

THE RELATIONSHIP BETWEEN COGNITIVE STYLES AND  
PERSONALITY TYPES

by

CAROL HUGO HARDIJZER

Submitted in part fulfilment of the requirements  
for the degree of

MASTER OF COMMERCE

in the subject

INDUSTRIAL PSYCHOLOGY

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: MR H VON DER OHE

NOVEMBER 2000

## **ACKNOWLEDGEMENTS**

I hereby express my sincerest thanks and gratitude to the following persons for their respective contributions:

Professor Frans Cilliers for his guidance during the forming stages of this dissertation;

My supervisor, Mr Harmut von der Ohe, who accommodated a typical ISTP trait, namely my need to work independently;

Dr Marietha Prinsloo for her guidance and support in the use of the Cognitive Process Profile;

Leanie Nel for her assistance in the collation of the necessary information;

Cas Coetzee for his guidance and patience during the statistical phase of this research;

Dr Anna-Mart Bonthuys for painstakingly editing and proofreading this dissertation;

Debbie Schoeman, who was always willing to assist with her wordprocessing skills;

My two sons, Marco and Hanno, who entered their teenage years while dad was busy "studying".

## **SUMMARY**

The general purpose of this study was to determine the relationship between cognitive styles and personality types in order to gain insight into the placement of leaders within the context of current and future organisational demands. The study was conducted among 123 managers within the information technology environment of a South African financial institution. Data was collected by means of the Cognitive Process Profile (CPP) and the Myers-Briggs Type Indicator (MBTI).

Supporting evidence, although not sufficient, indicates a probable relationship between cognitive styles and personality types. The assumption can therefore be made that the relationship between cognitive styles and personality types will be more pronounced among a more geographically distributed sample group which includes sufficient diverse respondents regarding the different cognitive styles and personality types.

## **KEY TERMS**

Cognition, Cognitive Process Profile, cognitive styles, personality types, Myers-Briggs Type Indicator.

## **TABLE OF CONTENTS**

	<b>Page</b>
Acknowledgements	i
Summary	ii
Key Terms	ii
List of figures	viii
List of tables	viii
List of appendices	ix
<b>CHAPTER 1: BACKGROUND TO AND MOTIVATION OF THE RESEARCH</b>	<b>1</b>
1.1 BACKGROUND TO RESEARCH	1
1.2 PROBLEM STATEMENT	2
1.3 AIM OF RESEARCH	3
1.3.1 Primary aim	3
1.3.2 Secondary aim	4
1.4 PARADIGM PERSPECTIVE OF RESEARCH	4
1.4.1 Relevant paradigms	4
1.4.2 Metatheoretical statements	5
1.4.2.1 Industrial psychology	5
1.4.2.2 Cognitive psychology	5
1.4.2.3 Analytical psychology	6
1.4.3 Theoretical models	6
1.4.4 Conceptual description	6
1.4.4.1 Cognition	7
1.4.4.2 Cognitive styles	8
1.4.4.3 Personality	9
1.4.4.4 Personality types	12

1.4.5	Central hypothesis	13
1.5	RESEARCH DESIGN	13
1.6	RESEARCH METHODOLOGY	14
1.6.1	Phase one: Literature review:	14
1.6.2	Phase two: Empirical investigation	14
1.7	CHAPTER DIVISION	15
1.8	CHAPTER SUMMARY	15
 <b>CHAPTER 2: COGNITIVE STYLES</b>		<b>16</b>
2.1	INTRODUCTION	16
2.2	COGNITIVE THEORY	16
2.2.1	Cognition defined	19
2.2.2	Cognition and problem solving	20
2.3	THE INFORMATION-PROCESSING APPROACH	21
2.3.1	History	21
2.3.2	Description of information processing	22
2.3.3	Criticism	24
2.4	COGNITIVE STYLE	25
2.4.1	Concept of style	26
2.4.2	Cognitive style defined	27
2.4.3	Cognitive style versus cognitive ability	30
2.5	COGNITIVE PROCESS PROFILE (CPP)	33
2.5.1	General description of the CPP	34
2.5.2	Cognitive Process Profile Styles	36
2.6	CHAPTER SUMMARY	38
 <b>CHAPTER 3: PERSONALITY TYPES</b>		<b>39</b>
3.1	THE NATURE OF JUNG'S PERSONALITY THEORY	39
3.1.1	The structure of personality	40
3.1.2	The dynamics of personality	42
3.1.3	Development of personality	44
3.1.3.1	Jung's basic principles of lifelong development	46
3.2	JUNG'S THEORY OF PERSONALITY TYPES	48

3.2.1	Attitudes	48
3.2.2	Functions	49
3.2.2.1	Two ways of perceiving	50
3.2.2.2	Two ways of judging	50
3.2.3	Personality types	51
3.3	EXTENSIONS OF JUNG'S PERSONALITY TYPE THEORY	53
3.4	DYNAMICS OF PSYCHOLOGICAL TYPE	61
3.4.1	Lack of a Balancing Auxiliary	63
3.4.2	Lack of Balance in Attitudes	64
3.4.3	Importance of opposite	64
3.5	PERSONALITY TYPE DEVELOPMENT	65
3.5.1	Development and Midlife	67
3.6	TYPES IN ORGANISATIONS	68
3.7	TYPES AND DECISION MAKING	71
3.8	CHAPTER SUMMARY	73

#### **CHAPTER 4: INTEGRATION OF COGNITIVE STYLES AND PERSONALITY TYPE THEORIES** **74**

4.1	PERSONALITY AND COGNITIVE TYPOLOGY	74
4.2	PAST RESEARCH ON THE RELATIONSHIP BETWEEN COGNITION & PERSONALITY	75
4.3	PITFALLS IN THE STUDY OF COGNITION AND PERSONALITY	77
4.4	COGNITION AND PERSONALITY	77
4.5	INFORMATION PROCESSING AND PERSONALITY	79
4.6	CONCLUSION	80
4.7	CHAPTER SUMMARY	80

#### **CHAPTER 5: EMPIRICAL STUDY** **81**

5.1	DESCRIPTION OF THE SAMPLE POPULATION	81
5.2	MOTIVATING CHOICE OF PSYCHOMETRIC BATTERY	82
5.2.1	Cognitive Process Profile (CPP)	83
5.2.1.1	Overview of the CPP	83
5.2.1.2	General description	85
5.2.1.3	Application of CPP	86

5.2.1.4	Administration of the CPP	86
5.2.1.5	Metric properties of the CPP	87
5.2.2	Myers-Briggs Type Indicator (MBTI)	90
5.2.2.1	Development of the MBTI	91
5.2.2.2	Description of the MBTI	91
5.2.2.3	Scales of the MBTI	92
5.2.2.4	Administration of the MBTI	94
5.2.2.5	Interpretation of the MBTI	95
5.2.2.6	Validity of the MBTI	96
5.2.2.7	Reliability of the MBTI	96
5.3	DATA COLLECTION	97
5.4	STATISTICAL METHODOLOGY	97
5.4.1	Background to statistical analysis of data	97
5.4.2	Frequency distributions and Chi-square statistics	97
5.4.3	Factor analysis of "cognitive style" variables	98
5.4.4	Comparison of means using the Analysis of Variance strategy	99
5.4.5	Correlational and Multiple Regression analyses	100
5.4.6	Level of statistical significance	100
5.5	FORMULATION OF RESEARCH HYPOTHESIS	101
5.6	CHAPTER SUMMARY	102
 <b>CHAPTER 6: STATISTICAL RESULTS</b>		<b>103</b>
6.1	DESCRIPTION OF SAMPLE IN TERMS OF PSYCHOMETRIC PROFILES	103
6.1.1	Description in terms of cognitive style factors	103
6.1.1.1	Frequency distribution of cognitive style factors	103
6.1.1.2	Mean scores of cognitive style factors	106
6.1.1.3	Factor structure of the cognitive style factors	106
6.1.2	Description in terms of the MBTI	108
6.1.2.1	Frequency distribution of the MBTI	108
6.1.2.2	Mean profile in terms of the four basic MBTI scales	112
6.2	THE RELATIONSHIP OF THE MBTI TO THE COGNITIVE STYLE FACTORS	112
6.2.1	Comparison of the MBTI versus the mean cognitive style scores	113
6.2.2	Explaining the MBTI from multiple cognitive style factors	115
6.3	SUMMARY OF FINDINGS	116

6.4	CHAPTER SUMMARY	117
<b>CHAPTER 7: LIMITATIONS, CONCLUSION AND RECOMMENDATIONS</b>		<b>118</b>
7.1	LIMITATIONS OF THE RESEARCH	118
7.2	CONCLUSION	119
7.2.1	Literature survey	120
7.2.2	Empirical study	121
7.3	RECOMMENDATIONS	122
7.4	CHAPTER SUMMARY	123
<b>REFERENCES</b>		<b>124</b>
<b>APPENDICES</b>		<b>136</b>

<b>LIST OF FIGURES</b>		<b>Page</b>
Figure 6.1	Mean scores of cognitive style variables	106
Figure 6.2	Eigenvalue plot of cognitive style factors	107
Figure 6.3	Mean scores of MBTI combinations	112

### **LIST OF TABLES**

Table 2.1	Cognitive styles	37
Table 3.1	General stages of development	46
Table 3.2	Brief description of the sixteen personality types	60
Table 5.1	Frequency table of sample group as per a few biographical variables	82
Table 6.1	Frequency distribution of cognitive styles	104
Table 6.2	Single and two-factor promax rotated solution for cognitive style variables	107
Table 6.3	Frequency distribution of MBTI types	109
Table 6.4	Detailed breakdown of MBTI preferences	110
Table 6.5	MBTI sample distribution by preference type (Extravert and Introvert separated)	111
Table 6.6	Comparison of Myers-Briggs Personality Types with regard to mean score on cognitive style factors	114

Table 6.7	Multiple regression analysis results	115
-----------	--------------------------------------	-----

## LIST OF APPENDICES

Appendix 1	Correlational analysis – Cognitive style (Pearson correlation coefficients)	136
Appendix 2	Correlational analysis – MBTI (Pearson correlation coefficients)	137
Appendix 3	Comparison of Myers-Briggs type indicators by preference type (Extraversion and Introversion separated) with regard to mean scores of Cognitive style factors: One-way Anova F-tests on mean scores	138
Appendix 4	Comparison of Extraversion/Introversion with Sensing/Intuition, with regard to Cognitive style factors: One-way Anova F-tests on mean scores	139
Appendix 5	Comparison of Extraversion/Introversion with Judging/Perceiving, with regard to Cognitive style factors: One-way Anova F-tests on mean scores	140
Appendix 6	Comparison of Sensing/Intuition with Judging/Perceiving, with regard to Cognitive style factors: One-way Anova F-tests on mean scores	141
Appendix 7	Comparison between Extraversion/Introversion, Sensing/Intuition and Judging/Perceiving with regard to Cognitive style factors: One-way Anova F-tests on mean scores	142
Appendix 8	Comparison of personality preferences with regard to mean scores of cognitive style factors: One-way Anova F-test on mean scores	143
Appendix 9	Correlational analysis between cognitive styles and personality type categories	144

## **CHAPTER 1: BACKGROUND TO AND MOTIVATION OF THE RESEARCH**

This dissertation investigates the relationship between cognitive styles and personality types.

### **1.1 BACKGROUND TO RESEARCH**

Over the years it has been fashionable to suggest that individuals are unique. Certainly each individual is a product of heredity and environment, and as a result, is different from everyone else. The doctrine of uniqueness, however, gives no practical help in understanding people whom we must educate, counsel, work with or deal with in our personal lives (Myers & McCaulley, 1992).

Organisations are, in reality, collectivities of individuals, so that knowledge of individual differences in behaviour such as their problem solving approach is important to understanding managerial performance. Such knowledge is very useful in the recruitment, selection, training, and placement of human resources (Davis, Grove & Knowles, 1990).

The role of personality variables such as personal preferences, individual differences in cognitive and perceptual styles, motives and values orientations have received renewed emphasis in contemporary career choice and development practices. It is the individual who, in his or her own way, synthesises the effects of all the driving forces. It is the person, the self, who is the decision maker and who has to choose between whatever possibilities and pressures are known or sensed when facing a choice (Super, 1994).

Having recently entered the global marketplace, many organisations in post-apartheid South Africa are only now beginning to come to terms with the consequent challenges, for example, unprecedented levels of competition for marketshare, the need to become more flexible, coupled with an ability to respond rapidly to changing situations, a demand from foreign investors for significantly higher levels of productivity, heightened expectations from employees belonging to previously disadvantaged population groups, relating inter alia to salaries and wages, career development and advancement, expectations from communities to become more socially

responsible. A fundamental requirement for South African organisations to rise and meet these and other challenges is strong organisational leadership (Conradie, 1996).

This dissertation intends to identify relationships that might exist between cognitive styles and personality types. Profiles completed during a managerial selection process within an Information Technology department were used for the purposes of this research.

Within this chapter further background and motivation to the research, as well as a formulated problem statement and research questions will be provided. To give further structure to the research, the aim and paradigm perspective will be discussed, followed by the planned research design and research method with the different steps. Finally, the various chapters of this dissertation will be presented.

## **1.2 PROBLEM STATEMENT**

Within the diverse Information Technology environment, the appointment of appropriately skilled managers has been problematic over the years. Individuals with specific technical skills and experience have been appointed to managerial positions, resulting in frustration with their new unfamiliar responsibilities, which then further impacts on the workforce due to poor management skills. Many Information Technology managers prefer to remain involved at the technical and operational level, and neglect the strategic and human aspect of their function, resulting in organisations not moving forward in terms of their vision.

Considering the above, this dissertation intends to identify relationships that might exist between cognitive styles and personality types in an attempt to improve future managerial selection or appointments within the Information Technology industry.

Two psychometric processes that could assist with the selection process would be cognitive and personality profiling, which leads to the following questions:

- How can cognitive styles be conceptualised?
- How can personality types be conceptualised?

- Does a theoretical relationship exist between cognitive styles and personality types?
- Is there a relationship between cognitive styles and personality types within the selected population group?
- Does cognitive styles act as a possible predictor for specific personality types and vice versa?
- What recommendations can be made with regard to future managerial selections?

### **1.3 AIM OF RESEARCH**

The aim of this research is to investigate the possible relationship between cognitive styles and personality types of a selected population group.

This research consists of a primary aim and a secondary aim.

#### **1.3.1 Primary aim**

The specific theoretical aims in terms of the above are to:

- conceptualise cognitive styles
- conceptualise personality types
- determine whether a theoretical relationship exists between cognitive styles and personality types

In terms of the empirical study, the specific aim is:

- to ascertain the possible relationship between cognitive styles and personality types within the selected population group
- to determine whether cognitive styles can act as a possible predictor of certain personality types and vice versa

### **1.3.2 Secondary aim**

As the personality profile intended for use in this research also measures an element of cognition, a factor analysis between the instrument for cognition and the instrument for personality will be completed, as secondary aim.

Finally, recommendations will be made in line with the findings from both the primary and the secondary aims in terms of future managerial selection.

## **1.4 PARADIGM PERSPECTIVE OF RESEARCH**

The paradigm perspective refers to the intellectual climate or variety of metatheoretical values or beliefs and assumptions underlying the theories and models that form the definitive context of this research (Mouton & Marais, 1990).

### **1.4.1 Relevant paradigms**

The literature on the cognitive styles will be presented from the cognitive-psychological paradigm which has its roots in the behaviouristic paradigm, while the literature survey on personality types will be presented from the psychodynamic, and more specifically, the neo-psychodynamic paradigm.

The basic assumptions of the cognitive-psychological paradigm, according to Reber (1995) and Coetzee (1996), are:

- underlying characteristics are of an abstract nature emphasising internal mental processes; and
- behaviour is not only specifiable in terms of overt properties but requires explanations at the level of mental events.

Meyer, Moore and Viljoen (1988) indicate that the basic assumptions of the psychodynamic paradigm are the following:

- a given psychological phenomenon is always determined by specific internal factors; and
- behaviour is therefore determined by forces within the person of which he or she is largely unaware

Meyer et al (1988) further indicate that the basic assumptions of the neo-psychoanalytic paradigm are that:

- man has the potential for growth and development; and
- human personality is therefore flexible and changeable.

#### **1.4.2 Metatheoretical statements**

As fields of application, this research will focus on psychology and industrial psychology. More specifically, the focus in the literature survey is on cognitive and analytical psychology.

In the empirical study, the focus is on psychometrics and statistical analysis.

##### **1.4.2.1 Industrial psychology**

Industrial psychology, also referred to as organisational psychology by practitioners in the field, is a branch of applied psychology. This branch covers aspects such as organisational, military, economic and personnel psychology and includes such areas as tests and measurements, the study of organisations and organisational behaviour, personnel practices, human engineering, human factors, the effects of work, fatigue, pay and efficiency, consumer surveys, and market research (Reber, 1995). Within this research, personality and cognitive variables influencing human and organisational behaviour will be studied.

##### **1.4.2.2 Cognitive psychology**

Cognitive psychology is a relatively young branch of psychology which aims to understand mental processes by developing adequate theories of mental functioning, the organisation of these

functions and their relationships to tasks such as learning and problem solving. The ideas and techniques that cognitive psychologists have at their disposal for addressing this task hail from such diverse fields as Gestalt psychology, neuropsychology, behaviourism, telecommunications technology and computer modelling. As a synthesis of these different fields, cognitive psychology might be seen as representing the *vanguard* of contemporary psychology and as having been put to use to explain a wide range of constructs (Reed, 1992; Prinsloo, 1992).

Cognitive psychologists according to Anastasi (1990) apply concepts of information processing to the study of human problem solving. Cognitive models therefore specify the intellectual processes used to perform the task, the way the processes are organised, the relevant knowledge store, and how this knowledge is represented in memory and retrieved when needed.

#### **1.4.2.3 Analytical psychology**

Analytical psychology refers to the theory of personality developed by Jung (1959, 1971) and represents the neo-psychodynamic approaches to explaining personality.

#### **1.4.3 Theoretical models**

The literature survey on cognitive styles will be presented from a cognitive-psychological perspective. Various theories will be assessed and integrated.

The literature survey on personality types will be presented from the analytical psychology perspective of Jung (1959, 1971), and more specifically, his theory on personality types.

#### **1.4.4 Conceptual description**

The conceptual descriptions that are of relevance to this study will be defined next.

#### **1.4.4.1 Cognition**

Cognitive science is the descriptive word for the various disciplines that study the relationship between brain and mind (Newman, 1996).

The conceptual framework of this dissertation is situated in the field of cognitive psychology – a subdiscipline of cognitive science which encompasses a variety of scientific fields and which has been the focus of much research over the past few decades. This surge of interest in the field can be ascribed to the challenges it poses as a subject for scientific scrutiny as well as to its role in addressing man's ultimate goal of understanding himself (Prinsloo, 1992; Reed, 1992).

Cognitive science according to Reed (1992) is the study of intelligence in humans, of computer programs, and of abstract theories, with an emphasis on intelligent behaviour as computation. It is also an attempt to unify views of thinking developed by studies in psychology, linguistics, anthropology, philosophy, computer science, and the neurosciences.

Cognitive psychology on the other hand focuses on the nature of human thinking, and in particular its structure, function, development and influencing factors. Attempts to identify and explain the laws governing these phenomena have resulted in a large number of diverse approaches (Prinsloo, 1992). Cognitive psychology therefore refers to all the processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used. It is therefore also referred to as human information processing (Reed, 1992).

Although research in contemporary cognitive psychology is still in an exploratory stage it incorporates a variety of approaches such as the neurological or physiological, the contextual or ecological, the developmental, the differential and the experimental traditions. These originated in the contributions of various philosophers (Prinsloo, 1992).

The most exciting development according to Reed (1992) in the field of cognitive psychology is not a particular theory or experimental finding but a general trend.

Reed (1992) defines cognition simply as the acquisition of knowledge. The acquisition and the use of knowledge however involve many mental skills. Cognition encompasses all the processes by which the brain deals with information, including perception, pattern recognition, imagination, reasoning, judgement, recall, learning, thinking and problem solving. Cognition is therefore a collective term for a set of dynamic operations (Prinsloo & Voss, 1996). Problem solving and decision making form part of this collective term. These are also referred to as "higher" cognitive skills. The focus in this dissertation will be mainly on problem solving.

The role of problem solving in learning new information is receiving increasing emphasis as cognitive psychologists discover more about the active nature of learning. Specifying the interactions among perception, memory, and thought is according to Reed (1992) one of the challenges that confront cognitive psychologists.

Anastasi (1990) further suggests that increasing attention is also being given to what has been called an executive process of metacognition, which refers to the control the individual exercises over his or her own choice of processes, representation, and strategies for carrying out the task.

#### **1.4.4.2 Cognitive styles**

Cognitive style is a complex area to research, as it has to do with processes that cannot be observed directly.

The student in cognitive styles would seek to answer questions such as "What are the distinctive ways in which humans perceive problems?" and "How does this affect the finding of solutions?"

Cognitive assessment is also concerned with the links between ability and personality. A frequently used term in this regard is that of cognitive styles, which refers to integrative styles of thinking, acting and expressing personality. Cognitive style, a broader theoretical construct than the cognitive process, therefore overlaps with personality to some extent (Prinsloo & Voss, 1996).

### 1.4.4.3 Personality

Adickes (1907), as referred to in Keirsey and Bates (1984), was of the opinion that man is divided into four worldviews: dogmatic, agnostic, traditional and innovative. Kretschmer (1920), referred to by the same authors, stated that abnormal behaviour was determined by the temperament similar to those of Adickes; hyperesthetic, anesthetic, melancholic and hypomanic. Around 1920, Adler similarly pointed to four "mistaken goals" people of different types may pursue when upset: recognition, power, service and revenge. Also in 1920, Spranger identified four human values that set people apart: religious, theoretic, economic and artistic. These views are all a revival of the view presented by Hippocrates when he spoke of the four temperaments: choleric, phlegmatic, melancholic and sanguine (see Keirsey & Bates, 1984).

The disenchantment with trait psychology and linear cause-and-effect research, which have failed to take situational variables into account as an influence on personality and cognition, has led researchers to turn their attention to the study of qualitative patterns. This has resulted in renewed interest in typological approaches, especially in that of Jung. Jung's theory of personality types satisfies many of the requirements of a systemic view of the individual and offers a view of both the nature and organisation of intra-individual qualities and person-situation interactions, by identifying the individual's basic attitudes and orientations toward perceptions of the environment (Richter, 1992).

Myers and Briggs who devised the Myers-Briggs Type Indicator, an inventory for identifying sixteen different patterns of action or types, made a revival of the idea of temperament in the 1950s. The inventory was so widely used that it created an international interest in the idea of types of people and revived interest in Jung's theory of psychological types. It also revived interest in the ancient theory of four temperaments, as the sixteen Myers-Briggs types fell neatly into the four temperaments of Hippocrates, Adickes, Kretschmer, Spranger and Adler (Benfari, 1991).

Personality therefore refers to the human psyche as defined by Jung (1959, 1971). The psyche is seen as a complex network of systems interacting with each other. Psychic energy flows continually from one system to another, in a constant striving for harmony. Personality

development is also viewed as a dynamic process which takes place throughout life as the primary development task of a person in self-actualisation (Jung, 1959, 1971).

Carl Jung's theory of personality contributed greatly to the field of psychology. It led to the development of several questionnaires to measure psychological type, which are currently used in career and educational settings, in individual and family counselling situations, as well as in situations requiring co-operation, teamwork and improved communications (Frazer, 1996).

Jung borrowed from the Greek philosopher Heracleitus the term *enantiodromia*, which means "running counter to". Enantiodromia suggests a state of inevitable tension between opposites. In psychological terms, it means that anything repressed or suppressed will come out in the course of time. Everything that exists eventually changes into its opposite. Youth becomes old age, decay follows creation, winter follows spring. Jung used this term to explain the inevitable emergence of the unconscious opposite function in the human psyche. Even as one function dominates our conscious life, its equally strong opposite function develops in our unconscious. If the opposite function never has an opportunity to play out its role, it may burst onstage, following a cue from the unconscious (Benfari, 1991).

