forgotten, all things that were experienced, but consciously noted and all things that are taking place and will become conscious in the future. Jung goes on to include psychoid functions in the unconscious. These functions in contrast to the previous components of the unconscious are incapable of conciseness. Jung (1993) viewed all the psychic contents which are not peculiar to an individual, but to many at the same time as the **collective unconscious**. The collective unconscious could refer to either a society, a people or to mankind in general. The content of the collective unconscious is made up of **archetypes**, which Platania (1997:58) describes as: "Universal patterns or motifs which come from the collective unconscious and are the basic

content of religions, mythologies, legends and fairy tales; emerging in individuals in the form of dreams, visions and fantasies. The archetype carries specific energy and is capable of acting upon the world." Jung viewed archetypes as universal i.e. all people are born with the same archetypes. However, each individual's personal experience will determine the manner in which the archetypes are manifested and diversified (Platania 1997). Jung also provided for the fact that diverse development of different cultural groups could be carried over to explain differences in the archetypes (Jung, 1971).

2.5.2.1 A person as energy system

Both Freud and Jung regarded people as complex energy systems. Jung used the term libido in reference to physical as well as psychic energy. Psychic energy is the specific energy of personality (Meyer *et al.*, 1988). Jung viewed psychic energy as a hypothetical construct that could be observed directly. However, psychic energy was seen as finding expression indirectly in all psychic attitudes and functions as well as in the psyche's attempts at achieving balance between the various systems of which it is composed. Jung (1960) explained it as follows: "Energy is always experienced specifically as motion and force when actual, and as state or condition when potential. Psychic energy appears, when actual, in the specific, dynamic phenomena of the psyche, such as instinct, wishing, willing, affect, attention, capacity for work, etc., which makes up the psyche's forces. When potential, energy shows itself in specific achievements, possibilities, aptitudes, attitudes, etc., which are its various states."

Both physical and psychic energy is generated by the metabolic processes and according to Jung (1960) there is a reciprocal interaction between physical and psychic energy, although Jung does not explain this interaction. The psyche can also obtain energy from external sources by means of individual experiences. Jung views the psyche's digestion of psychic experiences as being similar to way in which the body digests food and converts it into physical energy (Meyer *et al.*, 1988). Thus according to Jung (1960) the psyche is an energy system that strives toward creating equilibrium in the levels of energy within the system. This energy system is not closed though because it is constantly receiving energy from the environment by means of the senses.

Based on many years of research Jung (1971) identified and described basic psychic processes. Furthermore, he indicated how the various combinations of these processes lead to the formation of a number of personality types. The following section will deal with attitudes and functions, which form the combinations of personality types.

2.5.2.2 The attitudes of the psyche

Jung (1993:303) regarded attitudes as "...a readiness of the psyche to act or react in a certain direction. To have an attitude means to be ready for something definite, even though this definite something is unconscious. An attitude always has an objective; this can be either conscious or unconscious. Attitude signifies direction an expectation, and expectation always operates selectively – it gives direction." According to Spoto (1989), Jung's description of the attitudes of introversion and extroversion are formulated in terms of the direction of the libido, which is either towards the object or away from it. Jung believed that the category of extroversion-introversion reflected typological differences that cross all ranks

of society, cultural history and are gender neutral. Furthermore, Jung believed that the extroversion-introversion polarity was biologically based (Spoto, 1989).

According to Meyer *et al.* (1989) Jung placed emphasis on the manner in which an individual would primarily channel psychic energy, either inward (introversion) or outward (extroversion). Although all people possess both attitudes, one of the attitudes will be dominant and the other subordinate and unconscious. This subordinate and unconscious orientation can manifest as the dominant attitude in dreams and other exceptional circumstances. According to Jung (1971) reference can not be made to exclusive extroverted or introverted types, but to a particular function that is either introverted or extroverted. The following sections will deal specifically with introversion and extroversion.

2.5.2.2.1 Extroverted attitude

According to Jung (1993:310): "Extroversion means an outward-turning of the libido. With this concept I denote a manifest relatedness of subject to object in the sense of a positive movement of subject interest towards the object. Everyone in the state of extroversion thinks, feels and acts in relation to the object, and moreover in a direct and clearly observable fashion, so that no doubt can exist about his positive dependence upon the object. In a sense, therefore, extroversion is an outgoing transference of interest from the subject to the object." The following characteristics would typify an extrovert:

- A lively interest in the outside world.
- Awareness of and a need for stimulation and direction from the environment.
- An action orientation.
- A tendency toward impulsiveness.
- Finds communication easy.
- Appears social, hearty and sincere.
- Obtains energy through interaction with others.
- Is comfortable in the company of strangers (Myers & McCaully, 1985).

2.5.2.2.2 Introverted attitude

Jung (1993:328), regarded introversion as; "...a turning inward of the libido, whereby a negative relation of subject to object is expressed. Interest does not move toward the object, but recedes towards the subject. Everyone whose attitude is introverted thinks, feels, and acts in a way that clearly demonstrates that the subject is the chief factor of motivation, while the object at most receives only a secondary value."

The following characteristics would typify an introvert:

- Interested in gaining clarity regarding concepts and ideas.
- A thinker.
- Thoughtfulness before going over to action.
- Preference for privacy and being alone.
- Are energised by their privacy.
- Preference for one-to-one situations and small groups (Myers & McCaully, 1985).

2.5.2.3 The functions of the psyche

According to Jung (1993: 317). "By psychological function I understand a certain form of psychic activity that remains theoretically the same under varying circumstances. From an energetic standpoint a function is a phenomenal form of libido which theoretically remains constant. I distinguish four basic functions in all, two rational and two irrational, viz. thinking and feeling, sensation and intuition. I differentiate these functions from one another because they are neither mutually related nor mutually reducible." The two irrational functions, sensing and intuition refer to how people obtain information from their surrounding i.e. how they perceive stimuli. The two rational functions, thinking and feeling refer to how people process the stimuli i.e. they make judgements regarding the stimuli (Myers & McCaully, 1985).

Jung believed that each person possesses a natural preference to use the perceptual and judging processes. He also discovered that people are drawn more towards either, the inner or the outer world. As individuals practice their preferences, certain specific perspectives and approaches are developed towards life and interaction with others. The selection, usage and development of these variations lead to fundamental differences in people. The resultant predictable patterns of behaviour form the respective psychological types (Myers & McCaully, 1985).

2.5.2.3.1 The constructs perception and judgement

Jung only alluded to the constructs "**perception**" and "**judgement**" in his theory of psychological type. The dimensions of judging and perceiving were developed by Myers and Briggs during the construction of their type indicator and were used to determine type dynamics. These two dimensions indicate an individual's attitude toward the outer world, that is whether the individual prefers the perceiving functions (irrational) of sensing and intuition or the judging functions (rational) of thinking and feeling when extraverting. This is regardless of the individual's preference for introversion or extraversion (Quenk 1993, Myers 1980).

2.5.2.3.1.1 Sensing

According to Jung (1993: 335), "...is that psychological function which transmits a physical stimulus to perception. Sensation is related not only to outer stimuli, but also to the inner. Primarily, therefore, sensation is perception transmitted via the sense organs and bodily senses." Jung (1993":336) goes on to say: "Insofar as sensation is an elementary phenomenon, it is something absolutely given, something that, is not subject to the laws of reason." The product of sensing is concrete facts. The focus is on the here and now, due to the reliance on the senses and is often characterised by the following:

- Enjoyment of the moment.
- A realistic outlook.
- Sound observation skills.
- A memory for detail.
- A practical orientation (Myers & McCaully, 1985).

2.5.2.3.1.2 Intuition

Jung (1993:329), regarded intuition as; "...psychological function which transmits perceptions in an unconscious way. Everything whether outer or inner objects or their associations, can be the object of this perception. Intuition has this peculiar quality: it is neither sensation, nor feeling, nor intellectual conclusion, although it may appear in any of these forms. Through intuition any one content is presented as a complete whole, without our being able to explain or discover in what way this content has been arrived at. Intuition is a type of instinctive apprehension, irrespective of the nature of its contents." Intuition refers to the recognition of opportunities, explanations, linkages and relationships by means of insight. The characteristics associated with intuition are as follows:

- A focus on future occurrences.
- A movement past that which is merely noted by the senses.
- A preoccupation with new possibilities.
- Lack of attention paid to reality and actual matters.
- Imaginative.
- Theoretical.
- Abstract thought.
- Creative (Myers & McCaully, 1985).

2.5.2.3.1.3 Thinking

According to Jung (1993:351), "Thinking is that psychological function which, in accordance with its own laws, brings given presentations into conceptual connection. The term 'thinking' should, in my view, be confined to the linking up of representations by means of a concept, where, in other words, an act of judgement prevails, whether such an act be the product of one's intention or not. Furthermore, I describe directed thinking as the rational function, since it arranges the representations under concepts in accordance with the presupposition of my conscious rational norm." Thinking is the function that links ideas together to make logical conclusions. The use of impersonal cause and effect reasoning is applied. Individuals use thought to better understand themselves and the world they live in. Ideas are related to one another to form a general concept or to find solutions to problems. Further characteristics of the thinking type are:

- Analytical ability.
- Objectivity.
- Fairness based on rules and justice.
- Critical.
- Time oriented (Myers & McCaully, 1985).

2.5.2.3.1.4 Feeling

Jung (1993:314), regarded feeling as; "...primarily a process that takes place between the ego and a given content, a process, moreover, that imparts to the content a definite value in the sense of acceptance or rejection ('like' or 'dislike'); but it can also appear, as it were, isolated in the form of 'mood', quite apart from the momentary contents of consciousness or momentary sensations. Feeling, therefore, is an entirely subjective process, which may be in every respect independent of external stimuli. Feeling is also a kind of judging in that it does not aim at establishing an intellectual connection but is solely

concerned with setting up a subjective criterion of acceptance or rejection.” Feeling is the function used by individuals to make decisions based on relative values and merits of the matter at hand. Personal and group values are regarded as being important, thus leading to these individuals being more subjective. Characteristics of the feeling type are:

- Make decisions that consider other peoples feelings.
- Understanding of the others person's point of view.
- More concerned for people than technical aspects.
- Demonstrate a need for affiliation.
- Possess a capacity for warmth.
- Have a desire for harmony.
- Time orientation includes the maintenance of past values (Myers & McCaully, 1985).

The preceding discussion is graphically represented in the sketch in Fig 2.1, which indicates the respective functions and attitudes. According to the sketch, individuals use four essential processes in either the external and internal world as part of daily life. As is the case with the attitudes one of the functions is normally conscious and dominant and the other unconscious and secondary. Furthermore, each of the functions can manifest in an introverted or extroverted manner (Eysenck & Eysenck, 1985). Jung also indicated that though one function of the psyche is dominant all four are present in all individuals.

Myers (1987) states clearly that all people are required to use either of their preferences at different times, but that both preferences cannot be used at the same time and that these functions are not used with the same amount of confidence. Cartwright (1979:269) discusses Jung's viewpoint as follows: “Although every person has both mechanisms, one becomes more fully developed in the conscious mind while the other remains undeveloped and unconscious.” Jung described a person as a specific type on the grounds of characteristic conscious cognitive functions exhibited by that person (Cartwright, 1979).

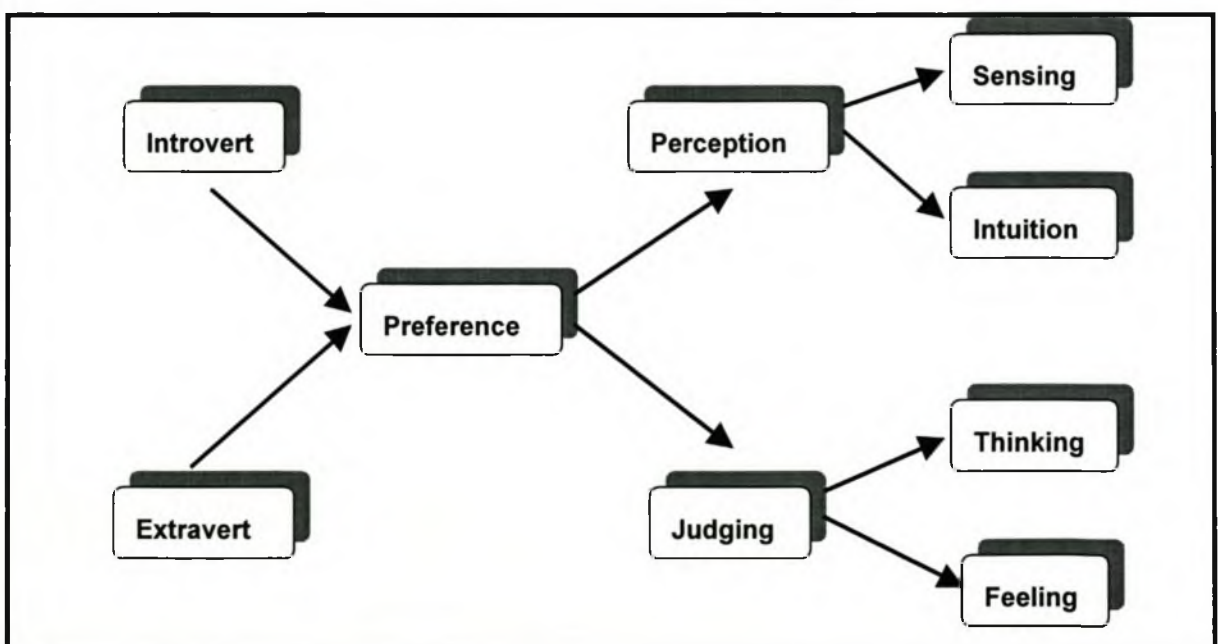


Figure 2.1 Model of the four preferences (Van Rooyen & De Beer, 1995)

Individuals can thus be recognised as certain types using the aforementioned four functions based on their inherent preferences. When the attitudes and functions are combined the dominant attitude and function can be employed to distinguish eight personality types, which will be discussed in the next section (Meyer *et al.*, 1988; Myers & McCaully, 1985; Quenk, 1993; Ewen, 1998).

2.5.2.4 Jung's eight personality types

Jung (1971) distinguishes between two principle types, introverts and extroverts, who can be further distinguished according to the respective functions (Myers & McCaully, 1985; Meyer *et al.* 1988). As Jung was opposed to placing people into rigid categories, his aim with the proposal of the eight energy types was to provide a framework that could be used to distinguish between the individual psyches through the examination of the flow of psychic energy. The result is the eight personality types, which will now be discussed. The above definitions and explanations were utilised by Myers and Briggs in the development of the Myers Briggs Type Indicator (MBTI), which forms an essential part of this study. The MBTI is thus the tool for the practical assessment of an individual's personality type as theorised by Jung. A comprehensive discussion of the MBTI is conducted in Chapter 4 of this assignment.

2.5.2.4.1 Extroverted Thinking type

The extroverted thinker tries to understand and interpret aspects of the external world. Logic and rules are used in the interpretation of things, while any subjective feelings are suppressed. These people tend to be practical and objective. They may even be seen as being cold and without feelings (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.2 Extroverted Feeling type

The extroverted feeling type makes judgements that conform to external standards. They are seen as being conservative and enjoy popular trends. These people may tend to be emotionally labile, flighty and capricious. They are extremely social, indulging in short lived intense relationships (Ewen, 1998; Meyer *et al.*, 1988).

2.5.2.4.3 Extroverted Sensing type

The extroverted sensing types are interested in perceiving and experiencing the external world. These people appear to be realistic and pragmatic, but unimaginative and could often resort to sensual pleasure seeking. These types accept the world as it is without giving it much thought (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.4 Extroverted Intuitive type

The extroverted intuitive types seek new possibilities in the external world. These people are often easily bored and find it difficult to persist in a job or activity for any length of time. This type is characterised by impulsive inventors and creative innovators who unfortunately find it difficult to focus (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.5 Introverted Thinking type

The introverted thinking types try to understand and interpret their own ideas. These people may appear to be stubborn, impractical, socially inhibited and intensely private. Furthermore, they tend to be intellectual with little expression of feeling for everyday life (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.6 Introverted Feeling type

The introverted feeling types tend to make judgements based on their own standards. They are characterised by intense emotionality and hypersensitivity, which is, directed outward in the form of art or literature. Their non-conformist views tend to be contrary to public opinion and they may seem to be cold, reserved and inscrutable (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.7 Introverted Sensing type

The introverted sensing type shows interest in perceiving and experiencing their inner self. They have a tendency to take the world as it is without the need to become socially involved in it. To others they seem passive, calm and even boring people who don't give much of themselves during interaction (Ewen 1998, Meyer *et al.* 1988).

2.5.2.4.8 Introverted Intuitive type

The introverted intuitive seeks new possibilities within the own inner self. They may tend to be impractical dreamers, but may develop brilliant new insights. They are perceived as being a-social and not always understood by others (Ewen 1998, Meyer *et al.* 1988).

2.5.2.5 The dominant and secondary (auxiliary) processes

According to Jung (1971) the four type functions are always combined with one of the attitudes i.e. introversion and extroversion. Individuals are also predisposed to preferring one of the functions above the others. Furthermore, to ensure that balance is maintained the individual makes use of a supplementary auxiliary function combined with the opposite attitude. However, this supplementary function can never be the opposite pole of the dominant function. The four functions are further divided into rational and irrational functions. Sensing and intuition are regarded as irrational functions because of their focus merely on what is happening or potential realities. Thinking and feeling are regarded as rational functions because of their discriminative nature. The selection of a rational or irrational function is what is observable to the outside world. Therefore the introvert's dominant function finds expression in the subjects' inner world and it is the auxiliary function, which is displayed to the world (De Beer & Van Rooyen, 1995).

2.5.2.5.1 The dominant function

According to Myers and Kirby (1994) individuals use all four of the functions, but the development of type is dependent on a person's natural preference for one of the four functions. This most preferred mental process becomes the dominant function. According to Quenk (1993) the dominant function represents

that which an individual wants to devote most of their attention and activity too. The dominant function is either a preferred form of judgement or perception. Thus there is a tendency to use the dominant function primarily in the preferred attitude or orientation of energy i.e. introversion or extroversion. Furthermore, Myers and Kirby (1994) regard the dominant function as giving overall direction to the personality and forms the mental tool people rely on most.

2.5.2.5.2 The auxiliary function

According to Quenk (1993), Myers and Kirby (1994), the auxiliary function provides balance for the personality in two ways. Firstly, if the dominant function is a judging one then the auxiliary function will be a perceiving function. Secondly if the dominant function is extroverted then the auxiliary function will be introverted. Furthermore, this mental structure ensures that people have a reliable way of taking in information and making decisions as well as efficient mechanisms for interacting with both the internal and external world. However, it is important to bear in mind that the auxiliary function is secondary.

2.5.2.6 The tertiary and inferior functions

The tertiary function is defined as the opposite to the auxiliary function. Disagreement exists among Type theorists regarding the attitude in which the tertiary function is normally used. Myers and McCaulley (1985) argue that if the dominant function is extroverted the tertiary function will be introverted and if the dominant function is introverted the tertiary function will be extroverted. Myers and Kirby (1994) feel that there is inconsistency regarding the orientation of the attitude in comparison to the attitude of the other three functions. Jeffries (1990) supported by other authors believe that the tertiary function always has the same attitude as the dominant function.

The inferior function is the opposite of the dominant function i.e. the opposite pole from the dominant. It is also typically used in the attitude opposite to that of the dominant function e.g. if extroverted sensing were dominant then introverted intuition would be inferior. The inferior function is that function that which receives the least energy and attention and therefore is least developed. According Jungian theory the inferior function is the primary connection to the unconscious and the most difficult to use in conscious life (Myers and Kirby 1994). According to Jeffries (1990), when people are under great amounts of stress they tend to slip from strength to weakness and fall back on their inferior function. This results in behaviour which is immature, primitive, childish and out of control. Quenk (1993) refers to this condition as being "in the Grip".

2.6 CONCLUSION

It can be concluded from this chapter that the term "personality" is a very complex and multidimensional concept. It is also reflected in the multitude of definitions that various authors have formulated regarding personality. This plethora of personality definitions can be placed into three broad categories, namely; definitions that define personality in terms of causal systems within individuals; the individual's behaviour; and the individual's thoughts, feelings and other internal experiences.

These differing views of personality can be regarded as shifts in emphasis that flow out of the various researchers' different work contexts and approaches. It should thus be accepted that all three approaches are important for understanding the broad concept of personality. A study of the theorists' approach to the problem of classification of personality seems to indicate that differing views exist with regard to the reasons for human behaviour. These differences of opinion have led to the formulation of different theories of personality and schools of thought such as behaviourists, humanists, type and trait theorist.

Attention was paid to Jung's theory of personality type as an example of a type as well as a depth psychological theory. Jung's theory is central to the development of the Myers Briggs Type Indicator (MBTI), which is to be used in this study. The aim of this chapter was to investigate what personality is, to discuss the various theories of personality and to focus specifically on Jung's theory of Psychological Type.

CHAPTER 3

CREATIVITY

3.1 INTRODUCTION

If it were not for creativity, human civilisation as we know it today would not exist. The ability to be creative has endowed human beings with the power to change their environment in a manner that dwarfs the abilities of any other species on the planet. From humble beginnings, such as sharpening a wooden stick in order to craft a spear with which to kill food, to being able to send people to the moon, or clone animals using merely their existing cell tissue, the human species' creative ability seems endless. What the future holds in terms of human creativity is open to speculation.

Unfortunately the outcomes of creativity are not always in the best interest on mankind. For example, the proliferation of nuclear weapons and the resultant fear that gripped the world in the latter part of the 20th century due to the Cold War. A further example is man's ability to harvest huge amounts of natural resources, but at what consequence to the environment? However, the challenges that have resulted from the creative outputs of those possessed by greed, jealousy and suspicion provide the driving force for finding creative solutions in the future to meet these challenges.

Even in the world of business, creativity has a vital role to play. The challenges that face modern industries will require creative solutions, which will ensure survival in an increasingly competitive, knowledge based environment. Furthermore this survival is not restricted to the industry itself, but also to the community in which it operates. The impact of the electronic media, e.g. e-mail, Internet and satellite communications are set to revolutionise the way business is conducted. The disparity in wealth, which exists between first and third world countries, will require creative strategies on the part of first world countries to ensure access to natural resources held by third world countries. The increased move toward automation in manufacturing industries and on-line technologies in the service industry will challenge the role played by human resources and will require a redefinition of the traditional view of work and career. Truly, the study of creativity is vital to the future prosperity of any enterprise.

The aim of this chapter is to cast some light on the subject of creativity. Creativity as a concept will be put into perspective and an attempt will be made to provide a more scientific approach to the subject. A historical perspective into creativity research will be given to emphasise the importance that the field has acquired in the past fifty years. The study of creativity requires the establishment of frameworks, which serve as guidelines within which the diverse nature of creativity can be contained. These frameworks will also be examined in order to establish a framework within which this study can be placed. The research perspectives regarding creativity will be examined in order to place this study in perspective and to indicate that these perspective are intertwined and cannot be viewed as being mutually exclusive. The final part of this chapter will examine the influence of thinking preferences on creativity and how these preferences are possibly linked to various dimensions of personality.

3.2 CONCEPT DESCRIPTION

According to Feldman, Csikszentmihalyi & Gardner (1994), creativity is one of those words that would appear to be everywhere. It is also a word that seems to have many meanings. These meanings are not made explicit enough to avoid confusion and the impediment of communication. In this section the various approaches and viewpoints regarding the definition of creativity will be examined and an attempt will be made to formulate an operational definition of creativity for the purpose of this study.

3.2.1 Related terminology

According to Rethi Devi (1993) it is important to make a distinction between creativity and other related terms. The reason for this distinction is due to the fact that creativity has only recently been studied scientifically and thus the field of creativity is still fraught with a number of mystical connotations. The following descriptions of related terminology are discussed in order to assist in putting the concept of creativity into perspective.

3.2.1.1 Discovery and invention

Demos and Gowan (1967) draw an analogy between discovery and invention by indicating that Columbus discovered the west and Bell invented the telephone. They argue that a fact is discovered and a theory is invented, but that only a masterpiece can be created and this requires the engagement of the entire mind. In this regard they refer to Shakespeare's Othello.

3.2.1.2 Giftedness

According to Rethi Devi (1993) the American Association for Gifted Children defines a gifted individual as "...a person whose performance in any line of socially useful endeavour is consistently superior." These endeavours can include art, music, drama and mathematics as well as those who possess mechanical and social skills and those with high verbal intelligence. Rethi Devi (1993) goes on to argue that a measure of overlap exists between giftedness, genius and creativity.

3.2.1.3 Originality

According to Mednick (1963) certain requirements need to be met before something can be deemed original. It is only once something is regarded as useful that it can be called creative. Mednick basis his argument on the many original ideas expressed by people in institutions for the mentally ill and mentally retarded, but few of which are creative. According to Guilford (in Rethi Devi, 1993) creativity is a more general behaviour trait than originality and consists of several other components such as fluency, flexibility and other temperamental traits.

3.2.1.4 Productivity and ingenuity

According to Flanagan (1963) productivity is demonstrated through the bringing forth of many ideas and solutions. The emphasis being on both quality and contribution. In contrast bringing something new into

being shows creativity. The emphasis is on the newness and lack of previous existence of the product. Inventing or discovering a solution to a problem shows ingenuity. The emphasis is on the existence of a problem and the demonstration of a quality of genius in solving it in an unusually neat, clever or surprising way (Flanagan, 1963).

3.2.1.5 Imagination and fantasy

According to Vinacka (1952) the general opinion regarding the interrelationship between creativity, imagination and fantasy is that creativity does not originate purely from either fantasy or imagination. Vinacka (1952) argues that creative thinking involves both realistic thinking and imagination. He goes on to say that creativity involves both problem solving and fantasy because no predetermined correct answer exists, but that the result is a tangible product.

3.2.2 Definitions

Moukwa (1995) views the complete description of creativity as problematic due to its dynamic nature. Creativity is seen as exceeding individual limitations and continually moving beyond codification. Creativity encompasses personality traits, deliberation, novelty, insight, spontaneity, originality, method, the actualisation of potential as well as creative responses. According to Clark (1979) the definitions of creativity tend to be specific to various authors rather than a matter of consensus. According to Ebert (1994) and Scott (1995) disagreement exists among researcher regarding whether to define creativity in terms of creative products or creative processes.

In terms of a creative process, Torrance (1965:47) offers the following definition: "... the process of sensing difficulties, problems, gaps in information, missing elements, something askew; making guesses and formulating hypothesis about these deficiencies; evaluating and testing these guesses and hypotheses; possibly revising and re-testing them; and finally communicating the results. Meredith and Mantel (1985:448) define the creative process as follows: "Creativity is the attribute of bringing into existence a unique concept or thing that would not have occurred or evolved naturally. The creative person combines, mixes, and expands past experiences so that new, non-obvious concepts, variations, or extensions of knowledge are generated.

On the other hand product definitions of creativity have been formulated as follows by the following authors. Ford and Harris (1992:187) view creativity as: "...a modifiable, deliberate process, which is verified through the uniqueness and utility of the product created." Greenberg (1992:76) defines creativity as: "...a process, which results in a novel work or output."

The definition of creativity is further influenced by the scope of the perspective that is used to examine the concept. Feldman *et al.* (1994) draw a distinction between what they call "big" creativity and "small" creativity. They regard big creativity as the achievement of something remarkable and new, something, which transforms and changes a field of endeavour in a significant way. The focus is on the kinds of things people do that change the world. In contrast small creativity is regarded as being able to bring a fresh and lively interpretation to any endeavour, whether it be humble or exalted.

It would appear that formulating an all-encompassing definition of creativity is a daunting task that has challenged many researchers and scholars in the past. In formulating a definition of creativity it would seem prudent to formulate it in terms of the perspective from which creativity is to be studied. For the purpose of this study creativity will be defined in terms of the creative process employed by all people during cognitive processing. The definition will thus be one of creative thinking rather than a generic definition of creativity. In compliance with the above statement Ebert's (1994:281) definition of creativity seems most suited: "Creative thinking is the cognitive search for patterns, relationships and perspectives between what is known by an individual and the stimulus which is perceived."

3.2.3 Conclusion

It would appear that the concept of creativity is extremely difficult to formalise, due to the vast amount of related terminology to which it is equated. Furthermore, creativity can be regarded as a multifaceted concept, which requires that a definition be formulated in terms of the perspective from which creativity is being viewed. For the purposes this study a process perspective will be adopted. In order to gain more insight into the field of creativity, the next section will provide an overview with regard to the history of research into creativity.

3.3 HISTORICAL PERSPECTIVE ON THE STUDY OF CREATIVITY

From about 1870 when Galton published "Hereditary Genius" to about 1950 very few scientific studies were conducted in the field of creativity. However, one theory of note is that of Wallas, that described creativity as an overlapping process consisting of preparation, incubation, illumination and verification, which was formulated in 1926. Since 1950 the number of works on creativity have proliferated at an astonishing rate (Stein, 1968). The major driving force behind the resurgence into the study of creativity in the 1950's, was J.P. Guilford, who was president of the American Psychological Association at the time. The beginning of the field of modern research into creativity can be traced back to Guilford's presidential address before the American Psychological Association in 1950. This speech laid out the conceptual basis for creativity research that would frame the vast majority of studies for the next twenty years (Feldman *et al.* 1994).

The proliferation in creativity research can be attributed to several factors including problems that the United States of America was experiencing at international and national level as well as new developments within psychology. At an international level the United States was concerned with its ability to maintain its position as a world power. Consequently funds became available for research into creativity in order to aid in the understanding, selection, and utilisation of the potential and abilities of scientific manpower. At national level there were concerns with the problems of conformity and the eroding effects of the experiences of the "organisational man" functioning in a mechanistic organisational structure. Within psychology the emphasis shifted away from pathology and towards ego psychology and the factors that made for mental health. Guilford also played a major role in this shift, with his study of the structure of intellect. Furthermore, social psychologists became more involved in the study of individuals in large organisations (Stein, 1968).

The basic rationale behind Guilford's approach to creativity was to isolate various traits of intellect and personality that creative individuals might possess in greater quantity than non-creative individuals. By comparing more creative individuals with less creative ones, it could be shown on which creative traits the two groups differed. Guilford then proposed that the best way to determine which traits were characteristic of creativity was to construct tests for the various qualities believed to be important. These tests would then be given to individuals with varying degrees of creativity, as measured in some real-world way. If covariation occurred it could be concluded that the tests were capable of differentiating creative from less creative individuals. Guilford also proposed the use of factor analytic methods to try to reduce a cumbersome set of variables to a smaller set of dispositional variables. Factor analysis became central to the way in which the field took shape. The most important reason Guilford saw for the use of factor analysis was to demonstrate that creativity was a separate dimension from intelligence. Based on his experience as a psychometrician during World War II, he believed that IQ measures were unsuccessful in predicting leadership, innovation and technological inventiveness (Feldman *et al.* 1994).