Psychological-type theory has an essential role to play in understanding management style, in career counselling, and in handling conflicts in organisations. Anomalies and inconsistencies do however arise when the test becomes the sole source of information. Carl Jung himself saw his theories as an important segment of analytical psychology but not as the whole (Benfari, 1991).

Jung (1971) did clarify that the basic principles of human development are not vested in any one faculty alone – they have no academic formula, for they embrace every function of human activity. They are commensurate with life. It is easier to teach and practice a formula than to try to interpret the meaning of life; but a rational formula is doomed from the outset, because it tends to seduce men to turn away from the enigma of life by offering them a formula in its stead: thus it opposes life, and its inherent destructiveness determines its own fate.

No psychological formula can ever explain life. At best it can only present the living process in a thinkable form to our reason. As soon as it claims to have explained a living process, its effect is

destructive, since it interposes an authoritative, ready-made explanation between the individual and the real problems life presents, thus apparently relieving him\* of the need to seek his own individual solution.

Personality also includes abilities. Abilities are the tools by which a person expresses or fulfils his or her needs. They are the communications system for those needs. Sometimes difficulties arise because the channel between needs and abilities is not direct, or it may be distorted. In such instances, the person may interpose a set of defences between his or her needs and abilities, which will serve to modify behaviour. These causes could upset a person considerably and the tension might act to reduce the efficient expression of his ability.

It has been acknowledged that personality is a complex phenomenon. It manifests an energy that appears to emanate from the individual's need system, and it manifests certain abilities:

- knowing (cognitive)
- doing (motor)
- feeling

In addition, it gives order and congruence to all the different kinds of behaviour in which an individual engages (Koehler, Anatol & Appelbaum, 1981).

Koehler et al (1981, p 167) suggests that there is no single definition of personality. For the purpose of the organisation, a definition of personality is:

... the way in which the individual relates to his or her circumstances. It is a combination of the knowledge, skills and intentions reflected in a person's actions as evaluated by other people. It is that which gives order and congruence to all the different kinds of behaviour in which an individual engages.

---

\* In words such as *person* or *individual*, both genders are implied. There might be instances in the text where, for grammatical or stylistic expediency, only the male pronoun is used; the female gender is implicitly intended as well.

According to Botha (1994) there is wide agreement on the assumption that personality manifests some type of energy. Whatever the level of the amount of energy, most researchers postulate that it (the energy) is located in the need system of the personality. The more important (or deeper) a need, the more potential energy it has to release. By observing individuals it can therefore be inferred from their behaviour what need system is in action.

The personality approach to the study of organisational behaviour may help us understand, explain, predict, and perhaps control the responses that people are likely to make in various situations (Koehler et al, 1981). The personality of an individual involving all of that person's unique traits, is therefore derived from the interplay of these elements with the environment external to the individual (McCroskey, 1976).

Within the framework of various definitions of personality, there is one constant: consistency. An individual will attempt to maintain a consistent façade in everyday interactions (Botha, 1994).

#### **1.4.4.4 Personality types**

Personality types are defined, as patterns in the way people prefer to perceive and make judgements. Apart from a dominant attitude, each person uses consciously, and in a specific way, the functions of perception and judgement when observing his world and assigning meaning to each experience (Coetzee, 1996).

Jung (1971, p 547) defines function as "a particular form of psychic activity that remains the same in principle under varying conditions". By combining an individual's dominant attitude and function, the basic type of personality may be determined. Jung (1971) further indicates that personality types differ in interests, values and needs.

This Jungian typology is a theory of personality dynamics and development based on the assumption that people differ naturally in the ways they use their perception, their judging, and their focusing of their attention. Observable behaviours allow us to hypothesise what these innate predispositions might be (Casas, 1996).

Jung's contribution therefore opened up ways of thinking about people and the way they handle themselves in all kinds of situations, providing some behavioural predictability and making it possible to render more reasonable judgements of those who do not seem to fit into a particular mould and comfort zone (Isachsen & Berens, 1991).

#### **1.4.5 Central hypothesis**

The central hypothesis of this research can be formulated as follows:

If personality types refer to patterns in the way that individuals prefer to approach problem resolution, then it can be assumed that a specific cognitive style could be linked to certain personality types.

### **1.5 RESEARCH DESIGN**

Research design is synonymous with rational decision making during the research process. Irrespective of how structured or unstructured a research project is likely to be, it is the duty of the researcher to ascertain which factors pose a threat to the validity of the findings (Mouton & Marais, 1990).

The aim of this research design is to plan and structure the research in such a manner that the eventual external and internal validity of the research findings are maximised (Mouton & Marais, 1990).

Within this research the dependent variables, for which the measurement will need to be reliable and valid, will be *cognitive styles* and *personality types* (Huysamen, 1988).

The emphasis of this research will be on the quantitative aspect as it will investigate, describe and explain the results from the statistical analysis.

For this research the external validity will be ensured by the selection of the sample to be representative of the total population. The findings will therefore have greater validity than merely for the project in which they were generated (Mouton & Marais, 1990).

Internal validity will further be ensured through:

- theories chosen in a representative manner and presented in a standardised manner; and
- measuring instruments selected based on representivity and presented in a standardised manner.

## **1.6 RESEARCH METHODOLOGY**

The research will be conducted in two phases, namely a literature review and an empirical investigation.

### **1.6.1 Phase one: Literature review:**

- Step 1: Conceptualisation of cognitive styles
- Step 2: Conceptualisation of personality types
- Step 3: Integration of cognitive styles and personality type theories

### **1.6.2 Phase two: Empirical investigation**

The empirical investigation will consist of the following steps:

- Step 1: Description of sample population
- Step 2: Motivating choice of psychometric battery
- Step 3: Data collection
- Step 4: Statistical methodology
- Step 5: Formulation of research hypothesis
- Step 6: Reporting and interpretation of results
- Step 7: Summary of findings

- Step 8:        Limitations of research
- Step 9:        Conclusion
- Step 10:      Formulation of recommendations

## **1.7        CHAPTER DIVISION**

The chapters of this dissertation will be presented as follows:

- Chapter 1:     Background to research
- Chapter 2:     Cognitive styles
- Chapter 3:     Personality types
- Chapter 4:     Integration of cognitive style and personality type theories
- Chapter 5:     Empirical study
- Chapter 6:     Statistical results
- Chapter 7:     Limitations, Conclusion and Recommendations

## **1.8        CHAPTER SUMMARY**

This chapter discussed the background to the research and presented the problem statement, aims, paradigm perspective, research design, research method and chapter division. Chapter two presents a theoretical background on cognitive styles.

## **CHAPTER 2: COGNITIVE STYLES**

This chapter, which represents the first step in the literature survey, focuses on cognition and more specifically, cognitive style. Individual behavioural differences in educational and organisational settings will be discussed in terms of cognitive, learning and personality factors. In doing so, a holistic approach will be followed, which considers the individual as an integrated whole within his/her environmental context.

### **2.1 INTRODUCTION**

Schnaitter, as referred to in Lee (1998), suggests that our entire intellectual heritage could be said to rest on the assumption that thinking about thinking is the way to understand human beings, and that understanding human beings is the first step towards understanding the world. Conscious thought is therefore a direct cause of human behaviour – it is the most important cause of human behaviour.

Human thinking has become a major focus in psychology. Psychology, it is generally acknowledged, has undergone a cognitive revolution in the past decades (Bootzin, 1985; Sperry, 1993, 1995). Clinical psychology, social psychology, and most of applied psychology are today unquestionably cognitive in outlook. Bolton (in Lee, 1998) also confirms that modern psychology is to a large extent the study of cognition.

Theorising in cognitive psychology is extremely complicated due to the multifaceted nature of mental processes. Cognitive processes possess an unlimited number of characteristics of which only some can be isolated for scientific investigation (Prinsloo & Voss, 1996). Cognitive theory will be discussed in more detail in the next section.

### **2.2 COGNITIVE THEORY**

Cognition can be seen as all the processes by which the brain deals with information. It is not considered as an object, but is seen as a collective term for a set of dynamic operations (Verster, 1982). Cognitive processes refer to mental activity or operations (as units of thinking) resulting in

certain products. In other words, the term *process* describes a general state of mental activity necessary to generate a product. According to Sigel and Cocking (1977), the operation involved determines the type of mental activity.

Contributions from a large number of disciplines during the 1940s and 1950s culminated in the emergence of cognitive psychology in the mid-1960s. The discipline formed part of the larger field of cognitive science, which includes a wide range of subdisciplines, such as philosophy, linguistics, psycholinguistics, computer science and neuroscience, all of which focus on higher mental processes (Dellarosa, 1988; Prinsloo, 1992).

Cognitive psychology, according to Prinsloo (1992), today encompasses subdisciplines such as the information-processing approach (as part of experimental psychology), the artificial intelligence perspective and neuroscience.

This emphasis on cognition has enhanced the scientific status of cognitive psychology and brought an end to the behaviourist monopoly in psychological research.

Gestalt psychology made an especially valuable contribution to early cognitive psychology, as did the emergence of information theory within the physical sciences which lent cognitive psychology the prestige and respectability of the so-called "hard sciences" (Prinsloo, 1992). According to Heinen (1980), information science provided the basis for cognitivism just as classical physics provided a model for behaviourism.

Modern psychology according to Lee (1998), to a large extent, has no room for non-cognitive explanations of behaviour. Boston (in Lee, 1998) suggests that almost by definition, psychology has become the study of cognition.

The new cognitive approach enabled researchers to focus on internal states and processes in a scientifically rigorous manner (Dellarosa, 1988). Initially it did so by focusing attention on limited cognitive tasks in order to facilitate the collection of data on cognitive processes to be used in the development of processing models. Fahlman (1981) commented that this approach represents a mechanistic approach, explaining that it is based on the assumption that intelligence can be

understood in terms of the operation of physical mechanisms upon symbolic representations of information.

According to Lee (1998), modern psychology's focus on individual cognition, its much-heralded "cognitive revolution," materialised cognition and artificially separates it from the person, and the person from the broader and physical context. The seemingly unchallengeable view that modern psychology is, and should be, the study of individual thought means that biological, social, economic, and environmental realities are ignored. Lee (1998) adds that increasingly, psychological research is theory-confirming research. Psychological models remain inventions, not explanations, while psychological theories are plausible but essentially metaphorical inventions, not causal explanations of human behaviour.

Richter (1992) adds to the above reductionistic criticism by indicating that in cognitive theorising and research, as in most other psychological disciplines, the major goal has been, and mostly still is, the discovery of exact rules by which behaviour can be explained. However, according to the systems perspective it is incorrect to assume that there is only one correct explanation for a certain phenomenon, a viewpoint that is the antithesis of the mechanistic perspective, which advocates that only one solution or explanation for any phenomenon exists.

Mischel (1981) refers to cognitive economics: the recognition that people (including scientists) are flooded by information that somehow must be reduced and simplified to allow efficient processing and to avoid an otherwise overwhelming overload. This reductionistic nature can be explained in terms of our limited view as researchers.

Lee (1998) continues by adding that from a holistic view, an exclusive focus on cognition, combined with a reluctance to become aware of the existence of alternative perspectives, is restricting an academic field that has the potential to deal with human behaviour in its broadest possible sense. That is the behaviour of individuals in the context of their biology, their physical and social environment, and their cultural and historical context.

Different perspectives and approaches have since emerged in response to the reductionistic nature of initial research attempts. The modern focus on emotional intelligence and integrated personality functioning are addressed from a more holistic perspective.

Cognition will be defined in more detail in the following section.

### **2.2.1 Cognition defined**

The terms *cognitive/cognition* are being used so widely that the question has to be asked whether there is anything in psychology that is not cognitive (Kreitler & Kreitler, 1976). Psychology's contemporary emphasis on the cognitive has inhibited the development of alternative approaches to the field of psychology.

Neisser, as referred to in Kreitler and Kreitler (1976), presents a definition that is typical of many others where it suggests that the term *cognitive* refers to all the processes by which the sensory input is transferred, reduced, elaborated, stored, recovered and used. Kreitler and Kreitler (1976) suggest that this definition is limited, and they therefore refer to the more precise definition by Kagan and Kogan (1970, p1275):

The term *cognitive* has typically referred to mental activities in the sense of both product and process. Cognitive process is a superordinate term, subsuming the more familiar titles of imagery, perception, free association, thought, mediation, proliferation of hypotheses, reasoning, reflection, and problem solving. All verbal behaviour must be a product of cognitive processes, as are dreams and intelligence test performances. But, skeletal muscle movement or visceral reactions are not necessarily linked to cognition.

A broad definition of cognitive processes which applies to the earlier developments as well as the current understanding of situation cognition advanced in the present research is also offered by Kreitler and Kreitler (1982, p103):

Cognition is defined as the meaning processing subsystem within the organism, that is the subsystem that grasps, elaborates, assigns, and manipulates meaning. It is the cognitive system, mainly meaning and operations with meanings, that decides the course of action.

Tiberghien (1989) defines cognitive psychology as a conception popularised under the name of "information-processing system". This implies that psychological phenomena are the product of a system which, although complex, should be studied like all other systems. The sub-processes of this psychological system like those of any other system deal with inputs and outputs which appear in different forms (movement, energy and information) according to the position they hold in the system's hierarchy.

As problem solving is an area in which information-processing research is done, the next step would be to discuss the concept of cognition and problem solving.

### **2.2.2 Cognition and problem solving**

A fundamental issue in cognitive psychology is understanding the thinking processes involved in problem solving. Cognitive psychology, as with psychology generally, is thus currently characterised by theoretical diversity (Prinsloo, 1992).

The term *problem-solving style* is sometimes used as synonymous with *cognitive or thinking styles*.

Procedures that the human mind appears to resort to automatically during problem-solving situations are, according to Guilford (1959), as referred to in Koehler et al (1981):

- Cognition – recognition of information
- Production – use of information or, in some cases, use to generate new information

Production may be divergent or convergent:

*Divergent production*: thinking that goes off in different directions during search of information

*Convergent production*: thinking that focuses on achieving one right answer

- Evaluation – determination of outcome, whether what was produced or conceptualised is suitable, correct or adequate

The information-processing approach will be discussed in the next section.

## **2.3 THE INFORMATION-PROCESSING APPROACH**

Information processing will be discussed in terms of history, description of information processing and criticism.

### **2.3.1 History**

The psychometric approach according to Prinsloo (1992) became a source of increasing disillusionment during the latter half of the previous century. This caused researchers to turn to the information-processing paradigm to provide a perspective on information-processing aspects. A variety of disciplines contributed to the development of the information-processing perspective on intelligence. The merging of ideas from formal logic and cybernetics, Gestalt psychology, computer technology and psychometrics, amongst others, were instrumental in the origination of the processing approach.

The "information-processing" metaphor has its origin in functionalism, which lies within the behaviourist orientation, as well as in the computing and informational science (Royce & Powell, 1983). Sternberg (1977) goes as far as to cite the stimulus-response concept of behaviourism as a main contributor to the development of the information-processing approach.

Although information processing partly developed from behaviourism, a shift occurred from the examination of observable phenomena to the study of the unobservable. According to Schlecter and Toglia (1985), this trend developed into a revolution which influenced a wide range of areas within psychology such as experimental, clinical, comparative, developmental and social

psychology. It has even spread beyond the boundaries of psychology according to Prinsloo (1992).

Computers opened up new possibilities and enabled researchers to model cognitive processes and develop artificial intelligence systems. A close relation was, and still is, maintained between cognitive psychology and artificial intelligence (Simon, 1979). Computerisation offers a number of advantages in testing. Possibly the most important of these are the capacity to do adaptive testing, and the capacity to devise new types of measures. New types of measures are those which give information about subjects which could not be obtained using conventional ability and trait measures.

The shift to a cognitive information-processing perspective of human functioning in psychology is of such a magnitude that it may be regarded as a paradigm shift.

The concept of information processing will next be discussed in more detail.

### **2.3.2 Description of information processing**

While the concept of information remains in many ways elusive, cognitive psychology basically deals with information-type input and output.

Whereas psychometric theories differ mainly in terms of the identification of factors and the interfactorial relationships, information-processing theories differ in terms of the "level of processing" focused on, with levels ranging from reaction time studies on a perceptual-motor level to the level of complex reasoning and problem solving (Prinsloo, 1992).

Theories on the processing of hierarchically organised information specify a number of processes and control processes and deal with strategy execution. Brown (1978) identified metacognitive processes such as predicting, checking, monitoring and reality testing, and cognitive processes such as those involved in visual scanning and memory retrieval. The differentiation between processes and control processes is either made explicitly or implicitly.

The information-processing approach has been used in cognitive research in a number of areas, namely re-conceptualisations of intelligence, analysis of tasks required in cognitive tests, problem solving, memory models and knowledge representation, and learning.

Most cognitive tasks which people do in their daily lives or in psychological tests are of a "macro" nature. These tasks can be split into a number of smaller "micro" steps that have to be executed in the right sequence in order to complete the macro task successfully. Cognitive psychologists have become aware that different sequences of a given set of micro steps may result in the satisfactory completion of a macro task. Also different selections of micro steps may appear in different peoples' procedures for doing the task, and different lengths of time may be devoted to individual micro tasks by different people.

Sternberg (1985) proposed six sources of individual differences in information processing:

- Individuals may use more, less, or different components to do a particular task.
- Some individuals may combine components according to one rule, some according to another rule.
- The components may be activated in different orders.
- People differ in the mode of component processing. For instance, a memory search may terminate as soon as a piece of information is found, or the search may not terminate until all available material has been examined.
- People differ in the time taken on each component and the accuracy with which it is executed.
- Some people may represent information in one way (e.g. pictorially) while others represent the same information in another way (e.g. verbally).

The above, according to Taylor (1987) indicates why information-processing theory has had problems generating broad theories. For this reason, most research in the field concentrates on highly circumscribed tasks where many of the above sources of individual differences are either absent or controlled.

In summary, the various information-processing theories see intelligence in terms of mental representation, the processes underlying these representations and the way in which these processes are combined. The identification of cognitive processes is regarded as a primary research goal. This is done by systematically varying task attributes as opposed to subject attributes, which is the approach taken by differential research. The methodology includes techniques such as content analysis, mathematical modelling and the computerised simulation of processing (Sternberg, 1979).

Cross-cultural issues cannot be ignored in information-processing research. Although certain specific processes may be used by individuals in all cultures, the choice and ordering of processes to achieve a macro task is likely to be influenced by cultural factors. Criticism against the information-processing approach will be discussed next.

### **2.3.3 Criticism**

The information-processing approach is, however, criticised in that the rigidity of computer models contrasts sharply with the flexibility of human performance. Gestalt psychologists, for example, believe that understanding, which is a fundamental characteristic of human cognition, cannot be adequately simulated by a computer (Dellarosa, 1988).

Taylor (1987) suggested that early information-processing theory which was heavily based on the computer analogy, tended to give a mechanistic caricature of how humans supposedly processed information. Later models broadened their perspective to include some of the higher level executive functions that are essential for the successful execution of most tasks. Nevertheless, the information-processing approach has to guard against the danger of being too mechanistic and too concerned with detail to the exclusion of the bigger picture. The information-processing approach has therefore assisted cognitive psychology to move further away from a "black box" conception of human functioning. Testing under the black box model involves eliciting rather gross responses to rather crude and ill-defined inputs, and interpreting these responses in an equally crude way.

Taylor (1987) suggests that modern cognitive theory describes human functioning in terms of basic information-processing processes; the theory has, however, been rather unsuccessful in

accommodating individual differences. The integration of psychometrics with information-processing theory would therefore benefit both disciplines.

Although theories contributing to the information-processing approach are often applauded for their precision and testability unrivalled by other accounts, they can be criticised on a number of grounds. Newell (in Prinsloo, 1992), for example, points out that their constructs lack external validity. He notes that this could well lead to the development of an isolated laboratory psychology that bears no resemblance to everyday cognition.

Because a large proportion of processing research makes use of a small number of units of cognitive behaviour, Horn (1986) criticises it for being limited in terms of the type of performance studied. He believes that such findings cannot be generalised to a wider range in intellectual capabilities.

The concept of cognitive style will now be discussed in more detail.

## 2.4 COGNITIVE STYLE

Various information-processing models exist that describe cognitive stages and approaches. These models differ in terms of the level at which they have been formulated. The concept *style* typically describes processing tendencies at a fairly general level of theorising. The information-processing approach also focuses on constructs other than *styles*. Within this research, the description remains at a general level for practical reasons.

It is useful to look at the concept of *style* as a construct, as it encompasses personality and intellectual tendencies. In psychology, as a descriptive science, practical utility remains the ultimate arbiter of value in terms of theoretical models.

Cohen (1983) proposes that by simply recording different patterns of an individual's behaviour is not always of value. Instead he regards the *classification of individuals into types* in order to determine which of, and how the individual's characteristics influence his unique pattern of cognitive abilities and performance on cognitive tasks, as more important. The purpose of such

typology would be to relate individual characteristics to cognitive levels and/or approaches. When focusing on performance, focusing merely on how much of an ability a person possesses does not answer adequately how that person solved the problem. Therefore, it has become imperative to consider the variety of problem-solving strategies or *cognitive styles* that characterise performance.

#### **2.4.1 Concept of style**

Richter (1992) argues that many tests used to study style dimensions actually measure abilities. Cognitive styles, according to Messick (1984), are characteristic self-consistencies in information processing that develop in congenial ways around underlying personality trends.

A framework – in this case a typology – is needed for the understanding and prediction of behaviour, and the design of measurement instruments for the assessment of patterns of cognitive functioning or styles, without losing sight of the variability and individual differences within types. Typologies are, in this sense, important since they help the observer to control his thoughts and not to be overwhelmed by too much information. The observer, according to Richter (1992) and Prinsloo and Voss (1996) should however keep in mind the constraints of such typology and the variability within types so that biased observation can be avoided. Types should be viewed as a guideline and it should not be expected that "pure" types would be found, a phenomenon which is very rare.

Richter (1992) suggests that these strategies or styles be personalised to a high degree. Such typology represents prototypical examples of behaviours, with individuals differing along a continuum in any one of two directions away from the central point. Using typology for classification or categorisation is necessary to organise our theorising and to be able to generalise and predict behaviour.

Richter (1992) cautions that cognitive styles are not to be regarded as completely stable or unchangeable, because individuals accommodate themselves according to the demands of the task they are presented with.

Cognitive styles will now be defined more in depth.

#### **2.4.2 Cognitive style defined**

From the literature on cognitive styles it is apparent that different theorists define styles differently. The term *cognitive style* originated in personality research (Green & Schroeder, 1990) and occupies a middle ground between aptitude measures and personality measures (Richter, 1992).

Cognitive style can be defined as the way an individual acts, reacts, and adapts to the environment. This action, reaction and adaptation can be mapped well enough to provide a high measure of insight into an individual's behaviour. We can study and even predict how a person will behave in a given situation. This term is often used synonymously with terms such as *learning style*, *teaching style* and *administrative style* (Kuchinskas, 1979).

Cognitive style is a hypothetical construct that was developed to explain the interaction process between stimuli and a response. This interaction process includes perception and interpretation, attention, memory, concept formation, problem solving and social cognition (Sparrow, 1994).

The constant individual differences in the above-mentioned processes are known as cognitive styles (Messick, 1976). Various definitions of cognitive styles can be found in the literature. Messick (1969) defines styles as habitual modes of processing information. Vernon (1973) defines cognitive style as a construct that is involved in cognitive processes and is responsible for individual differences in a collection of cognitive, perceptual and personality variables. A definition by Pratt (1980) describes cognitive styles as the method the individual uses to assimilate, understand and transfer information. Saracho (referred to in Swart & Van Vuuren, 1998) is of the opinion that cognitive styles are a psychological construct that includes elements such as perceptual style, personality, intelligence and social behaviour.

Educational psychologists according to Vernon (1984) are chiefly interested in individual differences, and might prefer to work with groupings of similar processes, which are referred to as styles.

Vernon (1984) suggests that:

- The terms *style* and *strategy* are almost interchangeable, though *strategy* usually seems to refer to broader or more inclusive sets of processes, which also commonly emphasise both motivational and cognitive components.
- Most authors insist that styles or strategies can be modified or developed by appropriate methods of training, whereas intelligence used to be conceived as essentially untrainable, except perhaps by long-term stimulation in a superior home environment.
- Another word for *style* is *type*, which may be regarded as the most general scheme for categorising people.
- Types are usually dichotomous or trichotomous classifications. Such classifications ignore the fact that most human attributes generally conform to a near-normal distribution.
- There are as many difficulties in arriving at a suitable series of cognitive styles as there were with psychological types.

The concept *style* can be defined as the *manner* in which things are done as opposed to the *matter* or content on which a person is working. This does not exclude the possibility and probability that the matter affects the manner in which a task is performed (Child, 1986). The concept of cognitive style is also viewed as a useful indicator of individuality (Garret, 1989).

Consistent differences in individuals' perception and assimilation of information amount to *styles* of thinking, which define how a person comes to grips with complex problems, both in terms of conscious strategies and unconscious habits (Hunt, Krzystofiak, Meindl & Yousry, 1989).

Child (1986) also suggested that individuals have personal preferences in the way they would approach a problem. In each person there are therefore established patterns or "response sets" which are compounded to give individuality to learning and problem solving processes.

According to Child (1986), the most appropriate definition of cognitive (or thinking) style is that given by Messick (1976, p 4):

Consistent individual differences in these ways of organising and processing information and experience have come to be called cognitive styles. These styles represent consistencies in the manner or form of cognition, as distinct from the content of cognition or the level of skills displayed in the cognitive performance. They are conceptualised as stable attitudes, preferences, or habitual strategies determining a person's typical modes of perceiving, remembering, thinking, and problem solving.

Child (1986) suggests that three salient aspects about Messick's definition are the emphasis on individual differences, the importance placed on consistency, and the intermediary nature of the concept of style, in other words, it is a process assumed from these differences.

Richter (1992, p 19) suggests the following definition:

Cognitive style, being part of personality organization, represents a characteristic mode of information processing which involves a constellation of metaprocesses. Cognitive styles, then, are stable individual preferences regarding the manner of perceptually organising and conceptualising the environment as well as reacting thereon or adapting thereto.

Richter (1992) adds that the above definition of cognitive style demonstrates that it can, in a way, be equated to a typology. Individuals can therefore be classified in terms of the type of cognitive approach or style he or she prefers in approaching and solving problems.

Krahe (1990) defines cognitive styles as hypothetical constructs referring to a person's consistent mode of organising incoming information from his or her environment. They are typically conceived of as mediating variables between situational stimuli and the individual's response to these stimuli, whereby the focus of interest is on the structural organisation rather than the content of the relevant perceptual and cognitive operations (Goldstein & Blackman, 1978).

Cognitive styles according to Krahe (1990) denote a variety of principles by which objective stimuli are translated into subjective representations and thus acquire psychological significance.

Krahe (1990) also indicates that cognitive styles refer to individual differences in responding to social stimuli, and in this respect they are similar to traits. However, the fact that they are focused specifically on processes of perception and meaning construction renders them distinctly different from the trait concept, casting doubts on the utility of equating cognitive styles with traits.

The cognitive system, and in particular the orientative aspect of cognitive contents as well as their various forms of interplay, determines the direction of human modular behaviour (Kreitler & Kreitler, 1976).

Sparrow (1994) highlights the fact that "strategic decision-making is underpinned by the cognitive base of a manager's perceptual process". According to Swart and Van Vuuren (1998), individuals with certain cognitive styles may be sensitive to the organisational change needed, whilst others may not see the need to change.

From the above, the following short definition can be derived: cognitive style is about the typical and preferred way of information processing, resulting in differences in individual behaviours and interactions.

As indicated before, cognitive style and ability are not synonymous. The difference between cognitive style and abilities will be discussed in the next section.

### **2.4.3 Cognitive style versus cognitive ability**

The distinction between cognitive styles and abilities has always been controversial. Recently, several attempts have been made to specify and differentiate the cognitive style concept in light of research findings and statements (Tiedemann, 1989).

Abilities, according to Richter (1992), refer to cognitive abilities underlying performance on tasks measuring a variety of abilities, emphasising maximum performance, with a value judgement according to how much of an ability an individual possesses. Ability is associated with the intelligence coefficient (IQ) tradition, in which intelligence is seen as inherited and static.

Styles on the other hand are associated more with the information-processing approach. Styles refer to *typical and preferred mode employed spontaneously to process information*, with individual differences in the methods of achieving a constant level of competence. The major difference is that ability is concerned with the level of performance, while style focuses on the manner of performance. This is the first criterion of "pure" cognitive style to which the theoretical definition of a style, as well as the instrument used to assess that style, should comply.

Messick (1984) distinguished cognitive styles from intellectual abilities. Intellectual abilities refer to the context and level of cognition, in other words: what? and how much? Intellectual abilities deal with what kind of information is being processed, by what operation, in what form, and how well (Tiedemann, 1989). In contrast, cognitive styles refer to the manner or mode of cognition – to the question of how?

The concept of abilities implies the measurement of competencies in terms of maximal performance, with the emphasis on accuracy and correctness of response, whereas the concept of style implies the measurement of propensities in terms of typical performance with the emphasis on a predominant or a customary processing mode. Abilities are seen as unipolar whereas cognitive styles are typically conceived to be bipolar. Abilities range from none to a greater deal, with increasing levels implying more and more of the same facility, for example, quantitative reasoning. Cognitive styles, on the other hand, range from one extreme to a contrasting extreme, with each pole of the dimension having different implications for cognitive functioning (Tiedemann, 1989).

Cognitive styles further differ from abilities in terms of the values usually conferred upon them (Tiedemann, 1989). Abilities are value-directional: having more of an ability is better than having less. On the other hand, cognitive styles are value-differentiated: each stylistic extreme has an adaptive value but in different circumstances. The higher end of the ability dimension is consistently more adaptive than the lower end, whereas neither pole of cognitive style dimensions is uniformly more adaptive. The adaptiveness of each pole depends on the nature of the situation and the cognitive requirements of the task at hand. Styles further differ from abilities in their breadth of coverage and their pervasiveness of application. Abilities are specific to a particular domain of content or function, such as verbal, numerical or spatial ability. A cognitive style in

contrast, cuts across domains – ability as well as other cognitive, personality and interpersonal domains. In this sense, styles serve as high-level heuristics.

Furthermore, abilities are called enabling variables since they facilitate tasks performance while styles are seen as organising and controlling variables in the sense that these variables contribute to the selection, combination and sequencing of both substance and process (organisation), and help to regulate the direction, duration, intensity, range, and speed of functioning (control) (Tiedemann, 1989).

Abilities are therefore conceived of as narrower than cognitive style, which is thought to have a much broader range of implications (McKenna, 1984). Cognitive style, for example, is much less threatening than an ability such as intelligence.

Cognitive style measures resemble both cognitive and personality measures, formulated at a general theoretical level. The former because of the focus on attention, perceiving, memory and processing, and the latter because the concern does not end with the limits of performance. What distinguishes cognitive style measures from ability and personality measures is that, while ability measures focus on the product of a test and personality measures are usually of the self-report questionnaire type, cognitive style measures focus on habitual behaviour which frequently involves laboratory tasks to facilitate the discovery of relatively permanent and dominant ways of approaching, encoding and processing information (Richter, 1992).

Cohen (1983), Green and Schroeder (1990), McKenna (1984) and Tiedemann (1989) suggest that no reference to the individual's ability for the task (which may be minimal) should be made, thus signifying the absence of value judgements, that is, one mode of processing should not be judged to be superior to another; instead, circumstances determine which style is more appropriate to use. As already mentioned, ability measures are value-directional, suggesting that having more of an ability is better than having less, while cognitive style measures are value-differentiated, with each extreme of a specific style having adaptive value but in different circumstances, depending on the situation and the cognitive requirements. This according to Richter (1992) is the second criterion posed for pure cognitive style measures.

Swart and Van Vuuren (1998) suggest that the way in which processes are approached constitutes the core of the concept "cognitive style". There is therefore no focus on the *ability* of the individual.

Swart and Van Vuuren (1998) summarise the above by suggesting that it is important to note that cognitive style differs from cognitive ability, since (i) ability emphasises the what of cognition and style emphasises the how (McKenna, 1984), (ii) cognitive style is free from value judgement, but cognitive ability distinguishes between above and below average (Messick, 1976), and (iii) cognitive style has a broader field of application than cognitive ability (Witkin, 1976).

The third point above is then also the reason why cognitive style is being used here to determine a possible relationship with personality types.

This diversity in the field of psychology determines the scientific status and nature of research undertaken. According to Royce (referred to in Prinsloo, 1992), unification is the ideal toward which science strives. Because of the conceptual pluralism that characterises psychology, it is regarded as a theoretically immature science. Psychological research according to Prinsloo (1992) currently relies predominantly on empirical exploration and focuses on the development of methods of observation and quantification. However, scientific progress also depends on advances in theoretical constructs, therefore a mere proliferation of alternative conceptual frameworks at the expense of reconceptualisation and theoretical synthesis cannot be justified.

The Cognitive Process Profile (CPP) as a cognitive measurement instrument will be discussed next.

## **2.5 COGNITIVE PROCESS PROFILE (CPP)**

In this section an overview will be given on the Cognitive Process Profile developed in South Africa by Prinsloo (1995).

Kogan (1973) offered a threefold classification for the type of measurement used in the resulting distance from the construct of ability:

- The first class of cognitive style is closest to the ability domain and measures are assessed in terms of accuracy versus inaccuracy of performance.
- The second class of cognitive style is assessed by measures that cannot be characterised in terms of accuracy of performance.
- The final class of cognitive style is regarded as the purest. Here neither accuracy nor value judgements are applied to the performance measure under consideration.

Various methodologies are used to measure cognitive styles. The CPP was chosen as the instrument to measure cognitive styles for this research. The CPP is a simulation exercise that evaluates everyday problem-solving abilities by tracking and recording thinking processes.

### **2.5.1 General description of the CPP**

The development of the CPP reflects the view that thinking is an integrated process. It is therefore difficult to identify the sub-components of the thinking process. A theoretical model that differentiates between thinking processes is, however, required for diagnostic and development purposes. It is for this reason that a number of cognitive processing constructs, which represent functional categories, have been identified. These constructs according to Prinsloo (1992) are not independent processes, but can be represented as overlapping fields of a matrix. A large number of processes can therefore be linked to each of the constructs.

The CPP is an assessment instrument devised by Prinsloo (1992) to measure the cognitive functions of a theoretical model of cognitive processes. It measures exploration, analysis, structuring, transformation, memory and metacognition in terms of a large number of micro components that are regrouped to represent different stylistic tendencies. More specifically it is designed to measure:

#### **(a) Cognitive styles**

Individuals show consistency regarding the way in which new and difficult problems are approached. These preferred approaches are referred to as styles.

## (b) Thinking Processes

Here the CPP indicates how effective and efficient someone is at processing information. In addition to thinking processes, the CPP also indicates strengths and development areas in terms of thinking, learning potential and a suitable work environment or level of work.

## (c) Development areas

Having established a person's particular cognitive profile, some prediction can be made as to which areas might be developed relative to his/her own functioning.

## (d) Potential

The potential an individual has for further cognitive development is established according to eight theoretical guidelines incorporated by the interpretation program of the CPP. The following aspects are taken into consideration when gauging potential:

- Profile characteristics
- Cognitive complexity
- Innate abilities
- Learnt strategies
- Metacognitive awareness
- Rate at which learning occurs/learning curves

## (e) Level of work

The CPP also establishes the level at which individuals currently function, according to Elliot Jaque's widely acclaimed Stratified Systems Theory (SST) (Prinsloo, 1995). Using data taken from *learning potential*, some indication is given on what level an individual might function in the future. The first five levels of the Stratified Systems Theory are used within the CPP, each

with particular requirements regarding cognitive functioning. These are: pure potential, diagnostic accumulation, alternative paths, parallel processing and pure strategic.

Within the framework of this research, the focus will remain on cognitive styles only. Cognitive styles measured by the CPP will be discussed next.

## **2.5.2 Cognitive Process Profile Styles**

For the most part, theory and research on cognitive styles have followed the assumption that individual differences in modes of thinking represent stable and characteristic traits and are displayed consistently over a wide range of situations (Peterson & Scott, 1975).

Prinsloo (1998) points out that the styles are not representative of a neat theoretical model (as in the case of processing constructs), but are rather based on a "fruit salad" approach of possible stylistic tendencies as described in the literature and observable in everyday life. Processing scores are therefore combined to provide an indication of a person's general approach to problem-solving situations of the individual's *cognitive style*.

Prinsloo (1998) further emphasises the fact that the CPP primarily measures a person's approach to new and unfamiliar environments. Should an individual therefore obtain a "random" and/or "impulsive" style on the CPP, but in actual life be very disciplined in a familiar, purely operational environment, the "random style" may indicate that the person finds it exceptionally difficult to function in unfamiliar and unstructured environments.

The CPP measures thinking skills only – Career performance depends on personality characteristics, interpersonal skills, motivation, knowledge and experience.

Within the CPP, Prinsloo (1998) has distinguished 16 cognitive styles, as illustrated in table 2.1 on next page.

**Table 2.1 Cognitive styles (Prinsloo, 1998)**

Cognitive style	Definition
<b>Exploration</b>	An explorative style is characterised by an emphasis on the investigation of a problem. It may involve the careful search for information, checking behaviour and a need for precision. Self-awareness and the application of metacognitive strategies for exploration are required for the effective investigation of a problem. The repeated exploration of a problem and repetitive checking behaviour may create unnecessary complexity and have a confusing effect.
<b>Analytical</b>	The application of an analytical style usually involves the differentiation between various characteristics of a situation and the systematic comparison of those elements to identify relationships. It is therefore characterised by a detailed, rule-oriented and systematic approach with an emphasis on precision, linking and comparative behaviour.
<b>Structured</b>	A structured approach is usually characterised by an emphasis on the rules of the task and the careful grouping and ordering of the information. Structuring behaviour includes the identification of core elements, the careful and/or repeated ordering of information, and the formulation of generalised structures based on commonalities between situations. In real-life situations it often manifests as summarising, documenting, mapping, ordering and filing information, as well as in the use of representational techniques such as pictures, maps and diagrams. It may reflect a need for precision and structure and is a useful technique for managing complexity and supporting memory functions.
<b>General style</b>	A general style refers to viewing situations globally, as opposed to a detailed approach. General impressions are created and the understanding of an overall idea is emphasised.
<b>Holistic Style</b>	A holistic style is often associated with the tendency to view a problem situation in its totality and to place an emphasis on the global perspective, wholeness and unity in determining the meaning of sub-elements, without losing track of relevant detail.
<b>Intuitive style</b>	An intuitive approach to problem solving usually, but not necessarily, involves the careful exploration of a problem and repetitive checking behaviour to meaningfully interpret complex information at a "gut" level. Experience that has resulted in an automatised knowledge base is the main point of reference. An absence of analytical strategies often characterises this style and relatively reductionistic structures may be formulated. It may result in the conceptualisation of creative ideas and/or unverified assumptions. An intuitive approach can be effectively applied when the problem solver has a well-developed knowledge base. An intuitive style in combination with resistance to learning behaviour is, however, less effective – especially in an unfamiliar environment characterised by novel and complex problems.
<b>Memory style</b>	A memory style is characterised by the tendency to internalise and automatise information as a problem-solving approach. The memory strategies that can be applied in this approach are: the use of external reminders, visualisation, association, practice and the integration of information. An emphasis on memory functions usually enhances problem-solving performance. However, a memory approach in conjunction with weak strategies for managing complexity and/or a relatively low level of cognitive complexity may create large memory burdens and have a confusing effect.
<b>Integrative style</b>	An integrative style refers to the tendency to combine, synthesise and structure information as it is encountered in order to make sense of, or meaningfully interpret new information. It usually involves the formulation and continuous adaptation of hypotheses, a tendency to follow links through and converge arguments, the effective use of memory functions and the formulation of coherent, as opposed to fragmented, conceptualisations (information structures). It usually reflects a need for understanding and often results in learning taking place. It also contributes towards economy of approach.
<b>Logical reasoning style</b>	A logical reasoning style is characterised by the tendency to look for logical evidence to verify and confirm arguments; to follow reasoning processes through in a metacognitively directed and logical way; and to manage high levels of complexity by applying a "process" approach to problem solving. An analytical style (being precise, systematic and focusing on detail) and cognitive complexity are regarded as prerequisites for the application of a logical reasoning approach.
<b>Reflective style</b>	Reflectiveness involves the tendency to explore the careful consideration of information, spontaneous comparative behaviour, the continual integration of new elements into existing information structures and the following through of reasoning process. Although it is usually associated with a relatively slow approach, pace control does occur. Metacognitive involvement in problem-solving behaviour is a prerequisite.
<b>Learning style</b>	A learning style is usually characterised by an emphasis on memory functions, integration of feedback, understanding and self-monitoring. This results in improved problem solving and a flexible approach. In addition, thorough exploration usually takes place, particularly with regard to the task requirements. Motivation and concentration are prerequisites for the application of a learning style. It usually facilitates the acquisition of new constructs and ideas.
<b>Random style</b>	A random style is usually characterised by a vague and unsystematic, trail-and-error approach to problem solving. Inadequate task orientation and insufficient goal direction are often present. The further development of, and an emphasis on metacognitive awareness, alertness and clarity is required. (Individuals, who show this style in an unfamiliar environment, may apply a more appropriate style in a structured and familiar environment.)
<b>Impulsive style</b>	Effective pace control involves the adaptation of processing speed to the complexity of the task requirements. Impulsivity (fast and inaccurate) is associated with inadequate pacing and an emphasis on the speed of problem solving, and may affect: exploration processes; comparative behaviour; the follow through of reasoning processes; closure; checking behaviour; the automatised of the routine aspects of the task; the making of assumptions and perceptions. Impulsive behaviour may be habitual, reflect a general personality trait or be the result of demotivation, anxiety and other emotional factors. Skills can be acquired for controlling impulsive tendencies, and this usually results in a significant improvement in performance.
<b>Quick insight</b>	An efficient problem-solving style is characterised by quick insight, effective task orientation, goal directedness and relatively fast processing in combination with effective integration, memory and reasoning processes. Cognitive complexity and intellectual competence are prerequisites for the effective application of this style.
<b>Metaphoric</b>	A metaphoric style is characterised by the tendency to view a situation abstractly and symbolically, as well as to combine elements of information in novel ways to formulate analogies and metaphors. Ideational fluency may occur in formulating flexible and unusual conceptualisations. This style may manifest in a tendency to use a "story telling" technique; the generation and use of partial similarities, resemblances and parallelisms in relationships; the formulation of abstractions; and the formulation of unusual conceptualisations to accommodate unfamiliar discrepant information.
<b>Balanced profile</b>	A balanced profile occurs when the person tends to equally use all, or most of the processing skills that are measured. It usually refers to processing activities related to the exploration of problems, the identification of relationships, reasoning behaviour, the integration of the information, memory functions and metacognitive awareness of thinking activities. The person does not therefore have particular processing preferences.

## **2.6 CHAPTER SUMMARY**

This chapter could be summarised as follows: Cognitive evaluation involves more than just the measurement of ability. Besides intelligence, cognition involves all the ways in which people obtain, process and use information. Some of the constructs in cognition are observation, interpretation, analysis, synthesis, learning styles and styles of thinking, decision making and planning.

The next chapter will define the concept of personality and personality styles, after which the theoretical integration between cognitive styles and personality types follows.

## **CHAPTER 3: PERSONALITY TYPES**

This chapter represents the second step in the literature survey, namely to define and describe personality types.

### **3.1 THE NATURE OF JUNG'S PERSONALITY THEORY**

Jung was both an empiricist and a phenomenologist, which means that he observed behaviour both in its consistencies and in its incongruities, then described it in terms of a structured approach to personality organisation. He compared his observations in the present – based on clinical data – with his studies of the past, based on thorough reviews of myths and religious symbols relating to what he called the "type problem" (Richter, 1992).

Jung's system has been described as the alpha and omega to individuality, not as an expression of personal power as the egoist would like to interpret it, but essentially as a function of the whole (Coetzee, 1996). Jung's theory on personality has also been described as extremely complex (Meyer et al, 1988; Möller, 1995; Coetzee, 1996), and has even been described as vague with ill-defined concepts (Carlson, 1985).

Jung, in his attempt to understand the psychological functioning of man, was convinced that the psychological types he found in his clinical observations had counterparts in other disciplines. He therefore drew on information from a wide spectrum of disciplines such as psychology, psychiatry, theology, philosophy, biology, physics, chemistry, archaeology, literature, history, anthropology and mythology (Benfari, 1991). Möller (1995) suggested that this resulted in an esoteric end product.

According to Benfari (1991) and Kainz (1989), much that is currently written about Jungian typology, misinterprets Jung's work. Psychological types have for example been confused with other independent factors such as needs and conflict styles, while assigning particular types behaviours that are not always present in them.

What follows is a broad summary of the basic principles of Jung's (1959, 1971) theory on personality.

### 3.1.1 The structure of personality

Mattoon (1981) indicates that Jung used the terms psyche and personality interchangeably, while Myers and McCaulley (1992) suggest that Jung referred to the total personality as the psyche. The psyche is made up of several major components, each of which can be envisaged as a combination of contents, and mental and emotional aspects. These components are *ego (or persona)*, *shadow* and *animus* or *anima*. These psychic components are not physical entities – they are combinations of mental contents that are manifested in observable behaviours, emotions and attitudes.

There is also a superordinate *Self*, which is not a component but has a significant relation to the components. The centre of the whole personality, which includes both consciousness and the unconscious, is referred to as the *Self* (Mattoon, 1981). The total personality benefits when the ego is connected to the *Self* (Jung, 1959).

The psyche is therefore seen as a complex network of systems interacting with each other. Three primary interdependent systems of the psyche are differentiated, namely the ego, the personal unconscious and the collective unconscious (Jung, 1959, 1971). Human personality or psyche can be divided into the following three systems.

#### (a) *The Ego*

The first system of the human personality or psyche is the personal conscious level of which the ego (or persona) forms a part. Ego, which means "I" in Latin, is the centre of consciousness. According to Mattoon (1981), "conscious" meant to Jung "under the control of the ego". As the centre of consciousness, a well functioning ego perceives reality accurately and differentiates the outer world from inner images (Mattoon, 1981).

The ego is also referred to as the *persona*. The term *persona* is derived from Greek and means *mask*, i.e. the mask or role that a person plays. The persona is made up of many masks, each of

which is assumed as the appropriate response to a specific environment and set of conditions (Mattoon, 1981). The persona is what the outside world sees. It represents our conventional role as defined by the expectations of others (Phares, 1991).

(b) *Personal unconscious*

The second system of the psyche is called the personal unconscious – "not under ego control" (Mattoon, 1981). This system is unique to the individual and may be made up of experiences, which the individual has long forgotten. The shadow and anima/animus are largely part of the personal unconscious. These aspects are briefly discussed below.

The shadow is characterised by traits and attitudes, whether negative or positive, which the conscious ego tends to reject or ignore. Consciously assimilating one's shadow usually results in an increase of energy. According to Jung (1959), all people have a shadow side, which is the unconscious. It is made up of material that people consider unpresentable, because they seem weak, socially unacceptable, or even evil. The shadow accounts in part for our aggressiveness, our cruelty and immorality, and even our passion (Phares, 1991). Jung according to Mattoon (1981) viewed the shadow not only as necessary for wholeness but also as capable of yielding positive aspects. The shadow is therefore not only negative but can also be useful if certain qualities become conscious and are developed.