Guilford and his associates spent the next twenty years researching and constructing tests that were largely independent of IQ and that would better predict creativity in the areas of technological and scientific inventiveness. However, this was not the only line of research followed during that time, but it was by far the most prominent and influential. During the same period studies of creative personality were carried out under the leadership of McKinnon and Barron. This group's methodology was to look at groups from several fields and to determine which of the individuals in the group were more creative and which were less creative. Their studies typically used a criterion for determining actual creative accomplishment. This technique involved seeking nominations from recognised experts in each field (e.g. architects, mathematicians) and then having other experts rate the nominated individuals with respect to demonstrated creative accomplishments. The result was the identification of a set of personality indicators that occurred more frequently or with greater strength in individuals rated as more innovative by their superiors (Feldman *et al.* 1994).

In the early 1960's the emphasis in the study of creativity shifted from studying adults to studying children. The major impetus for this shift was the publication of the Torrance Tests of Creativity. The Torrance Tests bore a great similarity to Guilford's Divergent Thinking Test model and included similar items that were adapted for children. The rationale for creativity research in children was that the earlier creative ability could be identified the greater chance there was that it could be channelled into fields of science and technology. This would bolster the USA's intellectual resources thus lending support to the efforts in the Cold War (Feldman *et al.* 1994).

The 1960's also produced a shift in the field of creativity away from pragmatic goals of identifying potential to serve the interests of science and technology, toward social reforms. Creativity was seen as a way of breaking the traditional mould of conservative educational practices, which were inhibiting creative expression in students. Research into creativity had moved away from serving the interests of national security to serving the cause of greater individual expression. This included applying creativity research to programs that promised people a more effective and satisfying work life. Needless to say many of the creativity improvement techniques were incorporated into the corporate and business environment (Feldman *et al.* 1994).

The 1970's to 1980's produced three noteworthy achievements in the field of creativity research. The first was a demonstration by Wallach (1971) that IQ is largely unrelated to divergent thinking. The second finding by Gardner (1988) was that certain personality traits are characteristic of more creative individuals. Thirdly, Barron (1988) found that divergent thinking skills can be improved with training and practice. Recent research has focused on showing why some individuals are more able to sustain the effort to produce original works than others are. Research by Amabile (1990) has demonstrated that intrinsic motivation and the desire to produce work for its own sake, rather than some external reward, is characteristic of creative individuals. Albert (1990) has found that individuals who were destined to become eminent in various fields shared certain family and environmental experiences.

The theories of creativity involving the role played by brain dominance have their origin in the 1960's with the research done by the Nobel Prize winner Robert Sperry. In 1979, Ned Herrmann devised an instrument, based on Sperry's theory of hemispheric specialisation, that could be used by individuals to determine their preferred thinking preference. In South Africa, Kobus Neethling devised his own instrument, the Neethling Brain Profile, to measure thinking preferences. Both Herrmann and Neethling contend that the process of being creative entails the use of all four hemispheres of the brain (Herrmann, 1995; Neethling, 1996).

In conclusion it can be stated that the establishment of creativity as a field of study has only gained momentum in the latter part of the 20th century. This burgeoning interest in the field of creativity has led to the establishment of a number of theories regarding creativity. In the following section the frameworks that have been proposed within which to study these theories of creativity will be examined. The reason for this is to identify the framework that is best suited for examining a process perspective on creativity.

3.4 FRAMEWORKS FOR THE STUDY OF CREATIVITY

In order to study creativity efficiently, a systematic approach needs to be devised. For this purpose Feldman *et al.* (1994) propose three models which can be applied to the study of creativity. Furthermore, they argue that these three models can be regarded as being nested within each other. The broadest of the models is Csikszentmihalyi's Domain, Individual, Field Interaction (DIFI) model, which proposes that creativity should be studied using a framework that provides for the interaction between a specific domain, person and field. The Evolving Systems model of Gruber fits within the person component of the DIFI model. Gruber argues that individual creativity can be analysed in terms of three interrelated systems, namely knowledge, purpose and affect. The final model is Feldman's Three-part Model of the Thought Processes in Creativity. Feldman's model can be nested within the knowledge component of Gruber's model. The three processes involved in Feldman's model are reflectiveness, transformational impulses for the unconscious and changing the world. A detailed description of the three models will be given in the following sections.

3.4.1 The DIFI framework

According to Feldman *et al.* (1994) the use of the DIFI framework allows a single perspective of creativity to be placed within a broader framework. Failure to do so may result in the overemphasis of the single

perspective at the expense of other perspectives. The DIFI framework reduces the likelihood that the work will be distorted, inflated or overly generalised.

The basic structure of the DIFI framework comprises three primary sub-systems: the **individual**, the **domain** and the **field**. Each one of these subsystems interacts with each of the others. An elementary functioning of the framework involves an individual acquiring knowledge contained in a challenging domain. Analysis of this knowledge leads to the individual identifying deficiencies or shortcomings in the domain and therefore proposing new knowledge for that domain. This new knowledge is then considered and evaluated by the field. If the field accepts the proposed new knowledge, it becomes part of the domain and is added to it. When another individual acquires the knowledge of the domain it will contain the new elements contributed by the individuals who have acquired knowledge of the domain at an earlier point. The following sections will examine each of the components of the framework in more detail (Feldman *et al.*, 1994; Sternberg *et al.* 1996).

3.4.1.1 Domains

Feldman *et al.* (1994:20) refer to a domain, "...as the formally organised body of knowledge that is associated with a given field". However, they contend that the identification of domains is a matter of informed judgement, due to the limited amount of formally proposed criteria for doing so. In order to describe a domain a level of description needs to be selected that allows for new knowledge to be evaluated in relation to existing knowledge. A domain of knowledge needs to exist before a person can try to master or transform it. Furthermore, a domain has a history that can be learned independently of the persons who constructed and distilled its contributions along the way. (Feldman *et al.*, 1994).

A feature of domains is that they possess representational techniques that uniquely capture the knowledge that is held in the domain by means of specially constructed symbols, or adaptations of other symbol systems, special terms and technologies that are used only within that domain. The more organised and coherent the presentation of the knowledge within the domain is, the greater the possibility to evaluate possible transformations (Feldman *et al.*, 1994).

Schank (1988) proposes that in order to understand a domain, an individual must have a set of knowledge structures and experiences that can be drawn on as a kind of reference point. Langley and Jones (1988) assert that a person cannot be expected to be creative in any domain until knowledge of that domain has been achieved. According to Sternberg (1988) creative thinking involves the manipulation of ideas from a knowledge base and that creative thinking occurs when ideas are extended, modified or combined in ways that turn out to be useful.

Yakuwa (as quoted in Wonder & Blake, 1992) argues that a considerable period of preparation is necessary before a particular individual can display creativity in a particular field and in a particular form. This implies that a large volume of knowledge must have been gained and that the individual must have undergone all kinds of training. However, he warns that the acquisition of vast amounts of knowledge can have an immobilising effect due to the individual becoming set in a certain way of thinking.

Feldman *et al.* (1994) argue that, although the processes that give rise to the transformation and shaping of domains, forms a vital aspect of creativity research, this process cannot be divorced from the context provided by the domain and the field. Their view of creativity is that it is a contextual judgement rendered upon variations that have been proposed by individuals. The domains provide the contexts and the fields' form the social support systems for the domains, as well as for the wider contexts of social system and culture. Thus the influence of the field on the establishment and maintenance of the domain form part and parcel of the creative process. The role of the field will therefore be discussed in the next section.

3.4.1.2 Field

According to Csikszentmihalyi (1988) the task of the field is to select promising variations and to incorporate them into the domain. He defines the Field as that which includes all those persons who can affect the structure of the domain. According to Feldman *et al.* (1994) the transformation of domains can be regarded as a boundary pushing activity in which one or more individuals decide that change is called for. In order to make the decision to change a domain, it is necessary to know where the current boundaries of the domain lie and to know which boundaries are vulnerable to change. Much of the activity within a field is aimed at protecting the current boundaries, to consolidate new boundaries and to provide the rationale why such boundaries should exist. According to Feldman *et al.* (1994) considerably less activity is spent trying to move boundaries because few individuals or groups see their primary role as boundary breaking.

Transformation to a domain comes from those members of the field who have mastered the principles of the domain and are dissatisfied with the domain or with aspect that exists within the domain. Furthermore, these people are not as entrenched in the established knowledge and belief of the domain and are willing to extend its boundaries. This activity may include importing resources from other domains e.g. Piaget who looked to the domain of biology to find explanations for the evolving behaviours of children. Various fields may merge creating new domains such as astrophysics and nuclear medicine. In some circumstances new domains may be created from scratch such as computer programming which in turn leads to the creation of a new field. The establishment of a new domain may act as a catalyst to changing parts of an existing domain, infusing a domain with new ideas, technologies or techniques or nurturing the development of a fledgling domain. In some instances an individual may have had no intention to change a domain or create a new one, in these instances the responsibility lies with the field to recognise the accomplishments and to include them into the domain (Feldman *et al.*, 1994). Central to the creation and changes to a domain as well as the composition are people. This leads to the examination of the third concept in the DIFI framework namely the individual, which will be discussed next.

3.4.1.3 Individual

According to Feldman *et al.* (1994) the individual person has traditionally been the focus of psychological research and that the assumption has been made that creativity could be adequately explained by investigating the qualities of people associated with creative endeavours. This is demonstrated by creativity research being focused on stable traits of intellect and personality. The result of which has

been the identification of a number of qualities associated with creative accomplishment. However, these findings have been criticised by Feldman *et al.* (1994) for not providing a satisfying explanation for how and why creative works are performed. Recent research has started to emphasise the developmental aspects of individuals and their relationship to creativity. This broad view of creativity requires that the interaction between the three components of the framework that have been mentioned thus far be discussed. The next section will thus focus on this interaction.

3.4.1.4 Interaction

Feldman *et al.* (1994) propose that individuals, domains and fields need to be studied in relation to each other as well as independently. They argue that a domain can only exist once it has been mastered, persevered and transformed by individuals. Furthermore, domains should be understood to have distinctive qualities that are independent of any one person, but that those individuals are still required to ensure the continued existence of the domain. Feldman *et al.* (1994) continue by stressing that regardless of how original, determined or skilled people are, it is only through knowing and confronting the boundaries of the domain that it can be transformed. This transformation of the domain through the setting and resetting of boundaries is the primary function of the field.

Feldman *et al.* (1994) believe that individuals, domains and fields combine in a set of interlocking systems that make up a reasonable context within which to carry out investigations into creativity. From the preceding it is obvious that creativity can be examined using an extremely broad framework such as DIFI. However the focus of the study is on individual personalities and how these are creative. Thus the DIFI framework would seem to be too comprehensive for the current study. The framework discussed in the next section will focus on the study of individual creativity and may thus cast some light on the research problem at hand.

3.4.2 Expression of evolving systems: A broad individual approach

Howard Gruber and his associates have, for the past two decades, pioneered research into the theory that creativity is an expression of "evolving systems". Gruber's group has followed an idiographic approach to researching creativity, arguing that in order to determine a general theory of creative people a study must be made of people who are unquestionably regarded as creative. Their focus has been on developing a set of concepts and techniques for organising research on the processes through which remarkable individuals have produced major contributions to knowledge. The most distinctive feature of Gruber's approach has been the establishment of "middle level" concepts that can be used to organise, but not reduce the complexity of an individual's life. Gruber (in Feldman *et al.* 1994) proposes that individual lives can be analysed in terms of three interrelated systems, namely, knowledge, purpose and affect. Each of these systems can be analysed separately, but may be enriched by their relations with other systems in the individual's overall personality (Gruber, 1989; Feldman *et al.*, 1994). Each of these systems is seen to evolve becoming more pervasive in the individual's work resulting in a creative product of considerable note.

The middle level concepts that Gruber proposes are to serve as a guide to research on individual creative processes. The term middle level in this context refers to the placing of these concepts between the

more general ideas that might be offered such as traits and those that are so specific that they offer little explanatory power. Gruber's aim was to cut human nature at just the right level of generality to offer explanatory power without falling into such broad theorising, that the distinctiveness of the individual creator is lost (Gruber, 1989; Feldman *et al.*, 1994).

In addition to the already mentioned "middle level" concepts Gruber has identified other organising principles, namely, "network of enterprise" and "images of wide scope". The principle of "network of enterprise" entails that creators of note have had multiple projects running simultaneously and that in the mind of the creator there is a meaningful orchestration of these enterprises allowing movement from one to the next as the opportunity, inspiration and internal timetables dictate. The principle of "images of wide scope" can be compared to a process of mind mapping. The images guide and inform theorising and speculating by an individual. Over time these images change and can be studied as a clue to creative development (Gruber, 1989; Feldman *et al.*, 1994).

Gruber's work provides concepts that are large enough to organise analysis over relatively long periods of time. These concepts provide ideas that help reveal the distinctiveness of creative individuals without getting bogged down in a morass of uniqueness of the particular individual (Gruber, 1989; Feldman *et al.*, 1994).

Gruber's framework appears to focus on what can be termed "big" creativity i.e. the study of those individuals who are unquestionably creative. The research problem at hand is more aimed at a broad population in general and how the creative processes of this population function. The evolving systems framework would thus appear to be too specialised. The next section will provide a discussion regarding a framework that can be applied to the creative process employed by individuals in general.

3.4.3 Three part model of thought processes in creativity

Feldman (1988) proposes that novel ideas stem from the co-ordinated contribution of three interrelated internal systems and that each has a distinctive function and purpose. He argues that all humans develop the processes discussed in his model, but they do not develop them in similar ways. The input into them varies with the sensitivities and inclinations of the particular individual. Furthermore, the circumstances that affect the individual differ from one case to another (Feldman, 1988). This view is supported by Vygotsky (in Feldman *et al.*, 1994), who indicates that while it is advantageous to outline what seems to be a fundamental human process of understanding and transforming information and experience, to bring about newness, innovation and changes that make a difference to others, it should not be at the expense of recognising that great variations also exist. Feldman (1988) believes that in order to account for creative accomplishment these systems will need to be integrated in a manner that leads to sustained co-ordination for a sufficient duration to bring about a fresh construction. The following sections will discuss the processes involved.

3.4.3.1 Reflectiveness

Reflectiveness is that ability which makes possible the belief that individuals can know themselves. Furthermore, reflectiveness entails that an individual's experiences and the experiences of others can be

subjected to examination and that a sense of self or identity can be built. Reflectiveness can also be regarded as that which is largely referred to as consciousness and makes possible virtually all of the symbolic and abstract activity that characterises human thought. It is therefore regarded as the key to any theory of creativity (Feldman, 1988).

Feldman (1988) believes that it must be possible for the human mind to reflect on its experiences, as well as being able to compare that experience with what has been learned from the experience of others. Feldman refers to the studies done by Piaget and Bickhard, both of which present a process of reflective abstraction, being a process which, involves examining experiences at a higher level. Reflective abstraction is thus seen, as an essential step through which all progress towards more powerful mental structures must progress.

3.4.3.2 Transformational impulses from the unconscious

According to Feldman (1988) for creativity to take place, the ability to imagine changes that can actually be brought into existence and become part of human culture must form an integral part of the process. This imaginative thought process can only occur if it is pushed by what Feldman (1988) terms a "transformational imperative", which is born out of unconscious experiences. These unconscious experiences should be forceful enough to bring about changes beyond the constraints of current reality. Furthermore, this purpose relies on evidence that previous productive changes are available and can be accessed by the individual. In other words individuals are capable of reflecting upon their external environment as well as their unconscious to determine if anything needs changing as well as for generating ideas for change. This reflection includes being able to gauge the success of previous change attempts, which if successful, provide a catalyst for the individual to repeat the process.

Feldman (1988) proposes that a key component to understanding the generative and transformational tendencies of the unconscious processes is knowing how these images are formed and re-formed and how this impacts on other representations coming from the external environment. He makes the assumption that there exists a continuous flow of traffic backwards and forwards between the conscious and the unconscious. Furthermore, whatever is formed in the unconscious must be constructed from materials sensed from the external environment and organised into images, events, objects and processes. Jung's theory about the self and the individuation process would appear to support this argument as well as alluding to the importance of the role played by the Shadow in the creative process (Young-Eisendrath & Dawson, 1997).

Feldman (1988) argues that any attempt to describe creativity must include explicit reference to the unconscious processes that are clearly part of the human experience. Feldman places emphasis on the following distinct features of the unconscious process:

- That unconscious processing is fluid, continuous, active and generative.
- That unconscious processing has contact with other sources of information going into the mind, especially those of a sensory nature representing humanly crafted ideas and objects.
- That unconscious processes can to some degree be applied to serve the purposes directed at least in some part by conscious goals.

According to Feldman (1988) unconscious processes operate continuously even when conscious processes are underway. Thus implying that the two processes are in constant contact with one another. This interplay of the two processes is what gives rise to the richness of human expression and contributes to making each individual unique. Feldman (1988) is of the opinion that, the key quality of the unconscious is that it has little regard for reality and seems to operate according to its own set of rules. It would appear that unconscious thought is motivated by a natural desire to transform or change things. There is a tendency to destabilise structures i.e. to break them down and render them less organised.

3.4.3.3 Changing the world

Feldman (1988) believes that it is important that the instability and disruptive tendency of the unconscious needs to be balanced by some other process that can bring about stability and predictability to the representations of the external world as well as the world of experience. This interplay between the processes of change and stability give rise to new and innovative ideas. In order for this to happen there needs to be a special kind of awareness built into the mind of an individual. This special kind of consciousness provides the realisation that the world as it is today need not be the world forever. This unique ability possessed by human beings enables them to realise that they have the power to make the world a different place, through the application of intentional efforts.

According to Feldman (1988) creativity depends not only on the ability of the unconscious to disrespect the status quo, but that all humans value a measure of stability and that they do not always want to change the world. This dimension of stability/instability is one along which individuals undoubtedly differ. However, even the most radical transformers desire a minimum of stability and the strictest conservatives recognise the need for change. It is within the interplay of these desires for preserving important features and qualities of experience and the desire to transform experience, that creativity takes place. Creativity requires the ability to comprehend that the internal and external environments can be intentionally transformed, within the limits that have evolved from the processes of representation, and with unconscious and conscious perceptions of change informing and reforming each other (Feldman *et al.*, 1994). This point of view is supported by Wonder *et al.* (1992) who refer to research done on brainstorming, which indicates that by exposing individuals to different thought patterns the creative process can be facilitated. Jung's view that individuals have a preferred Type, but are nonetheless able to utilise other dimensions contained in type theory is supported by the above theory.

3.4.4 Conclusion

The three above-mentioned frameworks provide researchers with various ways in which to approach the study of creativity. The Domain Individual Field Interaction (DIFI) framework provides for a very broad approach to examining creativity. It views the individual as a subsystem of a broader system, which governs creativity. In addition to the emphasis placed on the role of the individual in creativity, this system alludes to the influence that the environment has on the creativity as well as the evaluation of a product as being creative. The second framework allows for the examination of the characteristics of creative individuals. The assumption is made that the individuals being studied have proved themselves to be creative. The individual is thus regarded as the creative system. The third framework enables the

examination of the actual creative processes i.e. the origins and paths followed by thoughts, which contain creative content. These three frameworks would appear to contain four distinct perspectives; namely, the creative product, environment, individual and process. Each of these perspectives ultimately influences creativity and none can function in isolation. Therefore a study of one perspective should always take cognisance of the influence of the remaining perspectives. For the purposes it would appear that a process perspective would provide the most insight into the study at hand. The following section will examine each of these perspectives in greater detail.

3.5 PERSPECTIVES ON CREATIVITY

In the previous section three frameworks for the study of creativity were presented. Each of these frameworks is interwoven with the other by means of a number of interacting perspectives on creativity. These perspectives can be regarded as the specific focus of creative research. The description of these perspectives differs from author to author. Barron and Harrington (1988) approach creativity in terms of creative ability and creative achievement. Hennessey and Amabile (1988) suggest that creativity can be considered in terms of the creative person or the creative product. The perspectives to be used in the following discussion are those proposed by Mooney (1963) namely, the creative environment, the creative product, the creative person and the creative process. These perspectives are supported by MacKinnon (in Feldhusen, 1995) who suggests that creativity consists of four components, namely, the cognitive process, the product, the person and the situation. These views were originated by Wallas (1926). A comprehensive discussion of each perspective will be given in the following sections with emphasis being given to the process perspective, which is of particular interest to this study.

3.5.1 Product Approach

According to Gruber (1981) the study of creativity should start with unambiguous cases i.e. with those people whom have been deemed to be unquestionably creative. The crux is that in order for these people to be regarded as creative, the products of their endeavours need to have been evaluated as being creative by others. According to Feldhusen (1995) creative thinkers must possess the capacity to develop, advance, communicate or promulgate their creations. These inventions need to gain acceptance as well as being produced.

Eysenck (1993) contends that the term creativity has been applied in two different contexts, thus making it extremely difficult to measure. On the one hand creativity is seen, as a trait characteristic of a person e.g. Mozart, Picasso or Einstein. On the other hand creativity can be defined in terms of a finished product. Furthermore, these finished products may be extremely varied in nature e.g. Newton's "Principia Mathematica" or Da Vinci's "Mona Lisa". According to Eysenck (1993) the challenge facing researchers examining the psychology of creativity lies in the discovery of a relationship between creativity as a universal, normally distributed trait and creativity as a unique achievement, distributed more like a Poissonian (J-shaped) curve. Eysenck (1993) sites, the small proportion of scientists responsible for the major number of creative works, as evidence that the production of creative achievements is abnormally distributed. Eysenck (1993) believes that creative products are a result of a number of differing variables that can be categorised as cognitive, environmental and personality variables that are acting in a

synergistic manner. Amabile (1993) argues that product creativity should be regarded as a continuous quality (normally distributed). She states empirical research that provides evidence that expert judges are capable of perceiving and reliably rating creativity in products from the lowest "garden variety" levels to high levels of expertise. However, Amabile (1993) does concede that certain human products appear dichotomous or even qualitatively different from other products in their domain. Amabile (1993) and Eysenck (1993) both agree that continuous underlying characteristics and processes can produce what appear to be dichotomous results.

Csikszentmihalyi (1994) criticises the trait approach to defining creativity. He regards personal characteristics as being merely correlates of creativity, that facilitate its occurrences, without providing a direct description of what creativity is. He believes it is impossible to define creativity independently. Creativity is a judgement based on criteria that change from domain to domain and across time. In order for experts in a field, to judge the products of creative individuals, they need to apply criteria of what is deemed to be creative. However these criteria cannot be separated from current values and norms. Thus creativity is not an attribute possessed by an individual, but rather the product of a social system making judgements about individuals. Gardner and Wolf (1994) support this view by suggesting that no individual can exist in a vacuum and that ultimately every action must stand judged by the community.

In order for creativity to exist a comparative context needs to be created. Furthermore, if the evaluative criteria change, the product may no longer be regarded as being creative. It may also occur, that at the time of the product being produced it is not regarded as being particularly creative, but at some time in the future the value may be recognised as well as the creativity required to produce it (Csikszentmihalyi, 1994).

3.5.1.1 Measurement of creative production

The earliest attempts to measure creativity were pioneered by Guilford in the late 1940s, who believed that creativity could be measured in everyday people by means of a psychometric approach using pencil and paper tests. One of Guilford's tests, the Unusual Uses Test, examined the number of uses that could be found for a common object, such as a brick. Subjects were thus rated on the products of their divergent thoughts.

Building on Guilford's work Torrance developed the Torrance Tests of Creative Thinking. These tests also focused on divergent thinking and other problem solving skills. These tests were scored in terms of the following. Firstly, fluency of responses, which looked at the total number of relevant responses. Secondly, flexibility, which examined the number of different categories of relevant responses. Thirdly, originality was examined which entailed calculating the statistical rarity of the responses. Finally, elaboration was measured to determine the amount of detail in the responses. The evaluation of responses and final scoring of the Torrance tests were conducted by well-trained test administrators.

The psychometric approach to measuring creativity enjoyed a large following because it was quick and easy to administer as well as being an objectively scoreable device. However, this approach came in for a fair amount of criticism. Firstly, the pencil and paper tests were regarded as trivial and that creativity should be measured using more significant productions. Secondly, that fluency, flexibility, originality and

elaboration failed to capture the concept of creativity. Lastly, that these tests did not measure "big" creativity, which was seen as the ultimate aim of certain creativity researchers (Sternberg & Lubart, 1996; Boden, 1992).

Other methods that have been proposed for the measurement of creative products are Amabile's (1993) Consensual Assessment Technique that involves the assessment of a product by both experts and non-experts. Simonton (in Amabile 1993) proposes a historiometric method, which is suitable for studying eminent creators using an archival approach. Segal (1997) suggests that creative products should be evaluated in terms of the following: Their novelty in terms of how relevant the new product is to its environment. Resolution, which indicates to what extent the product, solves a problem within given parameters. Synthesis, which evaluates how well the product, combines different elements, and elaboration, which assesses how well the product, has been crafted.

3.5.1.2 Conclusion

It can be concluded that products are essential in providing evidence of creativity, but the researcher of creativity is still left in the dark regarding the conditions that gave rise to the creative product. Creativity is a label given to a product by people operating out of a paradigm that contains specific criteria for creativity. Furthermore, creative products do not cast much light on the characteristics of the type of person who produced the product, nor the processes that were applied. Therefore, in order to gain a clearer understanding of creativity it is essential to examine creativity from the perspectives of the environment, the creative individual and the creative process. The following sections will examine creativity from these perspectives.

3.5.2 Environmental influences approach

According to Guastello & Shissler (1994) it is debatable whether the distinguishing traits of creative people are the results of cultural norms of creative behaviours or a product of cultural attitudes towards creativity. They cite the industrial revolution in Britain as an example of where uneducated, but talented and pragmatic members of the proletariat saw the developments of their era as an opportunity to ensure the economic prosperity of future generations. By capitalising on the opportunities presented to them they ensured that their future generations would not be destined to a life of low technology agricultural labour. It would appear that the environment provided an opportunity for creative expression, which in turn stimulated intrinsic motivation to advance, within these individuals. Success reinforced this behaviour thus perpetuating the intrinsic motivation and resulting in defining the standards for what was to be regarded as creative.

In order for creativity to flourish an environment must be established in terms of both facilities and atmosphere, which encourages people to be innovative. The creation of such an environment entails the removal of barriers. Thus the environment must not only stimulate creative ideas, but this environment needs to be receptive to those ideas. Additionally the creative environment must allow for people to freely express their ideas and encourage risk taking in the presentation of new ideas. Communication plays a vital role in the building of an environment for creative activities. This includes communication with oneself and with others. Those individuals who are less inclined to communicate should be

encouraged to do so, by stressing the benefits that can be obtained. However, these individuals desire to work alone should be respected. Thus a balance needs to be established with regard to interpersonal interaction. The downplaying of the authoritative role of the leader creates a reduction in the importance of individual recognition from outside the group and increases the importance of peer recognition (Moukwa, 1995).

Smith (1993) has proposed that group climate is an important variable in the productivity of creative problem solving. Smith (1993) argues that if group members feel unsafe they have less psychological freedom to take risks and share their ideas. Higgins, Qualls & Couger (1992) express the importance of trust in group settings and the negative impact that intense emotions can have by distracting concentration, impeding trust and generating interpersonal conflict. The term "discounting" is used to define those verbal and non-verbal messages that are designed to castigate or diminish the verbal or non-verbal behaviour of another person. Discounting assaults self-esteem and attacks the credibility of others. This leads to the receiver of the discount wanting to exact revenge or get even with the person who originated the discount. The result is that interaction is inhibited through the delivery of fewer and safer statements. Smith's (1993) research has found that in the groups where discounting takes place, significantly less ideas are generated than in the groups where discounting was avoided.

According to Guastello (1995) creative teams require a unique type of leadership. This leadership style includes an additional dimension to the traditional two-dimensional framework of high versus low task orientation and high versus low relationship orientation. The third dimension is that of a development orientation, which refers to leadership actions that enhance the capabilities of group members to do more creative or otherwise better work. This dimension entails that the leader fulfils the role of trainer and facilitator, who develops and presents opportunities for participants to enhance their own creativity. The leader thus helps others to produce creative work. Bass & Avolio (1990) who make use of the term transformational leadership support this type of leadership. Transformational leaders are effective in mobilising groups to explore and adopt new viewpoints, to set new goals and to imagine new ways of accomplishing them. According to Guastello (1995) the transformational leader not only has the potential to imagine and explore new and creative thoughts, as one would expect from an entrepreneur, but also has the capability to develop an organisational culture around the vision that has been created.

Redmond, Mumford & Teach (1993) argue that environmental influences operate by shaping the nature and conditions under which creative capabilities are applied. Additionally environmental variables affect creativity by structuring problem solving efforts, facilitating development and application of the basic generation processes that give rise to novel problem solutions. Alternatively the environment can influence the individual's willingness or motivation to pursue new ideas. Finally the social environment provides the resources and support to implement new ideas while simultaneously conditioning evaluation and acceptance of the resulting products.

The conclusion can be drawn that in order to stimulate creativity, it is necessary to establish an environment in which creativity can be encouraged and nurtured. It also raises the question as to the impact of environmental influences on creativity and the potential impact on this study as a confounding

variable. Keeping the environmental impact on creativity in mind the final two perspectives will be discussed in the subsequent sections.

3.5.3 Person approach

From a study of the research it appears that the person approach to creativity comprises three distinct aspects. These aspects of the person approach to creativity can be summarised as follows. Firstly, an aspect of individual personality and value systems, secondly, a function of cognition i.e. the ability to discover and formulate new problems and thirdly, a function of intrinsic motivation, which influence the individuals intensity of interest (Csikszentmihalyi, 1990). The subsequent discussion will serve to elucidate each of these themes.

3.5.3.1 Individual personality and value system

According to Russ (1993) a significant measure of consensus exists in the literature regarding the personality traits found in creative individuals. Simonton (1988) supports this opinion that at least some personality traits of creative persons are both stable over time and firmly entrenched in concrete behaviours. Major research programs in the area of personality and creativity have led to the formulation of a personality profile of a creative individual. These major traits are listed as follows:

- Tolerance for ambiguity.
- Openness to experience.
- Possessing unconventional values.
- Independence of judgement.
- Curiosity.
- Preference for challenge and complexity.
- Self-confidence.
- Propensity for risk taking (Russ, 1993).

It would appear from the above discussion that the person being described would be a person who, in terms of the MBTI, is perceiving i.e. a person who is not rule bound and is not pressured to reach a point of closure. However, in order for a creative idea to be implemented the creative individual needs to convert their ideas and findings into a creative product, which requires a different set of traits as those listed above. Furthermore, a number of the traits are not covered by the categorisation of the MBTI as these are associated with emotional stability or are part of the individual's value system, which is not assessed by the MBTI. It would appear that the above traits are more descriptive of an innovative person rather than a creative individual.