Just as the shadow is part of the personal unconscious, the anima or animus is also a part of it. Every person has a contrasexual image, which is a part of him or her. Jung (1959) postulated that a woman has a primarily feminine consciousness and a primarily masculine unconscious while a man has a primarily masculine consciousness and a primarily feminine unconscious. This means that every man has an anima or woman image in his unconscious and every woman has an animus or male image in her unconscious. Both anima and animus are often projected on to the opposite sex (Jung, 1959). Failure to recognise the "other side" of the opposite sex can lead to difficulties in interpersonal relations (Phares, 1991).

(c) *Collective unconscious*

The third system of the psyche is known as the collective unconscious or objective psyche. *Objective psyche* refers to the fact that the collective unconscious is non-personal and, in its power to generate images and concepts, independent of consciousness (Mattoon, 1981). The archetype itself is neither an inherited idea nor a common image. Archetype according to Hopcke (1989) is like a psychic mould into which individual and collective experiences are poured and where they take shape, yet it is distinct from the symbols and images themselves. Jung (1959) defined the collective unconscious and described its function and its contents; he referred to these as archetypes or "typical modes of apprehension" (Hopcke, 1989). The concepts of archetypes and the collective unconscious are therefore interdependent.

Archetypes are general to human kind, and are patterns and processes rather than entities, where images are shaped by specific history and culture. Archetypes appear in consciousness in the form of archetypal images, which are universal motifs. Jung (1959) also noted that archetypal images often take on mythological forms.

Insofar as the archetypes themselves are, by definition, outside of conscious awareness, they function autonomously, almost as forces of nature, organising human experience for the individual in particular ways regardless of the constructive or destructive consequences to the individual life (Hopcke, 1989).

### **3.1.2 The dynamics of personality**

Jung (1959, 1969) views personality as an energy system. The motivation of personality is explained in terms of the movement of energy between the various structural systems of the psyche. Psychic energy flows continually from one system to another, in a constant striving for harmony.

Jung (1959) therefore views life as an energy process geared towards an aim. Energy is always used in terms of an aim, either physical or psychological. This self-orientation implies a capacity to make a freer choice.

(a) *Psychic energy*

For Jung (1959), the psychic system is engaged in a continuous energetic movement. By psychic energy Jung means the total force that pulses through all the forms and activities of the psychic system and establishes communication between them. Jung (1959) calls this kind of psychic energy *libido*. When actualised, psychic energy (or libido) is reflected in the specific phenomena of the psyche, namely: drives, wishes, will, affect, performance, and the like (Jacobi, 1968). When a large quantity of psychic energy is manifested in a specific thought or feeling such a thought or feeling will exercise a strong influence on the person's behaviour. Libido or psychic energy in the Jungian sense is the foundation and regulator of all psychic life (Jacobi, 1968).

Jung (1969) refers to psychic energy or libido, which is not at the disposal of the conscious, as the instincts. Instinct in this context means the impulsion to act towards certain activities. The impulsion can come from an inner or outer stimulus which triggers off the mechanism of instinct psychically, or from organic sources which lie outside the sphere of psychic causality (Jung, 1971). Instincts are therefore partly psychological and partly biological in nature. Instinct is the construct in which the influence of the psyche and the body are united within the personality and does not exist in isolation.

(b) *The principle of opposites*

The principle of opposites explains how psychic energy is generated. It also underlies changes in personality (Jung, 1969).

Opposing forces within the personality, for example love and hate, create a conflict from which energy arises. This, in turn, is expressed in behaviour. The same happens with the presence of opposing values. Every desire, thought or feeling has its opposite. The structural systems of the psyche are also in constant opposition to each other, for example the shadow and the ego or the conscious and the unconscious. The number of possible conflicts from which energy may be generated is unlimited.

According to Jung (1969), without an antithesis, there can be no energy, and this applies to both physical as well as psychic energy. Polarities lead to a process of equalisation and the result is energy. The greater the conflict, the stronger the energy generated.

(c) *The principle of equivalence and entropy*

Psychic functioning, according to Jung (1960), is determined by two principles, namely the principle of equivalence and the principle entropy. Jung adapted these two principles from physics in order to explain the movement of psychic energy on the same basis as physical energy (Meyer et al, 1988).

The *principle of equivalence* postulates that the psyche reserves energy and that it does not lose or gain energy. A decrease of energy in one component will result in the increase of energy in another component. The redistribution of energy within the psyche is therefore a continuous process (Meyer et al, 1988).

The *principle of entropy* postulates that energy flows from a stronger to a weaker component. By the redistribution of energy from the stronger to the weaker components, the psyche is continuously attempting to establish an equilibrium between the various subsystems (Meyer et al, 1988).

### **3.1.3 Development of personality**

According to Jung (1959, 1969), the primary developmental task of a person is self-actualisation. Personality development is therefore viewed as a dynamic process, which takes place throughout life.

(a) *Self-actualisation*

According to Jung (1959, 1969), self-actualisation is both teleological and causative in nature. Personality is determined by what the person hopes to become as well as by what he has been.

Jung (1959) describes two principles underlying growth and self-actualisation, namely individuation and transcendence:

- *Individuation* refers to the process whereby the systems of the psyche achieve the fullest measure of differentiation and development. Individuation leads towards wholeness (completeness and undividedness) of personality by integrating the conscious and unconscious parts of personality. Individuation further results in uniqueness, restricted or assisted by environmental factors, which results in differentiating oneself fully from other persons. Individuation is a process rather than a state, is collective and universal, and intensely individual.
- *Transcendence* refers to the integration of the various systems of the psyche in order to achieve unity and harmony within the psyche as well as unity with mankind.

Individuation leads to variety within the psyche, whereas transcendence brings unity, integration and harmony, with the development of the self as the highest form of integration.

(b) *Stages of development*

Jung (1959) views behaviour as goal-directed and describes the general stages of development as explained in table 3.1.

**Table 3.1 Jung's general stages of development (Adapted from Coetzee, 1996)**

<ul style="list-style-type: none"> <li>• <b>PRESEXUAL PERIOD</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ Specific tendencies or predispositions to act in a specific way under specific circumstances are inherited. Personality or the person's characteristics are not directly inherited.</li> </ul>
	<ul style="list-style-type: none"> <li>◆ When the child begins to create meaning by linking two or more contents, the conscious begins to develop. In further development the ego emerges. This takes place when the child begins to make subject-object distinctions.</li> </ul>
	<ul style="list-style-type: none"> <li>◆ The sexual instinct is not active at this stage and the most important functions are those of eating and growing.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>PREPUBERTY</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ This phase, which begins between three and five years of age, is characterised by the rapid expansion of the conscious, especially as a result of the influence of the school. It is also the period in which the sexual instinct begins to germinate.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>PUBERTY</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ This is the period in which a great deal of differentiation takes place, especially with regard to sexuality, career choice, socialisation and identity. All of this contributes to the fact that the person also begins to differentiate himself from his family.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>YOUTH</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ This phase, which lasts until 35 or 40, entails a person getting married, starting a family and becoming established in his job.</li> </ul>
<ul style="list-style-type: none"> <li>• <b>MID-LIFE PHASE</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ This phase is primarily characterised by the expansion of the conscious through new experiences and knowledge. The mid-life phase heralds the second half of life and the focus shifts to the unconscious (as opposed to the conscious).</li> </ul>
<ul style="list-style-type: none"> <li>• <b>OLD AGE</b></li> </ul>	<ul style="list-style-type: none"> <li>◆ This stage begins between 60 and 65. During this phase the person has a wonderful opportunity for individuation. This stage should also be characterised by the development of a balance or harmony in reconciling the opposite forces, because the individual has experienced so many situations and their opposites up until this phase.</li> </ul>

Following on the above, Jung also provided a model of the human journey. This will be discussed in the next section.

### 3.1.3.1 Jung's basic principles of lifelong development

Myers and Kirby (1994, p 20) summarise Jung's model of the human journey as follows:

- Each person has an innate urge to grow.

- Development means developing conscious control over and facility in the use of a function.
- To the degree that people are conscious or self-aware, they can make choices about their behaviour.
- In the first half of life, growth takes the form of development of the preferred functions at the expense of their opposite functions. In the second half of life, development becomes more generalised.
- Development is an interaction between a person's innate type preferences and environment. If the environment is supportive, growth tends to follow innate type. If the environment is not supportive, the pattern may be affected by a person's adaptation to the requirements of the environment.
- The human psyche is self-regulating and capable of healing itself.

Myers and Kirby (1994) suggest that Jung's model of type development is a theory – a hypothesis based on observations. Actual development takes place within an environment and a context. Each person's path is influenced by a variety of factors that impact on type development. The most common and important environmental influences on type development include:

- Cultural values and expectations
- Family norms and expectations
- Individual factors that require or encourage development of skills and behaviours in non-preferred areas
- Education

Each of the above factors tends to support or inhibit a person's development in the first half of life.

The next section will discuss Jung's theory around personality types.

## 3.2 JUNG'S THEORY OF PERSONALITY TYPES

Jung described the psychological types as pure templates, or patterns, not as true representatives of complex psychologies. His type outlined general personality features, not actual individuals (Benfari, 1991).

Every human being according to Jung (1971) possesses two mechanisms (diastolic and systolic), for example extraversion as well as introversion, as an expression of his natural life-rhythm. Outer circumstances and inner disposition frequently favour the one mechanism, and restrict or hinder the other, whereby a predominance of one mechanism naturally arises. If this condition becomes in any way chronic, a *type* is produced, namely a habitual attitude, in which one mechanism permanently predominates, although the other can never be completely suppressed since it is an integral part of the psychic economy. A typical attitude always means merely the predominance of one mechanism.

According to Jung (1971), several dimensions combined, create what he called personality types. These dimensions are the *attitudes* (extraversion and introversion) and the *functions* (sensation, intuition, thinking and feeling). Each personality has all of these, but each to a different degree. Usually, one attitude and one or two functions tend to be dominant.

### 3.2.1 Attitudes

The two basic attitudes in Jung's typology are extraversion and introversion. The extraverted attitude is characterised by a flow of psychic energy toward the outer world, an interest in events, people and things, a relation with them, and a dependence on them. Thus the flow of psychic energy is toward the object. The extraverted person is likely to adjust well to the environment, to be sociable, enthusiastic and optimistic. The introverted attitude is characterised by a flow of psychic energy directed inward, a concentration on subjective factors and inner responses. Thus the energy moves toward the subject. An introvert prefers his or her own thoughts to conversation with others and, consequently enjoys being alone (Jung 1971).

These two attitudes do not represent a dichotomy. Every personality has both introvert and extrovert characteristics. However, in every personality one attitude, for example extraversion, is dominant and conscious, while the other attitude is subordinate and unconscious. The subordinate attitude compensates for the dominant and vice versa. A normal extraverted attitude does not mean that the individual behaves invariably in accordance with the extraverted schema. Even in the same individual many psychological happenings may be observed, in which the mechanism of introversion is concerned (Jung, 1971).

These two attitudes therefore coincide with the flow of general life energy (or libido) and thus with the psychodynamics of the personality. The libido may be directed outwards (extraverted) or inwards, to the subjective experiences (introverted). However, this does not mean that one attitude is healthy and the other is not. Also, both have positive and negative consequences for development.

### 3.2.2 Functions

Jung's (1971) theory of personality types is concerned with the conscious use of the functions, of perception and decision making (or judgement) and the areas of life in which these functions are used.

Jung (1971) assumes that apart from a dominant attitude, each person also has a specific way in which he observes his world and assigns meaning to each experience. Jung distinguishes four such conscious mental functions, or processes, namely: two perception processes (sensing and intuition) and two judgement processes (thinking and feeling):

- **Sensing (S)** is the initial experience of a phenomenon, without any evaluation.
- **Thinking (T)** entails interpretation of memory so that it acquires meaning.
- **Feeling (F)** entails subjective evaluation of experiences in terms of emotions such as love, pity and hate.
- **Intuition (N)** is a direct experience of the world, without interpretation (thus perception by the unconscious).

### 3.2.2.1 Two ways of perceiving

A basic difference in the use of perception arises from the fact that mankind is equipped with two distinct and sharply contrasting ways of perceiving. There is not only the familiar process of *sensing*, by which we become aware of things directly through our five senses. There is also the process of *intuition*, which is indirect perception by way of the unconscious, accompanied by ideas of association which the unconscious tacks on to the perceptions coming from outside (Myers, 1962).

When individuals prefer sensing, they focus on the actuality around them and neglect to spend energy on listening for ideas. When individuals prefer intuition, they are interested in all the possibilities that occur to them to give a whole lot of notice to the actualities. As soon as a preference between the two ways of perceiving is exercised, a basic difference in development begins (Myers, 1962).

Regarding the function of perception in the workplace, sensing (S) types work more steadily with a realistic idea of how long it will take to complete the job, whereas intuitive (N) types work with bursts of energy powered by enthusiasm, often with slack periods between the peaks. An S type is patient with routine details and becomes impatient when details get complicated. An N type enjoys complicated situations and becomes impatient with routine (Myers, 1980).

### 3.2.2.2 Two ways of judging

A similar basic difference in the use of judgement arises from the existence of two distinct and sharply contrasting ways of coming to conclusions. One way is by the use of *thinking*, which is a logical process, aimed at impersonal finding. The other way is by the use of *feeling*, which is a process of appreciation, equally reasonable in its fashion, bestowing on things a personal, subjective value (Myers, 1962).

Each individual makes some decisions with thinking and some with feeling. One way of judging would however be preferred to the other.

Myers (1962) suggests that the child who prefers feeling becomes more adult in the handling of human relationships. The child who prefers thinking becomes more adult in the organisation of facts and ideas.

The function of judgement is illustrated in the working environment: Thinking (T) types like analysis and putting things into logical order and can get along without pleasing everyone, while feeling (F) types need harmony else their efficiency could be badly disturbed by aspects such as tension and office feuds. The T type is able to reprimand people and can fire when necessary, whereas the F type dislikes telling people unpleasant things (Myers, 1980).

Jung (1971) refers to thinking and feeling as rational functions because they involve evaluation. Sensing and intuition, on the other hand, involve passively recording, but not interpreting experience and as such are being referred to as irrational functions. Faithful to his principle of opposites, Jung (1971) groups the functions into opposite pairs. As with attitudes, he believed that one function of a pair of bipolar opposites is weaker than and subordinate to the other. The functions of the remaining pair exist in a type of twilight zone, partly conscious, partly unconscious. The dominant function is the most differentiated function, followed by the remaining pair, with the least differentiation in the subordinate function. Any of the four functions may be dominant.

Each of the above four combinations produces a different kind of personality, characterised by whatever interest, values, needs, habits of mind and surface traits naturally result from that combination.

There are thus thinking, feeling, sensing or intuitive types of people. An integrated or self-actualising person will be someone who uses all four functions in structuring his experiences.

### **3.2.3 Personality types**

Jung's work on types remained relatively unknown for a long time, as there was no scientific way of applying his theories. No objective instrument was available to determine psychological types (Benfari, 1991).

Jung intended his theory of personality types to be understood within the broader context of his psychological views of human development, rather than as an isolated system of classification (Kainz, 1989).

Coetzee (1996) confirms that personality type theory has been well documented, with many scientific studies verifying its utility. Personality type theory does not describe the individual entirely or precisely. Each person is unique, in spite of the patterns he or she shares with others. It is also important to keep in mind that all personality types are worthwhile and equal in value.

By combining an individual's dominant attitude and function, their basic personality type may be determined. The personality types are thus patterns in the way people prefer to perceive and make judgements. Jung (1971) distinguished between eight such personality types on the basis of the two attitudes (extraversion and introversion) and the four functions (sensing, intuition, thinking and feeling).

- The *extraverted thinking type* is driven by a need to make all their life's activities dependent on intellectual conclusions which are based on objective data. They thus live according to an intellectual formula, suppress their emotions and deny the aesthetic. Although they may seem concerned for the welfare of others, they are only interested in achieving their own objectives and will even exploit others in the process. This type could be the social reformer or the self-justifying critic.
- The *introverted thinking type* is also driven by their thoughts or ideas, but these ideas have their origin, not in objective data or external sources such as traditional morality, but in themselves, in their collective unconscious. As a result of the involvement in their own thoughts, they tend to come across as cold, aloof and socially inadequate.
- The feelings and behaviour of the *extraverted feeling type* are controlled by social norms, thus by others' expectations. Their feelings therefore vary from situation to situation and from person to person. In this type, independent thinking is suppressed.
- The *introverted feeling type* is a quiet, inaccessible type of person who tends towards pessimism. Such people do not open themselves to others and it is therefore usually difficult to understand them. Although they may seem unemotional, they can experience

intense emotions, but the emotions originate in the collective unconscious and may, for example, find expression in religious activities or poetry.

- The *extraverted sensing type* is essentially reality-oriented and avoids deep thoughts and contemplation. Such people are outgoing, joyful and look for pleasure and pleasant sensations (e.g. social interaction). They may be oriented towards aesthetic experiences and thus enjoy the arts and collecting artwork.
- The *introverted sensing type* is an irrational person. These types are led by the intensity of their subjective sensations and will over-react to external stimuli. They will, for example, interpret an innocent remark by someone else out of proportion and in a strange way. They keep others at a distance and therefore appear to be rational and in control of themselves.
- The *extraverted intuitive type's* main characteristic is that they are driven by a need to utilise external opportunities. Politicians and businessmen are examples of this type. Because they are so enterprising, they may encourage achievement in others, but often do little for themselves in the process. They are impatient and are always looking for new opportunities. They therefore often fail to complete what they have started.
- The *introverted intuitive type's* intense intuitive orientation leads to alienation of their external reality and even good friends view them as an enigma. They may be the great dreamer or mystic or, on the other hand, the arty, eccentric person. Others seldom understand them, and because their thoughts and feelings are so suppressed, they cannot communicate well with others either.

Jung (1971) based his theory on clinical observation and consequently portrayed each mental process in sharpest focus and with maximum contrast between its extraverted and introverted forms. Jung thus describes the rare, theoretically "pure" types (Myers, 1980).

### **3.3 EXTENSIONS OF JUNG'S PERSONALITY TYPE THEORY**

The revival of the idea of temperament was made in the 1950s. Myers developed an instrument, called the *Myers-Briggs Type Indicator (MBTI)*, to make it possible to empirically test and use Jung's theory with non-clinical populations (Myers, 1980).

Myers (1962) indicates that the gist of Jung's theory is that much apparently random variation in human behaviour is actually quite orderly and consistent, being caused by certain basic differences in mental functioning.

The aim of the MBTI is therefore to identify, from self-reporting of easily recognised reactions, the basic preferences, or random variation in human behaviour. This is done with regard to perception and judgement of people, so that the effect of each preference, singly and in combination, can be established by research and put to practical use (Myers & McCaulley, 1985). The purpose of the MBTI is therefore to make the theory of psychological types described by Carl Jung understandable and useful in people's lives.

The MBTI is focused on cognitive and perceptual processes. It describes the way individuals function in the world, the way people prefer to use their minds, specifically the way they perceive and the way they make judgements (Myers, 1980). The concern is primarily with mental activity or cognitive processes, rather than with emotional, ego, or value dimensions which many other personality scales measure.

According to Myers (1980), a personality theory must portray and explain people as they are. Jung's theory must, therefore, be extended to include the following three essentials:

- the constant presence of auxiliary process;
- the results of the combination of perception and judgement; and
- the role of the auxiliary in balancing extraversion – introversion.

Myers (1962) suggests that modern personality theory must take into account the fact that individuals are the unique product of their particular heredity and environment, and are therefore different. Myers (1962) further proposes that it is difficult to construct an economical theory for explaining the principles on which individuals accept or reject certain elements of their environment, the ways they act and react, the bases on which they reason, or the highly individual differences in the interests, values, and satisfactions that motivate them.

When the auxiliary process is taken into consideration, it splits each of Jung's personality types into two. Instead of merely the introverted thinker, there are the introverted thinker with sensing and the introverted thinker with intuition. Thus there are sixteen personality types instead of Jung's original eight types. Each of the sixteen personality types is the logical result of its own preferences and is closely related to other personality types that share some of those preferences.

(a) *The four bipolar preferences*

As mentioned before, Jung identified and defined two basic attitudes, namely extraversion and introversion, four orienting functions of human adaptation or basic mental processes which are divided into two pairs, that of sensation and intuition, and thinking and feeling. These four represent the individual's orientation to consciousness.

The judgemental functions, perception and judgement, implicit in Jung's theory, were made explicit by Isabel Myers in her formulation of the Myers-Briggs Type Indicator (McCaulley, 1981).

The fundamental attitude, extraversion or introversion, indicates the characteristic focus of attention. Extraversion represents an orientation to objects and objective facts with attention, energy and action flowing out to the environment, which includes other individuals and objects, as a source of factual material. Extraversion, therefore, represents an orientation towards the external world. Introversion represents a subjective orientation and the individual focuses attention on concepts and ideas rather than on objects. Energy flows from the environment to the individual and he or she focuses on the internal world as source of ideas and concepts, which represents an orientation towards the internal world. This fundamental difference represents the individual's primary direction of mental functioning.

It would therefore be incorrect to think in terms of shyness/gregariousness when considering this distinction. The characteristics associated with extraversion are sociability, outspokenness, good communication skills, interest in, awareness of and reliance on the environment for stimulation and guidance, and an action orientation. The characteristics associated with introversion are

thoughtfulness, contemplative detachment and an interest in and reliance on concepts and ideas (McCaulley, 1981, 1990; Carlson, 1985; Jung, 1971).

Sensation and intuition are perceptive functions that are data-gathering processes and involve all perceptive activities. These functions represent two opposite ways of perceiving, indicating the type of data selected (either literal or symbolic) (Helson, 1982). Sensation refers to attending to sensory realities (the observable) and, on a cognitive level, to facts and details, through the use of the five senses. Individuals with a sensation preference typically have acute powers of observation, and memory for facts and details. Intuition is a more global, less obvious process, with the focus on insight, meanings, relationships and possibilities within data that are perceived, these being worked out beyond the reach of the conscious mind. Intuition represents perception through the unconscious (Richter, 1992).

The MBTI questionnaire items are concerned with four bipolar preferences to determine the relative preference of one over the other. The four scales correspond to the four dimensions of Personality type as shown in table 3.2. The MBTI uses a shorthand designation for the eight characteristics as used in the table. The four preferences are as follows (Myers & McCaulley, 1992):

- *Extraversion attitude (E) or Introversion attitude (I)*

In the extraverted attitude (E), attention seems to flow out, or to be drawn out, towards the objects and people of the environment. There is a desire to act on the environment, to affirm its importance, to increase effect.

In the introverted attitude (I), energy is drawn from the environment, and consolidated within one's position. The main interests of the introvert are in the inner world of concepts and ideas.

This dimension sets the framework for the way individuals communicate. Extroverted managers tend to move around the organisation more, engage in more casual conversation, feel comfortable tossing around ideas, and interact with more people. Introverted managers tend to interact selectively (Barr & Barr, 1989).

Jung, according to Benfari (1991), viewed introversion and extraversion as innate, inherited attitudes that unfold regardless of environmental influences. Jung regarded it as impossible to be an introvert and an extrovert at the same time. Any attempt to convert an introvert into an extrovert, for example, would cause a distortion of that person's nature that could result in abnormal, maladaptive behaviour.

The extraversion and introversion attitudes have a decided impact on the employee and may contribute significantly to the individual's satisfaction or dissatisfaction with particular working environments. Extraverts like variety and action while introverts like a quiet environment for concentration. The extraverts tend to be faster and dislike complicated procedures, whereas introverts tend not to mind working on one project for a long time without interruption. The extraverts are often good at greeting people and like having people around, while introverts are content to work alone and may often have difficulty remembering people's names and faces. Extraverts are interested in the results of their jobs, in getting it done, and in how other people do it. Introverts, on the other hand, are more interested in the idea behind the job (Myers, 1980).

- *Sensing perception (S) or Intuitive perception (N)*

When using sensing perception (S), persons are interested in what is real, immediate, practical, and observable by the senses. The sensing focus therefore is establishing what exists. When using intuitive perception (N), persons are interested in future possibilities, implicit meanings, and symbolic or theoretical patterns suggested by insight.