3.5.3.2 Cognition

According to Simonton (1988) the creative individual is characterised by two main features one being cognitive and the other motivational, the role of motivation will be elaborated later in this section, when reference is made to the work of Amabile. In terms of cognition Simonton (1988) argues that the cognitive characteristics of creative persons enable them to discover overlaps and agreement where

formerly only isolation and differences were recognised. Furthermore, creative individuals are noticeably more intelligent than average. However, a strong intellect does not guarantee creativity, but rather provides a necessary but not sufficient condition for it to be exercised (Eysenck, 1993; Wallach in Sen and Hagvet, 1993). Individuals may share the same IQ, but differ in their creativity (Eysenck, 1993).

This notion is supported by MacKinnon (1978) who is of the opinion that a creative person has an unusual capacity to record, retain and have readily available the experiences of their life history. Simonton (1988) is of the opinion that in order for intelligence to be converted into creative potential, the intellect must be structured in a special way. This structure should endow the individual with the following cognitive abilities, verbal fluency, impulsiveness, originality, and breadth of interest, independence of judgement and flexibility. In agreement with this view, Glaser (1984) regards the creative person's knowledge base as being conceptually functional i.e. that issues and problems can be dealt with effectively by making use of conceptual schemas rather than through the cumbersome analysis of detail.

Furthermore, Simonton (1988) believes that these creative individuals are capable of concentrating attention as well as being able to shift it when appropriate. They are fluent in scanning thoughts and producing those thoughts that aid in problem solving. Guilford (1986) refers to this as transformational ability or flexibility of mind, which reflects the ability to shift mindsets, use different problem-solving approaches and to reorder information. Barron and Harrington (1981) list breadth of knowledge and a wide range of interests as cognitive abilities associated with creativity. In support Simonton (1988) views creative individuals as possessing a wide range of information at their command.

Guilford's (1986) divergent thinking is regarded as a cognitive process and includes such abilities as free association and fluidity of thinking. In addition to Guilford, Getzels & Csikszentmihalyi (1976) have identified sensitivity to problems and problem finding as an important cognitive ability in the creative individual. Weisberg (1988) has identified trying alternate problem solving approaches, task persistence as well as trial and error behaviour as important in problem solving. Sternberg (1988) has proposed a concept of different types of insight and synthesising abilities as being especially important in creative problem solving. Runco (1991) has identified critical and evaluative thinking as being essential to the creative act.

In conclusion it can be said that creativity is dependent on a high level of cognitive functioning, but that intellect does not guarantee creativity. However, the above mentioned studies focussed on examples of people at the pinnacle of their field. Surely creativity is evident among individuals with lower cognitive strength, but who nonetheless were able to apply their intelligence in a unique way which resulted in creativity within their particular field of expertise. It is also evident that creativity requires different types of cognition, or the ability to skip between various types of cognition. In MBTI terms this could indicate the ability to use the various type functions interchangeably.

3.5.3.3 Motivation

Simonton (1988) argues that even though an individual is blessed with a large intellectual capacity to generate what he refers to as chance permutations, it requires something extra to translate this potential into actual creativity. Appropriate motivations that facilitate rather than inhibit the creative process are

required. According to Simonton (1998) those motivations that nurture creativity will be strengthened and that those that discourage creativity will be weakened. Thus the motivational profile of a creative person will consist of two sides namely that of enhanced motives and suppressed motives. In terms of enhanced motives Simonton (1988) has singled out successful scientists who exhibit exceptional energy and are highly committed to their work. Furthermore, these individuals spend a disproportionate amount of time doing research and seem to be totally absorbed in their work (Eysenck 1993).

In terms of suppressed drives Simonton (1988) believes that the drive to create results in competing drives to assume a subsidiary role, resulting in a distinctive motivational profile. This profile is typified by individualistic hobbies that allow time for reflection and that these persons tend to shy away from interpersonal contacts, social affairs and political activities. Thus, there would appear to be a tendency for creative persons to be introverted. This introverted nature leads to these individuals having the disposition to reflect on the vast and complex content of their work. In contrast with extroverts who would rather expend energy in interaction with others. This theory has a definite influence on the current study, which will consider the influence of extraversion and introversion on creativity.

The motivation theme is strongly supported by Amabile (1990) who provides research results indicating that intrinsic motivation is conducive to creativity, but that extrinsic motivation is detrimental. Amabile (1990) argues that people are most creative when they feel motivated primarily by their interest, enjoyment, satisfaction and the challenge of the work itself and not by external pressures. These external pressures include expected evaluation; strict regimented educational methods, surveillance, competition, reward, restricted choice and deadlines. Furthermore, it would appear that the influence of the environment filters through strongly to influence the motivation of the creative individual.

3.5.3.4 Conclusion

Examination of the creative person perspective includes three specific areas. The first area examines the personality variables associated with creative individuals. These variables tend to be indicative of an unconventional non-conforming type of person. The second area involves cognition. Findings in this area indicate that intelligence is necessary for creativity, but is not a reliable predictor of creativity. However, cognitive flexibility would seem to characterise creative individuals. The third area involves the individual's motivation to be creative. This motivation would appear to stem from the ability to focus intensely on the subject at hand as well as having a strong awareness and desire for the intrinsic rewards that success would bring. This section has provided insight into the makeup of the creative person. The following section will examine the process employed by an individual in order to be creative.

3.5.4 Process approach

Having investigated the characteristics of creative people the next logical step is to examine the processes employed by these people that results in creativity. Amongst the earliest and most widely researched models of the creative thinking process is that of Wallas (1926) who proposed a multi-stage approach, the core of which can be described as follows:

- Stage one: **Preparation**, in which the problem, the need or desire, is defined. Any information that needs to be accounted for in the solution or response is gathered as well as the criteria that are needed to verify the acceptability of the solution.
- Stage two: **Incubation** allows the mind to contemplate and work through the problem at hand by taking a step back. In other words active exploration of the problem ceases and it is relegated to the subconscious. This process can last for minutes, weeks or even years.
- Stage three: **Illumination** in which ideas arise from the subconscious into the conscious mind to provide the basis for a creative response. These ideas can be pieces of the whole or the whole itself. Unlike the other stages, illumination is very brief, involving a tremendous rush of insights within a few minutes or hours.
- Stage four: **Verification** is the final stage during which activities are carried out to demonstrate whether or not that which emerged during illumination satisfies the needs and criteria that were defined in the preparation stage (Higgins, Qualls & Couger, 1992; Ebert, 1994; Herrmann, 1994; Feldhusen, 1995).

3.5.4.1 Cognitive processes

3.5.4.1.1 Koestler's Bisociation Theory

The concept of bisociation was developed by Koestler (1967) to explain his view of the creative process. Bisociation comprises two technical concepts namely, code and matrix. The concept of "code" entails those elements of thought and action that are neuropsychologically arranged and sequenced so that they can be activated with minimal effort and attention to serve the needs of the individual in problem-solving. A coherent arrangement of related coded elements constitute a "matrix" of predictable and reliable thought and/or action sequences. The matrix thus forms the frame of reference or associative context within which various related coded sequences may be activated.

According to Koestler (1967) when two matrices interact, elements of both may become bisociated and thereby acquire richer meaning. Koestler (1967) views the creative process as always operating on more than one plane, in contrast to routine thinking skills which operate on a single plane. The bisociative act connects previously unconnected matrices of experience. Koestler (1967) applied his theory to the domains of humour, art and science. His findings were that when two independent matrices of perception or reasoning interact with each other the result can be either a collision ending in laughter, or fusion in a new intellectual synthesis, or a confrontation ending in an aesthetic experience.

3.5.4.1.2 Heuristics

Eysenck (1993) believes that all human information processing, including creative thought is conducted through the use of heuristics. His argument is that the possible options that are available if a blind search strategy were to be employed are infinite and beyond the capability of the human mind. According to Eysenck (1993: 151) "...any problem defines its solution horizon, limiting its search to a given, circumscribed area." He regards creativity as a function of individuals' associative hierarchies or horizons. These horizons can be either wide i.e. they encompass a large number of unique associations or close i.e. they contain a low number of associations. A person with a wide horizon will consider some

words, concepts, memories or whatever to be relevant, but a person with a narrow horizon may consider these same elements irrelevant. Eysenck (1993) is of the opinion that the creative person will tend to have a wide horizon in contrast with the narrow horizon of the uncreative person. Furthermore, this horizon determines the person's search process i.e. no one will search outside their horizon because that which is outside is regarded as being irrelevant.

3.5.4.1.3 Cognitive spiral model

Ebert (1994) proposes a Cognitive Spiral model of creative thinking, which suggests that creative thinking, is very much a part of cognitive processing and learning. According to Ebert (1994), information-processing theory provides the general theoretical framework for the Cognitive Spiral model. A key feature of this information processing model is the proposed sequential nature of mental operations, which delineates a spiral flow of information as it undergoes transformation from stimulus detection, through semantic encoding, and response generation to expression. Ebert (1994) is of the opinion that creative thinking implies a natural inclination for the mind to seek patterns, perspectives and relationships resulting in the construction of knowledge. Thus the brain is regarded as a natural problem solving system and that creative thinking underlies the cognitive search for patterns that enable problem solving. This view lends support to the purpose of this study which is to examine the relationship between the workings of various parts of the brain and Jung's view of personality type and the role that the flow of information plays in information processing and therefore in the creative thought process.

Ebert (1994), who in the formulation of his Cognitive Spiral model has relied heavily on Piaget's Cognitive Development model, believes that every time a stimulus is processed the individual's knowledge base is altered. Thus no stimulus can be processed in exactly the same way because the knowledge base that has been brought to bear on an identical stimulus is not identical to the previous exposures. To quote Ebert (1994:285) "The same cognitive processes are invoked, and in the same sequence, but never from the same starting point; thus a spiral not a cycle".

The five components of Ebert's (1994) Cognitive Spiral model are described as follows: "Perceptual thought", which refers to the detection and translation of a stimulus through sensory organs, or cognitive processes in the case of an internally generated stimulus. During the next step, "Creative thought", the stimulus is compared with the knowledge base possessed by the individual. Pattern, perspectives and relationships are sought between what is known and what has been presented as a stimulus. Ebert views this process as the brain's natural problem solving ability at work. Relationships are sought, but are not judged until a later stage. This process seems to bare a resemblance to Eysenck's associative horizons, as discussed earlier in this section. The next step in the process is that of "Inventive thought" during which products based on the information received from the creative thought phase are assembled. The success of the inventive thought process is reliant on that which is provided by the creative thought process. The materials that are provided directly influence the originality, value and appropriateness of the eventual product and the successful solving of the problem at hand. It would appear that Koestler's Bisociation theory would fit well into is this part of Ebert's model, in that both models involve the assimilation of knowledge into something new. Once the inventive thought processes have assembled a product, "Metacognitive thought" exerts a pre-performance evaluation of the possible solution.

Metacognitive thought determines whether the product fulfils the criteria of the problem, whatever those criteria may be. Regardless of the verdict of the metacognitive thought, the decision to accept or reject the possible solution remains a deliberate one. Finally, "Performance thought" is the process through which the determination made during metacognitive thought finds its expression. This performance thought is expressed either in behaviour or in a belief held by the individual (Ebert, 1994).

3.5.4.1.4 Conclusion

There would appear to be similarities in the theories of Eysenck and Koestler. Both theories allude to functions that structure information so that when used in problem solving the relevant information is clustered together and is thus easily retrieved and processed within a predetermined frame of reference. However it would seem that Koestler's focus is on the analysis of information that has been gathered in contrast with Eysenck who emphasises the gathering of information and the impact of this action on the delineation of the problem at hand. These two approaches bear striking resemblance to the Perceiving (information gathering) and Judging (decision making) functions of Type theory and the MBTI. Ebert's theory would appear to put the models proposed Koestler and Eysenck into perspective by providing a comprehensive model of the creative process, which forms a natural part of the brain's problem solving function.

The preceding authors have emphasised the cognitive processes involved in creativity, but have ignored an important aspect namely, that of the role, played by affective processes. The role of emotion in the creative process will be discussed in the remainder of this section.

3.5.4.2 Affective processes

According to Higgins *et al.* (1992:119) "Psychological research is increasingly demonstrating the effects of feeling states upon information processing, memory and creativity in laboratory settings. This view is supported by Neethling *et al.* (1996) who is of the opinion that feelings of negativity have a detrimental effect on the creative process. According to Higgins *et al.* (1992), cognition and emotion show reciprocal influences. Beliefs, assumptions and thoughts shape the interpretation of the physiological arousal responses. On the other hand, emotion influences what is perceived as well as how information is coded, what information is stored and retrieved from memory, and how effectively information is applied to the immediate context.

Russ (1993) has identified five affective processes that are important to creativity. Two of these affective processes are related to cognitive creative abilities. These are firstly, access to affect-laden thoughts, which entails the ability to call up cognitive material with an affect-laden content. Martindale and Dailey (1996) and King and Pope (1999) support this view. Secondly, openness to affective states, which is the ability to experience the affect itself. This requires comfort with intense affect and the ability to tolerate the accompanying anxiety (King *et al.*, 1999). The following two processes identified by Russ (1993) are specific to affective functioning. These are firstly, affective pleasure in challenge, which entails the excitement and tension involved in identifying the problem and working on the task. Secondly, affective pleasure in problem solving, which is the deep pleasure and passion involved in solving a problem and achieving insight. These two processes bare strong resemblance to the theories of intrinsic motivation

proposed by Amabile. The final process proposed by Russ (1993) is that of overall cognitive control over the affective process. A crucial component of adaptive creative functioning is the cognitive integration and modulation of affective material.

In conclusion the process perspective of creativity appears to focus on the flow of information as well as the manner in which that information is brought into juxtaposition with existing knowledge structures on both a conscious and sub-conscious level. The result of this iterative process could be creative in nature depending on the challenge at hand. Furthermore, affective impulses and the control of these impulses impact on the creative process. The following section will examine the role of dominant areas of an individual's brain and how these areas of dominance influence the flow of information and how this impacts on the process of creativity.

3.6 BRAIN DOMINANCE AS A FOUNDATION FOR A PROCESS THEORY OF CREATIVITY

3.6.1 Triune Brain Theory

Neurological research conducted by MacLean (1973, 1990) led to him proposing the Triune Brain Theory, according to which the human brain is regarded as being three brains, each superimposed over the earlier, in a pattern of brains within brains. MacLean believes that these three brains, are products of human evolutionary development. The first of these brains, the primal brain, is regarded, as having been inherited from reptiles and strongly resembles the brains found in alligators and lizards today. The second brain, an emotional brain, inherited from early mammals, is found in lower mammals such as rats, rabbits and horses. Finally, a rational brain evolved. This brain is unique to higher mammals, such as chimpanzees, dolphins and whales, and is characterised by the development of a neo-cortex. Furthermore, MacLean's research led to the conclusion that in the course of human evolution, the human brain was not transformed into a single integrated new unit. Instead each new unit was superimposed upon the other resulting in three interrelated, but distinct brain systems. Each of these systems is unique with its own unique patterns and needs. This research further revealed that under stress or in a state of anticipated danger, the more primitive levels of the brain take precedence or control over the higher portions by distorting the input of information (MacLean, 1973; MacLean, 1990; Herrmann, 1994).

According to MacLean (1973, 1990) the reptilian brain, which comprises the brain stem, mid-brain, basal ganglia and reticular activating system, is driven by instinct and seems to contain the ancestral lore of the species. This includes a sense of safety, survival and territoriality. In humans it governs their need for order, routine and regularity as well as serving as a home base from which to explore. These reptilian instincts preserve a perfect memory for what their ancestors learned over millions of years, but the reptilian brain is poorly equipped for learning to cope with new situations. The reptilian brain provides mankind with a sense of security, without which it is unlikely to extend beyond the survival, or reptilian level (MacLean, 1973; MacLean, 1990; Herrmann, 1994).

The mammalian or limbic brain is found encircling the reptilian brain like a collar. The limbic system comprises the following structures. Firstly, the hippocampus, which acts as an information processing,

station between those parts of the brain, which receive sensory experience. Secondly, the hypothalamus, which regulates autonomic emotional reactions. The third structure, the amygdala, which is responsible for emotional memory. Fourthly the thalamus and cingulate cortex, which regulate arousal and alerting responses, and lastly the prefrontal cortex, which regulates rational decision-making. The limbic brain is responsible for registering rewards and punishments; it is the seat of emotion and controls the body's autonomic nervous system. The beginning of social groups, mating, breeding, flocking and migration forming can be attributed to the evolution of the limbic system. Clinical and experimental findings have indicated that the limbic brain evaluates sensory information in terms of emotion that guide behaviour required for preservation of the individual or the species. In responding to information about pleasure and pain, the limbic brain is primarily involved in experiencing, memory and the expression of emotion (MacLean, 1973; MacLean, 1990; Herrmann, 1994; Goleman, 1996).

The rational mind or neo-cortex lies over the limbic brain. In humans this part of the brain is disproportionately large in relation to the rest of the brain and the body. It is believed that this brain evolved because the stimuli from the external environment made it difficult for the organism to make clearly reasoned decisions for survival. The neo-cortex is viewed as the mother of invention and the preservation of ideas. It receives signals primarily from the eyes, ears and body wall. It focuses on material objects outside the organism and functions somewhat like a coldly reasoning, heartless computer. It is the neo-cortex that that seems to enable us to think, perceive, speak and act as civilised beings (MacLean, 1973; MacLean, 1990; Herrmann, 1994).

In summary it can be said that a cross section of the three brains look as if they have been successively superimposed on one another. The evolutionary process has also resulted in some new starts for each successive brain as well as replicating some of the older established functions, thus making it difficult to precisely define functional divisions. Although these three brains may overlap in the functions they perform, they do differ in style. The two lower order brains are thought to control genetic/instinctual behaviours. These brains also mediate the autonomic nervous system. The neo-cortex in contrast seems more adept at learning new ways of coping and adapting. It deals more with voluntary movements and with external environmental events (Herrmann, 1994). It would appear that these views of brain functioning bear a similarity to the way that type theory proposes that information is gathered by certain functions in the personality structure and that decisions based on that information are made by other personality structures. Thus personality would appear to stem from the interactive functioning of all the various systems located in the brain and is influenced by how an individual has learned to process and react to stimuli from the environment. In the next section research that has examined the location of specific functions in the various hemispheres of the brain will be discussed.

3.6.2 Split Brain research

According to Alder (1993) much of the present understanding regarding the physiology of the brain can be attributed to Roger Sperry and Michael Gazzaniga and the findings of their split brain experiments. The split brain experiments were conducted on patients suffering from epilepsy. These patients underwent a surgical procedure in which the Corpus Callosum, the main communication between the two sides of the neo-cortex was severed. The severing of the 200 million or so nerve fibres of the Corpus

Callosum resulted in each of the halves of the brain functioning separately without an inkling of what was happening inside its partner. According to Gazzaniga and Le Doux (1981:3): "One of the immediate and compelling consequences of brain bisection was that the inter-hemispheric exchange of information was totally disrupted, so that visual, tactual, proprioceptive, auditory and olfactory information presented to one hemisphere could be processed and dealt with in that half of the brain, but these activities would go on outside the realm of awareness of the other half of the cerebrum." This situation presented an opportunity to study the separate functions of each side of the brain. However, it is interesting to note that, when one of the hemispheres of the brain becomes damaged, the other hemisphere is able to adapt and replicate some of the functions of the damaged hemisphere (Papalia & Olds, 1988).

The findings of split brain research are beyond the scope of this study, but an attempt will be made to highlight some of the most relevant research results. According to Springer & Deutsch (1981) the design of the human nervous system is such that each cerebral hemisphere receives information primarily from the opposite half of the body. This phenomenon which is referred to as the "contralateral rule", applies to vision and hearing as well as to body movement and touch sensation. The contralateral rule is essential to understanding the findings of studies regarding the two hemispheres of split brain patients, which provided evidence that in most people the control over speech is localised in the left hemisphere. This conclusion was reached through an experiment where a visual stimulus of a common object was flashed firstly to the left visual field of a patient. The result was that the patient was unable to verbally identify the object. When the same object was flashed to the right visual field the patient had no difficulty in verbally identifying the object. Furthermore, when the object was flashed to the left visual field the patient was able to use the left hand to select an item similar to the object flashed, from among several objects placed outside the patient's field of vision. This provided an indication that the right brain was more adept at processing spatial information (Springer & Deutsch, 1981).

According to Gazzaniga & Le Doux (1981) further evidence of the spatial orientation of the right hemisphere of the brain can be found in a block design test that was administered to split brain patients. The test consisted of a patient being presented with four patterned cubes and a sample design. The patient was then required to arrange the cubes manually to form the sample design. The performance of each hand on the test was timed separately. The result was that the left hand consistently constructed the design faster than the right.

The results of these studies led to the popular belief that verbal abilities were situated in the left hemisphere and spatial abilities in the right hemisphere. However, according to Springer & Deutsch (1981) research into the specialised functions of the two hemispheres has led to the formulation of a new view as to how each hemisphere of the brain is to be conceptualised. Instead of a breakdown based on the type of task best performed by each hemisphere, a dichotomy based on different ways of dealing with information in general has emerged. According to this analysis the language specialisation of the left hemisphere is a consequence of the left hemisphere's superior analytical skills of which language is a manifestation. Similarly, the right hemisphere's superior visual-spatial performance is a result of the synthetic, holistic manner with which the right hemisphere deals with information. The manner in which the two hemispheres perceive information would seem to bear strong resemblance to the Sensing and Intuitive functions of Jung's Type theory.

According to Gazzaniga & Le Doux (1981) the asymmetrical nature of the brain's function has led to the erroneous assumption that each half of the brain has evolved its own specialised neural substrate to sustain a unique cognitive style and mode of information processing. In support of this view Springer & Deutsch (1981) refer to research conducted by Levy in which Chimeric figures (stimuli which are not encountered in everyday life) were presented to split brain patients. The results showed that when a patient was requested to point to the stimulus presented they would refer to the part of the figure presented to the right hemisphere. When asked to verbalise the stimulus they would refer to the stimulus presented to the left hemisphere. However, of particular interest was that the patients could point to the particular face with either hand. Thus providing evidence that the right hemisphere could control both left and right hand. The explanation for this occurrence is that in addition to the contralateral fibres, each hemisphere is equipped with ipsilateral fibres, which allow each hemisphere to exert some control over the same side of the body. Buzan (1993) is of the opinion that, although each hemisphere is dominant in certain activities, both are basically skilled in all areas, and the mental skills identified by Roger Sperry are actually distributed throughout the cortex.

The research into split brain patients provided revolutionary insight into the functioning of the human brain. However, uncertainty existed as to whether the results of these studies could be replicated in normal people. This uncertainty was laid to rest by Ornstein, who by applying electroencephalographic (EEG) techniques was able to demonstrate scientifically that hemisphere specialisation was not limited to abnormal people (Buzan, 1991; Gazzaniga & Le Doux, 1981; Herrmann, 1995; Hermann, 1996). The method that Ornstein followed was to attach two EEG machines to each of his normal subjects, one to each brain hemisphere. The brainwave responses were then measured while the subjects were involved in simple tasks of replicating block patterns and writing letters. The resultant data indicated that while a subject performed the visuo-spatial block task, the left brain idled in a state of relaxed electrical activity. Conversely, when the subject engaged in letter writing, the right brain idled while the left brain engaged (Buzan, 1991; Gazzaniga & Le Doux, 1981; Herrmann, 1995; Hermann, 1996).

In contrast to the above-mentioned findings, Weiten (2000) comments that although there is ample evidence to support the specialisation of the left and right hemispheres of the brain. This ability to handle different types of cognitive tasks is only true to a certain extent and should not be regarded as being carved in stone. Weiten (2000) is of the opinion that theories linking cerebral specialisation to cognitive processes are highly speculative and that an unfortunate consequence is that serious research into hemispheric specialisation has got lost in the descriptions provided by popular magazines. In conclusion Weiten (2000) states: "Cerebral specialisation is an important and intriguing area of research. However, it is unrealistic to expect that the hemispheric divisions in the brain will provide a biological explanation for every dichotomy or polarity in modes of thinking.

In summary it can be stated that evidence exists that different hemispheres of the brain are responsible for specific functions. However, the complexity of the brain's functioning makes it difficult to state conclusively that one part of the brain dominates the regulation of certain functions. However, the use of these research findings provides support for the creation of a dichotomous classification system for the functioning of the brain, albeit a metaphoric representation. Researchers such as Herrmann and

Neethling in constructing their brain dominance models, which will be examined in the following section, have used this dichotomous classification.

3.6.3 Self Report Measures of Brain Dominance

The results of Split-Brain research and the Triune brain model formed the foundation that led behavioural scientists such as Herrmann and Neethling to develop self report measures of brain dominance, namely the Herrmann Brain Dominance Instrument (HBDI) and the Neethling Brain Instrument (NBI) respectively. The development of a self-report measure was motivated by a need to create a convenient, accurate and reliable way with which to determine an individual's dominant style of thinking. The development of a self report thinking preference measure eliminates the impracticality of wiring subjects to EEG apparatus or subjecting them to PET scans, which are usually associated with the determination of brain functioning (Herrmann, 1995; Hermann, 1996; Neethling, 1996). A number of similar instruments have been developed, but do not enjoy the popularity of the HBDI or NBI.

Both the HBDI and the NBI models make use of a circle divided into four quadrants (Fig 3.1). According to Herrmann (1995) the circular display represents the whole thinking brain, which is divided into four conscious modes of knowing, each with its own behaviours demonstrably associated with it. The upper two quadrants are used to indicate cerebral cortex functioning. The lower two quadrants indicate limbic system functioning. The resultant model is a combination of, firstly the split brain research of Sperry and Gazzaniga which is applicable to the upper two quadrants of the model, and secondly the work of MacLean, especially his references to the limbic system which can be applied to the lower two quadrants of the model. The "reptile brain" which forms part of the Triune Brain theory is not incorporated into Herrmann nor Neethling's models. No explanation for this omission is provided, but it can be speculated that because of the primitive functioning of this part of the brain it has little to contribute to the creative process (Herrmann, 1995; Hermann, 1996; Neethling, 1996). Although the models are based on research findings of the above mentioned neuro-scientists, Hermann (1995) stresses that the whole brain model is not meant to be a physiological map of the brain, but should rather be regarded as a metaphoric representation. The reason for this is that research has found that the functioning of the brain was not as clear cut as was first reported and that the brain is immeasurably more subtle, complex and versatile than that, which is implied by a dichotic, model. A second reason is that the physiological functioning of the limbic system cannot easily be split into two distinct halves. However the data that was collected by the researchers indicated the existence of two distinct modes of knowing associated with limbic system functioning (Herrmann, 1995; Hermann, 1996; Neethling, 1996).

3.6.3.1 The Four Quadrants of the Neethling Brain Profile

Although no published research was found Neethling (1996) is of the opinion that the NBI provides an indication of a person's brain preferences. These preferences indicate how comfortable a person would be in a certain career, how they would act toward other people, communicate with others, solve problems and make decisions. The thinking preferences of each of the quadrants are summarised as follows.

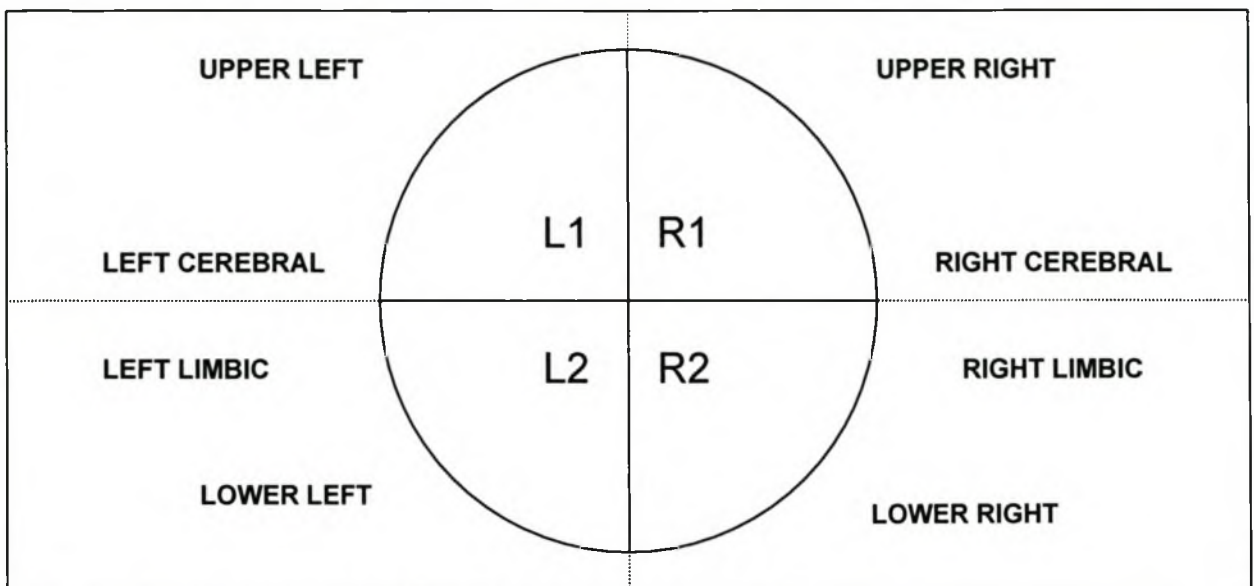


Figure 3.1 Model of Brain Profile quadrants (Herrmann, 1995)

3.6.3.1.1 The L1 Quadrant (Upper Left)

The thinking processes most commonly associated with top left quadrant of the brain model are the following:

- An enjoyment of working with facts.
- Facts and issues are dealt with in a precise and exact way.
- Problems are approached in a logical and rational way.
- An enjoyment of working with numbers.
- An interest in technical aspects.
- Performance is regarded as important.
- Preference for analysing facts (Neethling, 1996)

Thus individuals with a strong L1 preference would approach problem solving in a logical way. They would tend to be precise, give consideration to financial aspects and would tend to express little emotion. Factual accuracy and the evaluation facts are of importance to these individuals (Neethling, 1996).

3.6.3.1.2 The L2 Quadrant (Lower Left)

The thinking processes most commonly associated with lower left quadrant of the brain model are the following:

- A preference for traditional thinking.
- A need for facts to be organised and orderly.
- Enjoyment of work involving detail.
- A preference for a stable and reliable environment.
- Comfort with standard procedures.
- A preference for security and safekeeping above risk-taking.
- A preference for facts to be arranged sequentially and chronologically.

- A focus on the task at hand to ensure that it is completed on time.
- An enjoyment of practical aspects (Neethling, 1996).

Individuals with strong L2 preferences prefer to organise and keep track of essential information. They ensure the timely implementation of projects, maintaining a firm grip on financial matters and giving priority to security (Neethling, 1996).

3.6.3.1.3 The R1 Quadrant (Upper Right)

The thinking processes most commonly associated with top right quadrant of the brain model are the following:

- There is a tendency to see the whole picture, not the detail.
- An enjoyment of change and a willingness to try new things.
- An enjoyment in being busy with several things at the same time.
- Possession of a good imagination.
- A single answer not being accepted as correct, and that alternatives need to be found.
- An enjoyment of challenge or risk.
- A 'gut feel' for new ideas.
- Ideas can be rearranged and put together into a new whole.
- Things are not always done in the same way.
- A tendency to relate the present to the future (Neethling, 1996).

Individuals with a strong R1 preference tend to focus on the big picture rather than on the detail. They can recognise hidden possibilities, don't always play according to the rules and tend to act upon gut feel rather than logic when solving problems (Neethling, 1996).

3.6.3.1.4 The R2 Quadrant (Lower Right)

The thinking processes most commonly associated with lower right quadrant of the brain model are the following:

- Facts are experienced in an emotional way.
- An intuitive and understanding approach to other people.
- Communication tends to be expressive and non-verbal.
- Empathy is felt towards others.
- Problem solving seems to be a feeling process not a logical one.
- Enthusiasm is shown when new ideas are generated (Neethling, 1996).

Individuals with a strong R2 preference have a 'feel' for people and situations. There is an ability to read other's body language and an enjoyment of social interaction, be it one on one or in a group (Neethling, 1996).

3.6.4 Creativity as a result of whole brain thinking

Contrary to popular belief that “right brained” people are more creative, Neethling (1996) is of the opinion that anybody can be creative and that the key to creativity lies in whole brain thinking. This implies that all the quadrants of the brain model need to be applied, not only the ones for which the individual shows a preference. In support of this view Wonder and Blake (1992) state: “In fact the creative thought process cannot take place without the use of both logic and intuition.” Neethling (1996) contends that creativity not only applies to breakthrough thinking, but that it can be applied to everyday changes in a person's immediate environment. It would appear that the creativity Neethling is referring to, is small creativity, which was discussed earlier in par 3.2.2. Furthermore, Neethling (1996) is of the opinion that creativity can be taught and learned using the brain preferences as a foundation to understanding creativity.

Herrmann supports Neethling's views. Herrmann (1996) believes that Wallas' creative process, which was discussed earlier in par 3.5.4, strongly supports whole brain creative thinking. Herrmann (1996) has added two elements to Wallas' original process. These are “Interest”, which is required to get the process going, and “Application” which ensures that ideas are not left up in the air, but are implemented to solve real problems. Herrmann's expanded process would thus include the following elements: interest, preparation, incubation, illumination, verification and application. According to Herrmann (1996) the Preparation stage requires the application of L1 and L2 quadrant thinking, which involves information gathering, analysis of facts and chronological sequencing of the facts into an accurate statement of the problem. The Incubation stage involves both R1 and R2 quadrant thinking. The R2 quadrant provides an idea sensing function as well as the motivation provided by personal interest. The R1 quadrant provides intuitive and conceptual understanding, which allows potential solutions to surface. The emergence of a creative solution may not be immediate, but require an iterative process between preparation and incubation before the third stage, Illumination, is reached. Illumination is regarded as an integration of the previous stages in the creative process i.e. interest, preparation and incubation. The Verification stage requires a hard nosed, objective review of the potential solution in relationship to the facts of the original problem. This requires left mode processing that takes advantage of the critical, diagnostic and analytical capabilities of the L1 quadrant.

Buzan (1991) provides anecdotal evidence, which further supports the theory that the creative process is dependent on whole brain functioning. Buzan investigated icons of creativity such as Einstein, Cézanne and Picasso. Einstein, who could be typified as being left-brain dominant, failed French at school and numbered among his activities violin playing, art, sailing and imagination games. According to Buzan (1991), Einstein attributed many of his more significant scientific insights to imagination games, including the theory of relativity. The great artists, who could be typified as being right brain dominant, kept notebooks containing detailed analysis and descriptions of what was added to the masterpieces that were in progress, indicating left brain activity in the creative process.

Neethling (1996) views creativity as being dependent on the individual's motivation to be creative. Creativity is thus dependent on the individual's willingness to take action, which is creative. He regards negativity as being the enemy of creativity and that creativity is more about the breaking down of barriers and coping with life than the acquisition of skills and techniques. Furthermore, creativity is strongly

influenced by culture, environment and space. Neethling's view would seem to tie into the ideas of Mooney and MacKinnon as mentioned in par 3.5, that creativity consists of four components, namely, the product, person, process and environment. In order for people to be creative; firstly, they as individuals must be motivated to be creative. Secondly, they need to apply their creative process or thinking preference. Thirdly, their environment must stimulate and support the need to be creative thus providing an impetus for the motivation and lastly, that the product which they produce is evaluated as being a creative product.

3.7 PERSONALITY AND CREATIVITY

As pointed out in Chapters 2 and 3 and in the discussion of personality and creativity there seems to be a distinct relationship that can be observed between the two concepts. Due to the nature of the current research a brief review of existing research findings on the role that personality plays in the creativity of an individual, will be provided. Research into the relationship between personality and creativity has involved a number measures of personality, various research designs and samples.

Guastello and Shissler (1994) made use of a creativity index based on scores on the 16PF to compare creative individuals from two separate domains, namely; arts and science, with a control group of university students (aspiring professionals). Their findings were that professionals in scientific research and the arts share a pattern of personality traits that were captured by the 16PF creativity index. An explanation for this finding is that creative people tend to "cross-train" thus learning to master multiple creative media.

Fleenor and Taylor (1994) conducted research in which they compared the results of scores for a sample of 12,115 on the California Psychological Inventory (CPI) Creativity Scale, Myers Briggs Type Indicator (MBTI) Creativity Index and the Kirton Adaption Innovation Inventory (KAI). The first two measures are regarded as measures of creative level and the final instrument a measure of creative style i.e. an instrument that sorts individuals into two distinct groups, adapters and innovators, who have equal levels of creativity. The results of the study indicated that a significant relationship exists among the results of the CPI Creativity Scale and the MBTI Creativity Index ($r = .53$). The correlation between the CPI Creativity Index and the KAI was measured at ($r = .50$). Finally the correlation between the MBTI Creativity Index and the KIA was a significant ($r = .62$) (Fleenor and Taylor, 1994). The significant correlation of the KAI scores to the scores on the other two instruments was contrary to expectation. A reason for this can be attributed to the manner in which the definitions of creativity level are operationalised by the test constructors. The constructors of the MBTI Creativity Index were of the opinion that individuals who are innovative and holistic thinkers' i.e. those with a preference for Intuition and Perception in their type classification are more creative. In contrast Herrmann and Neethling are of the opinion that all people are potentially creative and that their creativity manifests in different ways (Herrmann, 1996; Neethling, 1996). This is an important point to keep in mind when contemplating research into the diverse field of creativity. A further outcome of this research was that gender did not have a significant outcome on the results of the research.

Research by Gyskiewics and Tullar (1995) using the KAI and MBTI scores of a sample of managers found that a significant relationship exists between innovation as measured on the KAI and intuition as measured on the MBTI. Furthermore, the research found that the MBTI perceiving preference was also significantly correlated to innovation. However, the intuition and perceiving preferences of the MBTI were not significantly related to one another, an indication that each of these preferences explains some unique variance in the KAI score. The characteristic tendency of individuals with intuitive preferences to see relationships and possibilities as well as the Innovators' initiation of change by seeing new ways of doing things would seem to bear a striking resemblance to the characteristics of the R1 quadrant of the Neethling Brain Profile. The tendency of individuals with a Perceiving preference to be open-ended and able to tolerate ambiguity provides further indication of a possible relationship.

A study by Martindale and Daily (1996) found that several measures of creativity were significantly related to primary process content. They view primary process thinking as autistic, free associative and analogical. It is the type of thinking found in fantasy, reverie and daydreaming. King and Pope (1999) support this view by arguing that creativity is a result of individuals' ability to tolerate the anxiety produced by the copresence of primary and secondary processes, so that objective reality can reflect their subjective experiences. According to Kris (in Martindale and Daily 1996) creative people are those who are able to shift readily between primary process and secondary process modes of thinking. In their research Martindale and Daily (1996) found that primary process thinking, as measured using the Regressive Imagery Dictionary, was significantly correlated to the Alternative Uses Test ($r = .33$), the Remoteness of Association test ($r = .30$) and a measure called Story Creativity ($r = .38$). It would appear that primary process thinking resembles the incubation phase in Wallas' theory of the creative process, in that the problem at hand is not actively engaged, but relegated to the subconscious for processing. It can also be argued that primary process thinking contains subconscious reasoning, which in turn can be related to contents of the Shadow archetype due to its archaic and primitive content.

A further finding of the Martindale and Daily (1996) study was that creativity was significantly related to extraversion as measured using the Eysenck Personality Questionnaire (EPQ) as well as the NEO Personality Inventory. The following significant correlations were obtained between the EPQ and other measures of creativity including, Alternative Uses Test ($r = .33$) and Remoteness of Association ($r = .33$). The Extraversion scale on the NEO Personality Inventory showed a significant correlation with the Alternative Uses Test ($r = .32$). Sen and Hagtvet (1993) using the EPQ and the Torrance tests of creativity also came to this finding in their study. These findings would appear to contradict Simonton's (1988) theory that views creative people as being almost reclusive and shy of interpersonal contact.

The next section will pay specific attention to research into the relationship between personality type and thinking preferences based on theories of brain dominance.

3.7.1 Previous research with regard to the relationship between thinking preference and personality type

The research that has been conducted on the relationship between thinking preference and personality type can be placed into two broad categories. Firstly, research into physiological functioning of the brain

and its relation to personality type and, secondly, the results of self report measures of thinking preference and their relationship to personality type. Concerning the latter, the instrument used by researchers to measure thinking preferences has been the Herrmann Brain Dominance Instrument (HBDI) (Herrmann, 1995, 1996). It would appear that the HBDI measures the same constructs in a similar way to the Neethling Brain Profile (NBI) and is thus included in this section. The above mentioned research yielded significant results which will be expanded on in the following sections.

3.7.1.1 Introversion/Extroversion scale

According to Eysenck (1985) extroversion is related to the functioning of the ascending reticular activating system (ARAS), which is located in the brain-stem reticular formation. Eysenck (1985) is of the opinion that information from the ascending sensory pathways excites cells within the ARAS, which then sends the excitation to various sites in the cerebral cortex. This would imply that introversion and extroversion are not associated with any particular hemisphere of the brain, a view that is supported by Newman (1995, 1998) who analysed EEG results of 27 subjects who were instructed to perform a number of cognitive tasks. The sample was composed of lawyers and artists, but this categorisation did not show any differentiation in EEG results. However, it was only when the sample was categorised according to psychological Type that meaningful results were recorded for two dimensions namely, Introversion/Extroversion and Sensing/Intuition. Newman was able to show that Extraverts and Introverts showed non-hemisphere specific differences in arousal. Surprisingly the results further indicated that intuitive types showed greater levels of activation than sensing types in the left hemisphere. This would appear to contradict the models of Herrmann and Neethling.

According to EEG recordings introverts are more cortically aroused than extroverts are. The result is that Introverts nervous system is more sensitive and is thus overwhelmed by Extraverted influences or people. However, Eysenck (1985) warns that these results can be misleading and have not been confirmed as being conclusive. Eysenck offers an explanation for these inconsistencies by pointing out that the arousal conditions under which the measurements were taken can influence the level of arousal of the ARAS in extroverts and introverts. Wilson and Languis (1989) found that measures of introversion/extroversion on the MBTI correlated with differences in EEG records. However, their findings were based on measurements of introversion/extroversion combined with sensing/intuition. It would appear that the intuitive dimension would result in an increased level of arousal regardless of the introversion/extroversion dimension, thus supporting Newman's findings.

It should be noted that the NBI does not have a scale to measure the introversion/extroversion dimension. In contrast the HBDI does have such a scale consisting of one item. However, this scale is not indicative of any hemispheric preference (Herrmann, 1995). Studies by Bunderson *et al.* (1981) found a strong relationship between the introversion/extroversion dimension as measured on the MBTI and the introversion/extroversion scale of the HBDI. Ford (1988) found no relationship between the introversion/extroversion dimension on the MBTI and any of the four cognitive preferences of the HBDI.

3.7.1.2 Sensing/Intuition scale

Research by Newman (1996) found that significant differences existed in the ratios of left-to-right hemisphere EEG records and the intuitive and sensing types of the MBTI. Newman's (1995, 1996) results showed the intuition preference to be more left hemisphere and the sensing preference to be more right hemisphere. This finding is supported by Wilson, Laposky and Languis (1991) who found that EEG records indicated that ENs' responses showed greater peak amplitude in the left hemisphere than the responses of ESs. However responses of IN and IS types showed differences in coherent processing patterns in both hemispheres. This finding would seem to contradict the structure of the models presented by Herrmann (1995) and Neethling (1996). Eysenck (1985) provides explanations for what seems to be inconsistency in research findings. Firstly, the placement of the electrodes of the EEG and the way in which the alpha activity is defined. Secondly, hand-scoring methods which are unreliable and subject to systematic error. Finally, the kinds of tasks at hand while the EEG recordings were being made.

Research by Bunderson *et al.* (1981) found that intuition preference on the MBTI correlated significantly with the upper right quadrant of the HBDI. Sensing preference on the MBTI were found to have a virtual equal correlation with the lower left and upper left quadrants of the HBDI. Research by Ford (1988), using a sample comprising only female students, supports these findings.

3.7.1.3 Thinking/Feeling scale

Newman (1996) reports that EEG research provided evidence that the thinking preference as measured by the MBTI is related to left hemisphere cortical functioning. The feeling preference as measured by the MBTI is related to right hemisphere cortical functioning. According to Newman (1996) these correlations were not significant, but could be regarded as being close to significant. He attributes this to the placement of the EEG electrodes. The model based on Newman's (1995) research posits that the feeling and thinking preferences of the MBTI should be viewed as being tied to cognitive processing of emotionally and biologically relevant stimuli. This raises the question of why measures of cerebral cortex functioning should be used to provide evidence of what is supposed to be limbic system function?

Research by Bunderson *et al.* (1981) indicates that a relationship exists between the feeling preference on the MBTI and the lower right quadrant of the HBDI. The thinking preference of the MBTI is related to the upper left quadrant of the MBTI. These results are supported by Ford's (1988) research findings.

3.7.1.4 Judging/Perceiving scale

Research by Bunderson *et al.* (1981) found that a significant relationship exists between the judging preference as measured by the MBTI and the lower left quadrant of the HBDI. Research by Ford (1988) found judging to be associated with left hemispheric functioning and perceiving with right hemispheric functioning.

3.8 CONCLUSION

Out of the discussion of creativity in this chapter it is clear that various definitions of creativity exist. The formulation of a comprehensive definition of creativity appears to be elusive, due to the dynamic nature of the subject. The definitions can thus be divided into two broad categories, namely product and process. This study is aimed at examining the creative process and has thus adopted the process definition of creativity.

A discussion of the frameworks required for studying creativity suggests that these frameworks are nested within one another. The first framework involved examining the subject of creativity very broadly and included the influence of factors outside the creative individual. The second framework examined the creative individual as a single entity. The third framework focused on the workings of the processes within an individual that give rise to creativity. This third framework would also be the one within which this study would take place.

These frameworks for the study of creativity provided insight into the existence of four perspectives from which creativity can be viewed, namely: The creative product perspective, which entails the evaluation of a product by others as being unique and useful and thus creative. Secondly, a creative environment perspective, which proposes that a stimulating environment is essential to the expression of creativity. Thirdly, the creative person perspectives, which examines creative individuals in terms of their personality traits, cognitive flexibility and motivation. Lastly, a creative process perspective, which examines the flow of information that, takes place in order to produce creative thought.

This process perspective of creativity led to a discussion of the role of thinking preferences in the creative thought process. Evidence was found that these processes could be measured both physiologically and psychometrically. Furthermore, it was found that personality was strongly related to the results of these measures of creative thought processes.

The discussions in chapters 2 and 3 provide answers to three of the research questions that have been posed. Firstly, that a relationship exists between creative processes and dimensions of personality. Secondly, the way in which personality has been conceptualised according to Jung and the Type theorists. Lastly, the conceptualising of the creative process according to Neethling has been provided. The following chapter (4) the methodology of the research will be discussed.

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CHAPTER 4

METHOD OF INVESTIGATION

4.1 AIM OF THE STUDY

The general aim of the study is to determine if a relationship exists between personality type and creative preference. A number of research questions have flowed out of the literature study, which has led to the formulation of the following specific aims of the study.

- Is there a relationship between certain dimensions of personality and certain creative thinking preferences?
- Is there a causal relationship between certain dimensions of personality and certain creative thinking preferences?

4.2 HYPOTHESES

4.2.1 The following null hypotheses (H_0) are to be investigated:

- There is no significant correlation between the Gregarious versus Intimate scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Enthusiastic versus Quiet scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Initiating versus Receiving scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Expressive versus Contained scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Participative versus Reflective scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Concrete versus Abstract scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Realistic versus Imaginative scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Practical versus Inferential scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Experiential versus Theoretical scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Traditional versus Original scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Critical versus Accepting scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Tough versus Tender scale and the respective thinking preferences (L1, L2, L3 & L4).

- There is no significant correlation between the Questioning versus Accommodating scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Logical versus Empathetic scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Reasonable versus Compassionate scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Early starting versus Pressure prompted scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Systematic versus Casual scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Scheduled versus Spontaneous scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Planful versus Open-ended scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Methodical versus Emergent scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Introversion/Extraversion scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Sensing/Intuition scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Thinking/Feeling scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Judging/Perceiving scale and the respective thinking preferences (L1, L2, L3 &L4).

4.2.2 The following alternative hypotheses (H_1) are to be investigated:

- There is a significant positive correlation between the Gregarious versus Intimate scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Enthusiastic versus Quiet scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Initiating versus Receiving scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Expressive versus Contained scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Participative versus Reflective scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Concrete versus Abstract scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Realistic versus Imaginative scale and the respective thinking preferences (L1, L2, L3 &L4).

- There is a significant positive correlation between the Practical versus Inferential scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Experiential versus Theoretical scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Traditional versus Original scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Critical versus Accepting scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Tough versus Tender scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Questioning versus Accommodating scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Logical versus Empathetic scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Reasonable versus Compassionate scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Early starting versus Pressure prompted scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Systematic versus Casual scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Scheduled versus Spontaneous scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Planful versus Open-ended scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Methodical versus Emergent scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Introvert/Extrovert scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Sensing/Intuition scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Thinking/Feeling scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is a significant positive correlation between the Judging/Perceiving scale and the respective thinking preferences (L1, L2, L3 &L4).

4.3 RESEARCH DESIGN

A quantitative research strategy will be used to analyse the numerical values of the continuous variables under investigation in the study. Furthermore, the data will be interpreted qualitatively by examining the categorical variables under investigation in the study. These analyses require that the data be subjected to inferential and descriptive statistical analysis (Kerlinger, 1986).

A survey method of data collection was used, which Kerlinger (1986:377) describes as: "...studying samples chosen from the populations to discover the relative incidence, distribution and interrelations of sociological and psychological variables." For the purpose of this research the sample was taken from the manufacturing industry population, more specifically the aerospace industry, with the aim of investigating the relationship between two psychological variables namely those of personality type and creative thinking preference. This obviously limits generalisability, but is nevertheless useful for practical managerial issues.

The collected data was subjected to a correlative research design in order to determine the measure of covariance that exists between the two sets of variables used in the study (Smit, 1991). This correlative approach fits within a non-experimental research design, which Kerlinger (1986:348) describes as follows: "Non-experimental research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relationships among variables are made, without direct intervention, from concomitant variation of independent and dependent variables." The use of data collected from the sample, using two self-report measures of the constructs under investigation, necessitates a non-experimental design seeing that none of the variables were manipulated, but are being examined *post hoc* (Kerlinger, 1986).

4.4 SAMPLE

An "accidental" sample (Kerlinger, 1986) of N=305 persons, who form part of a population employed in the aviation maintenance and manufacturing industry. The sample consists of members of 1st, 2nd and 3rd reporting level leaders in top and middle management positions in the organisation. The ages of the sample range between 25 and 60. The sample was tested as part of the organisation's leadership development program. The decision to use the sample was made due to the cost implications of the measuring instruments to be used and the availability of the sample. In order to attempt to eliminate the inherent flaws in the research design gender, age, level in organisation and race variables will be taken into account and will be reported as possible influences on differences, but this does not form the main aim of the study.

4.5 RESEARCH PROCEDURE

The Training Department of the organisation sponsoring the study administered the Myers-Briggs Type Indicator (MBTI) Step II and the Neethling Brain Instrument (NBI). The data was collected over a period of a two months during 15 assessment sessions. The aim of the testing was to compile psychological profiles of potential leaders in the organisation who would be most suited to the new structure of the organisation which had been derived following a reengineering exercise. All 305 members of the sample agreed to participate in the testing. Each individual in the sample was given individual feedback on the test results; the results were further used to compile teambuilding interventions.

4.6 MEASURES

The Myers-Briggs Type Indicator and the Neethling Brain Instrument are used in this study. The two instruments will be discussed in this section.

4.6.1 Myers-Briggs Type Indicator (MBTI)

4.6.1.1 Background

During World War I, Katherine Briggs became interested in the differences and similarities in human personality. Through the study of biographies she began to develop her own typology of personality. It was during this process that she discovered that Jung had developed a similar system. She subsequently adopted Carl Jung's typology, investigated it and expanded upon it (Myers, 1980).

Briggs' daughter, Isabel Myers, who shared her mother's interest in Jung's typology, was determined to develop a method of transforming Jung's typology into a practical and useable instrument. Her development started in earnest after World War II (Myers, 1980).

Myers' point of departure was to develop a pool of items that could be used to discern the attitudes, feelings, perceptions and behaviours of the various psychological types. The psychology community of that era focused their research on trait measures and scales based on factor analysis. They were sceptical and critical of the research done by a woman with no formal training in psychology. In 1962, with the co-operation of the Educational Testing Service, the first MBTI manual was published. Following this the awareness and use of the instrument increased. Myers dedicated forty years of her life to the development and improvement of the instrument (Myers, 1980).

In 1975 publication and distribution of the MBTI was transferred to Consulting Psychologists Press (CPP). Isabel Briggs Myers and Mary H. McCauly established the Centre for Applications of Psychological Type (CAPT) in 1975, as a service and research laboratory for the MBTI. In 1977 the MBTI released its own research journal, the *Journal of Psychological Type*. In 1987 an organisation was established for MBTI users, the international Type Users Organisation. The MBTI has become one of the most widely used personality measurements in the world, having been translated into a number of languages and used among various cultures (Myers, 1980). According to Newman (1996) the MBTI is used by five thousand professionals' world-wide has been administered to some two million persons each year since 1989.

4.6.1.2 Aim of the questionnaire

The aim of the questionnaire is to determine specific behavioural preferences and tendencies. Furthermore, the questionnaire attempts to make Jung's theory of psychological types comprehensible for the layman. The questionnaire is based on Jung's theory of personality and more specifically on the attitudes and functions of the psyche. The MBTI makes use of a self-report style questionnaire to determine the basic preferences of people with regard to four scales. The results are used to determine the effects of each preference, be it individually or in combination, on practical day to day situations.

The MBTI can be used in various situations. It has been successfully utilised for marital and family counselling, career guidance and in educational setting, where the influences of personality type on styles of learning and motivation to learn are examined. It has also been used with major success in organisations to develop and promote communication, co-operation and team problem solving and decision-making (Myers & McCaully, 1985).

4.6.1.3 Questionnaire composition and scales

Various editions of the MBTI questionnaire have been released. The original edition known as Form-F consisted of 166 items. Form K was used in the present study. The questionnaire consists of 131 forced choice items consisting of certain behavioural preferences or tendencies. The respondent is required to select one of two choices per item. These choices are represented on four dichotomous scales.

The opposite preferences do not imply that a respondent is only capable of functioning on one side of the selected scale. Myers (1987) compares this concept of opposite preferences too the concept of left and right handedness. Although people are generally able to write with both hands, each person has a natural preference to write with a specific hand. Right-handed people write with their right hand because it comes naturally and because it involves less time and effort. The opposite preferences of the four MBTI scales function in the same way. All people can and are often required to function on both sides of the continuum of the four bipolar scales. For example, it may be required of an introvert to address a large meeting. The introvert is capable of performing what is typically an extroverted activity, but too do it, requires more effort and energy on the part of the introvert as compared to the effort it would have required from an extrovert.

The scores on the four bipolar scales, namely Extroversion-Introversion (E-I), Sensing-Intuition (S-N), Thinking-Feeling (T-F) and Judging-Perceiving (J-P), are used to give an indication of the individual's preference for a specific personality orientation. A combination of all the combined preference scores, result in an indication of one of sixteen possible personality orientations (Van Rooyen & De Beer, 1995).

The scoring and interpretation of the MBTI is expressed in the form of a letter of the alphabet, which is an indication of the individual's preference. The numerical value of the score indicates the strength of the preference and not necessarily the ability to function according to that preference. The letters are finally combined to indicate the individual's preferred behavioural profile, e.g. ENFP.

According to Myers (1987), the questions in the MBTI questionnaire indicate certain basic preferences that can have far reaching consequences. There are right or wrong preferences, the indicators simply groups people according to types that are interested in different things, are drawn to different fields and who often have difficulty understanding one another. Myers (1987) is of the opinion that the essence of the MBTI lies in the indication of the valuable differences between people. These differences are the result of;

- where they prefer to focus their attention (E-I)
- the manner in which they prefer to gather information (S-N)
- the manner in which they prefer to make decisions (T-F)

- the type of lifestyle they adopt (J-P)

The MBTI thus represents four scales of basic observable cognitive functions, which are based on Jung's theory of Psychological Type (see Chapter 2). However, the fourth scale, namely the perception and judging scale, which indicates the individual's lifestyle, was added by Myers. Individuals are characterised as a certain type based on their inherent preferences on these four scales. The next section will provide a short description of each bipolar scale on the MBTI.

4.6.1.3.1 An explanation of the four bipolar scales

4.6.1.3.1.1 Extroversion-Introversion (E-I)

Introversion and Extroversion refers to the two opposite preferences that indicate where individuals prefer to focus their attention i.e. on the inner world or outer world.

- **Extrovert (E)**

In people with an extroverted attitude energy seems to flow, or be drawn out to objects or people in the environment. Extroverts want to act on the environment because it holds a special significance for them. Several of the characteristics of an extroverted attitude include; awareness and reliance on the environment for stimulation and guidance; an action orientation, a measure of impulsiveness, ease of communication and sociability (Van Rooyen & De Beer, 1995).

- **Introvert (I)**

In people with an introverted attitude energy seems to be drawn from the environment and focused inward. Introverts reflect upon the inner world of ideas and concepts. Several of the characteristics of an introverted attitude include; interest in the clarity of concepts and ideas; reliance on stable concepts more than passing external events; thoughtful contemplative detachment; and the enjoyment of privacy and solitude (Van Rooyen & De Beer, 1995).

4.6.1.3.1.2 Sensing-Intuition (S-N)

The Sensing and Intuition functions indicate the opposite ways that individuals go about gathering information.

- **Sensing (S)**

People with a Sensing preference gather information by means of the five senses. These individuals are observant of what is going on around them and focus on immediate experience, facts and details. Sensors are good at recognising the practical realities in a situation (Van Rooyen *et al*, 1995).

- **Intuition (N)**

People with an Intuition preference gather information by seeing the “big picture”. These individuals focus on the relationship and connections between facts. Intuitives are good at grasping patterns and seeing new possibilities or different ways of doing things (Van Rooyen *et al*, 1995).

4.6.1.3.1.3 Thinking-Feeling (T-F)

Once information has been gathered using one of the sensing or intuitive functions, it has to be processed further. The Thinking and Feeling functions indicate the opposite ways that individuals go about reaching conclusions, making decisions and forming opinions.

- **Thinking (T)**

People with a Thinking preference link ideas together by making logical connections. They rely on principles of cause and effect and tend to be impersonal, analytical and concerned with principles of fairness and justice (Van Rooyen *et al*, 1995). Their strength lies in determining what is wrong with something and applying their problem-solving abilities (Briggs, 1993).

- **Feeling (F)**

People with a Feeling preference come to decisions by weighing up the relative values and merits of an issue. They have a capacity for warmth, human concern and preservation of past values (Van Rooyen *et al*, 1995). Their goal is harmony and recognition of individuals and their strength lies in understanding, appreciating and supporting others (Briggs, 1993).

4.6.1.3.1.4 Judging-Perceiving (J-P)

The final scale on the MBTI describes the lifestyle that people adopt with regard to dealing with the outside world. The two opposite preferences refer to the previous two function scales. Individuals choose to exhibit either a Judging attitude (thinking or feeling) or a Perceiving attitude (intuition and sensing).

- **Judging (J)**

People with a Judging attitude are concerned with making decisions, seeking closure, planning operations and organising activities. People with a Judging attitude appear to be organised, purposeful and decisive in their behaviour (Van Rooyen *et al*, 1995). Their lifestyle is structured and they prefer to have things settled. Sticking to a plan or schedule is very important to them and they derive satisfaction from their ability to get things done (Briggs, 1993).

- **Perceiving (P)**

People with a Perceiving attitude are focused on incoming information. These people appear to be spontaneous and adaptable, open to new events and changes (Van Rooyen *et al*, 1995). Perceivers feel confined by plans and decisions. They prefer to stay open to experience and last-minute options. Furthermore, they place trust in their resourcefulness and ability to adapt to a situation (Briggs, 1993).

4.6.1.3.2 The sixteen MBTI personality types

Table 4.1: THE MBTI TYPE TABLES (Van Rooyen and De Beer, 1995)

ISTJ Introverted- Sensor with Thinking	ISFJ Introverted- Sensor With Feeling	INFJ Introverted- Intuitive with Feeling	INTJ Introverted- Intuitive with Thinking
ISTP Introverted- Thinker With Sensing	ISFP Introverted- Feeler With Sensing	INFP Introverted- Feeler with Intuition	INTP Introverted- Thinker with Intuition
ESTP Extroverted Sensor with Thinking	ESFP Extroverted Sensor With Feeling	ENFP Extroverted Intuitive with Feeling	ENTP Extroverted Intuitive with Thinking
ESTJ Extroverted Thinker With Sensing	ESFJ Extroverted Feeler With Sensing	ENFJ Extroverted Feeler with Intuition	ENTJ Extroverted Thinker with Intuition

4.6.1.3.3 An explanation of the sub-scales in the Expanded Interpretative Report (EIR)

The sub-scales are an elaboration on the existing four type components. Five sub-scales have been added to each of the four type components (Saunders, 1989). These will be discussed in more detail in the subsequent sections.