Our preference for sensory or intuitive information affects the way we see the world. People with a strong sensory preference prefer real world information that can be verified. They are most comfortable focusing on the present and interpreting anything new by what they have already experienced or can validate with physical sensation. Intuitors interpret information according to its meaning, possibility, and implication. They are by nature not focused on today. Possibility thrusts them toward the future. Sensors are good at spotting what is not working today and fixing it, while intuitors are good at spotting what could be a problem in the future, and therefore plan around it (Barr & Barr, 1989).

- *Thinking judgement (T) or Feeling judgement (F)*

When using thinking judgement (T), persons rationally link ideas together by making logical connections. Thinking relies on principles of cause and effect and tends to be impersonal. When using feeling judgement (F), persons rationally decide by weighing the relative importance or value of competing alternatives. Feeling relies on an understanding of personal values and group values and is thus more subjective than thinking.

This dimension indicates how individuals decide about what they see. Individuals perceive through sensing-intuiting channels and we make decisions about our perceptions through thinking-feeling channels. This affects personal styles. A feeler handles managerial issues in a different way to the thinker (Barr & Barr, 1989). The thinker judges according to rationality of the information while the feeler judges according to the personal application of the information. The thinker values logical organisation and the feeler values personal rapport with the information.

- *Judgement (J) or Perception (P)*

When the orientation towards the world uses judgement (J), a person is concerned with making decisions, seeking closure, planning operations, or organising activities. When the orientation to the world uses perception (P), a person is attuned to incoming information and open to changes, preferring to keep options open in case something better turns up.

Perception involves all the ways of becoming aware of things, people happenings, or ideas. Judgement involves all the ways of coming to conclusions about what has been perceived.

Barr and Barr (1989) confirm that perception and judgement thus constitute a large portion of the individual's total mental activity. Thus the processes of perception and judgement directly affect behaviour, and it is entirely reasonable that basic differences in perception or judgement should result in corresponding differences in behaviour.

The way in which individuals exercise control is also affected by their judging or perceiving preference. A strong judging preference indicates a desire to decide on, evaluate, plan, organise,

and maximise their use of time. Judge-controllers have strong ideas about the way things should be done and the way people should react. Perceivers have a desire to adapt, respond, decide on outcomes, and adjust as they go.

Judge-controllers want to get things finished and move on to the next challenge. Perceiver-adapters are interested in the process of doing and do not wait for a sense of closure to provide enjoyment (Barr & Barr, 1989). Judge-controllers tend to work in a steady, orderly, planned way while perceivers tend to work in a flexible, informal way. Judge-controllers drive towards closure, while perceivers like to discover tasks and manage emerging problems rather than plan for them.

(b) *The sixteen personality types*

While personality type is reported and explained in four parts, it is not merely a combination of parts. Nor is it static, as the term "type" often connotes. Personality type is a dynamic of the sixteen personality types.

To attempt to determine a person's personality type by observation, it is unnecessary to consider all sixteen personalities at once. Any preference that seems reasonably certain will reduce the possibilities by half. For example, any introvert belongs to one of the eight introvert types. An intuitive introvert belongs to one of the four IN types. If such a person prefers thinking to feeling, the type is further narrowed down to INT. The final step, identification of the dominant process, will depend on the JP preference (Myers, 1980).

According to Myers and McCaulley (1992), when making practical use of Personality Type theory and data, it is important to consider not only what can in theory be expected of a person with a given set of preferences, but also what has been observed in people of that personality type. The usefulness of counselling feedback to any respondent may depend to a large extent upon the interpreter's knowledge of personality characteristics. The best way to keep the personality types and their characteristics in mind is through understanding the dynamics previously outlined and by using the type tables.

Table 3.2 provides a brief description of the sixteen MBTI personality types within an organisational context.

**Table 3.2** *Brief description of the sixteen personality types (Adapted from Isachsen & Berens, 1991)*

<b>ENTJ</b>	<b>ISFP</b>
Work label : Field Marshall	Work label : Composer
Strengths : Energetic, futuristic, conceptual, dynamic	Strengths : Sensitivity, adaptability, perfection, flexible
They value : Intelligence, concepts and expertise	They value : Variety, sensual experience and challenge
On a team : They are the leaders; they cannot not lead	On a team : Loyal and value driven
<b>ESTJ</b>	<b>INFP</b>
Work label : Supervisor	Work label : Advocate
Strengths : Responsible, decisive, matter-of-fact	Strengths : Dedicated, conceptual, ingenious, idealistic
They value : The system, authority and control	They value : Harmony, self-determination and meaning
On a team : Take responsibility and get things done	On a team : Act as peacekeepers
<b>INTP</b>	<b>ESFJ</b>
Work label : Definer	Work label : Provider
Strengths : Independent, creative, analytical	Strengths : Warm, co-operative, involved, caring
They value : Concepts, intelligence and ingenuity	They value : Tradition, people & stable relationships
On a team : Work alone for the group	On a team : Bring human comforts to light
<b>ISTP</b>	<b>ENFJ</b>
Work label : Operator	Work label : Mentor
Strengths : Objective, independent, analytical, skilful	Strengths : Dependable, persuasive, considerate
They value : Flexibility, challenge and adventure	They value : Harmony and self-determination
On a team : Do their own thing	On a team : Enthusiastic communicators
<b>ESTP</b>	<b>INFJ</b>
Work label : Promoter	Work label : Foreseer
Strengths : Procuring, operating, situational, realistic	Strengths : Conceptual, compassionate, harmonious
They value : Flexibility, action and excitement	They value : Participation, co-operation & determination
On a team : Fight fires or start them	On a team : The ones to put things in writing
<b>ESFP</b>	<b>INTJ</b>
Work label : Performer	Work label : Strategists
Strengths : Easy going, accepting, situational, realistic	Strengths : Pragmatic, conceptual, tenacious, analytical
They value : Action, excitement and emotion	They value : Logic, ideas and ingenuity
On a team : Keep the humor going	On a team : Analyse the alternatives
<b>ISTJ</b>	<b>ENFP</b>
Work label : Inspector	Work label : Catalyst
Strengths : Practical, careful, determined, dependable	Strengths : Creative, imaginative, energetic
They value : Responsibility, tradition and accuracy	They value : Recognition and approval
On a team : Follow rules and guard the process	On a team : Can be great integrators
<b>ISFJ</b>	<b>ENTP</b>
Work label : Protector	Work label : Inventor
Strengths : Considerate, responsible, patient, dedicated	Strengths : Conceptual, enthusiastic, analytical
They value : Relationships, responsibility and harmony	They value : Ideas, energy and ingenuity
On a team : Care and do the work	On a team : Offer solutions and identify opportunities

### 3.4 DYNAMICS OF PSYCHOLOGICAL TYPE

Myers and Kirby (1994) summarise the dynamics of psychological type as follows:

(a) Dominant function

Though people use all of the basic mental tools, type develops because each person has a natural preference for one of the four functions, just as each person has an innate preference for left- or right-handedness. This most-preferred mental process becomes the *dominant function* – the core or guiding focus of one's personality. Individuals use their dominant function primarily in their preferred world – the outer world for Extraverts, the inner world for the Introverts. The dominant function can therefore be expressed in eight distinct ways. When a final decision needs to be made, it will generally be one that is congruent with the dominant function.

(b) Auxiliary function

The *auxiliary function* provides balance for personality in two ways. First, if the dominant function is a perceiving one (Sensing or Intuition), then the auxiliary will be a judging function (Thinking or Feeling). Likewise, if the dominant function is a judging one, then the auxiliary will be a perceiving function. Second, if the dominant function is extraverted, then the auxiliary function will be introverted, and vice versa.

This mental structure ensures that people have reliable ways of taking in information and arriving at decisions, as well as trustworthy ways to interact with both the external and internal worlds. It is important to recognise, however, that the auxiliary function is secondary. In case of conflict between the perspectives provided by the dominant and auxiliary functions, the dominant function will generally win out.

Adding the two possible auxiliaries to each of Jung's eight dominant function types results in the 16 MBTI types. For example, dominant Extraverted Sensing Perceiving (ES-P) may either have

Thinking or Feeling Judgement as the auxiliary function, resulting in two types: Extraverted Sensing with Thinking (ESTP) or Extraverted Sensing and Feeling (ESFP), and so on.

(c) The tertiary and inferior functions

The *tertiary function* is defined as the opposite of the auxiliary function. The *attitude* (extraverted or introverted orientation) in which the tertiary function is normally used seems to be less consistent than the attitude of the other three functions.

The *inferior function* is the opposite of the dominant function; that is, the opposite pole from the dominant. It is all typically used in the attitude opposite to that of the dominant function. For example, if the dominant function is Extraverted Intuition, the inferior function will be Introverted Sensing. Jung (1959, 1971) suggested that the superior function is always the expression of the conscious personality, its aim, its will, and its achievement, whilst the inferior functions belong to things that happen to one.

In the personality type there is the most favoured function or dominant function, or the inferior function, the opposite of the dominant. The remaining two functions serve as assisting functions. The most developed of these is termed the auxiliary function. Benfari (1991) states that the dominant function is the most clearly differentiated function. Knowing an individual's dominant function is the key to understanding and influencing that individual. Understanding the inferior function is just as important as understanding the dominant function. If it is suppressed or underutilised, it can undermine an individual and even break out disfunctionally when under stress.

Myers (1980) states that for people to be balanced, they need adequate (but by no means equal) development of a second process, not as a rival to the dominant process but as a welcome auxiliary. If the dominant process is a judging one, the auxiliary process will be perceptive: either sensing or intuition can supply sound material for judgements. If the dominant process is perceptive, the auxiliary process will be a judging one: either thinking or feeling can give continuity of aim. The auxiliary is thus always formed in the dimension that the dominant is not in.

Good personality type development thus demands that the auxiliary supplements the dominant process in two respects. It must supply a useful degree of balance not only between perception and judgement but also between extraversion and introversion. To live happily and effectively in both worlds, people need a balancing auxiliary that will make it possible to adapt in both directions – to the world around them and to their inner selves. When it fails to do so it leaves the individual literally "unbalanced", retreating into the preferred world and consciously or unconsciously afraid of the other world (Myers, 1980).

### **3.4.1 Lack of a Balancing Auxiliary**

One common development pattern is a lack of balance resulting from the failure to develop both a preferred way of perceiving (S or N) and a preferred way of judging (T or F). The failure to develop a judging function leaves the individual like a ship with sails but no rudder. Such people may be spontaneous, likable, even charming, but they have no follow-through. Whatever is going on around them is their reality. They are resourceful in responding to the moment, but they will be equally resourceful in responding completely differently the next moment. These are the people who can be endlessly enthusiastic about new places, people, or ideas, but never actually commit themselves to the pursuit of a goal or course of action (Myers & Kirby, 1994).

People who fail to develop a perceiving preference, on the other hand, take in almost no information before making decisions. They rigidly cling to their principles and value judgements and are incapable of seeing any other point of view. Because their judgements are so quickly reached and so clear (not clouded by perceptions of ambiguity or contradictory facts), people without a developed perceiving preference often don't hesitate to decide for others and can become dictatorial. New situations or changing requirements may throw them into great confusion and discomfort, since they have no reliable way of processing new information to understand their changing reality. Situations where they have to delay a decision are extremely uncomfortable (Myers & Kirby, 1994).

### **3.4.2 Lack of Balance in Attitudes**

A related problem of development comes from the failure to develop the auxiliary function in the opposite attitude to that of the dominant function. The dominant function is normally used in a person's preferred world – inner or outer – with the auxiliary function enabling communication with the non-preferred world (Myers & Kirby, 1994).

Some extraverts exhibit both perceiving and judging preferences. They seem never to pause for reflection or internal processing, and often have a fear of being alone or inactive. They often come across as insensitive because they miss cues from others. There seems to be "no one home inside," and they do not get information from their body or from internal processes. Extraverts who exhibit both perceiving and judging preferences are dependent on the external world. Individuals with a strong introverted inclination experience great difficulty with communication and reality testing. A balance between one's internal and external worlds is thus essential for healthy functioning (Myers & Kirby, 1994).

### **3.4.3 Importance of opposite**

According to Benfari (1991), Jung did believe that there exists within each individual the potential for development or emergence to opposite attitudes. The key to unlocking this potential would be to accept the predominant attitude and at the same time to recognise its opposite.

Jung's type theory does not allow for all eight preferences to be developed equally to achieve complete balance.

If a person attempts to develop both ways of perceiving equally, then either Sensing or Intuition will, for example, receive the focus of energy and attention necessary to become fully reliable and trustworthy. Likewise, Thinking and Feeling are opposite ways of making decisions; developing a reliable decision-making function requires directing most of one's energy to one side of this dichotomy and therefore taking it away from the other (Myers & Kirby, 1994).

The four functions tend to pull in opposite directions: Sensing, to the reality of the present; Intuition, to the possibility of the future; Thinking, to the decisions based on objective logic; and, Feeling, to decisions based on subjective values. People who do not establish the leadership of one of each pair of functions are inconsistent in their behaviour, pulled first in one direction and then another. They are unpredictable to others and to themselves, and remain what Jung termed a *primitive personality*. Because Jung's theory is one of opposites, directing attention and energy to all of the functions equally, results in the leadership of one not being developed, and the resulting perceptions and judgements will then be inconsistent and unreliable (Myers & Kirby, 1994).

### **3.5 PERSONALITY TYPE DEVELOPMENT**

Personality type development provides confidence and self-direction. According to Myers and McCaulley (1992), good personality type development is a journey that opens up new abilities and understanding.

Jung viewed individual development as a lifelong process. He believed human beings have an innate urge towards growth and have within themselves everything they need to become effective, healthy people. Within his model, psychological type is viewed as the compass directing this growth, suggesting the probable course of development for each type (Myers & Kirby, 1994).

As a lifelong process, type development provides for gaining greater command over the functions or powers of perception and judgement. For each personality type, two of the four functions are assumed to be more interesting and more likely to be consciously developed and used. The other two less-preferred functions are assumed to be less interesting and are likely to be relatively neglected. Development comes from striving for excellence in those functions that hold the greatest interest and from becoming at least passable in the other less interesting, but essential functions. In youth, the task is to develop the first (dominant) and the second (auxiliary) functions; in midlife one can gain greater command over the less preferred third and fourth (or inferior) functions. Very few exceptional persons may reach a stage of individuation where they can use each function easily, as the situation requires. The theory assumes that youth is the time for specialisation and that midlife is the time to become a generalist (Myers, 1980; Myers & McCaulley, 1992).

The primary task of type development in the first part of life is to establish the leadership provided by a trustworthy dominant function, balanced by the healthy development of the auxiliary function. The development of these functions gives the personality a sufficient degree of consistency, predictability, and effectiveness (Myers & Kirby, 1994).

Later in life, the focus of development shifts again, this time to less-preferred functions, aspects of the individual's personality and potential that have yet to be explored. This redirection of energy is part of the midlife transition, which Jung saw as the gateway to later life development and satisfaction. The task of the second half of life, then, is to move toward full development of all of oneself, including those parts that were previously neglected and unrealised (Myers & Kirby, 1994).

These shifts in the focus and direction of energy do not mean that one's basic type preference have changed. Rather, the individual moves towards increased balance and flexibility, while experiencing new sources of energy and an increased sense of satisfaction.

The timing of these stages varies from individual to individual. Some have developed their dominant and auxiliary functions clearly and reliably by their twenties; others may find it a much slower process. Some will reach the traditional midlife period and find that they have not, for various reasons, developed one or both of their preferred functions (Myers & Kirby, 1994).

Type theory assumes that individuals are born with a predisposition to prefer some functions over others. When young, individuals are most interested in the domain of the preferred function. They are motivated to exercise their dominant function, becoming more skilful, adept, and differentiated in its use. With the reinforcement of constant practice, the preferred function becomes more controlled and trustworthy. A sense of competence comes from exercising a function well. The pleasure of using the function generalises to other activities requiring use of the function, and leads to the surface traits, behaviours, and skills associated with the function (Myers & McCaulley, 1992).

Young people develop skills in their dominant function and confidence in using them well, which enhances their self-confidence and self-esteem. They also develop some characteristic personality patterns associated with their dominant function.

While this development of a preferred function is occurring, there is a relative neglect of the opposite pole of the same preference (Myers & McCaulley, 1992).

The above suggests that when people are young, their energy is directed toward the development of their most preferred, dominant function, and their behaviour reflects this. An *Introverted Feeling* child will be a quiet observer, with a seemingly instinctive sense of others' feelings; an *Extraverted Intuitive* child will be actively exploring the variety of the surrounding world; an *Extraverted Thinking* child will try to order his environment to fit in with his logical principles; an *Introverted Thinking* child will try to internally make sense of her world (Myers & Kirby, 1994).

Theory does not preclude an extravert for example, from developing a greater appreciation of and skill with introversion. Such development might be necessary to overcome the one-sided development of youth, making higher levels of personality integration possible in later life. Nevertheless, an assumption of theory is that the type preferences differentiated by early development will hold their relative dominance throughout life (Kainz, 1989).

### **3.5.1 Development and Midlife**

Myers and Kirby (1994) suggest that one of the issues that makes midlife transition more difficult is that people tend to misunderstand their undeveloped preferences and have biases against them. For example, those with a preference for Intuition have probably not developed their own Sensing function and may judge all Sensing-related activities by their own undeveloped form. They will then tend to see Sensing as a boring repetition of detail, "bean-counting." Likewise, Sensors may see Intuitives as "flaky" or "off-the-wall," as their own Intuition is likely to be in its undeveloped form. These distorted understandings can inhibit a person's motivation and ability to develop the ignored functions.

Particular type preferences can also raise roadblocks for those approaching a midlife transition. Thinking types, for example, may find it especially difficult to begin experiencing things that are "not logical" or that raise long-ignored emotions to the surface. Feeling types may find it particularly hard to begin changing when important people in their lives do not like or support change. Judging types may find the inherent disorder and ambiguity of this major transition period very difficult to accept, as they prefer transitions with clear goals, structures and timelines.

It is important to consider the above situations of type behaviour, as it will have an impact on organisational behaviour. Types and their impact on organisations are therefore discussed next.

### **3.6 TYPES IN ORGANISATIONS**

Personality types differ in their interests, values, and needs. They learn in different ways, cherish different ambitions, and respond to different rewards. Personality type preferences become evident in work situations as well as in different occupations. Many working environments call for decidedly different behaviours. People with different personality type preferences generally differ in their attitudes and behaviours in the workplace (Lynch, 1985; Myers, 1980).

While personality type preferences illustrate a style of behaviour, they do not limit people to only that style. Sometimes people need to strategise and deliberately use preferences that do not come as naturally to them. Personality type theory however provides a framework for individuals to enhance their self-awareness, which enables them to make better decisions. A mismatch between personality type preferences and job characteristics may result in experiences of stress or dissatisfaction that may lead to burnout or lack of productivity (Coetzee, 1996; Hammer, 1993; Hirsch & Kummerow, 1989).

According to Myers and McCaulley (1992), no occupation provides a perfect match between personality type preferences and work tasks, but good occupational choices can prevent major mismatches. Work can also become a good arena for personality type development. Every job has tasks that require the use of less preferred processes. Counselors can help clients see that disliked tasks can be good tools for developing less preferred functions.

Hammer (1993) states that knowledge and understanding of personality type preferences are especially valuable to help employees adapt to current realities. Adapting may be directly or indirectly related to the person's job and may involve changing areas of the person's life that are outside of work. When trying to adapt, the person will still be working against the grain of this preferred function, but the awareness of the preferred function and their conscious attempts to control any negative effects, can greatly reduce the stress.

The goal for the person therefore is not to become another personality type, but rather to expand their choices and the amount of control that they have. The person may still be successful and productive in a job that does not fit their personality type preferences if they are careful to find other areas of life that provide opportunities to express their preferences, such as leisure activities, or volunteer activities.

Barr and Barr (1989) report that the majority of organisations they have worked with were principally STJ organisations. Regardless of the mission statement, the majority of people are still working in more traditional organisational structures. The larger the organisation, the more it tends towards a bureaucratic management style. Comparing the four types of managerial patterns is useful in identifying work patterns in organisations. Each pattern has strengths and weaknesses. Organisational cultures are changing, and leaders are needed to focus on the changes.

- *STJ organisation:* The theme of this type of organisation is *hierarchy*, where *titles* mean something. An STJ characteristic makes the organisation look ill suited to deal with today's volatile environment. The STJ organisation is traditionalist, with strong values of conservatism and stabilisation. This type of organisation is not well suited for today's ambiguous business climate.

The management role in the STJ organisation is usually seen as a dominant controller of work. Emphasising work roles rather than the worker is part of the hierarchical theme. The focus is on work and the roles required to complete work. Fast-track managers are usually identified because of their tough-minded ability to get others to do the job.

- *NTJ organisations*: Barr and Barr (1989) report that within the category of NTJ, more individual executives than organisations are found.

An NTJ organisation is continually innovating, with the driving theme being improvement. This type of organisation values originality, creativity, and new ways of doing things. The NTJ organisation is driven by a vision of the ideal system and seeks continuously to develop prototypes, pilots, and models throughout the organisation that are conceptually harmonious with that vision. The NTJ organisation therefore drives itself to grow and develop. This type of organisation finds itself well suited for today's ambiguous business climate.

The NTJ manager is largely visionary, with the intensity to be unique. Driven by the need for individuality, the NTJ manager can get trapped in the search for uniqueness and may lose touch with the practical aspects of doing business.

- *STP managers*: STP managers are rarely found in executive positions. The strong need for freedom and the complex forces in executive management usually thwart the independence of the STP. The STP managers like to deal with expedient needs of the situation, therefore they find forecasting, planning, strategising, investing, and long-range planning dull and cumbersome. STP managers prefer roles of negotiator or trouble-shooter where they can move in quickly, respond spontaneously, and move onto the next problem.
- *NF managers*: Barr and Barr (1989) report that they have come across an insignificant number of NF organisations. The NF manager is driven by the need for personal growth. The NF manager wants people to be co-operative, harmonious, and self determined. NF managers tend to play the role of catalysts or energisers. The NF manager is usually persuasive and convinces people to do their jobs through a mixture of enthusiasm, acceptance, and warmth.

Life-style preferences also show up in the workplace: Judging (J) types work better when they can plan their work ahead and follow that plan; perceptive (P) types adapt well to changing situations.

A J type may not wish to interrupt the project on which he or she is working; in contrast, a P type may start too many projects and have difficulty finishing them (Myers, 1980).

According to Myers and McCaulley (1992) and Hammer (1993), when the person and working environment are compatible, there is generally less stress and more job satisfaction. Often, however, adaptations must be made by the worker to accommodate work environments that are different from his or her preferred style. If individuals understand this need to accommodate, they may find it easier to accomplish.

### 3.7 TYPES AND DECISION MAKING

The use of the MBTI to successfully match appropriate personality types with different decision environments should not be overlooked. One way to study individual differences in decision-making ability may be through the use of the MBTI as an analogue for decision-making style (Davis et al, 1990).

To Jung, according to van Rooyen and de Beer (1994), it seemed very clear that some people habitually prefer to weight facts and analyse when making important decisions. In studying the way in which individuals reacted to different circumstances, Jung recognised the fact that every person has an accustomed way of making decisions and dealing with difficulties. The basis of people's decisions can give valuable insights into the individuals psychic system of adaptation.

Since the two aspects of personality type, perception and judgement, tend to be mutually exclusive and the two perception modes are independent of the two judgement modes, the process may be partitioned into analogues for four decision-making styles, i.e., sensing-thinking (ST), intuiting-thinking (NT), sensing-feeling (SF), and intuiting-feeling (NF).

Davis et al (1990) summarised these decision analogues as follows:

- According to the theory, an individual who fits the *sensing-thinking* (ST) mode of decision making, focuses primarily upon facts which can be collected and verified by the senses and makes judgements about problems primarily through an impersonal

evaluation of those facts. In essence, decisions made by those exhibiting this style tend to be practical and matter-of-fact.