4.6.1.3.3.1 Extroversion versus Introversion

The five sub-scales relevant to this component are as follows:

- **Gregarious versus Intimate**
 - **Gregarious.** These persons derive satisfaction from being with other people. They join groups primarily to satisfy a desire for belonging and pursuing popularity is seen as a means to this end. They are as much at home with acquaintances as with friends and are generally poised (Saunders, 1989).
 - **Intimate.** These persons derive satisfaction from maintaining complicated informal relationships with a few significant others. They have a tendency to seek deep friendships and real one-to one involvement's, even at the expense of superficial popularity. They treat others as individuals and expect to be treated the same way (Saunders, 1989).
- **Enthusiastic versus Quiet**

- **Enthusiastic.** These people want to be where the action is, and keep up with the action everywhere else. They enjoy being the centre of attention and contribute wit and humour to a group. These people can be noisy and flirtatious, or eccentric, impulsive show-offs. They feel that if life is not exciting it is not really life (Saunders, 1989).
- **Quiet.** These people prefer calm and serenity and even silence. They are not attracted to the centre of action and avoid drawing attention to themselves. They have a tendency toward modesty and conservatism and are most comfortable with people who are the same (Saunders, 1989).
- **Initiating versus Receiving**
 - **Initiating.** These people are committed to acting as social facilitators. They are assertively outgoing, performing social amenities with finesse and building bridges between others to help them get to know one another (Saunders, 1989).
 - **Receiving.** These people display little social initiative and tend to be quiet and shy even to the point of silence. They find social amenities relatively unimportant and tend to leave them for someone else to do (Saunders, 1989).
- **Expressive versus Contained**
 - **Expressive.** These people readily show their feelings and make their interests obvious. The feelings that are expressed are typically positive, warm and humorous. These persons find it easy to confide in others and describe themselves as easy to know (Saunders, 1989).
 - **Contained.** These persons inhibit expression of their feelings and interests. They describe themselves as difficult to know. Their primary emotional responses are internal and they may find it difficult to confide in others. The more upset they become the less they allow to show (Saunders, 1989).
- **Participative versus Reflective**
 - **Participative.** These persons prefer sound as their medium of communication. They like to speak and listen, rather than to read and write (Saunders, 1989).
 - **Reflective.** These persons prefer to read and write, rather than to speak and listen (Saunders, 1989).

4.6.1.3.3.2 Sensing versus Intuition

The five sub-scales relevant to this component are as follows:

- **Concrete versus Abstract**

- **Concrete.** These persons need to achieve clarity in perception. They depend on the facts, which they treat in methodical, literal way. Furthermore, they are cautious not to go beyond the facts (Saunders, 1989).
- **Abstract.** These people are comfortable with the non-literal interpretation of stimuli. They tend to be more interested in the association value of a stimulus than in the stimulus itself. These people tend to be reflective and artistic (Saunders, 1989).
- **Realistic versus Imaginative**
 - **Realistic.** These people prefer practicality and cost-effectiveness. They pride themselves on common sense and place a high value on personal comfort and family security (Saunders, 1989).
 - **Imaginative.** These people enjoy exercising cleverness and ingenuity for their own sake. They are resourceful in dealing with new and unusual experiences (Saunders, 1989).
- **Practical versus Inferential**
 - **Practical.** These people maintain a primary focus on material things. They are interested in physical comforts that can be experienced in the here and now. The application of an idea appeals to them more than the idea itself (Saunders, 1989).
 - **Inferential.** These people maintain a primary focus on mental virtuosity. They tend to score well on IQ tests and enjoy the role of scholar where they can exercise their skill at acquiring knowledge (Saunders, 1989).
- **Experiential versus Theoretical**
 - **Experiential.** These persons rely primarily on direct experience. They are particularly cautious not to over generalise and tend to be fussy and adamant about details, even at the expense of larger considerations (Saunders, 1989).
 - **Theoretical.** These people trust and use theory as well as being equally comfortable at inventing new theories. They spontaneously search for patterns in any array of facts. They are seen as being resourceful and insightful (Saunders, 1989).
- **Traditional versus Original**
 - **Traditional.** These people identify strongly with the familiar. They admire and support established institutions or methods simply because they exist and provide a precedent (Saunders, 1989).
 - **Original.** These people have a strong sense of uniqueness. They need to demonstrate originality and may be clever, ingenious, adventurous and enterprising. They tend to take initiative to expound their original ideas (Saunders, 1989).

4.6.1.3.3 Thinking versus Feeling

The five sub-scales relevant to this component are as follows:

- **Critical versus Accepting**
 - **Critical.** These people tend to be argumentative and sceptical. They take nothing for granted and concede nothing in return. They may behave as if in an adversarial state were normal and view every situation as a potential “win–lose” opportunity (Saunders, 1989).
 - **Accepting.** These people are praiseful, forgiving, kind and tolerant towards others. They expect others to respond in the same way towards them. They view the “win-win” solutions of problems as possible and worth striving for (Saunders, 1989).
- **Tough versus Tender**
 - **Tough.** These people use “muscle” to achieve objectives. There is a one-sided quality to their toughness and they tend to free of internal contradictions. Furthermore, they frequently base interactions on the assumptions that alternatives do not exist (Saunders, 1989).
 - **Tender.** These people use affection and gentleness to achieve objectives. Behind their gentleness lies awareness that there are two contradictory sides to many issues, which makes it impossible to reach purely rational resolutions (Saunders, 1989).
- **Questioning versus Accommodating**
 - **Questioning.** These people are intellectually independent and like to think for themselves, even though others will not automatically or widely share some of their conclusions (Saunders, 1989).
 - **Accommodating.** These persons manifest modesty and deference. They like consensus and find that a simple way to achieve this is to agree with the viewpoints of others (Saunders, 1989).
- **Logical versus Empathetic**
 - **Logical.** These persons value and trust logic and place emphasis on its use in everyday life, notwithstanding their actual skill at applying it (Saunders, 1989).
 - **Empathetic.** These people place a heavy emphasis on emotion in everyday decision making. They value and trust their own feelings regardless of their effectiveness in using them (Saunders, 1989).
- **Reasonable versus Compassionate**
 - **Reasonable.** These people demonstrate logic in everyday decision making by effectively using sequential reasoning. They appear to be confident and clear thinking (Saunders, 1989).

- **Compassionate.** These persons are in touch with their own emotions in everyday decision making. They are effective at knowing their likes and dislikes (Saunders, 1989).

4.6.1.3.3.4 Judging versus Perceiving

The five sub-scales relevant to this component are as follows:

- **Early starting versus Pressure prompted**
 - **Early starting.** These people like to allow plenty of time so that an activity can be carried out efficiently, without fuss and bother. They accomplish most by doing one thing at a time and seeking to structure their lives in accordance with this rule (Saunders, 1989).
 - **Pressure prompted.** These people find that a certain degree of stress facilitates any activity. They are happiest and most productive when trying to do several things at once. They are prone to let things pile up just to create a more satisfying challenge (Saunders, 1989).
- **Systematic versus Casual**
 - **Systematic.** These people are interested in the thoroughness of the planning process, especially contingency planning. They don't enjoy being caught by surprise and want to be able to deal with any situation (Saunders, 1989).
 - **Casual.** These people display a high tolerance for surprise. They are comfortable with taking things as they come and adjusting their activities as necessary. These people are characterised by others as being leisurely (Saunders, 1989).
- **Scheduled versus Spontaneous**
 - **Scheduled.** These people are comfortable with routine. They regard tried methods and tested routines as the only reliable, efficient way to get things done. Routine provides them with an important degree of comfort and security (Saunders, 1989).
 - **Spontaneous.** These people are uncomfortable with routine, which they view as a liability rather than an asset. They find those routine requirements are likely to interfere with their responses to unexpected opportunities. They usually have a wide range of interests, hence the exposure to wide range of opportunities (Saunders, 1989).
- **Planful versus Open-ended**
 - **Planful.** These people are especially interested in long range planning. They regard it a their duty to be concerned about the future. They focus their energies and plan activities days and weeks in advance (Saunders, 1989).

- **Open-ended.** These people refer to make decisions on the spur of the moment. They value freedom, live in the here and now and like to go with the flow. They dislike being tied down by long range plans and prefer plans to be flexible (Saunders, 1989).
- **Methodical versus Emergent**
 - **Methodical.** These persons develop plans in great detail. They program themselves in advance in a very thorough and precise way. They identify and order specific steps well before undertaking any project (Saunders, 1989).
 - **Emergent.** These people take an ad hoc approach to problem solving. They plunge ahead without detailed plans even though they acknowledge the risks involved with such an approach (Saunders, 1989).

4.6.1.4 Reliability and validity of the MBTI Step II

4.6.1.4.1 Reliability

Research into the reliability of the MBTI has been conducted using both the Classical Test Theory and the Item Response Theory approaches. The Classical Test Theory method has examined the internal consistency as well as the temporal stability of the instrument. The Item Response Theory method has focused on the way in which people who score differently on the instrument's scales tend to respond differently to the individual test items (Hammer, 1996).

According to Hammer (1996), an overwhelming number of researchers have examined the internal consistency of the MBTI scales using the split-half method. Although inconsistencies in findings were reported these could be ascribed to the use of very small samples and that these research result had succumbed to the effects of sampling error. Research on a sample of N=100 000 subjects using the split-half method has produced an average reliability on the MBTI of .84. According to Hammer (1996:8): "This level of internal consistency compares very favourably with results obtained from popular trait-based instruments". Further evidence of internal consistency is provided by Harvey and Murray (in Hammer, 1996), who reported a pooled alpha coefficient of .85 across the four MBTI scales in the course of their examination of the size of the confidence intervals that would be expected for the MBTI scales.

Temporal stability as a measure of the reliability of the MBTI has been tested using test-retest situations. Hammer (1996) is of the opinion that test-retest situations provide at least two highly desirable properties. Firstly, the question as to how stable the MBTI scores would be when subjected to repeat testing could be addressed. Secondly, the estimates of reliability are not likely to be negatively biased due to the presence of heterogeneity within the four main MBTI item pools (Hammer, 1996). According to Hammer (1996), test-retest studies using shorter inter test intervals tend to produce correlations that are higher than those using longer inter test intervals. Research findings have indicated that the average short inter-test interval correlations fall in the vicinity of .80, whereas the long inter test interval correlation averages fall within .60 - .70 range. It would thus appear that the shorter inter test interval results are better at indicating temporal stability of the instrument. Hammer (1996) suggests that the sample size of N=1600

used for the test retest studies should be given careful consideration and that the research results should be viewed as being less conclusive than the internal consistency results obtained from the split-half studies.

A further estimate of test retest reliability lies in assignment of type category i.e. the extent to which the individuals four letter type designation e.g. ENFP changes from one test to the next. Research has indicated that categorical stability is generally quite consistent across the four scales and consistently superior for shorter inter test intervals. The nine month and shorter inter test interval groups produce average type stability rates in the low-to-mid 80% range for all four MBTI scales. The longer inter test interval groups produce stability percentages in the mid 70% (Hammer, 1996). According to Hammer (1996) these results generally reflect a very good degree of test retest similarity, especially when the inevitable loss of information that results whenever any continuous scale is dichotomised is taken into consideration. A further research finding of categorical stability studies was that when changes did occur in categorisation it was found that the change occurred in that scale in which the individual initially exhibited a very low numerical preference. These changes in preference are regarded by Hammer (1996) as being supportive of the hypothesis that measurement errors near the cut-off scores may be prime determinant of type instability in test retest situations.

Reliability research into the MBTI using the Item Response Theory method found that the distribution of scores for the MBTI scales was bimodal in nature. These findings lend support for the dichotomization of preference scores in order to produce categorical types. However, research findings also indicated that the reliability of correctly categorising individuals falling within the uncertainty zones around the type cut-offs was a point of concern (Hammer, 1996).

4.6.1.4.2 Validity

According to Hammer (1996) a numerous number of strategies exist that can be applied to collect evidence regarding the question of the validity of the MBTI. Those strategies that pose the greatest psychometric concern for the validity of the instrument are firstly, convergent and discriminant validity and secondly, construct validity.

The aim with convergent validity is to determine whether the MBTI scales correlate strongly with scores on other measures with which there is an expectation for them to correlate strongly. In contrast the aim of discriminant validity is to assess whether the scales that purport to measure different constructs actually demonstrate the desired degree of separation among themselves. According to Hammer (1996) a great deal of correlational evidence has been reported that provides proof of convergent and discriminant validity of the MBTI scales. Of particular importance is the degree of convergence that has been observed between the four primary scales of the MBTI and the Five Factor Model of personality, which achieved a great deal of popularity in recent years among proponents of trait based approaches (Hammer, 1996).

According to Hammer (1996:17): "The question of what the factor structure of the MBTI looks like is a fundamentally important one with respect to assessing the instrument's validity; in essence, finding that the factor structure is as it was predicted to be by its authors represents compelling evidence in support

of the construct validity of the MBTI". Two basic kinds of factor analytic studies have been performed on the MBTI namely, exploratory and confirmatory factor analyses.

Hammer (1996:18) is of the opinion that: "It seems most appropriate to characterise the results of the exploratory factor studies as having produced positive—but hardly definitive—support for the hypothesised MBTI factor structure. This can be concluded from the following facts: (a) several large-sample exploratory studies have reported results that are extremely similar to the predicted MBTI four-factor model, and (b) studies that have not recovered the predicted factor structure can be criticised with respect to one or more of the decisions they made when conducting their analyses."

With regard to confirmatory factor analysis, several studies have been conducted. Johnson and Saunders (in Hammer, 1996) analysed the sub-scales produced by the Form J, Expanded Analysis Report scoring system to determine the degree to which they grouped into the predicted overall scales of the instrument. The results of the study indicated clear support for the plausibility of the predicted hierarchical structure of the instrument. However, the absence of any meaningful competing models limits the breadth of the conclusions that can be drawn. A study by Thompson and Borrello (in Hammer, 1996) examined the degree to which the predicted MBTI structure holds at the item level. Their conclusion was that the four-factor model fit well in their sample. However, a firm conclusion regarding performance of the four-factor hypothesis model could not be drawn due to the absence of a competing model. An item level study conducted by Harvey, Murray and Stamoulis (in Hammer, 1996) tested three competing views of the latent structure of the MBTI. The results of the study provided strong support for the validity of the predicted four-factor model. In addition the study also provided evidence of fundamental flaws in the competing models.

In summary, the exploratory and confirmatory factor analytic results provide a clear and positive conclusion regarding the construct validity of the MBTI.

4.6.2 Neethling Brain Instrument (NBI)

4.6.2.1 Background

The developer of the Neethling Brain Instrument (NBI), Dr Kobus Neethling, has been mentioned in nine international Who's Who publications for the contribution he has made to the field of creative development and is recognised as a leader on the subject of creativity. Studying under Torrance, Neethling did extensive research into the split brain studies of Sperry, Bogen and Gazzaniga. Neethling was later introduced to the brain dominance research of Herrmann, Wonder, Donovan, Moore and others, which led to the development of the Neethling Brain Instrument program. This program was the culmination of two years of extensive empirical research and practical experimentation, which resulted in a unique program, based on the four-quadrant theory. This theory proposes that an individual's preferred modes of knowing and thinking can be clustered into four distinct quadrants, as discussed earlier (Neethling, 1996).

4.6.2.2 Aim of the questionnaire

The Neethling Brain Instrument was originally created as a tool for selection purposes and multi-dimensional evaluation. However, users of the instrument world-wide are placing greater emphasis on the NBI as a personal development tool, to be used during training and development interventions (Neethling, 1997).

4.6.2.3 Questionnaire composition and scales

The Neethling Brain Instrument (NBI) consists of two programmes. One programme is for children aged 11 to 17 years of age, the other is for adults. The instrument comprises 30 questions to which there are no right or wrong answers, or good or bad responses. A total of 300 points are scored on the instrument. These points are distributed over four quadrants. Each of the quadrants has definite situational implications, which indicate a preference for performing certain tasks or mastering certain skills. It is important to keep in mind that the NBI does not measure ability or skill, but indicates a preference. This preference indicates how an individual would act toward other people, communicate, learn, solve problems and make decisions (Neethling *et al*, 1996).

4.6.2.3.1 An explanation of the scales

The NBI indicates scores in four quadrants. Each scale depicts a score in one of the quadrants. The quadrants lie either left or right and either upper or lower. The left and right division indicates the hemisphere of the brain that is in use. The upper two quadrants represent functioning in the Cerebral Cortex and the lower quadrants represent Limbic System functioning.

The scores on the NBI serve as guidelines and should rather be interpreted in terms of categories than a specific numerical value. The higher the score in any specific quadrant/s the stronger and more visible the preferences are. Scores on the NBI can be allocated to the following five categories:

- **Category 1 (95+)** This score indicates that an individual has a very strong preference for the use of that quadrant. If the Individual's personal circumstances are in harmony with that preference those circumstances can be regarded as being highly desirable.
- **Category 2 (80-94)** This score indicates that an individual has a strong preference for the use of that quadrant. If the Individual's personal circumstances are in harmony with that preference those circumstances can be regarded as being desirable.
- **Category 3 (65-79)** This score indicates that an individual has an average preference for the use of that quadrant. This score indicates that the individual is comfortable with the processes of that particular quadrant.
- **Category 4 (50-64)** This score indicates that an individual has a low preference for the use of that quadrant. A low preference indicates that the individual views the attributes and characteristics of that process as merely functional and clearly secondary. The individual will prefer other the processes of other quadrants, but will not necessarily avoid the processes of this quadrant.

- **Category 5 (30-49)** This score indicates that an individual has a very low preference for the use of that quadrant. A very low preference may indicate that the individual is lacking the processes and procedures of that quadrant or even that the features of the quadrant are being avoided or rejected.

4.6.2.3.2 An explanation of the four quadrant scales

- **The L1 Quadrant (Upper Left)**

Individuals with a strong L1 preference are characterised by a logical approach to problem solving. They don't express much emotion, but seem concerned with factual accuracy and the evaluation of facts. There is a focus on exactness and preciseness among these persons (Neethling *et al*, 1996).

- **The R1 Quadrant (Upper Right)**

Individuals with a strong R2 preference are characterised by a preference for the "big picture", rather than focusing on the detail. They are able to see hidden possibilities and do not always act according to the set rules. They rely on their "gut-feeling" to solve problems and prefer to do their own thing (Neethling *et al*, 1996).

- **The L2 Quadrant (Lower Left)**

Individuals with a strong L2 preference are characterised by their need to organise and keep track of essential information. They ensure the timely implementation of projects, keep a firm hand on financial matters and place security as a priority (Neethling *et al*, 1996).

- **The R2 Quadrant (Lower Right)**

Individuals with a strong R2 preference are characterised by having a gut feel for people and situations. They are adept at reading body language and enjoy social interaction with others in-groups or as individuals (Neethling *et al*, 1996).

4.6.2.4 Reliability and validity of the Neethling Brain Profile

According to Neethling (1997), the reliability and validity of the NBI lies in the sound theory of four quadrant thinking, which has been confirmed through research in the works of Sperry, Gazzaniga and Ornstein. This research found that hemispherical brain processes could be identified and measured. Furthermore, Neethling (1997) refers to unpublished research that affirms that:

- Four stable preference groupings exist.
- That the four groupings are compatible with the NBI model.
- That the scores indicated by the NBI are valid indications of the four groupings.
- That valid conclusions can be made from the scores of a person's thinking preferences.
- That the instrument complies not only with strong professional standards as a measuring instrument but can also be utilised as an instrument for counselling, development, teaching, communication, culture etc.

Neethling (1997) is of the opinion that structural validity is most applicable with regard to the NBI. The structure of the Whole Brain Thinking approach recognises that an individual's dominance score can change over a period of time as a result of a variety of influences. Despite these influences, the test-retest scores of the first 1000 assessments demonstrated the following reliability:

- Left .89
- Right .89
- L1 Quadrant .79
- L2 Quadrant .82
- R2 Quadrant .83
- R1 Quadrant .86.

With regard to the NBI being culturally unbiased, no formal research has been conducted. However, at face value no cultural bias is evident. This is deduced from the fact no negative reports have been received from members of the indigenous cultures of Africa whom completed the assessment (Neethling, 1997). It should be kept in mind that the purpose for which the assessment results are used could influence the perception of the fairness of the instrument.

4.7 STATISTICAL PROCEDURES

The processing and analysis of the research data was done using the SPSS statistical software package (Norušis, 1994). Various statistical techniques were used in the various stages of the research. The statistical procedures that were employed in the research are summarised in Table 4.2.

Table 4.2 STATISTICAL PROCEDURES APPLIED IN THE RESEARCH

Phase of Research	Type of Statistic	Procedure	Method	Statistic
Relationship between sub-scales of the MBTI Step II and Creative Thinking Preference	Inferential	Zero order correlations	Pearson Correlation	r
	Descriptive	Average preferences for the sample	Averages	\bar{x}
Analysis of variables to identify underlying factor structure to determine relationship between MBTI preferences and Creative Thinking Preference	Inferential	Factor analysis	Principle Component Analysis	λ_a r
Causal Relationship between Personality Type Preferences and Creative Thinking Preference	Inferential	Analysis of variance	Multiple Regression Analysis	R F sr_i^2 R^2 β

Table 4.2 indicates the existence of two variables namely; personality type and creative thinking preference. The relationship between these variables is the principle aim of this study. In order to determine if any relationship exists between the sub-scales of the MBTI Step II and the creative thinking preferences of the Neethling Brain Instrument the data was analysed by examining the using the Pearson

Product Moment correlation statistic. Furthermore, a descriptive examination of the average scores on the NBI for each of the sixteen MBTI types was conducted.

In the second phase of the research the data was subjected too Principle Component Analysis. The purpose for this form of factor analysis was twofold. Firstly, evidence would be provided as to whether the four creative thinking style preference ratings and the twenty MBTI Step II sub-scale ratings were measuring the same underlying constructs. Secondly, data simplification would be achieved and allow for more convenient reporting on the actual MBTI preferences e.g. introversion (I) or sensing (S).

In the final phase of the research an explanatory relationship between the NBI ratings and the MBTI dimensions (E,I,S,N,T,F,J & P) was investigated. A Multiple Regression Analysis of Variance was conducted on the data using the NBI ratings as dependent variables and the factor loadings of the MBTI sub-scales for each of the identified factors as independent variables.

The results of these analyses are reported in the following chapter (5).

CHAPTER 5

RESEARCH RESULTS AND DISCUSSION

5.1 REPORTING OF RESEARCH RESULTS

In this chapter the results of the research will be presented and discussed. The null hypotheses will be tested statistically in order to determine if there is a significant correlation between the dimensions of personality type and creative thinking preference.

5.1.1 Size, composition and distribution of the sample

The sample used in the research consists of 305 subjects. 271 (88.9%) of the sample are males and 34 (11.1%) are females employed in 1st, 2nd and 3rd level managerial positions. The distributions of the MBTI personality profiles of the total sample are presented in Table 5.1. The gender distribution of the sample is also indicated.

Table 5.1: *DISTRIBUTION OF MBTI RESULTS*

ISTJ N=86 28.2% Male = 80 Female = 6	ISFJ N=10 3.3% Male = 6 Female = 4	INFJ N=2 0.7% Male = 2 Female = 1	INTJ N=24 7.9% Male = 21 Female = 3
ISTP N=18 9.2% Male = 16 Female = 2	ISFP n=2 0.7% Male = 1 Female = 1	INFP N=3 1.0% Male = 2 Female = 1	INTP n=11 3.6% Male = 10 Female = 1
ESTP N=20 6.6% Male = 18 Female = 2	ESFP n=0 0% Male = 0 Female = 0	ENFP N=4 1.3% Male = 3 Female = 1	ENTP n=16 5.2% Male = 15 Female = 1
ESTJ N=80 26.2% Male = 74 Female = 6	ESFJ N=5 1.6% Male = 2 Female = 3	ENFJ N=3 1.0% Male = 2 Female = 1	ENTJ n=21 6.9% Male = 20 Female = 1

An examination of Table 5.1 indicates that the majority of the members of the sample are ISTJs (28.2%). The second largest group is the ESTJs (26.2%). The third largest group is ISTPs (9.2%). The STJ grouping thus forms the largest portion of the sample (54.4%) and the ST preference is shared among 63.6% of the sample. The fourth largest grouping is formed by the INTJs (7.9%) and in fifth place are the ENTJs (6.9%). Thus NTJs represent 14.8% of the sample and the NT preference is shared by 25,6% of the sample. The sixth largest group is the ESTPs (6.6%), which increases the representation of the ST preference to 70.2% of the sample. The seventh and eighth places are filled by the ENTPs (5.2%) and the INTPs (3.6%) respectively. This raises the NT representation to 25.6% of the sample. The SFJ

grouping represents 4.9%, and the SFP grouping 0.7% of the sample. The NFP grouping represents 2.3%, and the NFJ grouping represents 1.7% of the sample. The ESFP grouping of the sample contained zero members.

Furthermore, the sample can be seen to have the following representivity with regard to each of the MBTI preferences:

- Extroverts (E): n = 149.
- Introverts (I): n = 156.
- Sensing (S): n = 221
- Intuition (N): n = 84
- Thinking (T): n = 276
- Feeling (F): n = 29
- Judging (J): n = 231
- Perceiving (P): n = 74

5.1.2 Correlation between sub-scales of the MBTI Step II and Creative Thinking Preference

To investigate the existence of a correlation between the sub-scales of the MBTI Step II and the NBI ratings, a Pearson Product Moment analysis was conducted to calculate the required inferential statistics. The descriptive statistics were derived from calculating the average ratings on the four NBI scales for each of the sixteen MBTI groupings.

The results of these analyses are presented in tables (5.2 to 5.7).

5.1.2.1 Results of Pearson Product Moment Analysis

It is pointed out that the sub-scale ratings of the MBTI Step II are constructed in such a manner that a low score indicates a preference for either extroversion, sensing, thinking and judging and high scores a preference for introversion, intuition, feeling and perceiving. Thus, negative correlation's between the NBI dimensions and the MBTI sub-scales would actually indicate a positive correlation with those preferences associated with a low score.

5.1.2.1.1 The Correlation Between the Introversion/Extroversion Sub-Scales and the Thinking Preferences of the NBI

The following null hypotheses are tested in Table 5.2:

- There is no significant correlation between the Gregarious versus Intimate scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Enthusiastic versus Quiet scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Initiating versus Receiving scale and the respective thinking preferences (L1, L2, L3 &L4).

- There is no significant correlation between the Expressive versus Contained scale and the respective thinking preferences (L1, L2, L3 &L4).
- There is no significant correlation between the Participative versus Reflective scale and the respective thinking preferences (L1, L2, L3 &L4).

An examination of Table 5.2 leads to the conclusion that a significant correlation exists between all of the various sub-scales of the Introversion/Extroversion attitude of the MBTI. These correlations are significant at a 99% level of confidence. Further examination of the data provides evidence of the following. That the preferences for L1, Left Upper and L2, Left Lower quadrant use are significantly related to the Participative vs Reflective sub-scale of the MBTI at a 95% level of confidence. The preference for R1, Right Upper quadrant use is significantly related to the Initiating vs Receiving sub-scales of the MBTI at a 95% level of confidence. The preference for R2, Right Lower quadrant use is negatively related to the Enthusiastic vs Quite and Expressive vs Controlled sub-scales of the MBTI at a 99% level of confidence. Furthermore, the preference for R2, Right Lower quadrant use is negatively related to the Initiating vs Receiving sub-scales of the MBTI at a 95% level of confidence.

Table 5.2: PEARSON CORRELATION OF THE RELATIONSHIP BETWEEN THE INTROVERSION/EXTRAVERSION SUB-SCALES OF THE MBTI AND THE THINKING PREFERENCES OF THE NBI

	Gregarious vs Intimate	Enthusiastic vs Quite	Initiating vs Receiving	Expressive vs Controlled	Participative vs Reflective
Gregarious vs Intimate	r =1.00** P =0.0				
Enthusiastic vs Quite	r =0.48** P =0.00	r =1.00** P =0.0			
Initiating vs Receiving	r =0.47** P =0.00	r =0.31** P =0.00	r =1.00** P =0.0		
Expressive vs Controlled	r =0.45** P =0.00	r =0.39** P =0.00	r =0.38** P =0.00	r =1.00** P =0.0	
Participative vs Reflective	r =0.57** P =0.00	r =0.45** P =0.00	r =0.28** P =0.00	r =0.40** P =0.00	r =1.00** P =0.0
L1 Left Upper Cerebral	r =-0.02 P =0.78	r =0.11 P =0.06	r =-0.01 P =0.86	r =0.07 P =0.22	r =0.11* P =0.05
L2 Left Lower Limbic	r =0.07 P =0.25	r =0.07 P =0.20	r =-0.02 P =0.74	r =0.06 P =0.30	r =0.16* P =0.01
R1 Right Upper Cerebral	r =0.03 P =0.66	r =0.05 P =0.44	r =0.14* P =0.01	r =0.08 P =0.17	r =-0.13 P =0.03
R2 Right Lower Limbic	r =-0.08 P =0.17	r =-0.21** P =0.00	r =-0.14* P =0.02	r =-0.20** P =0.00	r =-0.10 P =0.09

** Significant at 99% level of confidence (p ≤ 0.001)

* Significant at 95% level of confidence (p ≤ 0.05)

The null hypothesis that there is no significant correlation between the Gregarious versus Intimate scale and the respective thinking preferences (L1, L2, L3 & L4) is not rejected. The other null hypotheses are rejected. However, it is noted that the correlation coefficients on which the null hypotheses were rejected ranged from low ($r = 0.13$) to moderate ($r = 0.21$). Thus the rejection of these null hypotheses should be regarded as tentative and that generalisation of the acceptance of the research hypotheses must be made with care.

5.1.2.1.2 The Correlation Between the Sensing/Intuition Sub-Scales and the Thinking Preferences of the NBI

The following null hypotheses are tested in Table 5.3:

- There is no significant correlation between the Concrete versus Abstract scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Realistic versus Imaginative scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Practical versus Inferential scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Experiential versus Theoretical scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Traditional versus Original scale and the respective thinking preferences (L1, L2, L3 & L4).

An examination of Table 5.3 leads to the conclusion that a significant correlation exists between all of the various sub-scales of the sensing/intuition function of the MBTI. These correlations are significant at a 99% level of confidence. Further examination of the data provides evidence of the following. That the preferences for L1, Left Upper quadrant thinking are negatively related to the Concrete vs Abstract as well as the Realistic vs Imaginative sub-scales of the MBTI at a 99% level of confidence. Furthermore, L1 is negatively related to the Experiential vs Theoretical sub-scale of the MBTI at a 95% level of confidence. The preference for L2, Left Lower quadrant thinking is negatively related to all the sub-scales of the Sensing/Intuition function at a 99% level of confidence. The preference for R1, Right Upper quadrant thinking is significantly related to all of the sub-scales of the Sensing/Intuition function, except for Practical vs Inferential, at a 99% level of confidence. The preference for R2, Right Lower quadrant thinking is significantly related to the Concrete vs Abstract as well as the Traditional vs Original sub-scales of the MBTI Step II, at a 95% level of confidence.

All of the stated null hypotheses are thus rejected. It is noted that strong correlation coefficients were obtained for the correlations between the preference for L2, Left Lower quadrant thinking and the respective sub-scales as well as the R1, Right Upper quadrant thinking and the respective sub-scales. Furthermore the left quadrant thinking is negatively correlated and the right quadrant is positively correlated. The L1, Left Upper quadrant thinking preference is also negatively correlated with three of the sub-scales. These correlations range from low, through moderate up to strong. The correlation coefficient's obtained for the R2, Right Lower quadrant thinking preference are low and should thus be interpreted with care.