- By comparison, *sensing-feeling* (SF) decision makers also focus primarily upon facts that can be collected and verified by the senses but tend to make judgements about problems primarily by weighing values and considering others. Decisions made by SF decision makers tend to be sympathetic and friendly.
- Subjects with a SF decision-making style should not perform as well as those with NT or ST styles. Although SF personality types focus on the facts, they judge on a subjective, good versus bad, personal worth basis. Subsequently, the cold formality of the operational decision environment should not be a decision-making context conducive to those subjects with such decision-making style.
- Those who use intuition for perception and combine it with judgement through feeling, represent a third decision-making style. These *intuiting-feeling* (NF) decision makers perceive problems in a Gestalt manner, recognising a wide range of possible solutions. They judge those possibilities by weighing values and considering others. Decisions made by those exhibiting this personality type tend to be enthusiastic and insightful.
- NF personality types are characterised by their preference for possibilities instead of facts. Furthermore, they judge on the basis of subjective assessment and are more interested in people than in things.
- Finally, those who use intuition for perception and combine it with analytical thinking for judging (NT), represent a fourth decision-making style. Like the intuiting-feeling decision maker, those possessing this style focus upon an array of possibilities in solutions for problems, yet they approach these with impersonal analysis. Consequently, the possibility that is chosen by an NT decision maker, is usually a theoretical or technical one that tends to be logical and ingenious.
- NT personality types, using intuition for perception and thinking for judgement, focus less on facts and more on possibilities. Nevertheless, they analyse the possibilities with an impersonal detachment. Under the present experimental conditions, an individual who has an NT decision-making style should perform well, but not as well as an individual with an ST style because the former relies upon intuiting rather than sensing.

Viewed together, the four decision-styles that emerge from combining the sensing-intuiting and thinking-feeling indices of the MBTI represents very different approaches to problem solving. Davis et al (1990) conclude by suggesting that if relationships can be discerned between personality type and performance, such information might be quite useful in a variety of organisational settings such as business and government.

### **3.8 CHAPTER SUMMARY**

The aim of this chapter, namely to define and describe personality types, has been completed through the discussion of Jung's (1959, 1971) theory on personality, with specific reference to his Personality Type theory, Myers and Brigg's extension of his work, type development, types in organisations and types and decision making.

Based on the literature survey on both cognitive styles and personality type, chapter four will integrate the theoretical relationship between cognitive style and personality types.

## **CHAPTER 4: INTEGRATION OF COGNITIVE STYLES AND PERSONALITY TYPE THEORIES**

Chapter 2 and 3 presented the literature survey on cognitive styles and personality types respectively. In this chapter, which represents the third step in the literature survey, the theoretical relationship between cognitive styles and personality type will be discussed.

This will be approached by firstly discussing the concept of typology in the field of personality and cognition, followed by a survey of past research conducted on this topic, potential pitfalls in researching the relationship between personality and cognition, the link between personality and cognition and finally a conclusion.

### **4.1 PERSONALITY AND COGNITIVE TYPOLOGY**

Dunn (as referred to in Fourqurean, Meisgeier & Swank, 1990) defines learning style as the way individuals concentrate on, absorb, and retain new or difficult information or skills. As conceptualised by Jung (1971), psychological type can be used to classify individuals by the way they prefer to process information and make decisions. Jung believed that individuals preferred modes of interacting and of receiving information and responding to it. According to Barger and Hoover (1984), psychological type is descriptive of what is now called learning style or cognitive style.

Richter (1992) points out that the notion of a typology is not new. Human individuality has been recognised for many centuries, and philosophers have attempted to understand how individuals differ during the classical age, an example being the theorising of the Gnostic philosophers who thought of individuals varying along three dimensions, namely the pneumatici (a thinking orientation), the psychici (a feeling orientation) and the hylici (a sensation orientation). Richter (1992) adds that Schiller, in the eighteenth century divided individuals according to realists and idealists, naïve and sentimental types; Nietzsche, in the following century, proposed his own typology, the Appolonian-Dionysion typology.

Jung's typology according to Helson (1982) is a structural theory of individual differences in cognitive style. Theorists like Jung were interested in the variety of strategies that people use in their approach to the environment. Problem-solving theories according to Richter (1992) therefore illustrate the link between personality and thinking or problem-solving style.

Jung's typology may be regarded as a theory of individual differences in information processing and exchange. Jung considered this information-processing system to have innate determinants, but he thought that the need to adapt or compete in one's environment was the impetus for specialisation and differentiation of functions (Helson, 1982). By *functions* here is meant the perceptive functions of sensation and intuition which are data-gathering processes, differing in whether the data gathered are literal or symbolic, and the judgemental functions, thinking and feeling, which are data-evaluation processes, differing in whether the criterion is logical adequacy and coherence or affective value.

Based on a Jungian scheme, Mitroff (1983) utilises a similar classification scheme, which recognises that individuals differ in the way that they acquire information and in the methods that they use to process data. The information-acquisition dimension differentiates individuals who are sensation-oriented (S) from those who are intuition-oriented (I). The sensation-oriented information acquirer prefers structured problems, which involve routine and detail, while the intuitive information acquirer prefers unstructured problems. The information-evaluation dimension differentiates those individuals who adopt a thinking (T) approach when evaluating information from those who adopt a feeling (F) approach. These dimensions are seen as being independent and thus combine to produce four basic composite styles: Sensation-Thinking (ST), Sensation-Feeling (SF), Intuition-Thinking (NT), and Intuition-Feeling (NF). Each individual is thought to be predominately of one of these types.

#### **4.2 PAST RESEARCH ON THE RELATIONSHIP BETWEEN COGNITION AND PERSONALITY**

Kihlstrom (1981) reports that a dramatic increase has been noticeable during the late seventies and early eighties with regard to the interest among both experimental and clinical psychologists in the relations between personality and cognitive processes. Sperry (1995) confirms that cognitive

approaches are enjoying overwhelming success in bringing an integrated perspective to the difficult problem of understanding the complexity of human behaviour in a suitably scientific manner.

In a study by Weinman (1987), where the association between extraversion and rigidity was investigated through the use of a perceptual maze test, it was found that personality factors apparently do not play a major role in determining the response choices made by maze solvers at the binary decision configurations investigated in the study. At this level of analysis, error patterns and response tendencies reflect cognitive factors associated with an overall level of maze-solving ability. Although this study showed that extraverts tend to make more errors overall, personality factors appear to be reflected primarily in the 'cognitive tempo' of maze solvers, particularly in the amount of time they spend on different phases of problem-solving. This approach by Weinman (1987) has highlighted the role of personality factors in accounting for individual differences in the time taken on different phases of problem solving.

Ferguson and Fletcher (1987) examined the relationship between cognitive style and personality type. Correlational analysis showed that there are significant variations in cognitive style with different preferences on the MBTI. At the conclusion of this research it was suggested that feeling types tended to be better at verbal-based tests, whereas perceiving types tended to be better at tasks requiring cognitive control and attention.

Carey, Fleming and Roberts (1989), confirm that subscales of the Myers-Briggs Type Indicator correlated significantly with the measure of field dependence-independence but not with the measure of cognitive complexity. The MBTI measures some but not all aspects of cognitive style.

Taken as a whole, Carey et al (1989) suggest that the MBTI does not provide a comprehensive description of individual differences in perceptual and cognitive style. Inferring a person's degree of field dependence-independence from the MBTI is therefore ill advised. Inferring a person's cognitive complexity would therefore be unwarranted.

Since personality type appears to affect problem-solving patterns, accounting for personality variables may alter future findings concerning gender differences in cognitive functions (Hunter & Levy, 1982).

Fourqurean et al (1990) suggest that because of the similarities between learning style and psychological type, it would follow that instruments purporting to measure these constructs would be related.

### **4.3 PITFALLS IN THE STUDY OF COGNITION AND PERSONALITY**

Cantor and Kihlstrom (1987) point out that various cognitive style constructs have been subject to vigorous criticism. The generality of the supposed cognitive style is often at issue: The various ostensible laboratory measures of psychological differentiation do not intercorrelate highly.

Cantor and Kihlstrom (1987) further indicate that the cognitive styles tradition provides the following important lessons about possible pitfalls in the study of cognition and personality:

- It is probably fruitless to attempt to develop a small set of basic cognitive styles derived from very abstract individual-difference constructs.
- There should be no expectation that any aspect of problem solving necessarily will be generalisable across markedly different problem contexts, or across different phases in the life cycle.
- The effectiveness of any mode of thinking must be evaluated not with respect to normative standards within a culture, but rather with respect to the individual's own goals, as perceived within the framework of the life tasks in which he or she is currently engaged.

### **4.4 COGNITION AND PERSONALITY**

In 1921, Jung published a "cognitive reconceptualisation of personality" in which he attempted to show that a great deal of personality and interpersonal behaviour was attributable to differences in

cognitive-affective style (Helson, 1982). Its combination of systematic complexity and subjective emphasis has, however, made it difficult to test.

Kihlstrom (1981) defines the field of personality as being concerned with the distinctive patterns of thought, behaviour, and experience that characterise a person's unique adjustment to his or her life situation. In principle, any personality theory must be a general psychological theory in which the knowledge gained from the study of physiological, cognitive, social, and developmental processes is synthesised into a comprehensive view of individual behaviour and experience. The psychology of personality according to Kihlstrom (1981) seeks to understand the joint operation of these processes from the point of view of the person involved, as individuals act to understand, respond to, and change the physical and social world in which they live.

One of the longest standing traditions in personality and cognition has to do with the characteristic styles for perceiving and thinking that people develop. Whereas these styles are typically measured in impersonal perceptual-cognitive tasks, the assumption is that they generalise to the interpersonal domain as well; that is, the proponents of the cognitive-style approach assume that performance on standard laboratory tasks is indicative of broad personality characteristics that mediate the person's behaviour in the social world outside the laboratory. Many early theorists of cognitive style were influenced by psycho-analytic ego psychology, and related various stylistic dimensions to defensive as well as adaptive functions. However, the psychodynamic theory does not have to be embraced in any form to appreciate the heritage of cognitive style theory for modern cognitive approaches to personality (Cantor & Kihlstrom, 1987).

The cognitive basis of personality according to Cantor and Kihlstrom (1987), can be conceptualised as the declarative and procedural knowledge that individuals bring to bear in interpreting events and making plans in everyday life situations. These concepts, personal memories, and interpretive rules are the cognitive structures of personality; together they constitute the expertise that guides an individual's approach to the problems of social life.

Cantor (1981) and Mischel (1981) suggest that personality psychology in its broadened form shares substantially with both social and cognitive psychology. Although it is easy to distinguish between personality and cognitive style measures, theoretically the two concepts are similar.

Cognitive styles are considered to be dimensions of personality organisation by many cognitive psychologists. The description of a cognitive style thus provides personality descriptions (Richter, 1992).

Kirton and de Ciantis (1986, p 141) summarise the aspects of cognitive style and personality as follows:

Cognitive style has been defined as "consistent individual differences in preferred ways of organising information" and as such provides a hypothetical mediator between stimuli and responses. The emphasis is on style over content; thus cognitive style is considered to be independent of level of abilities, skills or intelligence or levels of cognitive complexity.

Cognitive styles are noted as tending towards stability across time and situations and consequently remain largely unresponsive to specific training. This stability suggests cognitive styles to be related to underlying personality traits, whereby a "personality space" is suggested which links the concepts. This term may be thought of as describing the area of conceptual space in which the key components linking cognitive style and personality are located (Kirton & de Ciantis, 1986).

#### **4.5 INFORMATION PROCESSING AND PERSONALITY**

For many psychologists, the work of cognitive social-learning theorists is attractive because it gives information processing and self-regulation an important place in behaviouristic psychology of concrete interpersonal or functional realities (Helson, 1982).

Jung was a pioneer in the field of the psychology of knowledge. Individual differences in information processing contribute to the fact that individuals live in personal worlds that are unique from other individuals. Jung thought that the ability to diversify one's style of information processing was an essential aspect of the expansion of consciousness which takes place in what he called the individuation process (Helson, 1982).

## **4.6 CONCLUSION**

Richter (1992) defines cognitive style as being part of personality organisation, representing a characteristic mode of information processing which involves a constellation of metaprocesses. Cognitive styles, then, are stable individual preferences regarding the manner of perceptual organising and conceptualising of the environment as well as reacting thereon or adapting thereto.

Cognitive styles according to Richter (1992) are not limited to specific situations with cognitive task requirements, but rather, should be conceived of as an integral part of personality organisation. Individuals are continually processing information in the course of their daily activities and interactions with others, so that cognitive style is actually to a great extent a determinant of behaviour. Richter (1992) suggests that Jung's theory can therefore also be called a theory of cognitive styles, because it is a holistic view of individual functioning. From a systems perspective, personality and cognition are inextricably linked to one another and are interdependent - a feature which is characteristic of the Jungian typology. How a person thinks, perceives, selects and carries out any of the processes involved in daily living or problem solving is influenced by the person's unique personality characteristics.

The conception of cognition, defined as "the act or process of knowing", and which includes awareness and judgement (Mish, 1987, referred to in Frisbie, 1990), makes it clear that Jung's concepts of perception and judgement fit easily into this definition. Also, the concepts of sensation, intuition, thinking and feeling are reflections of cognitive processes involved in both learning and problem solving and are therefore descriptors of cognitive styles.

## **4.7 CHAPTER SUMMARY**

Chapter 4 discussed the theoretical relationship between cognitive styles and personality. Chapter 5 will address the first five steps of the empirical investigation of this research.

## **CHAPTER 5: EMPIRICAL STUDY**

Chapter 5 contains the empirical study with the specific aim to ascertain the relationship between cognitive styles and personality types. The research hypothesis will be tested by means of descriptive research.

This phase consists of 10 steps, namely:

- |         |   |
|---------|---|
| Step 1  | Description of sample population              |
| Step 2  | Motivating the choice of psychometric battery |
| Step 3  | Data collection                               |
| Step 4  | Statistical methodology                       |
| Step 5  | Formulation of research hypothesis            |
| Step 6  | Statistical results                           |
| Step 7  | Summary of findings                           |
| Step 8  | Limitations of research                       |
| Step 9  | Conclusion                                    |
| Step 10 | Formulation of recommendations                |

Steps 1 to 5 are addressed in this chapter while steps 6 to 10 will be discussed in chapters 6 and 7.

### **5.1 DESCRIPTION OF THE SAMPLE POPULATION**

Within the context of this research it was decided to limit the population to a single organisation and a single area of expertise, namely Information Technology employees. All the individuals within a large financial institution who manage Information Technology projects at either technical or managerial level were included in this process.

The full population of individuals at either team leader or managerial level within this group (n=123) were requested to complete the profiling exercise.

This exercise was completed during a stage of major transformation within the organisation. Various psychometric batteries were used during this period. However, for the purpose of this research only the cognitive and personality style results were extracted. The MBTI was paper and pencil based, while the CPP was computerised.

Table 5.1 provides a breakdown in terms of a few biographical variables of this sample group.

**Table 5.1** *Frequency table of sample group as per a few biographical variables (n=123)*

		N	%
<b>Gender</b>	Male	98	79,7
	Female	25	20,3
<b>Race</b>	Asian	7	5,7
	Black	4	3,3
	Coloured	1	0,8
	White	111	90,2
<b>Age</b>	20-29 years	1	0,8
	30-39 years	45	36,6
	40-49 years	61	49,6
	50 years +	16	13,0
<b>Managerial Experience</b>	Less than 3 years	30	24,4
	3-5 years	21	17,1
	5-10 years	27	21,9
	10-15 years	29	23,6
	>15 years	16	13,0

In summary, the group can be described as follows: The mean age of the respondents is 42 years; 49,6 percent of the sample group were within the 40-49 age bracket; the majority of this group were male (79,7%). A significant aspect is that a large percentage of these persons have had 10 years or more service with the organisation (36,6%).

## **5.2 MOTIVATING CHOICE OF PSYCHOMETRIC BATTERY**

The psychometric instruments were considered as to their applicability to the relevant models and theories underlying this research.

The following instruments were used during the research:

- The Cognitive Process Profile (CPP) developed by Prinsloo (1995) to determine cognitive patterns or problem-solving styles
- The Myers-Briggs Type Indicator (MBTI), form F, developed by Briggs and Myers (1977) to measure the personality type construct

These two instruments will now be described in more detail.

## **5.2.1 Cognitive Process Profile (CPP)**

The CPP will be discussed with reference to an overview, general description, application, administration, validity and reliability of the instrument.

### **5.2.1.1 Overview of the CPP**

The CPP is an assessment instrument marking the culmination of an extensive ongoing study by Prinsloo (1992) on problem-solving processes.

According to Prinsloo (1995), problem solving might be construed in terms of six thinking processes. Thinking processes are described as functional categories and can be represented as overlapping fields of a matrix. These thinking processes include:

- Exploration / focusing and selecting – The depth and effectiveness by which issues are investigated with the objective of identifying relevant information for further processing
- Analysis / linking (identification of relationships) – Involves working with detail and precision to break a situation into its sub-components, comparing these sub-components and drawing associations, or linking the components according to certain rules
- Logical and lateral transformation (reasoning processes) – Changing information structures through the use of logical and lateral reasoning processes, to generate new possibilities, create abstract concepts, or change perspective; follow-through of an

argument by means of a disciplined and logical verification of conclusions is an important component of logical reasoning

- Structuring and integration – the ordering, categorisation, representation and integration of information to make sense of the situation
- Memory / retention and recall – the use of memory processes to store and retrieve information
- Metacognition – the self-aware monitoring of one's own thinking processes, generally regarded as the key to effective thinking

A number of sub-dimensions, or processing functions can be linked to the above-mentioned processing constructs. Most of the sub-dimensions may belong with more than one of the proposed processing constructs. For example, the processing function of "discrimination", meaning "deciding what is and what is not important in a relatively structured situation", will apply to exploring problems, linking components of problems or structuring information to make sense of a situation (Prinsloo, 1998). These sub-components were, however, categorised in terms of four meta-criteria (necessity, generality, purpose and conscious application) to ensure the convergent and discriminant validity of each of the processing constructs.

By means of the CPP simulation exercise, each of the approximately 100 processing sub-components measured by the CPP is measured on approximately 100 points to ensure the content validity of the items. An average score representing an average level of functioning can therefore be calculated for each individual (Prinsloo, 1998).

These sub-dimensions were grouped in terms of the meta-criteria to indicate the processing constructs, but were also regrouped to indicate individual differences in terms of stylistic tendencies (at a more generalised level).

Prinsloo (1998) points out that the styles are not representative of a neat theoretical model (as in the case of the processing constructs), but are rather based on a "fruit salad" approach of possible stylistic tendencies as described in the literature and observable in everyday life.

The CPP primarily measures a person's cognitive approach to new and unfamiliar problem-solving environments. For example, should an individual obtain a random and/or impulsive style on the CPP, but in actual life be very disciplined in a familiar, purely operational environment, the random style may indicate that the person finds it exceptionally difficult to function in unfamiliar and unstructured environments.

The styles are also analysed to determine whether a "left brain" or "right brain" orientation is reflected. Should the person capitalise on both orientations, a *Balanced* profile is indicated. This indicates cognitive adaptation to a wide variety of thinking skills requirements that work environments may pose.

It should however be pointed out that the identified thinking processes can be executed at various levels – including the performance (task focused), metacognitive (self-aware) and subconscious levels.

Processes and levels according to Prinsloo (1995) are theoretically differentiated, to simplify the operationalisation of thinking – a highly integrated process. The cognitive processes and stylistic tendencies largely reflect learning experiences, they are reasonably stable over time, they are particular to each individual and they are measurable. Prinsloo (1995) further suggests that every person's thinking processes can be mapped out, compared and developed.

#### **5.2.1.2 General description**

The CPP is an assessment instrument that measures an individual's thinking processes and learning potential.

It is a computerised simulation exercise that evaluates everyday problem-solving ability by tracking and recording cognitive processing. It consists of eight problems where symbol messages have to be deciphered. Subjects proceed by flipping information cards to reveal their meanings, assimilating the information and formulating particular conceptualisations. Both the detailed card movements as well as the final conceptualisations indicate processing and stylistic trends and tendencies.

The CPP is computer driven and once the subject has completed the test, his/her conceptualisations are typed in by a test administrator and automatically integrated with the subjects' card movements, in order to be analysed.

### **5.2.1.3 Application of CPP**

The CPP has been designed to assess the cognitive problem-solving skills and learning potential of adults with matriculation certificate, or higher. This minimum is merely a yardstick to ensure the language proficiency of test subjects. The CPP demands an adequate grasp of standard 3 mother tongue English (or standard 7 English for second language users). Potential candidates for testing who do not meet this criterion can prove proficiency on an equivalent literacy test.

Prinsloo (1995) indicates that the CPP is being used for the following purposes:

- Selection
- Placement
- Career guidance and pathing
- Cognitive development & capacity building
- Job analysis
- Determining managerial potential
- Affirmative action

### **5.2.1.4 Administration of the CPP**

The CPP has only been submitted during 2000 to the Health Professions Council of South Africa (HPCSA) for classification.

Because the CPP is computer based, several subjects can be tested at any one time with the minimum of supervision. The CPP takes between one and a half to three hours to complete. Scoring, interpretation and report writing functions are fully automated.

### 5.2.1.5 Metric properties of the CPP

Here the validity, reliability, and cultural bias and fairness of the CPP will be discussed.

#### (a) *Validity*

The following metric properties have been recorded in terms of the theoretical model:

- Construct validity: According to the Linear Structural Relations Modelling techniques (LISREL), the constructs measured by the self-contained theoretical model have adequate convergent and discriminant validity. A fit of 0.9 was obtained. Convergent and discriminant validity are two aspects of construct validity (Prinsloo, 1995).

The following metric properties have been recorded in terms of the CPP:

- Content validity: In order to establish whether the CPP represents and covers the constructs in question, each of the approximately 100 sub-dimensions are measured in terms of approximately 100 measuring points. Trends and tendencies in processing behaviour are then identified. As a qualitative evaluation, the post-test interviews of 300 subjects were submitted to qualitative analysis. Evident from this strategy was that the number and nature of items included in the test comprehensively covered the theoretical model (Prinsloo, 1995).
- Empirical/concurrent/criteria validity: Empirical analysis of the CPP test scores and criteria which independently and directly measure the characteristics that the CPP is designed to predict, was completed. The CPP has been compared with the Wechsler Adult Intelligence Scale (WAIS) and the General Reasoning Test of the GSAT (General Scholastic Aptitude Test).

For the WAIS (2 studies, n=100 in each) a correlation of between 0,45 and 0,6 with a significance level of 0,001 was achieved, while for the GSAT (n=63) a correlation of between 0,32 and 0,37 with a significance level of 0.01 was achieved (Prinsloo, 1995).

- Predictive validity: When an instrument is able to estimate some important variable, such as performance or behaviour, it is said to have predictive validity.

In a study conducted amongst disadvantaged engineering students, the CPP successfully predicted first year performance on the 0,0001 level of significance, thereby outperforming matric scores, traditional IQ scores and knowledge test results (Farquharson, 1998).

In another study, amongst trainee accountants in the financial sector, where the CPP results were compared to performance criteria in the work environment, correlations of 0,60 were obtained (Smit, 2000).

#### *(b) Reliability*

Reliability refers to the dependability, degree of error and consistency of a measurement technique.

The current CPP is a learning instrument. This renders indices of internal consistency inappropriate as a measurement of reliability. In the case of the CPP, error is addressed via construct validity.

However, before a learning component was added to the CPP, the following reliability indices were reported by Prinsloo (1998):

- Cronbach Alpha – 0,968 to 0,990
- Internal Reliability – 0,979 to 0,991
- Spearman Brown Split Halves – 0,960 to 0,991
- Kuder-Richardson-20 – 0,970 to 0,990

Prinsloo (1998) adds that the above reliability scores reflect a range in values because they are calculated separately for each processing construct.