Table 5.3: PEARSON CORRELATION OF THE RELATIONSHIP BETWEEN THE SENSING/INTUITION SUB-SCALES OF THE MBTI AND THE THINKING PREFERENCES OF THE NBI

	Concrete vs Abstract	Realistic vs Imaginative	Practical vs Inferential	Experiential vs Theoretical	Traditional vs Original
Concrete vs Abstract	$r = 1.00^{**}$ $P = 0.0$				
Realistic vs Imaginative	$r = 0.46^{**}$ $P = 0.00$	$r = 1.00^{**}$ $P = 0.0$			
Practical vs Inferential	$r = 0.14^*$ $P = 0.02$	$r = 0.30^{**}$ $P = 0.00$	$r = 1.00^{**}$ $P = 0.0$		
Experiential vs Theoretical	$r = 0.40^{**}$ $P = 0.00$	$r = 0.46^{**}$ $P = 0.00$	$r = 0.17^*$ $P = 0.00$	$r = 1.00^{**}$ $P = 0.0$	
Traditional vs Original	$r = 0.39^{**}$ $P = 0.00$	$r = 0.47^{**}$ $P = 0.00$	$r = 0.18^*$ $P = 0.00$	$r = 0.43^{**}$ $P = 0.00$	$r = 1.00^{**}$ $P = 0.0$
L1 Left Upper Cerebral	$r = -0.38^{**}$ $P = 0.00$	$r = -0.26^{**}$ $P = 0.00$	$r = -0.09$ $P = 0.13$	$r = -0.13^*$ $P = 0.03$	$r = -0.10$ $P = 0.07$
L2 Left Lower Limbic	$r = -0.47^{**}$ $P = 0.00$	$r = -0.46^{**}$ $P = 0.00$	$R = -0.05$ $P = 0.39$	$r = -0.38^{**}$ $P = 0.00$	$r = -0.31^{**}$ $P = 0.00$
R1 Right Upper Cerebral	$r = 0.54^{**}$ $P = 0.00$	$r = 0.54^{**}$ $P = 0.00$	$R = 0.10$ $P = 0.08$	$r = 0.45^{**}$ $P = 0.00$	$r = 0.48^{**}$ $P = 0.00$
R2 Right Lower Limbic	$r = 0.13^*$ $P = 0.02$	$r = 0.03$ $P = 0.64$	$R = 0.00$ $P = 0.95$	$r = -0.05$ $P = 0.38$	$r = -0.17^*$ $P = 0.00$

** Significant at 99% level of confidence ($p \leq 0.001$)

* Significant at 95% level of confidence ($p \leq 0.05$)

5.1.2.1.3 The Correlation Between the Thinking/Feeling Sub-Scales and the Thinking Preferences of the NBI

The following null hypotheses are tested in Table 5.4:

- There is no significant correlation between the Critical versus Accepting scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Tough versus Tender scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Questioning versus Accommodating scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Logical versus Empathetic scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Reasonable versus Compassionate scale and the respective thinking preferences (L1, L2, L3 & L4).

An examination of Table 5.4 leads to the conclusion that a significant correlation exists between all of the various sub-scales of the thinking/feeling function of the MBTI. These correlations are significant at a 99% level of confidence. Further examination of the data provides evidence of the following. That the preference for L1, Left Upper quadrant thinking is negatively related to all of the subscales of the Thinking/Feeling function of the MBTI at a 99% level of confidence. The preference for L2, Left Lower quadrant thinking is negatively related to the Critical vs Accepting, Logical vs Empathetic and the Reasonable vs Compassionate sub-scales of the Thinking/Feeling function at a 95% level of confidence. The preference for R1, Right Upper quadrant thinking is significantly related to the Questioning vs Accommodating sub-scale of the Thinking/Feeling function of the MBTI at a 95% level of confidence. The preference for R2, Right Lower quadrant thinking is significantly related to all the sub-scales of the MBTI Step II, at a 99% level of confidence.

Table 5.4: PEARSON CORRELATION OF THE RELATIONSHIP BETWEEN THE THINKING/FEELING SUB-SCALES OF THE MBTI AND THE THINKING PREFERENCES OF THE NBI

	Critical vs Accepting	Tough vs Tender	Questioning vs Accommodating	Logical vs Empathetic	Reasonable vs Compassionate
Critical vs Accepting	r =1.00** P =0.0				
Tough vs Tender	r =0.56** P =0.00	R =1.00** P =0.0			
Questioning vs Accommodating	r =0.21** P =0.00	R =0.26** P =0.00	r =1.00** P =0.0		
Logical vs Empathetic	r =0.29** P =0.00	R =0.30** P =0.00	r =0.16* P =0.01	r =1.00** P =0.0	
Reasonable vs Compassionate	r =0.45** P =0.00	R =0.35** P =0.00	R =0.26** P =0.00	r =0.23** P =0.00	r =1.00** P =0.0
L1 Left Upper Cerebral	r =-0.37** P =0.00	R =-0.35** P =0.00	R =-0.19** P =0.00	r =-0.27** P =0.00	r =-0.36** P =0.00
L2 Left Lower Limbic	r =-0.18* P =0.00	R =-0.08 P =0.20	R =0.11 P =0.07	r =-0.12* P =0.04	r =-0.15* P =0.01
R1 Right Upper Cerebral	r =0.01 P =0.83	R =-0.11 P =0.06	R =-0.14* P =0.01	r =0.04 P =0.55	r =0.02 P =0.78
R2 Right Lower Limbic	r =0.45** P =0.00	R =0.47** P =0.00	R =0.22** P =0.00	r =0.29** P =0.00	r =0.41** P =0.00

** Significant at 99% level of confidence (p ≤ 0.001)

* Significant at 95% level of confidence (p ≤ 0.05)

All of the stated null hypotheses are thus rejected. It is noted that very strong correlations of r=0.37, r=0.35 and r=0.36 were obtained for the correlations between the preference for L1, Left Upper quadrant thinking and the Critical vs Accepting, Tough vs Tender and Reasonable vs Compassionate sub-scales

respectively. Furthermore, a moderate correlation was obtained on the Logical vs Empathetic sub-scale and a low correlation was obtained on the Questioning vs Accommodating sub-scale. Of further importance are the strong negative correlations that were obtained for the correlations between the preference for R1, Right Upper quadrant thinking and the Critical vs Accepting, Tough vs Tender and Reasonable vs Compassionate sub-scales. Furthermore, it is noted that moderate correlations were obtained for the correlation between the Logical vs Empathetic and Questioning vs Accommodating sub-scales.

Low negative correlation coefficients were obtained for the correlation between the L2, Lower Left quadrant thinking and the Critical vs Accepting, Reasonable vs Compassionate and Logical vs Empathetic sub-scales. Finally a low negative correlation was obtained for the correlation between R1, Right Upper quadrant thinking and the Questioning vs Accommodating sub-scale.

5.1.2.1.4 The Correlation between the Judging/Perceiving Sub-scales and the Thinking Preferences of the NBI

The following null hypotheses are tested in Table 5.5:

- There is no significant correlation between the Early starting versus Pressure prompted scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Systematic versus Casual scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Scheduled versus Spontaneous scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Planful versus Open-ended scale and the respective thinking preferences (L1, L2, L3 & L4).
- There is no significant correlation between the Methodical versus Emergent scale and the respective thinking preferences (L1, L2, L3 & L4).

An examination of Table 5.5 leads to the conclusion that a significant correlation exists between all of the various sub-scales of the Judging/Perceiving attitudes of the MBTI. These correlations are significant at a 99% level of confidence. Further examination of the data provides evidence of the following. That the preference for L2, Left Lower quadrant thinking is negatively related to all of the sub-scales of the Judging/Perceiving attitude of the MBTI at a 99% level of confidence. Of equal importance is the significant correlation between R1, Right Upper quadrant thinking and all of the sub-scales of the Judging/Perceiving attitude of the MBTI at a 99% level of confidence. The L1, Left Upper quadrant preference is also significantly related to the sub-scales of the Perceiving/Judging attitude at a 99% level of confidence except for the Methodical vs Emergent sub-scale, which is related at a 95% level of confidence. The R1, Right Upper quadrant preference is significantly related to the Early starting vs Pressure prompted sub-scale at a 99% level of confidence. Furthermore, the R2, Lower Right quadrant preference is significantly related to the Systematic vs Casual, Planful vs Open ended and Methodical vs Emergent sub-scales at a 95% level of confidence.

Table 5.5: PEARSON CORRELATION OF THE RELATIONSHIP BETWEEN THE JUDGING/PERCEIVING SUB-SCALES OF THE MBTI AND THE THINKING PREFERENCES OF THE NBI

	Early Starting vs Pressure Prompted	Systematic vs Casual	Scheduled vs Spontaneous	Planful vs Open Ended	Methodical vs Emergent
Early Starting vs Pressure Prompted	r =1.00** P =0.0				
Systematic vs Casual	r =0.51** P =0.00	r =1.00** P =0.0			
Scheduled vs Spontaneous	r =0.36** P =0.00	r =0.44** P =0.00	r =1.00** P =0.0		
Planful vs Open Ended	r =0.42** P =0.00	r =0.51** P =0.00	r =0.40** P =0.00	r =1.00** P =0.0	
Methodical vs Emergent	r =0.42** P =0.00	r =0.50** P =0.00	r =0.30** P =0.00	r =0.40** P =0.00	r =1.00** P =0.0
L1 Left Upper Cerebral	r =-0.20** P =0.00	r =-0.22** P =0.00	r =-0.15** P =0.01	r =-0.26** P =0.00	r =-0.17* P =0.00
L2 Left Lower Limbic	r =-0.46** P =0.00	r =-0.47** P =0.00	r =-0.40** P =0.00	r =-0.50** P =0.00	r =-0.33** P =0.00
R1 Right Upper Cerebral	r =0.35** P =0.00	r =0.41** P =0.00	r =0.38** P =0.00	r =0.48** P =0.00	r =0.25** P =0.00
R2 Right Lower Limbic	r =0.19** P =0.00	r =0.16* P =0.01	r =0.06 P =0.28	r =0.13* P =0.03	r =0.16* P =0.01

** Significant at 99% level of confidence ($p \leq 0.001$)

* Significant at 95% level of confidence ($p \leq 0.05$)

All of the stated null hypotheses are thus rejected. It is noted that strong correlations were obtained for the correlations between the preference for both L2, Left Lower quadrant thinking and R1, Right Upper quadrant thinking and the sub-scales of the Judging/Perceiving attitude of the MBTI. The correlations obtained for the correlation between L1, Left Upper quadrant thinking and the sub-scales of the Judging Perceiving attitude can be regarded as being moderate to low and thus subject to careful interpretation. The correlations obtained for the correlation between the R2, Right Lower quadrant thinking and the sub-scales of the Judging/Perceiving attitude can be regarded as being low and should thus be interpreted with care.

An examination of Table 5.6 leads to the following conclusions. The L2, Left Lower quadrant thinking preference is significantly related to L1, Left Upper quadrant thinking at a 99% level of confidence. The L1, Left Upper quadrant preference is significantly related to the R1, Right Upper quadrant preference at a 99% level of confidence. This strong correlation coefficient indicates a negative correlation between the

two variables. Thus an increase in one preference indicates a decrease in the other. The L1, Left Upper quadrant thinking is significantly related to the R2, Right Lower quadrant thinking at a 99% level of confidence. This very strong correlation indicates a negative correlation between the two variables. Thus an increase in one preference indicates a significant decrease in the other. It can thus be concluded that a sound measure of discrimination exists between the various dimensions except for L1 and L2 that share a significant correlation.

5.1.2.1.5 Intercorrelation of NBI Thinking Preferences

Table 5.6: PEARSON CORRELATION OF THE RELATIONSHIP BETWEEN THE THINKING PREFERENCES OF THE NBI

	L1 Left Upper	L2 Left Lower	R1 Right Upper	R2 Right Lower
L1 Left Upper Cerebral	r =1.00** P =0.0			
L2 Left Lower Limbic	r =0.36** P =0.00	r =1.00** P =0.0		
R1 Right Upper Cerebral	r =-0.42** P =0.00	r =-0.75** P =0.00	r =1.00** P =0.0	
R2 Right Lower Limbic	r =-0.66** P =0.00	r =-0.38** P =0.00	r =-0.10 P =0.10	r =1.00** P =0.0

** Significant at 99% level of confidence ($p \leq 0.001$)

5.1.2.1.6 Conclusion

In summary the following conclusions can be reached. A strong correlation exists between the sub-scales of the Sensing function and the L2, Lower Left quadrant thinking. A moderate correlation exists between the sub-scales of the Sensing function and the L1, Left Upper quadrant thinking. The R1, Right Upper quadrant preference is strongly correlated with the sub-scales of the Intuition function. The L1, Upper Left quadrant preference correlates moderately to strongly with the sub-scales of the Thinking function of the MBTI. The R2, Lower Right quadrant preference correlates moderately to strongly with the sub-scales of the Feeling function of the MBTI. The sub-scales of the Judging attitude correlate strongly with the L2, Lower Left quadrant preference and moderately with the L1, Left Upper quadrant preference. The R1, Right Upper quadrant thinking process correlates strongly with the sub-scales of the Perceiving attitude of the MBTI. The R2, Right Lower quadrant thinking process correlates weakly with the sub-scales of the Perceiving attitude.

5.1.2.2 Average Ranking of NBI preferences in relation to MBTI profiles

The preceding results indicate that significant correlations do exist between the sub-scales of the various MBTI dimensions of personality and the thinking style preferences of the NBI. The full potential and strength of the MBTI personality dimensions can only be fully exploited if the various dimensions of the

MBTI are examined as a complete type descriptor e.g. ENFP. The examination of the various MBTI descriptors may cast some light on the prediction of thinking style preferences as well as strengthening the existing evidence of a correlation between the two instruments.

The subsequent discussion will focus on the descriptive analysis of the research data. The ipsative nature of the NBI rating scales provides an opportunity to arrange the thinking style preferences in order from the strongest to the weakest preference. The results of this data analysis are presented in Table 5.7. Average scores were calculated for each thinking style preference and arranged from strongest to weakest preference for each of the sixteen MBTI personality profiles.

Table 5.7: NBI PREFERENCES PER MBTI PROFILES

Type	N	High	→	→	Low
ISTJ	80	L1 Avg. = 91.26	L2 Avg. = 85.17	R1 Avg. = 73.61	R2 Avg. = 68.7
ESTJ	80	L1 Avg. = 84.56	L2 Avg. = 77.19	R1 Avg. = 69.2	R2 Avg. = 65.3
ISTP	18	L1 Avg. = 85.17	R1 Avg. = 79.06	L2 Avg. = 71.5	R2 Avg. = 64.28
ESTP	20	L1 Avg. = 82	R1 Avg. = 80.55	R2 Avg. = 68.9	R2 Avg. = 68.55
ISFP	2	L1 Avg. = 79.5	L2 Avg. = 75.5	R1 Avg. = 74.5	R2 Avg. = 70.5
ESFP	0	-	-	-	-
ISFJ	10	L1 Avg. = 79.5	L2 Avg. = 77.4	R2 Avg. = 75.9	R1 Avg. = 67.2
ESFJ	5	L2 Avg. = 81.4	L1 Avg. = 81	R2 Avg. = 79	R1 Avg. = 58.6
INTJ	24	R1 Avg. = 72.25	L1 Avg. = 77.71	L2 Avg. = 69.86	R2 Avg. = 60.71
ENTJ	21	R1 Avg. = 83.33	L1 Avg. = 82.57	L2 Avg. = 71.43	R2 Avg. = 62.67
INTP	11	R1 Avg. = 92.46	L1 Avg. = 79.27	R2 Avg. = 65.46	L2 Avg. = 62.82
ENTP	16	R1 Avg. = 86.44	L1 Avg. = 73.56	R2 Avg. = 62.94	L2 Avg. = 58.31
INFJ	2	R1 Avg. = 89.5	L1 Avg. = 77	R2 Avg. = 67	L2 Avg. = 66.5
ENFJ	3	R2 Avg. = 82.33	R1 Avg. = 76.67	L2 Avg. = 71.67	L1 Avg. = 69.33
INFP	3	R1 Avg. = 91	R2 Avg. = 85.33	L1 Avg. = 67.67	L2 Avg. = 56
ENFP	4	R1 Avg. = 96.25	R2 Avg. = 92.5	L1 Avg. = 60.25	L2 Avg. = 51

The following observations were drawn from an analysis of the results displayed in Table 5.7:

- The following MBTI profiles all have a primary preference for a L1, Left Upper quadrant thinking: ISTJ, ESTJ, ISTP, ESTP, ISFP and ISFJ. Of these profiles the following show a secondary preference for L2, Lower Left quadrant thinking: ISTJ, ESTJ, ISFP and ISFJ. The ISTP and ESTP profiles show a secondary preference for R1, Upper Right quadrant thinking. It should also be noted

that the difference between the average score for the secondary preference and the average score for the third preference, of the ISFP and ISFJ profiles, are almost equal.

- The next group of MBTI profiles is those that shows a primary preference for R1, Upper Right quadrant thinking, namely: INTJ, ENTJ, INTP, ENTP, INFJ, INFP and ENFP. . Of these profiles the following show a secondary preference for L1, Upper Left quadrant thinking, namely: INTJ, ENTJ, INTP, ENTP and INFJ. The INFP and ENFP profiles show a secondary preference for R2, Lower Right quadrant thinking.
- The ESFJ profile shows a primary preference for L2, Lower Left quadrant thinking and a secondary preference for L1, Upper Left quadrant thinking. The ENFJ profile shows a primary preference for R2, Lower Right quadrant thinking and a secondary preference for R1, Upper Right quadrant thinking.
- There was no data for the ESFP profile.

In conclusion it would appear that the profiles with STJ dimensions show a predominantly left brain preference. Conversely, the profiles with NFP dimensions show a predominantly right brain preference. Furthermore, the difference in average ratings of the secondary and tertiary preference, for those profiles containing SFP or SFJ dimensions, are negligible. The profiles that have a STP, NTP or NTJ dimension all share a quadrant from each side of the brain as either a primary or secondary preference.

5.1.2.3 Conclusion

The preceding discussion has provided evidence that significant correlations do exist between the various sub-scales of the MBTI and the thinking style preferences of the NBI. However, the significance of these correlations range from weak to strong, providing a challenge as to determining which of these correlations have any practical value. Furthermore, it cannot be stated with certainty, which thinking style preferences are significantly related to which of the principle dimensions of the MBTI i.e. E, I, S, N, T, F, J & P. In order to meet this challenge a factor analytic method will be employed in the following section.

PEARSON PRODUCT MOMENT CORRELATION MATRIX FOR MBTI STEP II AND NBI RATINGS

		Introversion/Extraversion					Sensing/Intuition					Thinking/Feeling					Judging/Perceiving					Thinking Styles				
		Ingregious vs Intimate	Enthusiastic vs Quite	Initiating vs Receiving	Expressive vs Controlled	Participative vs Reflective	Concrete vs Abstract	Realistic vs Imaginative	Practical vs Inferential	Experiential vs Theoretical	Traditional vs Original	Critical vs Accepting	Tough vs Tender	Questioning vs Accommodating	Logical vs Empathetic	Reasonable vs Compassionate	Early Starting vs Pressure Prompted	Systematic vs Casual	Scheduled vs Spontaneous	Planful vs Open Ended	Methodical vs Emergent	L1 Left Upper	L2 Left Lower	R1 Right Upper	R2 Right Lower	
Introversion/ Extraversion	Oregarious vs Intimate	r = 1.00** p = 0.0																								
	Enthusiastic vs Quite	r = 0.48** p = 0.000	r = 1.00** p = 0.0																							
	Initiating vs Receiving	r = 0.47** p = 0.000	r = 0.31** p = 0.000	r = 1.00** p = 0.0																						
	Expressive vs Controlled	r = 0.45** p = 0.000	r = 0.38** p = 0.000	r = 0.38** p = 0.000	r = 1.00** p = 0.0																					
	Participative vs Reflective	r = 0.57** p = 0.000	r = 0.45** p = 0.000	r = 0.28** p = 0.000	r = 0.40** p = 0.000	r = 1.00** p = 0.0																				
Sensing/Intuition	Concrete vs Abstract	r = -0.10 p = 0.079	r = -0.08 p = 0.142	r = -0.05 p = 0.397	r = -0.01 p = 0.853	r = -0.13** p = 0.022	r = 1.00** p = 0.0																			
	Realistic vs Imaginative	r = -0.13 p = 0.030	r = -0.10 p = 0.090	r = -0.01 p = 0.867	r = -0.01 p = 0.710	r = -0.22** p = 0.000	r = 0.48** p = 0.000	r = 1.00** p = 0.0																		
	Practical vs Inferential	r = 0.02 p = 0.780	r = 0.08 p = 0.148	r = -0.09 p = 0.138	r = -0.02 p = 0.012	r = -0.04 p = 0.694	r = 0.14* p = 0.019	r = 0.30** p = 0.000	r = 1.00** p = 0.0																	
	Experiential vs Theoretical	r = -0.04 p = 0.480	r = -0.14* p = 0.20	r = 0.05 p = 0.425	r = 0.01 p = 0.817	r = -0.13* p = 0.028	r = 0.40** p = 0.000	r = 0.48** p = 0.000	r = 0.17* p = 0.004	r = 1.00** p = 0.0																
	Traditional vs Original	r = -0.08 p = 0.281	r = 0.02 p = 0.783	r = 0.13 p = 0.024	r = 0.03 p = 0.639	r = -0.14* p = 0.013	r = 0.36** p = 0.000	r = 0.47** p = 0.000	r = 0.18* p = 0.000	r = 0.43** p = 0.000	r = 1.00** p = 0.0															
	Critical vs Accepting	r = -0.05 p = 0.442	r = -0.24** p = 0.000	r = -0.07 p = 0.235	r = -0.10 p = 0.087	r = -0.11 p = 0.089	r = -0.20** p = 0.000	r = 0.16* p = 0.007	r = 0.12* p = 0.040	r = 0.01 p = 0.836	r = -0.04 p = 0.485	r = 1.00** p = 0.0														
	Tough vs Tender	r = -0.12 p = 0.035	r = -0.18** p = 0.001	r = -0.13* p = 0.005	r = -0.08 p = 0.194	r = -0.12 p = 0.080	r = -0.10 p = 0.067	r = 0.09 p = 0.139	r = 0.10 p = 0.098	r = -0.03 p = 0.801	r = -0.07 p = 0.198	r = 0.56** p = 0.000	r = 1.00** p = 0.0													
Thinking/Feeling	Questioning vs Accommodating	r = 0.14 p = 0.016	r = 0.05 p = 0.422	r = 0.03 p = 0.631	r = 0.03 p = 0.634	r = 0.21** p = 0.000	r = -0.08 p = 0.107	r = -0.12* p = 0.032	r = 0.05 p = 0.400	r = -0.21** p = 0.000	r = -0.15* p = 0.008	r = 0.21** p = 0.000	r = 0.26** p = 0.000	r = 1.00** p = 0.0												
	Logical vs Empathetic	r = -0.08 p = 0.178	r = -0.11 p = 0.060	r = -0.15* p = 0.008	r = -0.14* p = 0.016	r = -0.07 p = 0.262	r = 0.12* p = 0.041	r = 0.16* p = 0.007	r = 0.18** p = 0.001	r = 0.09 p = 0.121	r = 0.08 p = 0.122	r = 0.29** p = 0.000	r = 0.30** p = 0.000	r = 0.16* p = 0.006	r = 1.00** p = 0.0											
	Reasonable vs Compassionate	r = 0.10 p = 0.075	r = 0.08 p = 0.338	r = 0.00 p = 0.947	r = -0.01 p = 0.838	r = 0.07 p = 0.248	r = 0.13* p = 0.025	r = 0.12* p = 0.047	r = 0.05 p = 0.375	r = 0.04 p = 0.454	r = 0.00 p = 0.993	r = 0.45** p = 0.000	r = 0.35** p = 0.000	r = 0.26** p = 0.000	r = 0.23** p = 0.000	r = 1.00** p = 0.0										
	Early Starting vs Pressure Prompted	r = -0.05 p = 0.354	r = -0.04 p = 0.523	r = -0.07 p = 0.208	r = -0.12* p = 0.031	r = -0.12* p = 0.035	r = 0.20** p = 0.000	r = 0.20** p = 0.001	r = 0.02 p = 0.782	r = 0.08 p = 0.184	r = 0.11 p = 0.051	r = 0.18* p = 0.002	r = 0.18* p = 0.002	r = 0.04 p = 0.512	r = 0.05 p = 0.398	r = 0.15* p = 0.01	r = 1.00** p = 0.0									
	Systematic vs Casual	r = 0.02 p = 0.798	r = 0.02 p = 0.778	r = -0.02 p = 0.771	r = -0.12* p = 0.044	r = -0.10 p = 0.086	r = 0.28** p = 0.000	r = 0.17* p = 0.003	r = 0.05 p = 0.434	r = 0.08 p = 0.180	r = 0.08 p = 0.157	r = 0.14* p = 0.017	r = 0.08 p = 0.298	r = 0.02 p = 0.731	r = 0.08 p = 0.147	r = 0.08 p = 0.287	r = 0.15** p = 0.000	r = 1.00** p = 0.0								
Judging/Perceiving	Scheduled vs Spontaneous	r = -0.04 p = 0.470	r = 0.00 p = 0.957	r = 0.07 p = 0.211	r = 0.00 p = 0.980	r = -0.03 p = 0.572	r = 0.25** p = 0.000	r = 0.18* p = 0.002	r = 0.08 p = 0.524	r = 0.08 p = 0.008	r = 0.11 p = 0.070	r = 0.14* p = 0.017	r = 0.04 p = 0.470	r = 0.12* p = 0.034	r = -0.01 p = 0.933	r = 0.00 p = 0.982	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	r = 0.08 p = 0.000	
	Planful vs Open Ended	r = -0.12 p = 0.041	r = -0.08 p = 0.298	r = -0.02 p = 0.748	r = -0.09 p = 0.108	r = -0.19** p = 0.001	r = 0.41** p = 0.000	r = 0.35** p = 0.000	r = 0.02 p = 0.738	r = 0.19** p = 0.001	r = 0.06 p = 0.271	r = 0.20** p = 0.000	r = 0.20** p = 0.000	r = 0.08 p = 0.167	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	r = 0.01 p = 0.816	
	Methodical vs Emergent	r = 0.15* p = 0.009	r = 0.10 p = 0.099	r = 0.07 p = 0.208	r = 0.03 p = 0.579	r = 0.06 p = 0.320	r = 0.20** p = 0.001	r = 0.12* p = 0.036	r = 0.04 p = 0.549	r = 0.05 p = 0.380	r = 0.07 p = 0.200	r = 0.17* p = 0.003	r = 0.02 p = 0.795	r = 0.02 p = 0.945	r = -0.02 p = 0.793	r = 0.13* p = 0.028	r = 0.42** p = 0.000	r = 0.50** p = 0.000	r = 0.30** p = 0.000	r = 0.40** p = 0.000	r = 0.40** p = 0.000	r = 0.40** p = 0.000	r = 0.40** p = 0.000	r = 0.40** p = 0.000	r = 0.40** p = 0.000	
	L1 Left Upper	r = -0.02 p = 0.775	r = 0.11 p = 0.057	r = -0.01 p = 0.858	r = 0.07 p = 0.224	r = 0.11* p = 0.050	r = -0.38** p = 0.000	r = -0.28** p = 0.000	r = -0.09 p = 0.133	r = -0.13* p = 0.028	r = -0.10 p = 0.072	r = -0.37** p = 0.000	r = -0.35** p = 0.000	r = -0.19** p = 0.001	r = -0.27** p = 0.000	r = -0.36** p = 0.000	r = -0.20** p = 0.000	r = -0.22** p = 0.000	r = -0.15** p = 0.009	r = -0.26** p = 0.000	r = -0.17* p = 0.003	r = 1.00** p = 0.0				
	L2 Left Lower	r = 0.07 p = 0.248	r = 0.07 p = 0.202	r = -0.02 p = 0.739	r = 0.08 p = 0.301	r = 0.16* p = 0.005	r = -0.47** p = 0.000	r = -0.46** p = 0.000	r = -0.05 p = 0.368	r = -0.05 p = 0.000	r = -0.05 p = 0.000	r = -0.31** p = 0.000	r = -0.18* p = 0.002	r = -0.08 p = 0.197	r = 0.12 p = 0.088	r = -0.12* p = 0.040	r = -0.15* p = 0.011	r = -0.48** p = 0.000	r = -0.47** p = 0.000	r = -0.40** p = 0.000	r = -0.50** p = 0.000	r = -0.33** p = 0.000	r = 0.38** p = 0.000	r = 1.00** p = 0.0		
	R1 Right Upper	r = 0.07 p = 0.858	r = 0.05 p = 0.439	r = 0.14* p = 0.013	r = 0.08 p = 0.165	r = -0.13 p = 0.027	r = 0.54** p = 0.000	r = 0.54** p = 0.000	r = 0.10 p = 0.084	r = 0.45** p = 0.000	r = 0.48** p = 0.000	r = 0.01 p = 0.831	r = -0.11 p = 0.061	r = -0.14* p = 0.014	r = 0.04 p = 0.547	r = 0.02 p = 0.778	r = 0.35** p = 0.000	r = 0.41** p = 0.000	r = 0.38** p = 0.000	r = 0.48** p = 0.000	r = 0.25** p = 0.000	r = -0.42** p = 0.000	r = -0.75** p = 0.000	r = 1.00** p = 0.0		
	R2 Right Lower	r = -0.08 p = 0.174	r = -0.21** p = 0.000	r = -0.14* p = 0.018	r = -0.21** p = 0.000	r = -0.10 p = 0.080	r = 0.13* p = 0.023	r = 0.03 p = 0.837	r = 0.00 p = 0.953	r = 0.05 p = 0.376	r = -0.17* p = 0.004	r = 0.45** p = 0.000	r = 0.47** p = 0.000	r = 0.22** p = 0.000	r = 0.29** p = 0.000	r = 0.41** p = 0.000	r = 0.19** p = 0.001	r = 0.16* p = 0.005	r = 0.08 p = 0.277	r = 0.13* p = 0.027	r = 0.16* p = 0.005	r = -0.66** p = 0.000	r = -0.38** p = 0.000	r = -0.10 p = 0.098	r = 1.00** p = 0.0	

5.1.3 Principal Component Analysis

The principal component analysis method will serve two purposes. Firstly, it will be applied to identify if any of the thinking style preferences are measuring the same factor as that which the sub-scales of the MBTI are measuring. Secondly, to reduce the number of variables, which will be used, to determine if a significant correlation exists between the principle dimensions of the MBTI and the thinking styles of the NBI (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992).

An examination of the correlation matrix in Table 5.8 indicates the existence of four distinct clusters of strongly correlated variables. Furthermore, the structure of the MBTI provides a four-factor model for the classification of personality. Through the application of principle component analysis it can be determined if these four factors actually do exist. Principle component analysis comprises two phases. The first phase comprises the extraction of factors and the second phase the rotation of factors (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992).