(c) *Cultural bias and fairness*

Whereas bias refers to the technical aspect of test discrimination, fairness refers to the socio-political aspect of psychometric assessment.

Prinsloo (1998) indicates that a systematic approach to cultural bias was adopted in the design of the CPP. Several aspects received particular attention:

- item content
- levelling effects related to the familiar and unfamiliar aspects of the CPP
- the presentation of verbal and non-verbal material
- the use of auditive and visual material
- stylistic preferences
- the rate at which learning occurs
- the theoretical interpretation of processing profiles
- the technique of profile matching
- technological sophistication
- diagnostic requirements
- a focus on thinking processes rather than on the products of reasoning (as measured by IQ tests)

Prinsloo (1995) reports that except for the application of a metaphoric style, no significant differences were found between cultural groups (n=120, Manova results). It is thought that the tendency found among certain race groups to apply the metaphoric style reflects a language-related predisposition.

## 5.2.2 Myers-Briggs Type Indicator (MBTI)

There are several reasons why the MBTI was chosen for this study over numerous other personality measures. Firstly, the MBTI measures preferences. It does not measure talent, competency, ability, adjustment or the lack thereof. The MBTI assumes a neutral test situation in which the individual is free to express his/her natural inclinations. The scores do not carry evaluative connotations – that is, there is no inherently good or bad score. Scores simply reflect an individual's preference for activities, given minimal situational constraints (Burger, 1992).

Secondly, the MBTI focuses on stylistic types which incorporate cognitive and perceptual processes. It describes the way that individuals function in the world, the way people prefer to use their minds, specifically the way they perceive and the way they make judgements (Myers, 1980).

The concern is primarily with mental activity or cognitive processes, rather than with emotional, ego, or value dimensions which many other personality scales measure. Botha (1994) suggests that the MBTI is therefore a measure of cognitive styles more than personality styles.

The MBTI according to Botha (1994) is one of the most frequently used scales today, probably because of its ease of interpretation and application.

It must be kept in mind that the MBTI is concerned with differences in normal behaviour and, therefore, no information can be gained about emotional problems or psychopathology.

Although the MBTI is used for the assessment of cognitive styles, it does not provide any indication of levels of creativity.

The MBTI is unusual among personality assessment devices for three reasons (McCrae & Costa, 1989):

- It is based on one of the classic statements of personality theory.
- It purports to measure types rather than traits or other continuous variables.

- It is also widely used to explain individuals' personality characteristics to laymen and professionals alike.

The MBTI will be discussed with reference to the development, description, scales, administration, interpretation, validity and reliability of the instrument.

### **5.2.2.1 Development of the MBTI**

The MBTI is based on Jung's (1971) ideas about perception and judgement, and the attitudes in which these are used in different types of people. The MBTI is used to identify, from self-report of easily recognised reactions, the basic preferences and judgement, so that the effects of each preference, singly and in combination, can be established by research and put to practical use (Myers & McCaulley, 1992).

### **5.2.2.2 Description of the MBTI**

The MBTI (Myers & McCaulley, 1992) is published in three forms – Form F (166 items), Form G (126 items) and Form AV, the Abbreviated Version, which is self-scoring (50 items). Both Form F and Form G contain research items as well as the items scored for personality type; Form AV contains no research items. The Form F and Form G items scored for type are almost identical, but Form G items are arranged so that items that best predict total personality type are at the beginning, thus increasing the likelihood that respondents who do not finish the MBTI will receive accurate reports of their personality type. Form F was used for this research project.

The MBTI, Form F, is a self-reporting instrument and consists of three parts. Part I contains 71 items, part II 52 items and part III 43 items. All in all, the individual has to respond to 166 items. The items measure individuals' preferences in regard to the basic functions of perception and judgement that enter into almost every behaviour. The items describe various types of easily recognised behaviours or reactions in various life settings. In parts I and III, items force individuals to choose between types of behaviours or reactions and in part II, the items force individuals to choose between word pairs. In choosing a preferred type of behaviour or a word, individuals actually indicate preferences in regard to the four scales or indices, Extraversion

versus Introversion (E/I); Sensing versus Intuition (S/N); Thinking versus Feeling (T/F) and Judging versus Perceiving (J/P) (Myers & McCaulley, 1992).

The MBTI items scored for each index offer forced choices between the poles of the preference at issue. Choices are between seemingly inconsequential everyday events, chosen by Myers as stimuli to evoke the more comprehensive type preferences. All choices reflect the two poles of the same Jungian preference, e.g. E (Extraversion) or I (Introversion), S (Sensing) or N (Intuition), T (Thinking) or F (Feeling), J (Judging) or P (Perception). The extent of the difference between the poles is computed to produce the preference score and letter.

### **5.2.2.3 Scales of the MBTI**

The MBTI contains four separate indices or scales. Each index reflects one of four basic preferences that, under Jung's (1971) theory, direct the use of perception and judgement. The preferences affect not only what people attend to in any given situation, but also how they draw conclusions about what they perceive. The indices EI, SN, TF and JP are designed to point in one direction or the other. They are not designed as scales for measurement of traits or behaviours. The intent is to reflect a habitual choice between rival alternatives (Myers & McCaulley, 1992).

The four separate indices are as follows:

- Extraversion-Introversion (EI): The EI index is designed to reflect whether a person is an extravert or an introvert. Extraverts are oriented primarily toward the outer world; thus they tend to focus their perception and judgement on people and objects. Introverts are oriented primarily toward the inner world; thus they tend to focus their perception and judgement upon concepts and ideas.
- Sensing-Intuition (SN): The SN index is designed to reflect a person's preference between two opposite ways of perceiving; one may rely primarily upon the process of sensing (S), and report observable facts or happenings through one or more of the five senses; or one may rely more upon the less obvious process of intuition (N), which

reports meanings, relationships and/or possibilities that have been worked out beyond the reach of the conscious mind.

- **Thinking-Feeling (TF):** The TF index is designed to reflect a person's preference between two contrasting ways of judgement. A person may rely primarily on Thinking (T) to decide impersonally on the basis of logical consequences, or a person may rely primarily on feeling (F) to decide primarily on the basis of personal or social values.
- **Judgement-Perception (JP):** The JP index is designed to describe the process a person uses primarily in dealing with the outer world, that is, with the extraverted part of life. A person who prefers judgement (J), will report a preference for using a judgement process (either thinking or feeling) for dealing with the outer world. A person who prefers perception (P) has reported a preference for using a perceptive process (either sensing or intuition) for dealing with the outer world.

The preference in each scale of index is independent of preferences for the other three scales, so that the four indices yield sixteen possible combinations called personality types, denoted by the four letters of the preferences (e.g. ISTP, ENTJ). The characteristic of each personality type follow from the dynamic interplay of the attitudes of extraversion and introversion and the processes of perception (S and N) and judgement (T and F).

For the purpose of this research project, the SN and TF indices are of interest. The SN and TF indices represent the individual's orientation to consciousness and are referred to as orienting functions (Myers & McCaulley, 1992).

Myers and McCaulley (1992) considered four personality type groupings as the most important of the groupings of the types. Combinations of perception (S and N) with judgement (T and F) give four groupings of personality types, namely Sensing-Thinking (ST); Sensing-Feeling (SF); Intuition-Feeling (NF) and Intuition-Thinking (NT) types. Each personality type has specific characteristics that are assumed to stem from the preferred use of the mental functions.

While the letters indicate the direction of the preference, the number indicates the strength of the preference. This means that the numerical portion of a score shows how strong the preference is reported, which is not necessarily the same thing as how strongly it is felt. A higher preference score does not necessarily mean that the skills for this preference score are more effectively developed or used more skilfully than for a lower score on any of the other dominant preferences. The extent of the differences between the poles is calculated to produce the preference score and letter.

In general, a score of 9 or less is not statistically significant, and possibly, if the MBTI was done at another time or in another frame of mind, this same preference might not be shown, but rather the opposite (Botha, 1994).

#### **5.2.2.4 Administration of the MBTI**

The MBTI is virtually self-administering. All necessary instructions are given on the cover of the question booklet and on the response sheets. The same response sheet is used for hand scoring and computer scoring (Myers & McCaulley, 1992).

The MBTI has no time limit, but those who are making unusually slow progress may be encouraged to work rapidly and not study the items at length. In group testing, group members should not be allowed to discuss the items (Myers & McCaulley, 1992).

Omissions are permitted if respondents do not understand a question or cannot choose an answer. The reason for permitting omissions is that no item can reliably contribute useful evidence of personality type unless choices are understood and the question lies within the respondent's experience (Myers & McCaulley, 1992).

To determine the person's personality type, the points for each preference are totaled, yielding eight numerical scores. These eight scores are interpreted as four pairs of scores, with the larger of each pair indicating the preferred role.

MBTI scoring generates four basic scores. Points are the sums of the "votes" cast for each pole of the four preference scales or indices (EI; SN; TF; JP). For the EI preference for example, the scores total the answer in the direction of E and the answer in the direction of I. Answers carry weights of 0, 1 or 2. Weights reflect the relative popularity of each answer with those for whom it was intended and with those at the opposite pole of the preference. Points were not intended for further analysis. Preference scores are the basic scores for the MBTI. They consist of a letter to denote the direction of the preference and a number to show the consistency of the preference (e.g. E31 and F13) (Myers & McCaulley, 1992).

Because the aim of the MBTI is to determine habitual choices between opposites, the questions are set up in forced-choice form. Each scored item has one answer weighted in favor of one of the eight preferences and the other answer weighted in favor of the opposing preference. Different weights have been assigned to certain answers in an attempt to offset social desirability bias (Myers, 1962).

The Indicator yields two types of scores for each person. It classifies respondents on four dichotomous type categories, and it also produces eight numerical scores that can be transformed into four continuous scores. MBTI scores may therefore be regarded as either dichotomous or continuous data (Carlyn, 1977).

#### **5.2.2.5 Interpretation of the MBTI**

Preference scores reflect the relative preference for one pole over the other. The letters indicate which of each pair of alternatives the person prefers and presumably has developed, or can develop, to a greater degree. For example, a preference score letter E suggests that the person prefers extraverted to introverted behaviour, and probably has spent more time in extraverted behaviour than in introverted behaviour. Consequently, the person is likely to be better at activities that call for extraversion than activities that call for introversion, and will find more satisfaction from a career that requires extraversion. The characteristics associated with a preference are often less apparent when the numerical portion of the preference score is low. A low score shows almost equal votes for each pole of the preference. While letters indicate the

direction of the preference, the number indicates the strength of the preference (Myers & McCaulley, 1992).

#### **5.2.2.6 Validity of the MBTI**

Myers and McCaulley (1992) provide extensive validity data. The Manual (Myers & McCaulley, 1992) reports 30 pages of correlation between continuous scores of the MBTI and scales of other instruments. Although the MBTI continuous scores ignore theory of dichotomous preferences, correlations tend to be in the expected directions (Coetzee, 1996).

While the fixed-choice, bipolar nature of the MBTI items has generated some arguments with respect to measurement issues, the instrument has been subjected to extensive validity testing, which indicates that results obtained from application of the MBTI can be meaningfully interpreted (Davis et al, 1990).

Carlyn (1977, p 471) had the following to say about the validity of the MBTI:

Numerous studies of construct validity suggest that the individual scales of the MBTI measure important dimensions of personality, which seem to be quite similar to those postulated by Jung. Findings indicate that MBTI scores relate meaningfully to a large number of variables including personality, ability, interest, value, aptitude and performance measures, academic choice, and behaviour ratings. The indicator appears to be a reasonably valid instrument that is potentially useful for a variety of purposes.

#### **5.2.2.7 Reliability of the MBTI**

Myers and McCaulley (1992) in the MBTI Manual present extensive data. The data shows split-half correlations and alpha coefficients to estimate internal consistency and test-retest correlations to estimate stability over time. In addition, retest and the percentage of time that 4, 3, 2, 1 or 0 preferences are the same on retest, show consistency over time. When subjects report change in type, it is most likely to occur in only one preference and in scales where the original preferences were low. In general, about three-fourths of time the retest will show three of four letters the same.

The validity of the MBTI remains a greater question than its reliability (Carlson, 1985).

### **5.3 DATA COLLECTION**

This step refers to the data collection stage in the research design.

In gathering the data, and as part an internal exercise in identifying the most suitable managerial candidates for taking the organisation forward, the following process was followed:

- A letter was forwarded to each manager explaining the process that would be followed.
- Sessions were then booked where managers completed the paper-based MBTI process and the computerised CPP process in one sitting.
- Shortly after the completion of these profiles, managers were given individual feedback by the researcher on the outcome of their profiles.

### **5.4 STATISTICAL METHODOLOGY**

The statistical methodology applied within this research will be discussed in this section.

#### **5.4.1 Background to statistical analysis of data**

Only the CPP was computer scored, while the MBTI was hand scored. Raw scores were transformed to categories of preference. This enabled the researcher to treat the variables as categorical or frequency data to be measured on a nominal scale.

The approach in terms of statistical analysis for this research will be discussed next.

#### **5.4.2 Frequency distributions and Chi-square statistics**

Biographic and organisational questions are often categorical in nature so that it is usual to give frequency distributions of the responses to such questions (tables 6.1 and 6.3). In the case where

two categorical variables are cross-tabulated, the Chi-square statistic as a test of the null hypothesis of independence between these two variables are computed and reported (Kerlinger, 1986; Hays, 1963).

### 5.4.3 Factor analysis of "cognitive style" variables

A statistical technique that is excellent for the investigation of the underlying structure of a number of variables, is *factor analysis* (Kerlinger, 1986). Those variables that refer to the same dimension, or that share the same dimension, should correlate highly with one another, and factor analysis uses this fact to uncover factors or dimensions.

Kerlinger (1986, p 569) describes factor analysis as follows:

Factor analysis serves the cause of scientific parsimony. It reduces the multiplicity of tests or measures to greater simplicity. It tells us, in effect, what tests or measures belong together – which ones virtually measure the same thing, in other words, and how much they do so. It thus reduces the number of variables with which the scientist must cope. It also helps the scientist locate and identify unities or fundamental properties underlying tests and measures.

In the present study the factor analysis program PROC FACTOR of the statistical software package SAS (Statistical Analysis Systems) was used to investigate whether the number of cognitive style variables could be viewed in terms of two or three underlying dimensions (SAS User guide, 1985). The method of factor analysis used was Principle Factor Analysis (Mulaik, 1972; Morrison, 1967), and the steps followed were as follows:

Step 1: Computation of a matrix of correlations between the cognitive style variables

Step 2: Making a decision on the number of factors (dimensions) to be extracted

(In the present study all factors with an eigenvalue greater than 1.0 were extracted. This criterion for deciding on the number of factors to extract is referred to as the Kaiser-Guttman rule (Cattell, 1978).)

- Step 3: Subjecting the correlation matrix to a Principle Factor Analysis
- Step 4: Extracting all factors with eigenvalues  $> 1$
- Step 5: The oblique rotation of the factor solution to a more interpretable solution utilising the mathematically criterion "promax" (Mulaik, 1972)

The essence to the factor analysis results is contained in the promax rotated factor solution (also called the factor matrix) matrices. In the present study the oblique rotation gives two factor solution matrices, namely a structure as well as a factor pattern solution matrix. For the purpose of interpreting the factors, that is, ascertaining the theoretical nature of the factors, only the factor structure matrices will be reported. The values in these factor solution matrices are regression coefficients of the items on the factors. By studying all those items that have high loadings (or regression coefficients) on a particular factor, the nature of that factor is derived. See table 6.2.

In this study it was decided to consider all factor loadings  $\geq 0,30$  as significant. This cut-off point of 0,30 is to a large extent arbitrary and is based on judgement by the researcher.

#### **5.4.4 Comparison of means using the Analysis of Variance strategy**

The "cognitive-style scales", as well as combinations of these scales based on factor analysis results or theoretical considerations, were treated as interval-scales so that statistics such as means, standard deviations, and correlations may be computed. A basic goal of the present study was to establish whether the Myers-Briggs personality categories are associated with the "cognitive-style" scales. An appropriate strategy for comparing various categories with respect to mean scores is the statistical technique called Analysis of Variance approach (Kerlinger, 1986; Hays, 1963; Winer, 1971). The categorical variables (Myers-Briggs personality types) on the basis of which subdivisions into groups are made, are called independent variables. The dependent variables on the other hand, to which the categories are compared, are the "cognitive-style scales" or any other continuous variable of interest.

In all cases where an independent variable consisted of more than two levels (in other words: more than one personality category), and the Analysis of Variance F-test proved significant, post

hoc Schéffe tests (Keppel, 1973) was performed at the 0,05 level of significance. See table 6.6 and appendices 3 to 8.

#### **5.4.5 Correlational and Multiple Regression analyses**

In this study the four continuous, bipolar variables were used, namely:

Extraversion – Introversion

Sensing – Intuition

Thinking – Feeling

Judging – Perceiving

The question was asked: "Can the cognitive style factors explain the scores obtained on the four personality factors?" It was decided to perform stepwise regression analyses with each of the personality factors as dependent variable and the cognitive style variables as predictors or explanatory (independent) variables. This procedure selects as a first step that cognitive style variable which has the highest significant correlation with the dependent variable, then selects in the second step, that variable which increases R-square (the variance in the dependent variable explained) maximally and significantly. The process is repeated in the third step and so on until no variable can be found which leads to a significant increase in R-square (Draper & Smith, 1966). See table 6.7.

#### **5.4.6 Level of statistical significance**

Conventionally, the levels 0,05 and 0,01 are used by most researchers as levels of significance for statistical tests performed. These levels of significance are rather severe because the purpose is to limit the risk of incorrectly rejecting the null hypothesis, or erroneously concluding a significant result. Such errors are referred to as type I errors and in many cases should be kept small in, for example, the medical sciences where an error could have grave consequences. Often, however, for example in the human sciences, we are just as concerned with missing a significant result or making a type-II error. Winer (1971) and Hays (1963) point out that when both types of errors

(type I and type II) are equally important, levels such as 0,20 (and possibly 0,30) are more appropriate than the conventionally used 0,05 and 0,01 levels.

However, there are also other important considerations in the choice of the level of significance. This is the total number of statistical tests to be performed by the researcher. As this total number of statistical tests increases, the probability of a type I error also increases. One approach to counter this accumulative effect is to set the level of significance smaller for the individual statistical test so as to compensate for the overall type I error effect. One method (the so-called Bonferonni method (Kirk (1968)), is to divide the chosen level of significance, say 0.30 for overall research, and divide this by the total number of tests to be performed. Suppose for example that the total number of tests to be performed are 60. Then the level of significance for any individual statistical test is  $0,30/60= 0,05$ . This gives a conservative and possibly strict level in practice (Morrison, 1967). There is no easy solution and the final choice remains subjective and to some extent arbitrary. Given the arguments above, a decision was taken to use the following levels of significance:

- the level 0,01 for all statistical tests involving factors or dimensions which underlie the various cognitive style factors (if such factors are found)
- the level 0,01 for post-hoc Schéffe tests concerning such factors
- the level of 0,05 for all results involving the 15 cognitive style variables

## **5.5 FORMULATION OF RESEARCH HYPOTHESIS**

Although this research has essentially been exploratory in nature, a research hypothesis was formulated regarding the potential relationship between cognitive styles and personality types. This will allow for the empirical testing of the relationship between these variables.

According to Kerlinger (1986) and Coetzee (1996), there are essentially two criteria for *good* hypotheses and hypothesis statements, namely:

- Hypotheses should be statements about the relations between variables.
- The hypothesis statements should be such as to carry clear implications for the empirical testing of the stated relations.

These criteria mean that hypothesis statements contain two or more variables that are measurable or potentially measurable and that they specify how the variables are related (Coetzee, 1996).

The following research hypotheses were formulated with a view to cover the objectives of the study and meeting the criteria for the formulation of hypotheses as outlined above:

$H_0$  – There is no relationship between cognitive styles and personality types.

$H_1$  – There is a relationship between cognitive styles and personality types.

## **5.6 CHAPTER SUMMARY**

This chapter, which represents the first five steps of the empirical investigation, discussed the sample population, the motivation of the choice of battery, the approach to data collection and the statistical methodology applied, and finally formulated the research hypotheses. Chapter 6 will discuss steps 6 and 7 of the empirical investigation.

## **CHAPTER 6: STATISTICAL RESULTS**

Within this chapter, the sample of 123 will be described in terms of frequency distribution and mean scores for both the cognitive style factors and the MBTI. The cognitive style will also include a discussion on the factor structure. This is followed by a discussion on the relationship between the MBTI and cognitive styles, while a summary of the findings will conclude the chapter.

### **6.1 DESCRIPTION OF SAMPLE IN TERMS OF PSYCHOMETRIC PROFILES**

As indicated before, this research was limited to a population of a single organisation and a single area of expertise, namely Information Technology employees. All individuals (n=123) in a large financial institution who manage Information Technology projects at either technical or managerial level were included in this process.

#### **6.1.1 Description in terms of cognitive style factors**

In this section the frequency distribution of cognitive style factors, the means of cognitive style factors as well as the factor structure of the cognitive style factors will be presented.

##### **6.1.1.1 Frequency distribution of cognitive style factors**

Table 6.1 displays the sixteen cognitive styles and the related frequencies for the total sample.

An individual cognitive profile analysis can reveal between one and four preferred cognitive styles. This means that there will be a first style but there could also be a second, third and fourth preferred style. It should be pointed out that these styles largely overlap in terms of the sub-dimensions incorporated.

The explorative preference in table 6.1 suggests that 17 respondents indicated this style as a first preference, while 9 respondents indicated this style as a second preference, with a further 1 each

showing this style as a third and fourth preferred cognitive style. 28 (22,8%) of the respondents therefore indicated an explorative preference as part of their cognitive styles.

**Table 6.1** *Frequency distribution of cognitive styles (n=123)*

STYLE	FREQUENCY OF PREFERRED STYLES					
	1st	2nd	3rd	4 <sup>th</sup>	TOTAL	%
Explorative	17	9	1	1	28	22,8
Analytical	19	20	16	1	56	45,5
Structured	4	2	4	1	11	8,9
General	0	1	6	1	8	6,5
Holistic	0	1	2	0	3	2,4
Intuitive	8	5	3	1	17	13,8
Memory	6	4	4	1	15	12,2
Integrative	20	11	7	0	38	30,1
Logical Reasoning	32	21	11	0	64	52
Reflective	5	18	11	2	34	27,6
Learning	1	5	10	0	16	13
Random	5	10	1	0	16	13
Impulsive	0	1	2	0	3	2,4
Metaphoric	5	2	7	0	14	11,4
Quick Insight	1	6	8	0	15	12,2
Balanced	.	.	.	.	66	53,7
No 2 <sup>nd</sup> ,3 <sup>rd</sup> ,4 <sup>th</sup> Preference	0	7	30	115		
<b>TOTAL</b>	123	123	123	123		

Aspects of the data in table 6.1 that can be highlighted are:

- Logical reasoning (52%) and analytical (44,7%) styles were most often the preferred style. These respondents were therefore detailed, systematic, rule-based, process oriented and disciplined in their approach.
- 53,7 percent or 66 respondents had balanced profiles. This suggests a fair distribution in terms of left versus right brain preferences. Even though personality preferences prevailed (as measured by the MBTI), these respondents have developed analytical (left brain) and conceptual (right brain) skills to match a variety of cognitive requirements in the work environment. Balanced profiles therefore indicate that a variety of stylistic preferences have been practiced and acquired. This may reflect educational and work exposure.
- A low representation on both holistic (2,4%) and impulsive (2,4%) styles appears for this sample group. An impulsive style has a number of negative consequences for effective information processing in most contexts. Information is encoded less deeply and less extensively. Impulsive behaviour not only negatively affects the storage of information, it results in poor performance in most problem-solving exercises (Taylor, 1987).

Explorative, reflective, structuring and analytical styles are often associated with an operational (as opposed to a strategic) approach. The logical integrative, intuitive, and holistic learning styles are associated with a more strategic orientation.