5.1.3.1 Principle Component Analysis of MBTI sub-scales and NBI thinking style preferences

The factor extraction phase of the principle component analysis comprises a number of steps. The first step is to calculate the eigenvalues in order to identify the overall strength between the factor and the original variables. Factors that possess a value of ≥ 1 can be regarded as being stable (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992). The Eigenvalues for the research data are contained in Table 5.9.

Table 5.9: *LATENT ROOTS (EIGENVALUES) FOR PRINCIPLE COMPONENT ANALYSIS OF MBTI SUB-SCALES AND NBI THINKING STYLE PREFERENCES*

Factors	1	2	3	4	5
Eigenvalues	5.137	3.175	2.640	1.938	1.076
Factors	6	7	8	9	10
Eigenvalues	0.901	0.849	0.785	0.715	0.704
Factors	11	12	13	14	15
Eigenvalues	0.653	0.621	0.569	0.556	0.524
Factors	16	17	18	19	20
Eigenvalues	0.491	0.456	0.446	0.415	0.401
Factors	21	22	23	24	
Eigenvalues	0.342	0.321	0.285	0.000	

As can be seen from the eigenvalues in Table 5.9, five stable factors have been identified i.e. factors with a value of >1 . The next step in the principle component process is the extraction of just the right number of factors. To assist in this process a scree curve has been plotted in figure 5.1. The factors that are not extracted are those that occur below the point on the curve where the plotted factors add appreciably to the cumulative variance explained by the eigenvalues. This point usually occurs as a definitive elbow in the scree curve. The optimal factor solution is thus one factor less than the solution corresponding to this elbow (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992). For the data under investigation the optimal number of factors to be extracted is thus four.

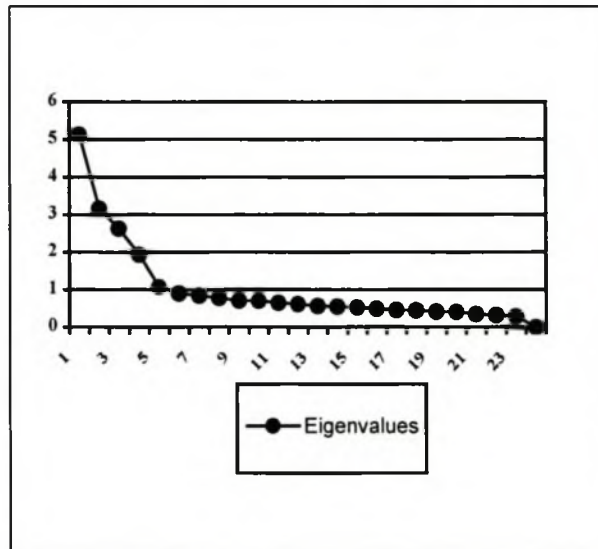


Figure 5.1: Scree Plot of Eigenvalues

The next step in the principle component process is to evaluate the quality of the factor solution. A good factor solution is one that explains the most variance with the fewest factors. A factor solution that explains between 50-75% of the variance can be accepted as satisfactory (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992). The factor solution for current research is depicted in Table 5.10.

Table 5.10: *VARIANCE EXPLAINED BY COMPONENTS (UNROTATED)*

Factors	1	2	3	4	Total
Variance	5.137	3.175	2.640	1.938	
% of total variance explained	21.404	13.228	11.000	8.073	53.70%

The results in Table 5.10 indicate that, Factor 1 explains 21.4% of the variance in the original variables. Factor 2 explains 13.2% of the variance in the original variables. Factor 3 explains 11% and Factor 4 explains 8.1% of the variance in the original variables. In total the variance explained by the four extracted factors accounts for 53.7% of the variance in the original variables, thus an adequate factor solution.

The next phase in the principal component analysis involves the orthogonal rotation of the factor structure. The aim of factor rotation is to achieve a simpler factor structure i.e. one that is more interpretable. The data is subjected to an orthogonal rotation, which entails maintaining the perpendicular nature of the axes along which the data is plotted, while the axes are rotated left or right. Orthogonal factor rotation is typified by two characteristics. The first is that the rotated factors explain the same amount of total variance as the unrotated factors do, but that this variance is redistributed. The second characteristic is that the rotated factor structure is considerably simpler and thus easier to interpret (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992). The results of the rotated factor structure are indicated in Table 5.11.

Table 5.11: *VARIANCE EXPLAINED BY COMPONENTS (ROTATED)*

Factors	1	2	3	4	Total
Variance	3.572	3.218	2.867	3.232	
% of total variance explained	14.882	13.410	11.945	13.468	53.705%

A varimax rotation was used to rotate the original factor structure for the following reasons. Firstly, factor interpretation is facilitated in that the numbers of variables that load strongly on a factor are minimised. The second reason is that this form of rotation minimises the proportion of variance explained by each factor (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992). The results in Table 5.11 indicate that Factor 1 explains 14.84% of the variance in the original variables. Factor 2 explains 13.4% of the variance in the original variables. Factor 3 explains 12% and Factor 4 explains 13.5% of the variance in the original variables. In total the variance explained by the four extracted factors accounts for 53.7% of the variance in the original variables, thus an adequate factor solution.

The product of the rotated factor structure is the factor structure matrix, which is depicted in Table 5.12. An examination of the factor loading patterns provides an indication of which variables load on which factor. For the purposes of this study only variables that meet the criteria of a $> .40$ loading will be regarded as being interpretable (Kerlinger, 1986; Diekhoff, 1992; Kline, 1992).

5.1.3.1.1 Interpretation of factors

The four factors presented in the factor structure matrix have been named as follows. Factor 1 Structured vs Loose, Factor 2 Fact oriented vs People oriented, Factor 3 Introversive vs Extraversive, and Factor 4 Detail focused vs Holistic. Each of these factors will be interpreted in the subsequent section.

Factor 1; Structured vs Loose, loads on all the sub-scales of the Judging-Perceiving attitude of the MBTI Step II. These sub-scales are, Systematic vs Casual, Early Starting vs Pressure Prompted, Methodical vs Emergent and Scheduled vs Spontaneous. It would appear that the Systematic vs Casual scale is the best measure of the factor. A further analysis of the data reveals that the L2, Left Lower quadrant preference of the NBI loads negatively on Factor 1. This negative value indicates that high scores on the L2 scale are related to low scores on the Judging attitude sub-scales of the MBTI. This is a result of the bipolar stem scale used to plot the results of the MBTI scoring and that the pole indicating a Judging preference is indicated by a value of <5 . Furthermore, it should be noted that the L2, Left Lower quadrant scale of the NBI is also negatively loaded on Factor 4, Detail focus vs Pattern orientation. The negative loading can be attributed to the same explanation given previously regarding the bipolar stem scale along which MBTI sub-scale scores are plotted and the fact that the a preference for the Sensing function is indicated by a scores of <5 .

A further finding is that the R1, Right Upper quadrant scale of the NBI is loaded on Factor 1 as well as on Factor 4. The finding that both the L2, Left Lower scale and R1, Right Upper scale load on Factor 1 and Factor 4 even though an orthogonal varimax rotation was done on the factor axes is unique. The

conclusion that can be reached is that the L2, Left Lower quadrant scale and the R1, Right Upper quadrant scale, each measure two unique factors,

Table 5.12 ROTATED LOADING MATRIX (VARIMAX)

Variables	Factor 1: Structured vs Loose	Factor 2: Fact Oriented vs People oriented	Factor 3: Introversion vs Extroversion	Factor 4: Detail focus vs Pattern orientation
Systematic vs Casual	0.795**	0.069	-0.026	0.027
Early Starting vs Pressure Prompted	0.705**	0.158	-0.089	0.046
Methodical vs Emergent	0.701**	0.089	0.166	-0.061
Planful vs Open Ended	0.691**	-0.042	-0.145	0.300
L2 Left Lower Limbic	-0.639**	-0.170	0.073	-0.473**
Scheduled vs Spontaneous	0.639**	-0.033	0.011	0.101
R1 Right Upper Cerebral	0.534**	-0.065	0.083	0.673**
R2 Right Lower Limbic	0.219	0.755**	-0.175	-0.106
Critical vs Accepting	0.110	0.730**	-0.110	0.046
Tough vs Tender	-0.001	0.722**	-0.166	-0.030
Reasonable vs Compassionate	0.041	0.678**	0.110	0.050
L1 Left Upper Cerebral	-0.282	-0.645**	0.016	-0.268
Questioning vs Accommodating	-0.107	0.507**	0.222	-0.232
Logical vs Empathetic	-0.065	0.504**	-0.135	0.195
Gregarious vs Intimate	0.030	0.046	0.824**	-0.084
Participative vs Reflective	-0.065	0.022	0.735**	-0.216
Enthusiastic vs Quite	0.055	-0.174	0.698**	-0.068
Expressive vs Controlled	-0.105	-0.071	0.698**	0.140
Initiating vs Receiving	0.020	-0.085	0.647**	0.162
Realistic vs Imaginative	0.168	0.109	-0.090	0.761**
Experiential vs Theoretical	0.026	-0.037	-0.059	0.728**
Traditional vs Original	0.105	-0.129	0.008	0.718**
Concrete vs Abstract	0.366	0.164	-0.048	0.602**
Practical vs Inferential	-0.147	0.183	0.143	0.422**

** Criteria of >0.40

Factor 2; Fact oriented vs People oriented, loads on all the sub-scales of the Thinking-Feeling function of the MBTI Step II. These sub-scales are Critical vs Accepting, Tough vs Tender, Reasonable vs Compassionate, Questioning vs Accommodating and Logical vs Empathetic. A further examination of the results indicates that the R2, Right Lower quadrant scale loads on Factor 2. Furthermore, it is the highest loading on this factor. The L1, Left Upper quadrant scale loads negatively on Factor 2. This is a result of the bipolar sten scale used to plot the results of the MBTI scoring and that the poles indicating a Thinking preference is indicated by a value of <5.

Factor 3; Introversion vs Extroversion, loads on all the sub-scales of the Introversion-Extroversion attitude of the MBTI Step II. These sub-scales are Gregarious vs Intimate, which also provides the highest factor loading, Participative vs Reflective, Enthusiastic vs Quiet, Expressive vs Controlled and Initiating vs Receiving.

Factor 4; Detail focused vs Holistic orientation, loads on all the sub-scales of the Sensing-Intuition function of the MBTI Step II. These sub-scales are Realistic vs Imaginative, which also provides the highest factor loading, Experiential vs Theoretical, Traditional vs Original, Concrete vs Abstract and Practical vs Inferential. As mentioned in the discussion of Factor 1, the L2, Left Lower and R1, Right Upper quadrant thinking scales both load significantly on Factor 4 as well.

5.1.3.2 Principle Component Analysis of MBTI only

The purpose of the principal component analysis of the MBTI only, is to see if the number of factors could possibly be reduced, to determine if a significant correlation exists between the principle dimensions of the MBTI and the thinking styles of the NBI. These calculations can thus be regarded as a process of data simplification.

Table 5.13: *LATENT ROOTS (EIGENVALUES) FOR PRINCIPLE COMPONENT ANALYSIS OF MBTI ONLY*

Factors	1	2	3	4	5
Eigenvalues	3.796	2.753	2.295	1.903	0.982
Factors	6	7	8	9	10
Eigenvalues	0.884	0.753	0.724	0.690	0.626
Factors	11	12	13	14	15
Eigenvalues	0.617	0.563	0.532	0.496	0.468
Factors	16	17	18	19	20
Eigenvalues	0.444	0.435	0.384	0.338	0.317

An examination of the data in Table 5.13 provides evidence of the existence of four stable factors that may be extracted. The extraction is based on the assumption that the factors with an eigenvalue of > 1 provides evidence that these factors explain more variance than that provided by any single original variable.

Table 5.14: *VARIANCE EXPLAINED BY COMPONENTS (ROTATED)*

Factors	1	2	3	4	Total
Variance	2.900	2.869	2.386	2.591	
% of total variance explained	14.500	14.345	11.931	12.954	53.73%

Scrutiny of Table 5.14 indicates that the total variance explained by the four extracted and rotated factors is 53.73%. This level of variance thus provides an adequate factor solution.

The factor structure matrix for the principal component analysis of the MBTI Step II, is depicted in Table 5.12. For the purposes of this study only variables that meet the criteria of a > .40 loading will be regarded as being interpretable.

5.1.3.2.1 Interpretation of factors

The four factors presented in the factor structure matrix have been named as follows. Factor 1 Judging vs Perceiving, Factor 2 Introversion vs Extroversion, Factor 3 Thinking vs Feeling, and Factor 4 Sensing vs Intuition. Each of these factors will be interpreted in the subsequent section.

Factor 1; Judging vs Perceiving, loads on all the sub-scales of the Judging-Perceiving attitude of the MBTI Step II. These sub-scales are Systematic vs Casual, which also provides the highest factor loading, Early Starting vs Pressure Prompted, Methodical vs Emergent and Scheduled vs Spontaneous. It would appear that the Systematic vs Casual scale is then best measure of the factor.

Table 5.15: ROTATED LOADING MATRIX (VARIMAX)

Variables	Factor 1: Judging/Perceiving	Factor 2: Introversion/Extroversion	Factor 3: Thinking/Feeling	Factor 4: Sensing/Intuition
Systematic vs Casual	0.807**	-0.028	0.054	0.032
Methodical vs Emergent	0.733**	0.162	0.071	-0.024
Early Starting vs Pressure Prompted	0.727**	-0.098	0.167	0.065
Planful vs Open Ended	0.701**	-0.147	-0.103	0.318
Scheduled vs Spontaneous	0.646**	0.000	-0.038	0.092
Gregarious vs Intimate	0.028	0.823**	0.050	-0.089
Participative vs Reflective	-0.068	0.739**	0.053	-0.215
Enthusiastic vs Quite	0.047	0.708**	-0.159	-0.069
Expressive vs Controlled	-0.102	0.703**	-0.041	0.137
Initiating vs Receiving	0.014	0.655**	-0.102	0.163
Critical vs Accepting	0.171	-0.142	0.761**	0.062
Tough vs Tender	0.059	-0.194	0.744**	-0.005
Reasonable vs Compassionate	0.076	0.084	0.695**	0.049
Questioning vs Accommodating	-0.092	0.200	0.556**	-0.266
Logical vs Empathetic	-0.038	-0.140	0.525**	0.207
Realistic vs Imaginative	0.181	-0.082	0.101	0.770**
Experiential vs Theoretical	0.011	-0.042	-0.055	0.733**
Traditional vs Original	0.123	0.016	-0.124	0.731**
Concrete vs Abstract	0.385	-0.059	0.121	0.605**
Practical vs Inferential	-0.099	0.156	0.226	0.470**

** > 0.40 criteria for interpretability

Factor 2; Introversion vs Extroversion, loads on all the sub-scales of the Introversion-Extroversion attitude of the MBTI Step II. These sub-scales are Gregarious vs Intimate, which also provides the highest factor loading, Participative vs Reflective, Enthusiastic vs Quiet, Expressive vs Controlled and Initiating vs Receiving.

Factor 3 Thinking vs Feeling, loads on all the sub-scales of the Thinking-Feeling function of the MBTI Step II. These sub-scales are Critical vs Accepting, Tough vs Tender, which also provides the highest factor loading, Reasonable vs Compassionate, Questioning vs Accommodating and Logical vs Empathetic.

Factor 4; Sensing vs Intuition, loads on all the sub-scales of the Sensing-Intuition function of the MBTI Step II. These sub-scales are Realistic vs Imaginative, which also provides the highest factor loading, Experiential vs Theoretical, Traditional vs Original, Concrete vs Abstract and Practical vs Inferential.

5.1.4 Multiple Regression Analysis of Variance

The purpose of the multiple regression analysis is to determine if the principle dimensions of the MBTI can explain variation in the thinking style dimensions of the NBI. The thinking style dimensions of the NBI were used as dependent variables and the dimensions of the MBTI were used as independent variables. A standard multiple regression strategy was used, in which all the independent variables were simultaneously entered into the regression equation. Each of the independent variables was assessed as if it had entered the regression equation after all the other independent variables had been entered. Thus each independent variable was evaluated in terms of what it added to the prediction of the dependent variable that was different from the predictability afforded by the other independent variables.

The standard multiple regression strategy was chosen for its appropriateness in assessing correlations among variables and answering the basic question of multiple correlations. The normal problem of intercorrelation between independent variables, which usually bedevils the interpretation of standard regression analysis results, would appear to be less of a concern in the interpretation of these research results. This argument is based on the existence of four clear factors, which were identified from the principle component analysis. The MBTI sub-scale loadings serve as the independent variables in the regression equation. Furthermore, the results of the correlation matrix (Table 5.8), appears to indicate significant correlations between elements of the independent variables and the dependent variables, but an absence of a significant intercorrelation among these elements. Thus the findings of the multiple regression analyses are presented with enough confidence (Kerlinger, 1986; Tabachnick & Fidell, 1996).

5.1.4.1 Multiple Regression Analysis using L1 as Dependent Variable and the Dimensions of the MBTI as Independent Variables

The null hypotheses that, there is no significant correlation between the L1, Left Upper quadrant thinking style of the NBI and the respective dimensions of the MBTI i.e. (E-I, S-N, T-F & J-P), was tested using the results of the multiple regression analysis of variance. The L1, Left Upper quadrant thinking style, of the NBI, as dependent variable and the dimensions of the MBTI as independent variables. The results of the calculations are depicted in Table 5.16.

The following can be concluded from the results depicted in Table 5.16. The use of a sample of N = 300 respondents and four independent variables is well above the minimum requirement for testing individual predictors in standard multiple regression. 3 cases were deleted due to missing data (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5:16 displays the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (β), the semi-partial correlations (sr^2), R and R^2 . R for regression (0.548) was significantly different from zero, $F=31.688$, $p<0.001$. Three of the independent variables contributed significantly to the prediction of L1, Left Upper quadrant thinking, Judging/Perceiving ($sr^2=0.06$), Thinking/Feeling ($sr^2=0.2$) and Sensing/Intuition ($sr^2=0.05$). The four independent variables in combination contributed another 0.312 in shared variability.

Altogether, 30.1% of the variability in L1, Left Upper quadrant preference was predicted by the results obtained on the four independent variables. The independent variable, Thinking/Feeling, contributed the most weight ($\beta=-0.438$) to predicting L1. The negative value for β indicates that as L1 on the NBI increases in value the TF scale of the MBTI will decrease, keeping in mind that a low value on the TF scale indicates a preference for the Thinking dimension. It can be concluded that the Thinking dimension of the MBTI is significantly related to the L1, Left Upper quadrant thinking preference of the NBI and thus the null hypothesis is rejected (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5.16: MULTIPLE REGRESSION ANALYSIS OF VARIANCE USING THE L1 LEFT UPPER QUADRANT PREFERENCE AS DEPENDENT VARIABLE AND THE DIMENSIONS OF THE MBTI AS INDEPENDENT VARIABLES

Standard Multiple Regression Analysis			
Description	Result	Description	Result
N	300	sr_{TF}^2	0.20
Multiple R	0.548	sr_{SN}^2	0.05
R^2	0.301	X_1 B (Judging-Perceiving)	-2.213
% Variance explained	30.1%	X_2 B (Extroversion-Introversion)	0.439
Standard error of estimate	7.522	X_3 B (Thinking-Feeling)	-3.906
F-ratio	31.688	X_4 B (Sensing-Intuition)	-1.919
Df	4 and 259	X_1 Weighted β (Judging-Perceiving)	-0.247
P	< 0.001 or 1%	X_2 Weighted β (Extroversion-Introversion)	0.049
Constant	83.162	X_3 Weighted β (Thinking-Feeling)	-0.438
sr_{JP}^2	0.06	X_4 Weighted β (Sensing-Intuition)	-0.214
sr_{EI}^2	0.002		

5.1.4.2 Multiple Regression Analysis using L2 as Dependent Variable and the Dimensions of the MBTI as Independent Variables

The null hypotheses that, there is no significant correlation between the L2, Left Lower quadrant thinking preference, of the NBI, and the respective dimensions of the MBTI i.e. (E-I, S-N, T-F & J-P), was tested using the results of the multiple regression analysis of variance using the L2, Left Lower quadrant thinking preference, of the NBI, as dependent variable and the principal dimensions of the MBTI as independent variables. The results of the calculations are depicted in Table 5.17.

Table 5.17 indicates that the use of a sample of $N = 300$ respondents and four independent variables is well above the minimum requirement for testing individual predictors in standard multiple regression. 3 cases were deleted due to missing data (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5.17: *MULTIPLE REGRESSION ANALYSIS OF VARIANCE USING THE L2 LEFT LOWER QUADRANT PREFERENCE AS DEPENDENT VARIABLE AND THE DIMENSIONS OF THE MBTI AS INDEPENDENT VARIABLES*

Standard Multiple Regression Analysis			
Description	Result	Description	Result
N	300	sr_{TF}^2	0.006
Multiple R	0.685	sr_{SN}^2	0.17
R ²	0.469	X ₁ b (Judging-Perceiving)	-5.629
% Variance explained	46.9%	X ₂ b (Extroversion-Introversion)	0.840
Standard error of estimate	7.615	X ₃ b (Thinking-Feeling)	-0.802
F-ratio	65.083	X ₄ b (Sensing-Intuition)	-4.230
Df	4 and 259	X ₁ Weighted β (Judging-Perceiving)	-0.542
P	< 0.001 or 1%	X ₂ Weighted β (Extroversion-Introversion)	0.080
Constant	74.628	X ₃ Weighted β (Thinking-Feeling)	-0.077
sr_{JP}^2	0.293	X ₄ Weighted β (Sensing-Intuition)	-0.406
sr_{EI}^2	0.006		

Table 5:17 displays the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (β), the semi-partial correlations (sr^2), R and R². R for regression (0.685) was significantly different from zero, $F=65.083$, $p<0.001$. Two of the independent variables contributed significantly to the prediction of L2, Left Lower quadrant thinking, Judging/Perceiving ($sr^2=0.293$) and Sensing/Intuition ($sr^2=0.17$). The four independent variables in combination contributed another 0.475 in

shared variability. Altogether, 46.9% of the variability in L2, Left Lower quadrant thinking preference was predicted by the results obtained on the four independent variables.

The independent variable, Judging/Perceiving, contributed the most weight ($\beta=-0.542$) to predicting L2. The independent variable, sensing/intuition, with a weighted contribution to L2 of ($\beta=-0.406$) is also highly significant of notice. The negative value for β for the above mentioned independent variables indicates that as L2 on the NBI increases in value the JP and SN scales of the MBTI will decrease, keeping in mind that a low value on the JP and SN scales indicate a preference for the Judging and Sensing dimensions respectively. It can be concluded that the Judging and Sensing dimensions of the MBTI are significantly related to the L2, Left Lower quadrant thinking preference of the NBI and thus the null hypothesis is rejected (Kerlinger, 1986; Tabachnick & Fidell, 1996).

5.1.4.3 Multiple Regression Analysis using the R1 as Dependent Variable and the Dimensions of the MBTI as Independent Variables

Table 5.18: MULTIPLE REGRESSION ANALYSIS OF VARIANCE USING THE R1 RIGHT UPPER QUADRANT PREFERENCE AS DEPENDENT VARIABLE AND THE DIMENSIONS OF THE MBTI AS INDEPENDENT VARIABLES

Standard Multiple Regression Analysis			
Description	Result	Description	Result
N	300	sr_{TF}^2	0.011
Multiple R	0.733	sr_{SN}^2	0.314
R ²	0.537	X ₁ b (Judging-Perceiving)	5.766
% Variance explained	53.7%	X ₂ b (Extroversion-Introversion)	0.765
Standard error of estimate	8.621	X ₃ b (Thinking-Feeling)	-1.295
F-ratio	85.406	X ₄ b (Sensing-Intuition)	7.079
Df	4 and 259	X ₁ Weighted β (Judging-Perceiving)	0.458
P	< 0.001 or 1%	X ₂ Weighted β (Extroversion-Introversion)	0.060
Constant	75.542	X ₃ Weighted β (Thinking-Feeling)	-0.103
sr_{JP}^2	0.21	X ₄ Weighted β (Sensing-Intuition)	0.561
sr_{EI}^2	0.004		

The null hypotheses that, there is no significant correlation between the R1, Right Upper quadrant preference, of the NBI, and the respective dimensions of the MBTI i.e. (E-I, S-N, T-F & J-P), was tested using the results of the multiple regression analysis of variance using the R1, Right Upper quadrant

preference as dependent variable and the dimensions of the MBTI as independent variables. The results of the calculations are depicted in Table 5.18.

Table 5.18 indicates that the use of a sample of $N = 300$ respondents and four independent variables is well above the minimum requirement for testing individual predictors in standard multiple regression. 3 cases were deleted due to missing data (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5:18 displays the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (β), the semi-partial correlations (sr^2), R and R^2 . R for regression (0.733) was significantly different from zero, $F=85.406$, $p<0.001$. Two of the independent variables contributed significantly to the prediction of R1, Right Upper quadrant thinking, Judging/Perceiving ($sr^2=0.210$) and Sensing/Intuition ($sr^2=0.314$). The four independent variables in combination contributed another 0.539 in shared variability. Altogether, 53.7% of the variability in R1, Right Upper quadrant preference was predicted by the results obtained for the four independent variables. The independent variable, sensing/intuition, contributed the most weight ($\beta=0.561$) to predicting R1. The independent variable, judging/perceiving, with a weighted contribution to R1 of ($\beta=0.458$) is also worthy of notice. The positive value for β for the above mentioned independent variables indicates that as R1 on the NBI increases in value so too will the JP and SN scales of the MBTI, keeping in mind that a high value on the JP and SN scales indicate a preference for the Perceiving and Intuition dimensions respectively.

It can be concluded that the Perceiving and Intuition dimensions of the MBTI are significantly related to the R1, right upper quadrant preference of the NBI and thus the null hypothesis is rejected (Kerlinger, 1986; Tabachnick & Fidell, 1996).

5.1.4.4 Multiple Regression Analysis using the R2 as Dependent Variable and the Dimensions of the MBTI as Independent Variables

The null hypotheses that, there is no significant correlation between the R2, Right Lower quadrant thinking preference, of the NBI, and the respective dimensions of the MBTI i.e. (E-I, S-N, T-F & J-P), was tested using the results of the multiple regression analysis of variance using the R2, Right Lower quadrant thinking preference as dependent variable and the dimensions of the MBTI as independent variables. The results of the calculations are depicted in Table 5.19.

Table 5.19 indicates that the use of a sample of $N = 300$ respondents and four independent variables is well above the minimum requirement for testing individual predictors in standard multiple regression. 3 cases were deleted due to missing data (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5:19 displays the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (β), the semi-partial correlations (sr^2), R and R^2 . R for regression (0.607) was significantly different from zero, $F=42.923$, $p<0.001$. Three of the independent variables contributed significantly to the prediction of R2, Right Lower quadrant thinking, Judging/Perceiving ($sr^2=0.035$), Introversion/Extroversion ($sr^2=0.034$) and Thinking/Feeling ($sr^2=0.30$). The four independent variables in combination contributed another 0.376 in shared variability. Altogether, 37.6% of the variability in R2, Right Lower quadrant preference was predicted by the results obtained on the four independent

variables. The independent variable, Thinking/Feeling, contributed the most weight ($\beta=-0.544$) to predicting R2. The positive value for β indicates that as R2 on the NBI increases in value so too will the TF scale of the MBTI, keeping in mind that a high value on the TF scale indicates a preference for the Feeling dimension. It can be concluded that the Feeling dimension of the MBTI is significantly related to the R2, Right Lower quadrant preference of the NBI and thus the null hypothesis is rejected (Kerlinger, 1986; Tabachnick & Fidell, 1996).

Table 5.19: MULTIPLE REGRESSION ANALYSIS OF VARIANCE USING THE R2 RIGHT LOWER QUADRANT THINKING PREFERENCE AS DEPENDENT VARIABLE AND THE DIMENSIONS OF THE MBTI AS INDEPENDENT VARIABLES

Standard Multiple Regression Analysis			
Description	Result	Description	Result
N	300	sr_{TF}^2	0.30
Multiple R	0.607	sr_{SN}^2	0.007
R ²	0.368	X ₁ b (Judging-Perceiving)	2.076
% Variance explained	36.8%	X ₂ b (Extroversion-Introversion)	-2.044
Standard error of estimate	8.848	X ₃ b (Thinking-Feeling)	6.003
F-ratio	42.923	X ₄ b (Sensing-Intuition)	-0.929
Df	4 and 259	X ₁ Weighted β (Judging-Perceiving)	0.188
P	< 0.001 or 1%	X ₂ Weighted β (Extroversion-Introversion)	-0.184
Constant	66.668	X ₃ Weighted β (Thinking-Feeling)	0.544
sr_{JP}^2	0.035	X ₄ Weighted β (Judging-Perceiving)	-0.084
sr_{EI}^2	0.034		

5.1.4.5 Conclusion

In conclusion it can be stated that the Neethling Brain Instrument, seems to measure the same thing as two dimensions of the MBTI. Firstly, the Thinking/Feeling dimension. A preference for Thinking being measured by the L1, Left Upper quadrant preference scale, and a preference for Feeling being measured by the R2, Right Lower quadrant preference scale. Secondly a combination of the Judging/Perceiving and Sensing Intuition preferences are related as follows. The R1, Right Upper quadrant preference scale appears to measure a combination of Perceiving and Intuition, and the L2, Left Lower quadrant preference scale appears to measure a combination of Judging and Sensing. In the following section the results of this study will be compared to previous results and findings.

5.2 DISCUSSION OF THE RESEARCH RESULTS

The aim of the research was to determine if a significant correlation exists between personality dimensions and the preference for certain creative thinking preferences. The following section will be devoted to the discussion of the research results to determine if the aim of the research was achieved.

5.2.1 The size, composition and distribution of the sample

The largest group in the study was the ISTJs (28.2%) profile, followed by the second largest group the ESTJs (26.2%) profile. The third largest grouping were the NTJs (INTJ 7.9% and ENTJ 6.9%). The groups that were underrepresented were those profiles containing Perceiving (P) and Feeling (F) preferences. These results correspond with those of De Beer (1999) who reported that the pattern of type distribution, amongst three South African groups (English, Afrikaans and indigenous African speaking), showed clear similarity to each other and to international studies. Furthermore, De Beer's results indicated that the STJ profiles reflected the highest incidence, whereas profiles with NF and P reflected lower incidence.

Internationally the assumption has been that Thinking/Feeling (T-F) scale on the MBTI is affected by gender. Research by De Beer (1999) has found that females from the Indigenous languages as well as the English and Afrikaans language groups showed a significantly higher incidence of preference for Feeling than males in the same language group. However, exploratory research by Smit and Van der Berg (in De Beer, 1999) found that the employed females showed a higher preference for Thinking (T) and that housewives showed a greater preference for Feeling (F). Based on these results and the small number of female subjects (11.1%) in the sample the assumption has been made that the effect on the research results would be negligible and thus the study has not been controlled for the effect of gender as covariate.

5.2.2 Correlation between the Sub-scales of Personality Type and Creative Thinking Preference

The discussion of the correlation between the sub-scales of Personality Type and Creative Thinking Preference will be conducted using the data in tables 5.2 to 5.7.

5.2.2.1 Pearson correlation of the correlation between the introversion/extroversion sub-scales of the MBTI and the thinking preferences of the NBI

From the results in Table 5.2 it can be seen that the L1, Left Upper and L2, Left Lower thinking preferences share a low, but statistically significant, correlation with the Reflective sub-scale of the MBTI. A comparison of Quenk's (1997) description of the Reflective sub-scale and Neethling's (1996) explanation of the L1 and L2 preferences casts some light on the results. According to Quenk (1997): "For reflective people the very meaning of things arises from their active mental engagement with them rather than from the physical or verbal interaction with the environment. Consequently they tend to learn best from written material which they may use for study at their own leisure." Neethling (1996) describes L1 people as those who regard factual accuracy and the evaluation of facts as being important and that

there is not much expression of emotion. Thus there is no need to share information with others. Additionally, L2 people like facts to be organised and orderly. There is a preference for a stable environment and that the facts should be sequential and orderly. There would thus appear to be reluctance to share or debate ideas and facts with others. It would thus seem plausible that the L1 and L2 dimensions of the NBI are sensitive to those who have a tendency toward the reflective component of introversion.

A further deduction that can be made from the results in Table 5.2 is that a R1, Right Upper thinking preference has a low, but statistically significant, correlation with the Receiving sub-scale of the MBTI. According to Quenk (1997). "Part of the receptive person's approach to group mixing stems from the effort they sometimes find it takes to keep a conversation going with someone with whom they seem to have little in common, or at least little that they can discover." Neethling describes people with a R1 preference as those that seek change, are comfortable with trying new things and that they enjoy being busy with several things at a time. An explanation for the sensitivity of the R1 preference for the receiving component of introversion could thus be that these individuals are too wrapped up in the prospects of discovering something new that they don't have time for people who may stifle their imagination. These people would possibly be selective in their choice of interpersonal contact, seeking out those who share their preference or those who could provide insight into some topic in which the person is interested in at present.

A final inference that can be made from the data in Table 5.2 is that the R2, Right Lower preference shows a moderate, but statistically significant, correlation with the Enthusiastic, Initiating and Expressive sub-scales of the MBTI. According to Quenk (1997) Initiating individuals are adept at quickly finding some common link with the person to whom they have been introduced so that they have a common ground from which to proceed in getting to know each other. Additionally, she describes expressive people as ready and willing to communicate and share their feeling states with others. Consequently expressive people are easy to get to know and don't waste time in making their feelings known to others. Quenk (1997) describes enthusiastic people as talkative, hearty and lively. They convey humour about personal histories allowing those who hear them to share the most entertaining sides of themselves. At the same time, they also provide a means through which the energy and emotional states of the present moment may be communicated and shared directly. In summary it would appear that these sub-scales tap into a common dimension of emotional expression. This emotional dimension would appear to be present in Neethling's (1996) description of the R2 thinking preference, which views these individuals as; experiencing facts in an emotional way, being intuitive towards people, showing enthusiasm and enjoying interaction with others. Thus it can be concluded that the R2 thinking preference shows sensitivity towards those with an extroverted disposition.

By comparing the results in Table 5.2 with the descriptive findings in Table 5.7 a number of valuable conclusions can be drawn. Firstly, the average scores on L1 for ISTs is higher than average scores for ESTs, indicating that the L1 dimension shows greater sensitivity for introverts than for extroverts. Secondly, the average scores on R2 for ENFs is higher than average scores for INFs, indicating that the R2 dimension shows greater sensitivity for extroverts than for introverts. However, this pattern does not seem to hold true for the average scores on R1 for ENTs and INTs. It would appear that the Judging and

Perceiving attitudes of the MBTI are affecting the influence that introversion and extraversion exert on the R1 function. According to Quenk (1997) the Initiating/Receiving sub-scale reflects a fundamental difference in energy flow, while the remaining sub-scales focus more on the specific contexts or styles in which this energy flow takes place. The above mentioned results provide tentative support for Eysenck's (1985) theory that, information from the ascending sensory pathways excite cells within the ARAS, which then sends the excitation to various sites in the cerebral cortex.

5.2.2.2 Pearson correlation of the correlation between the sensing/intuition sub-scales of the MBTI and the thinking preferences of the NBI

The results in Table 5.3 indicate that the L2, Left Lower thinking preference shares a high, statistically significant, correlation with the Concrete, Realistic, Experiential and Traditional sub-scales, of the MBTI. According to Quenk (1997) the Concrete/Abstract sub-scale captures the broad orientation towards the Perceptive attitude. The Realistic/Imaginative, Practical/Inferential and Experiential/Theoretical sub-scales are aimed more at how the individual begins to make meaning out of the initial concrete or abstract perception. The Traditional/Original sub-scale describes how the initial perceptions and the meanings constructed from them may be put together as an enduring framework, which guides the individual to find, what is being searched for in the environment.

According to Quenk (1997) individuals with a preference for Concrete perception tend to be grounded in and anchored to the tangible aspects of their world. People with a Realistic preference focus on things that are practical with an emphasis being placed on sensible, matter-of-fact things and people, rather than on those things that are fascinating or imaginative. Furthermore, Experiential individuals are described as preferring the certainty of their own participation in the world around them and are distrustful of theory and unvalidated procedures. Lastly, Traditional persons are viewed as those that prefer doing things according to the established ways that are shared by most people around them. The L2 thinking preference of Neethling (1996) would appear to be describing the same concept as the MBTI sub-scales. A preference for the L2 thinking style is indicated by traditional thinking i.e. the way I know how, facts that are organised and orderly, a desire for a stable and reliable environment, a focus on the task at hand and an enjoyment of the practical aspects of doing things. Of interest is that the expected correlation between the L2 thinking preference and the Practical/Inferential sub-scale was not found, even though the descriptions of the two dimensions would appear to suggest it.

The results in Table 5.3 also indicate that Concrete perception is strongly correlated, Realistic perception moderately correlated and Experiential perception weakly correlated with the L1 thinking preference. The description of L1 thinking characteristics would appear to indicate that this type of thinking is also anchored in the here-and-now, and is in general a matter-of-fact type of approach. This finding is supported by the strong correlation (0.358), in Table 5.7 between L1 and L2, which indicates a significant amount of overlap between the two dimensions.

The results for the correlation of L1, L2 and the Sensing sub-scales would appear to support the research findings of Bunderson *et al.* and Ford on the correlation between the MBTI and the Herrmann Brain Dominance Instrument, as mentioned in 3.7.1.2. The previous research results found a significant

correlation between Lower Left and Upper Left quadrant thinking and the Sensing preference on the MBTI.

The results in Table 5.3 indicate that the R1, Right Upper preference shares a high, statistically significant, correlation with the Abstract, Imaginative, Theoretical and Original sub-scales, of the MBTI. According to Quenk (1997) individuals with a preference for Abstract perception believe that real and important meanings lie in ideas and abstractions and not in physical reality or tangible things. Concrete reality is thus thought of as being primarily a stimulus for directing attention toward the more interesting world of intangibles. Those people with an Imaginative preference believe that tangible matters are nearly as important as the possibilities they suggest. Facts are thus only valuable for the associations and images they bring to mind. Additionally, Theoretical individuals operate at a level or two removed from things that are immediately tangible. Their understanding and knowledge of the world are contained in an abstract series of principles, explanations and theories, or understandings, sympathies and values. Finally, Original persons are viewed as those who regard repetition and sameness in important areas as the trigger for innovation, and that through ringing the changes these people find an opportunity for self-expression.

Neethling's (1996) R1 thinking preference would appear to be describing the same concept as the MBTI sub-scales. A preference for the R1 thinking style is characterised by an enjoyment of change and trying new things, use of the imagination, a search for alternative answers, synthesising information, finding new ways of doing things and relating the present to the future. Of interest is that the expected correlation between the R1 thinking preference and the Practical/Inferential sub-scale was not found. The R1 one preference for concentrating on the whole picture and the Inferential preference of looking for meanings in that which can be seen in the environment would appear to be analogous. Of further interest is the low correlation between the R2 thinking preference and the Abstract and Traditional subscales. However, any explanation of this phenomenon would be based on mere speculation, which is not the purpose of this study.

The results for the correlation of R1 and the Intuitive sub-scales would appear to support the research findings of Bunderson *et al.* and Ford on the correlation between the MBTI and the Herrmann Brain Dominance Instrument, as mentioned in 3.7.1.2. The previous research results found a significant correlation between Upper Right quadrant thinking and the Intuition preference on the MBTI.

5.2.2.3 Pearson correlation of the correlation between the thinking/feeling sub-scales of the MBTI and the thinking preferences of the NBI

The results in Table 5.4 indicate that the L1, Left Upper preference shares a high, statistically significant, correlation with the Critical, Tough and Reasonable sub-scales, a moderate, statistically significant, correlation with the Logical sub-scale and a low, statistically significant, correlation with the Questioning sub-scale, of the MBTI. According to Quenk (1997) the Logic/Empathy sub-scale captures the broad orientation towards the Judging attitude. The Questioning/Accommodating, Criticism/ Acceptance and Reasonable/Compassionate sub-scales are aimed at addressing differences of opinion. Finally, the Tough/Tender sub-scale determines the manner in which individuals will stand by their decisions.

Quenk (1997) is of the opinion that individuals with a preference for Logic comprehend the world only to the extent that it can be shown to make logical sense. Further, those people with a Reasonable preference conceive their relations with others as primarily task focused. However, the co-ordination of tasks with others involves working closely with the human element that each person brings to the situation, which requires that human needs be factored into the problem solving logic. Those individuals with a preference for Questioning, pursue the thinker's goal of detached, impersonal truth, but place emphasis on asking questions either to, make logical sense of something, or to solve problems, or as an attempt to find common ground from which the group can proceed. Individuals with a Critical preference are not so much interested in disparaging others or their views as they are in bettering some particular part of their world, and that things cannot be improved without critique. Their argument is that without the willingness to pass judgement on things, there is no way that they can be made better. Lastly, persons with a preference for Tough-mindedness are characterised by standing firm by their judgements. However, this decisiveness is not blind or arbitrary, but stems from a belief in the soundness of the process, which led to the decision being reached.

The L1 thinking preference of Neethling (1996) would appear to be describing the same concept as the MBTI sub-scales. A preference for the L1 thinking style is characterised by an enjoyment of working with and analysing facts, issues are dealt with in a precise and exact way, problems are looked at in a rational and logical way and there is an emphasis on performance. Table 5.4 provides evidence that the L2 thinking preference has a low correlation with the Critical, Logical and Reasonable sub-scales. The emphasis on facts and procedure associated with L2 thinking provides support for this correlation. Additionally, this finding is supported by the strong correlation (0.358), in Table 5.7 between L1 and L2, which indicates a significant amount of overlap between the two dimensions.

The results for the correlation of L1 and the Thinking sub-scales would appear to support the research findings of Bunderson *et al.* and Ford on the correlation between the MBTI and the Herrmann Brain Dominance Instrument, as mentioned in 3.7.1.3. The previous research results found a significant correlation between Upper Left quadrant thinking and the Thinking preference on the MBTI. Partial support is also provided for research findings by Newman that a Thinking preference is associated with left hemisphere cortical functioning.

Furthermore, the results in Table 5.4 indicate that the R2, Right Lower thinking preference shares a high, statistically significant, correlation with the Accepting, Tender, Empathetic and Compassionate sub-scales, and a moderate, statistically significant, correlation with the Accommodating sub-scale, of the MBTI.

According to Quenk (1997) individuals with a preference for Empathy view the logic of thinkers as but one means of understanding the world, and not necessarily the best one at that. They regard the world as being a framework of relationships that link people and things to each other. Further, those people with a Compassionate preference conceive the world as being personalised and interconnected rather than impersonal and detached. Consequently they attend to the unique needs which other people bring to situations. Those individuals with a preference for Accommodating regard reality as being socially defined. While they may concede that an "objective" truth independent of other people exists, they are

much more concerned with how that truth is understood, valued and used by others. Individuals with an Accepting preference are interested in affirming the truth concerning the value and worth of other people's ideas and viewpoints. From their perspective an individual's environment is primarily human and social. Finally, people with a preference for Tender-mindedness view the logical approach to arriving at a judgement as being far less impressive or important than the effects that a decision may have on others. Rather than being based on logic, tender-minded judgements focus on personal impacts as the primary criteria to be considered in making decisions.

The R2 thinking preference of Neethling (1996) would appear to be describing the same concept as the above mentioned MBTI sub-scales. A preference for the R2 thinking style is characterised by an intuitive understanding of people, an enjoyment of interaction, expressive and non-verbal communication and enthusiasm. Furthermore, problem solving is often a feeling process, not a logical one. Additionally Table 5.4 provides evidence that the R1 thinking preference has a low correlation with the Questioning sub-scale. This could be ascribed to these individuals being innovative and imaginative, thus possessing an enquiring mind, which generates questions that begged to be answered.

The results for the correlation between R2 and the Feeling sub-scales would appear to support the research findings of Bunderson *et al.* and Ford on the correlation between the MBTI and the Herrmann Brain Dominance Instrument, as mentioned in 3.7.1.3. The previous research results found a significant correlation between Lower Right preference and the Feeling function of the MBTI.

5.2.2.4 Pearson correlation of the relationship between the judging/perceiving sub-scales of the MBTI and the thinking preferences of the NBI

The results in Table 5.5 indicate that the L2, Left Lower thinking preference shares a high, statistically significant, correlation with the Early Starting, Systematic, Scheduled, Planful and Methodical sub-scales, of the MBTI. Quenk (1997) is of the opinion that the Systematic/Casual sub-scale captures the broad orientation towards the Judging/Perceiving scale. The remaining sub-scales describe much narrower instances in which this general orientation is played out.

According to Quenk (1997) individuals with a Systematic preference strive toward orderliness in their lives through the establishment of structures, methods and deliberate systematic approaches. Further, those people with a Planful preference, prefer a definite schedule for their leisure time so that they can know what they are going to do on a given day and even when they will be doing it. Those individuals with a preference for Early Starting are able to proactively cope with deadlines by starting far enough ahead of time to ensure that the task or project is completed ahead of deadline. Individuals with a Scheduled preference find comfort in routine that enables them to function efficiently without wasting time and energy unproductively. Lastly, individuals with a Methodical preference begin by organising themselves and whatever materials, tools or people they will need in order to be more efficient and save time.

The emphasis on terms such as procedures, organising, chronological sequences as well as a stable, reliable environment and an absence of risk, provides evidence that the L2 thinking preference bears a strong resemblance to the above mentioned description of the MBTI sub-scales. Furthermore, the L1 thinking preference is, moderately correlated with the Early Starting, Systematic, and Planful sub-scales,

and that L1 shows a low correlation with the Scheduled and Methodical sub-scales of the MBTI. This finding is supported by the strong correlation (0.358), in Table 5.7 between L1 and L2, which indicates a significant amount of overlap between the two dimensions.

These findings are supported by the research conducted by Bunderson *et al.* The previous research results found a significant correlation between Lower Left quadrant thinking as measured using the Herrmann Brain Dominance Instrument and the Judging attitude of the MBTI. Research by Ford that the Judging attitude of the MBTI is significantly related to left hemisphere thinking is also supported

Additionally, the results in Table 5.5 indicate that the R1, Right Upper thinking preference shares a high, statistically significant, correlation with the Pressure Prompted, Casual, Spontaneous, Open Ended and Emergent sub-scales, of the MBTI. Quenk (1997) is of the opinion that individuals with a Casual preference, regard systems and order as a burden that tends to make their work day several times heavier than it would be if it was approached from a spirit of spontaneity. They prefer an easy-going approach to many things including time schedules, deadlines, decision making etc. Further, those people with an Open Ended preference, prefer their leisure time to be unscheduled so that they can take advantage of unexpected opportunities that may arise. Those individuals with a Pressure Prompted preference find it hard to work well without the time pressure of a deadline. They are rarely inspired to do their best work unless they are under sufficient time pressure. Individuals with a Spontaneous preference feel cramped at the very thought of having the same routine day after day. However they are energised by the prospect of variety in their daily work. Lastly, people with an Emergent preference don't necessarily start a large task or project by beginning with the first step. They tend to treat projects as explorations or discoveries and take delight in finding out what to do and how to do it as they go along.

The emphasis on terms such as change, trying new things, busy with several things at once when describing the preferences for R1 thinking provides an indication that this dimension bears a strong resemblance to the above mentioned description of the MBTI sub-scales. This conclusion is further supported by descriptions such as; looks for alternatives, enjoys risks and does not always do things in the same way. A further observation that can be made from the data in Table 5.5 is the low correlation between R2 thinking and the Pressure Prompted, Casual, Open Ended and Emergent sub-scales, of the MBTI. This finding is supported by Ford's research, which concluded that the Perceiving attitude is significantly related to right hemispheric functioning.

5.2.3 Analysis of variables in order to identify an underlying factor structure

5.2.3.1 Results of the principle component analysis using both the NBI dimensions and the MBTI sub-scales

The results of the principle component analysis provided evidence of the existence of four underlying factors measured by the two instruments. The data in Table 5.12 indicates that all the sub-scales of the Judging/Perceiving dimension as well as the R1 and L2 thinking preferences load on Factor 1. However, the L2 thinking style has a negative factor loading, which indicates a significant correlation with the sub-scales of the Judging attitude. Furthermore, the subscales of the Perceiving attitude and the R1 thinking preference are also measuring the same underlying construct i.e. the Perceiving dimension of the MBTI.

This Judging/Perceiving factor was the first factor to be extracted and is thus the underlying factor that is most strongly reflected in the set of original variables.

Table 5.12 provides further evidence that all the sub-scales of the Thinking/Feeling dimension as well as the R2, Right Lower and L1, Left Upper thinking preference load on Factor 2. It should be pointed out that the negative factor loading of the L1 thinking preference indicates the existence of a correlation with the sub-scales of the Thinking function. Additionally the results indicate that the R2, thinking preference and the sub-scales of the Feeling function are measuring the same underlying construct. This second factor is a product of an orthogonal rotation of the factor matrix and is thus a measurement of a distinctly separate dimension to that of the first factor.

The third factor to be extracted, from the results in Table 5.12, indicates a significant absence of any dimensions of the NBI loading on this factor. However all the sub-scales of the Introversion/Extroversion attitude load strongly on this factor. These results are supported by the research findings of Eysenck, Newman and Ford as mentioned in section 3.7.1.1. However, these results contradict the findings of Martindale and Daily, Sen and Hagtvet as well as Simonton's theory, presented in section 3.7. However, these researchers made use of trait measures of extroversion in which the operational definition, of extroversion, may be different to the one utilised to define the Introversion/Extroversion dimension of personality type. Furthermore, these researchers focused on a creative product and not on the process of thinking creatively, which provides a possible explanation for the contradictory results.

The fourth factor indicates that all the sub-scales of the Sensing/Intuition functions as well as the R1, L2 thinking preferences load strongly on factor four. The negative factor loading of the L2 thinking style indicates the existence of a significant correlation with the sub-scales of the Sensing function. Additionally, the R1 thinking style and the Intuition sub-scales would appear to be measuring the same underlying dimension. Of particular interest is the fact that the R1 and L2 thinking preferences load strongly on both Factor 1 and Factor 4, even though the factor loadings have been determined using an orthogonal Varimax rotation. These two factor loadings thus provide evidence that the R1 and L2 dimensions of the NBI are each measuring two distinct dimensions of the MBTI.

The results of the principal component analysis lend further support to the research findings of Bunderson *et al.* and Ford. Furthermore, implicit evidence is provided of the concurrent validity between the NBI and the Herrmann Brain Dominance Instrument. This conclusion is drawn from the fact that the research by Bunderson *et al.* and Ford made use of the Herrmann Brain Dominance Instrument and the MBTI, and the present research examined the correlation between the NBI and the MBTI. The NBI and the Herrmann Brain Dominance Instrument both appear to measure the same constructs. The current research findings appear to support the existence of these constructs through their shared correlation with the constructs of the MBTI.

5.2.4 Results of the principle component analysis using only the MBTI sub-scales

The results of the principal component analysis conducted on only the sub-scales of the MBTI are depicted in Table 5.14. It is evident from the results, that the sub-scales of the Judging/Perceiving dimension all load strongly on Factor 1, but not on any of the other factors. This Judging/Perceiving

factor is also the underlying factor that is most strongly reflected in the original variables. Furthermore, the sub-scales of the Introversion/Extroversion, Thinking/Feeling and Sensing/Intuition dimensions all load strongly on Factor 2, Factor 3 and Factor 4 respectively, but not on any of the other factors. These research findings thus provide confirmatory evidence of the construct validity of the MBTI Step II, although the absence of a meaningful competing model limits the breadth of the conclusions that can be drawn. These results also lend support to the research by Johnson and Saunders (in Hammer, 1996), who examined the factor structure of the MBTI, Form J Expanded Analysis Report (EAR).

5.2.5 Relationship between Personality Type and Creative Thinking Preference

5.2.5.1 Results of multiple regression analysis of variance

The results of the multiple regression analysis of variance provide further confirmation of the studies by Bunderson *et al.* (1981) and Ford (1988). The results in Tables 5.16 – 5.17 indicate that an increase in the L1, Left Upper quadrant preference is most significantly influenced by the Thinking function, as well as by the Sensing function and the Judging attitude, but to a lesser extent. However, the Introversion and Extroversion attitude have a negligible influence. An increase in the L2, Left Lower quadrant thinking preference is most significantly influenced by both the Judging attitude and Sensing function, while the Thinking/Feeling and Introversion/Extroversion dimensions have an insignificant influence. It can thus be concluded that persons with a STJ type profile prefer left brain functioning. Furthermore, Thinkers rely on cerebral function, and Sensing and Judging individuals rely primarily on limbic functioning along with a measure of cerebral activity.

The results in tables 5.18 – 5.19 indicate that an increase in the R1, Right Upper quadrant thinking preference is most significantly influenced by both the Intuition function and Perceiving attitude, whilst the Thinking/Feeling and Introversion/Extroversion dimensions have an insignificant influence. An increase in the R2, Right Lower Upper quadrant preference is most significantly influenced by the Feeling function, as well as by the Extroverted and Perceiving attitudes, but to a minute extent. It can thus be concluded that persons with a NFP type profile prefer right brain functioning. Thus Intuitives and Perceivers prefer cerebral functioning, and Feelers prefer limbic functioning.

It can be concluded that the NBI measures two dimensions of the MBTI. Firstly, the Thinking/Feeling dimension, and secondly a combination of the Sensing/Intuition and Judging Perceiving dimensions.

5.3 CONCLUSION

From the reporting and discussion of the research results it would appear that a significant relationship exists between the sub-scale of the MBTI Step II and the thinking preferences of the Neethling Brain Instrument. The most prominent relationships that were found are; firstly, between the sub-scales of the Judging/Perceiving attitude and the L2 and R1 thinking preferences, secondly, between the sub-scales of the Thinking/Feeling function and the L1 and R2 thinking preferences and lastly between the sub-scales of the Sensing/Intuition function. A moderate correlation was found between the L1 and L2 preferences

and certain of the Introverted attitude sub-scales. Additionally a moderate correlation was found between the R2 preferences and certain of the Extroverted attitude sub-scales.

The results of the principle component analysis provided evidence that the sub-scales of the MBTI Step II and the dimensions of the Neethling Brain Profile are measuring the same underlying factors. The factors that were identified bear a striking resemblance to the Judging/Perceiving, Thinking/Feeling and Sensing/Intuition dimensions of the MBTI. None of the NBI dimensions loaded on the Introversion/Extroversion dimension. A further product of the principle component analysis was evidence in support of the construct validity of the MBTI Step II.

The results of the multiple regression analysis of variance provided evidence that a significant relationship exists between the primary dimensions of the MBTI and the dimensions of the NBI. These findings indicated that the NBI measures two dimensions of the MBTI. Firstly, the Thinking/Feeling dimension, and secondly a combination of the Sensing/Intuition and Judging Perceiving dimensions. The comparison of all the research results to findings of previous results provide implicit evidence of the concurrent validity of the NBI. This validity is derived from similar research results obtained from measures of a relationship between the MBTI and the Herrmann Brain Dominance Instrument.

From the examination of the literature and the discussion of the research results, the conclusion can be drawn that the MBTI can be utilised as a measure of creative thinking preference. The results of the NBI give an indication of an individual's preferred way of approaching challenges. However, true creativity, according to Neethling, lies in the ability to utilise all of the thinking preferences equally. This concept of whole brain thinking thus appears to exhibit similarities to the Jungian concept of Individuation. The elegance of the MBTI in depicting the dynamics of Jung's typology thus provides a valuable tool for assisting individuals and teams to discover and develop their unique creative abilities.

In this chapter the specific goals of the research, stated in chapter 1, were addressed. Thus, all the research questions have been answered and the general aim of the study: To determine if personality type can be used as an indicator of an individual's creative processes has been addressed. Chapter 6 will concentrate on discussing the limitations of the study and providing recommendations for future research.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 DISCUSSION OF THE STUDY AND RECOMMENDATIONS FOR FUTURE RESEARCH

In closing it is necessary to concentrate on the limitations of the study as well as providing recommendations for future research.

- The sampling method posed certain limitations on the research. An accidental sampling approach was applied with the result that the findings of the study can only be generalised to the sample used in the study i.e. managers in the aviation manufacturing and maintenance industry. Future research should attempt to make use of a random sampling strategy within a particular domain.
- A further limitation was that each of the MBTI personality types was not equally represented and there appears to have been an overrepresentation of individuals with an STJ preference and an under representation of individuals with a FP preference. Future research can thus attempt to obtain a more equal representation for all sixteen-personality types.
- The very low number of females and people from other ethnic groups were represented in the sample is seen as a limitation. Thus future research can attempt to ensure representivity of the sample in terms of gender and ethnicity, or it could be focused on a specific gender or ethnic group.
- A further limitation of the study is that it examined only one perspective of creativity i.e. that of creative process. Therefore the focus of the research can be regarded as being very narrow and that generalisations with regard to the broader field of creativity should be undertaken with great care. The complex and dynamic nature of the concept of creativity makes it extremely difficult to research it in its entirety. Thus inferences regarding links between the various perspectives would need to be made whenever creativity is researched.

6.2 VALUE OF THE STUDY

The examination of the literature regarding the relationship between personality dimensions and creative thinking preference was insightful. The process perspective of creativity and the manner that it fits into a framework of study was discussed. The gathering of evidence which links certain physiological processes to specific thinking preferences, which in turn were related to specific aspects of personality, was significant.

The similarity of research findings regarding the existence of a relationship between the NBI and MBTI, to findings of a relationship that exists between the MBTI and the Herrmann Brain Instrument, provides evidence of the validity of the NBI, and thus confirms its value as a measuring instrument.

The general aim of the study was successfully met in that evidence was found that personality type could be used as an indicator of how an individual's creative processes function. Furthermore, that a type

indicator such as the MBTI is able to provide insight into the dynamics of personality function, whereas the creative thinking preferences provide only a static view of a preference for thinking in certain ways.

Regarding the specific goals of the study the following outcomes were established:

- It was found that a significant correlation was found between the dimensions of personality type as measured with the MBTI Step II and the thinking preferences measured by the Neethling Brain Instrument (NBI), indicating the existence of a relationship. The following was evident from the research results; A significant relationship exists between the Intuitive and Perceiving functions of the MBTI and the Right Upper Quadrant of the NBI. A significant relationship exists between the Sensing and Judging functions of the MBTI and the Left Lower Quadrant of the NBI. Additionally a significant relationship exists between the Thinking function of the MBTI and the Left Upper Quadrant of the NBI, as well as between the Feeling function of the MBTI and the Right Lower Quadrant of the NBI. The only exception was for the dimension of introversion/extroversion, which is not catered for on the NBI.
- Due to the highly complex nature of the brain's functioning and the contentiousness surrounding the "brain dominance" debate it is not possible to equate personality type to the specific functioning of any part of the brain without the use of highly specialised neurological measuring instruments, which are far beyond the scope of this study. However, what can be concluded is that Neethling's metaphoric representation of creative thinking bears a strong relationship to personality type as envisaged by Jung.
- It was found that when the subscales of the MBTI Step II were subjected to principal component analysis, four clear factors were formed. Furthermore, it was established that these four factors were strongly related to the four dimensions on the NBI. Therefore, it can be stated that each of the subscales of the MBTI Step II contributes to determining the creative preference of an individual.
- Due to the under representation of women and individuals from other ethnic groups other than European, it was not possible to establish if the factors of gender and ethnicity have any significant influence on the relationship between personality type and creative preference.

An obvious question that arises is, which personality type is more creative? The process perspective on creativity would appear to indicate that certain personality types have a preference for contributing more effectively to specific parts of the creative process. Thus it can be concluded that no single personality type is more creative than the other is, but that creativity requires the use of all the functions of Personality Type. The key to creativity is the integration of all the Type functions both preferred and not preferred in a synergistic manner. This requires recognition that creativity will require the expenditure of significant amounts of psychic energy to apply non-preferred functions in the process of being creative.

The research results can be regarded as valuable for the following reasons:

- Through an understanding of the dynamics of Personality Type work teams can plan and structure their approach to problem solving, as well as identifying areas in which the problem solving process may run into trouble.
- Individuals can discover how to become more creative through understanding the strengths and limitations of their Personality Type and how this impacts on the creative capabilities.

- Supervisors and managers can capitalise on the unique creative capabilities of their subordinates, as well as use the research results as a foundation for coaching and mentoring the development of creativity among subordinates. This could be accomplished by providing advice on how to overcome limitations.
- However, a caveat is that creativity should not be viewed as merely a process conducted by an individual. Instead, creativity is dependent on several external factors, namely; the impact of the environment on the efficiency of the creative process as well as that the creative product will be evaluated by others that may have a different perception of what can be deemed as creative.

6.3 CONCLUSION

It is clear from the research that creative thinking preference is closely related to an individual's personality dimensions. Furthermore, individuals need to utilise all the dimensions of their personality, including those preferences for which there is a low preference or which are regarded as inferior. It is only when these inferior dimensions are utilised that creativity can be unleashed by letting the creative process run its course. These lesser preferred, inferior dimensions appear to contain sub-conscious material that is archaic and primitive in content and are thus not easily understood by the rational thought of the conscious mind. The disruption of conscious thought by these unconstrained sub-conscious influences provides the impetus for the generation of creative outcomes.

In order for individuals to become their complete self, they need to accept that the content of their inferior function is part and parcel of who they are and that acknowledging this function is an important part of being a creative person. Furthermore, an inability to embrace the value of integrating all the functions of personality type destines the individual to being shackled by the constraints of societal norms, thus resulting in inhibition, which stifles any hope of the expression of true creativity.

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