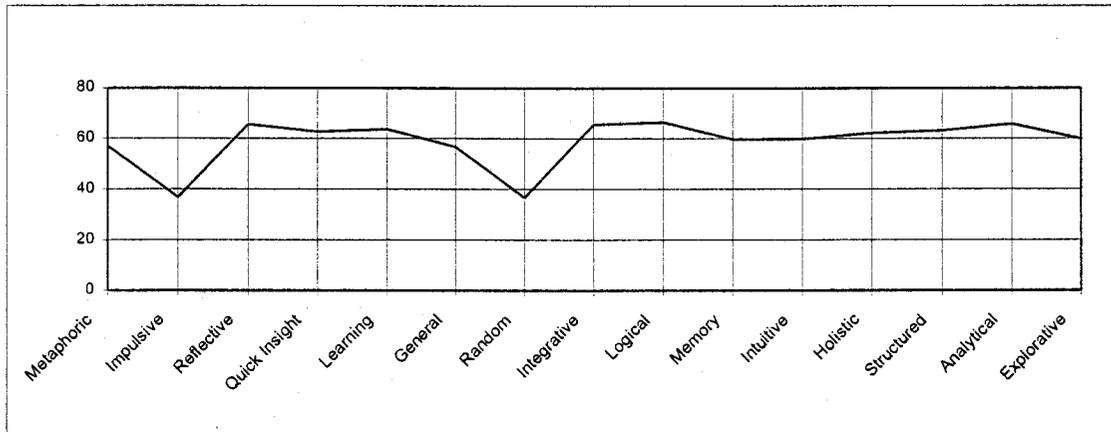
Integrative, intuitive, metaphoric and general styles primarily indicate an original right brain preference. These can be combined with other styles, which normally develop as a result of exposure to predominantly left brain schooling and university requirements. Although this research does not analyse brain dominance, Prinsloo (personal communication, 21 July 2000) points out that people with right brain preferences would develop logical rather than analytical styles in response to left brain environments. This is because of the more difficult reasoning requirements involved in the logical style, as opposed to the more linear detailed analytical requirements. People with original left brain preferences are not as likely to develop right brain skills (as right brain people tend to develop left brain skills), unless specifically exposed to intuitive and conceptual requirements within the tertiary educational and work environments. On

the CPP, left brain preferences are normally indicated by a combination of two or three of the analytical, logical, explorative, reflective and structured styles.

**6.1.1.2 Mean scores of cognitive style factors**

Figure 6.1 presents the mean scores of the cognitive style variables.

**Figure 6.1** *Mean scores of cognitive style variables*



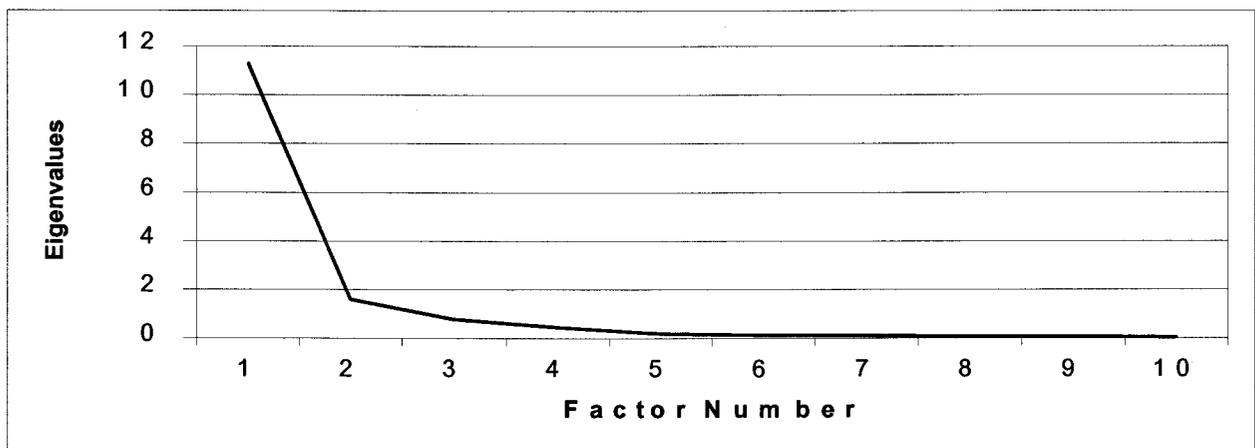
From figure 6.1 it is clear that both impulsive and random styles had a relatively low mean score compared to the remainder of the cognitive styles.

**6.1.1.3 Factor structure of the cognitive style factors**

In order to investigate whether some of the 15 cognitive styles combine to form broader dimensions of cognitive style, a factor analysis was performed on the scores of the 15 cognitive factors, exclusive of the balanced style, due to this style including a variety a stylistic preferences. (The correlations between these 15 cognitive factors are given in appendix 1.) The plot of eigenvalues is presented in figure 6.2 while the promax rotated solution is given in table 6.2.

From figure 6.2 below, there appears to be a clear factor 1, but possibly 2 factors as the graph levels off at factor number 2. It was subsequently decided to extract both a single factor and a two-factor solution.

**Figure 6.2** *Eigenvalue plot of cognitive style factors*



From table 6.2 it would appear that all the cognitive styles, with the exception of *explorative*, load on a single factor, and that a two-factor solution does not make theoretical sense.

**Table 6.2** *Single and two-factor promax rotated solution for cognitive style variables (Standardised regression coefficient)(n=123)*

Cognitive style variable	Single Factor	Two factors	
		Factor I	Factor II
Analytical	90	67	45
Explorative	.	-32	82
General	96	97	.
Holistic	98	95	.
Impulsive	-93	-72	-40
Integrative	96	97	.
Intuitive	74	83	.
Learning	93	96	.
Logical	95	78	33
Memory	75	105	-49
Metaphoric	61	62	.
Quick Insight	91	94	.
Random	-98	-90	.
Reflective	85	51	67
Structured	94	86	.

\* Values less than 0,30 have been omitted

The above raises the question as to whether the various cognitive styles have sufficient divergent validity.

It should also be pointed out that the stylistic constructs, as measured by the CPP, overlap in terms of the sub-dimensions included. The interaction between sub-components does however differ. The factor analytical technique indicates co-variance and fails to accommodate the complex interactions among the processing sub-dimensions.

## **6.1.2 Description in terms of the MBTI**

Within this section the frequency distribution of the MBTI as well as the means and standard deviations of the four basic scales will be discussed.

### **6.1.2.1 Frequency distribution of the MBTI**

The frequency distribution of the various personality types for the total sample group is displayed in table 6.3.

Table 6.3 indicates that the largest representation of preferences (69,1%), falls within four categories, namely ISTJ (19,5%); ENTJ (18,7%); ESTJ (16,3%) and ENTP (14,6%).

Various studies describing psychological type of managers have identified ISTJ, INTJ, ESTJ and ENTJ as the most commonly found behavioural preference (van Rooyen & de Beer, 1994). This research confirms the above in terms of the ISTJ (n=24), ESTJ (n=20) and ENTJ (n=23); the only exception for this research being that ENTP (n=18) is higher than INTJ (n=6).

**Table 6.3** *Frequency distribution of MBTI types (n=123)*

SENSING TYPES			INTUITIVES	
Thinking	Feeling		Feeling	Thinking
ST	SF		NF	NT
<b>ISTJ</b>	<b>ISFJ</b>	<b>INTROVERSION</b>	<b>INFJ</b>	<b>INTJ</b>
n = 24 % = 19,5	n = 4 % = 3,3		n = 1 % = 0,8	n = 6 % = 4,9
<b>ISTP</b>	<b>ISFP</b>		<b>INFP</b>	<b>INTP</b>
n = 5 % = 4,1	n = 0 % = 0		n = 2 % = 1,6	n = 10 % = 8,1
<b>ESTP</b>	<b>ESFP</b>	<b>EXTRAVERSION</b>	<b>ENFP</b>	<b>ENTP</b>
n = 4 % = 3,3	n = 2 % = 1,6		n = 1 % = 0,8	n = 18 % = 14,6
<b>ESTJ</b>	<b>ESFJ</b>		<b>ENFJ</b>	<b>ENTJ</b>
N = 20 % = 16,3	n = 3 % = 2,4		n = 0 % = 0	n = 23 % = 18,7

Table 6.4 provides a more detailed breakdown of information presented in table 6.3.

From table 6.4, it is clear that Feeling (F) is the only common preference reported in the combinations with low scores, whilst Thinking (T) is the only common preference in the highly represented combinations of the research sample, suggesting that Thinking (89,4%) predominates as a preference amongst technology managers. Paired combinations with the F preference therefore also have a low representation. This further results in the thinking dominance (Tdom) being reported as 47,2 percent, compared to the feeling dominance (Fdom) of only 4,1 percent.

Research conducted by Botha (1994) reported a 92,8 percent for the Thinking dimension. Botha (1994) also reported greater proportions amongst a sample of 263 South African managers falling into certain preference type categories. A similar pattern was found in a study by Myers and McCaulley (1985).

**Table 6.4** *Detailed breakdown of MBTI preferences (n=123)*

	N	%		n	%
E	71	57,7	NP	31	25,2
I	52	42,3	NJ	30	24,4
S	62	50,4	TJ	73	59,3
N	61	49,6	TP	37	30,1
T	110	89,4	FP	5	4,1
F	13	10,6	FJ	8	6,5
J	81	65,9	IN	19	15,5
P	42	34,1	EN	42	34,1
IJ	35	28,5	IS	33	26,8
IP	17	13,8	ES	29	23,6
EP	25	20,3	ET	65	52,8
EJ	46	37,4	EF	6	4,7
ST	53	43,1	IF	7	5,7
SF	9	7,3	IT	45	5,7
NF	4	3,3	Sdom	34	27,6
NT	57	46,3	Ndom	26	21,1
SJ	51	41,5	Tdom	58	47,2
SP	11	8,9	Fdom	5	4,1

Coetzee (1996) reported a ST of 71,2 percent, while the results from this research indicated a 43,1 percent preference towards this style. The highest combined style is TJ (59,3%).

Table 6.5 gives an indication of the representation of preferred personality types with the introversion and extraversion being separated.

**Table 6.5** *Myers-Briggs Type Indicator (MBTI) sample distribution by Preference type (Extraverts and Introverts separated) (n=123)*

Preference	Extraverts	Introverts	Total	%
STJ	20	24	44	35,8
STP	4	5	9	7,3
NTJ	23	6	29	23,6
NTP	18	10	28	22,8
SFJ	3	4	7	5,7
SFP	2	0	2	1,6
NFJ	0	1	1	0,8
NFP	1	2	3	2,4
TOTAL	71	52	123	100

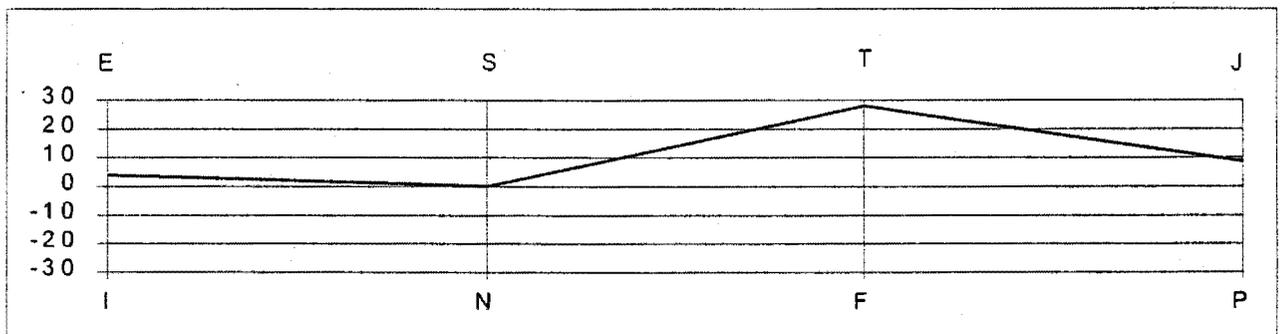
The highest representation is that of the NT (46,4%) grouping (NTJ + NTP). According to Barr and Barr (1989), this suggests that managers within this sample group are largely visionary in their approach. The next highest representation, namely the STJ (35,8%) group, suggests that there is also a strong element of traditionalist approach with conservatism and stabilisation being prime values. This section of the sample group might not be well suited for today's ambiguous business climate due to a reluctance to accept change (Barr & Barr, 1989). The lowest representation is that of NF (3,3%) and SF (7,3%), suggesting that there exists little warmth and enthusiasm amongst this sample group.

### 6.1.2.2 Mean profile in terms of the four basic MBTI scales

Figure 6.3 presents the means of the four basic scales of the MBTI, while appendix 2 provides the correlations between the four MBTI style dimensions.

It was decided to score the four style dimensions of the MBTI (i.e. extraversion/introversion, sensing/intuition, etc.) as continuous scales ranging from high negative to high positive. For example, when a subject is scored on the extraversion-introversion style dimension, he/she either obtains a score for introversion or a score for extraversion. By making introversion scores negative, a single scale was constructed. The same was done for the other three dimensions. The mean scores for these dimensions are displayed in figure 6.3 below. Dimensions E/S/T/J represent the positive scores while I/N/F/P represent the negative scores.

**Figure 6.3** *Means of the MBTI*



From figure 6.3 above, it is clear that the sample group has a strong preference towards thinking, followed by judging. Neither extraversion/introversion nor sensing/intuition stand out in terms a clear group preference. Figure 6.3 confirm the results as in table 6.4.

## 6.2 THE RELATIONSHIP OF THE MBTI TO THE COGNITIVE STYLE FACTORS

This section will compare the MBTI results with the cognitive style results.

### 6.2.1 Comparison of the MBTI versus the mean cognitive style scores

It was decided to compare the 16 different MBTI personality categories with respect to each of the cognitive styles individually, as well as some theoretically justified cognitive composite scores derived from underlying processes linked to various cognitive styles. Table 6.6 gives the mean scores for each of these variables for each of the MBTI groups (provided that at least 3 individuals were represented in a group).

The composite cognitive scores, as measured by the CPP, in table 6.6 and appendices 3 to 8 are represented as follows at the bottom of each table or appendix, with the amount of selected processes indicated in brackets. This categorisation reflects the degree of overlap among stylistic tendencies:

- EAL = Explorative, Analytical and Logical (2 processes)
- SMR = Structured, Memory and Reflective (4 processes)
- ILQ = Intuitive, Learning and Quick Insight (2 processes)
- HIG = Holistic, Integrative and General (4 processes)
- RI = Random and Impulsive (2 processes)
- META = Metaphoric (2 processes)

From table 6.6 it is clear that the MBTI groups do not differ from one another regarding their mean cognitive style scores. The conclusion from table 6.6 is therefore that there is apparently no significant relationship between the CPP cognitive styles and MBTI personality types, with a possible exception of "explorative". These findings may, however, be a function of the statistical methodology used. The more linear correlational techniques may not account for complex interactions and dynamic data as well as dynamic techniques can.

It was further decided to do a detailed analysis in terms of various paired MBTI preferences to determine whether this would differ from any of the initial results derived from table 6.6. As for table 6.6, no significant results were found. See appendices 3 to 8.

**Table 6.6 Comparison of Myers-Briggs Personality Types with regard to mean score on Cognitive Style factors:  
One-way Anova F-test on mean scores (n=123)**

Cognitive Style variables	Myers-Briggs Personality types										P-value of F-test *
	ENTJ (n=23)	ENTP (n=18)	ESFJ (n=3)	ESTJ (n=20)	ESTP (n=4)	INTJ (n=6)	INTP (n=10)	ISFJ (n=4)	ISTJ (n=24)	ISTP (n=5)	
Explorative	61,86	55,77	55,33	61,95	62,50	60,33	62,90	49,50	60,54	61,00	0,084
Analytical	68,56	61,11	63,00	65,05	73,00	61,33	69,40	57,25	64,25	71,40	0,465
Structured	63,65	60,77	61,66	61,50	65,75	59,00	65,90	59,50	63,83	67,20	0,692
Holistic	63,86	60,11	58,00	58,95	66,00	58,16	64,00	57,25	62,16	66,80	0,469
Intuitive	62,17	57,94	53,33	54,40	62,75	56,00	59,30	62,50	60,79	66,80	0,130
Memory	60,34	60,61	60,33	54,85	63,75	57,50	58,20	62,00	58,75	61,00	0,339
Logical	69,73	61,50	62,00	63,20	70,50	61,83	70,10	56,75	65,75	74,40	0,359
Integrative	66,65	63,44	58,33	60,85	69,50	62,50	67,00	60,75	65,95	74,20	0,562
Random	35,21	39,16	40,33	40,00	32,75	39,00	34,80	41,00	36,33	32,00	0,507
General	57,00	55,00	56,33	54,20	61,25	54,50	57,90	51,25	56,45	59,60	0,770
Learning	66,82	61,88	56,33	60,55	65,75	61,33	64,60	64,50	62,08	65,80	0,180
Quick Insight	65,52	61,05	55,00	58,55	65,75	59,83	63,20	61,75	62,45	66,00	0,133
Reflective	67,30	61,11	63,66	65,85	69,75	63,66	68,00	56,25	65,25	70,40	0,240
Impulsive	36,13	39,55	36,00	37,45	33,00	38,00	35,10	43,25	36,75	33,20	0,615
Metaphoric	57,69	55,77	50,00	52,15	54,00	52,16	59,30	56,50	59,66	62,20	0,122
EAL	66,72	59,46	60,11	63,40	68,66	61,16	67,46	54,50	63,51	68,93	0,227
SMR	63,76	60,83	61,88	60,73	66,41	60,05	64,03	59,25	62,61	66,20	0,647
ILQ	64,84	60,29	54,88	57,83	64,75	59,05	62,36	62,91	61,77	66,20	0,120
HIG	62,50	59,51	57,55	58,00	65,58	58,38	62,96	56,41	61,52	66,86	0,578
RI	35,67	39,36	38,16	38,72	32,87	38,50	34,95	42,12	36,54	32,60	0,595
META	57,69	55,77	50,00	52,15	54,00	52,16	59,30	56,50	59,66	62,20	0,122

\* One-way Anova F-test performed on all groups with n size equal or bigger than 10 (highlighted columns)

## 6.2.2 Explaining the MBTI from multiple cognitive style factors

It was decided to score the four basic personality dimensions of the Myers-Briggs along a continuum from high negative to high positive. The procedure followed is explained in chapter 5 (section 5.4.5).

A stepwise regression analysis was now performed with the MBTI personality dimensions as dependent variables and as possible predictors, the 15 cognitive styles. These results are given in table 6.7 below, while a matrix of correlations between the dependent variables (the MBTI personality dimensions) and the CPP cognitive style factors are given in appendix 9.

**Table 6.7** *Multiple regression analysis results*

Dependent Variable	Predictors entered during step 1	R-square	P-value of F-test
Extraversion-Introversion	Metaphoric	0,05	0,0116
Sensing-Intuition	Memory	0,06	0,005
Thinking-Feeling	Explorative	0,03	0,041
Judging-Perceiving	Explorative	0,04	0,021

No variables were entered into the equation beyond step 1 of the step-wise regression procedure.

The multiple regression analysis results in table 6.7 above appear to indicate that once a particular cognitive style has been entered into the equation, no other cognitive styles are able to increase the prediction of the dependent variable significantly. It should be noted that this is probably due to the high inter-correlations of the cognitive styles. It might be worthwhile noting a few high correlations between each of the dependent variables and other cognitive style variables given in appendix 9. These are as follows:

- From the correlation matrix (appendix 9) it appears that besides *metaphoric*, other cognitive style factors that correlate significantly with Extraversion and Introversion (EI) are the *analytical*, *intuitive* and *integrative* styles. Since these however correlate with *metaphoric*, they did not enter the multiple regression equation.
- For Sensing and Intuition (SN), the *quick insight* and *learning* styles also correlated significantly.
- For Thinking and Feeling (TF), the *memory* style also showed a significant correlation.
- For Judging and Perceiving (JP), no further significant correlations were found beyond the *explorative* style.

### 6.3 SUMMARY OF FINDINGS

The general aim of this research was to examine the relationship between cognitive styles and personality types. This was addressed and achieved by means of a literature survey and an empirical study.

The hypothesis of this study was that a relationship exists between the MBTI and the cognitive style factors. This hypothesis could not be confirmed as far as various groupings based on the MBTI scores were concerned. However, when four interval-scaled scales were created to represent the basic four dimensions of the MBTI, some significant correlations were found with the cognitive style factors. Because of the large number of cognitive style factors (15) and a probability of a type I error being committed, future studies will have to verify these correlations before serious interpretations are to be attempted.

The findings of this research further imply that the IT industry, which is normally regarded as a typical left brain environment, also poses sufficient exposure to conceptual and creative challenges (right brain) and therefore provide a rich and challenging environment to people in the industry for continuous cognitive development.

From the sample (n=123), very few people demonstrated excessive structure needs or emotional factors that inhibit their thinking. Most were therefore relatively intellectually inclined.

It should perhaps also be taken into consideration that the group functions in a knowledge environment where the majority have tertiary qualifications. Most also have computer programming skills (which are generally regarded as an ideal cognitive skills training tool and which tends to enhance metacognitive awareness). In terms of the Stratified Systems Theory (SST), the majority reflected levels 3 and 4 of the SST in terms of cognitive functioning. This may be an added reason for the balanced and integrated nature of cognitive skill found amongst the sample group.

#### **6.4 CHAPTER SUMMARY**

This chapter, which represents steps 6 and 7 of the empirical investigation, contained the statistical results and a summary of the findings. Chapter 7 will discuss the last three steps (steps 8-10) of the empirical study, namely the limitations of the research, the conclusion and some recommendations.

## **CHAPTER 7: LIMITATIONS, CONCLUSION AND RECOMMENDATIONS**

This chapter focuses on steps 8 to 10 of the empirical research. Firstly the limitations of the research will be discussed, followed by the formulation of the research conclusions and some recommendations.

### **7.1 LIMITATIONS OF THE RESEARCH**

The limitations of the research are discussed with regard to the literature survey and the empirical study.

With regard to the literature survey, the following limitations were encountered:

- Limited literature seems to exist on the relationship between cognition and personality and therefore clearly needs further exploration. Few researchers have made explicit the notion of a basic relationship between cognitive capacity or style and psychological type (Ferguson & Fletcher, 1987). Hunter and Levy (1982) in their research to identify differences in individual problem solving and personality types, have also found that data regarding the relationship between personality variables and individual differences in problem solving are scarce.
- Cognitive psychology compared to personality theories, is still a developing science.

With regard to the empirical study the following limitations were encountered:

- Correlations between the various cognitive styles as formulated in the CPP were very high. The reason for this being that different styles incorporate the same processing items and that only the processes have been re-normalised and not the styles.
- Sample characteristics, with regard to both MBTI and cognitive style factors, were homogenic. All individuals profiled were from the same discipline with a high level of cognitive functioning. A high percentage also had a balanced profile. Further research could therefore also be conducted within other occupational groupings to explore any possible relationship between cognitive and personality styles.

- The distribution of personality types of this homogenic group was not very broad in terms of the 16 possible type preferences. The Thinking (T) dimension of the MBTI had a very high representation within this sample group, therefore having a possible distorting impact on the final results of this research.
- The sample size (n=123) was not significant and not diverse enough to draw any significant conclusions, limiting the potential for generalisation of the results.
- Single psychometric instruments (namely CPP and MBTI) were used to measure each of the cognitive and personality preferences. The use of other appropriate psychometric instruments measuring cognition and personality can therefore be considered.
- The average age of 42 of the sample group could also have had an impact on the outcome of the results. Salthouse (1982) states that older adults are less proficient than younger adults at remembering many types of information. Based on research it can be concluded that increased age is often associated with a decline in the efficiency, and perhaps the effectiveness, of reasoning and decision-making processes. It is also likely that internal cognitive processes are affected by the slowing down and not just input (perceptual) and output (motor) processes, as both the rate of memorial activation and rehearsal have been found to be slower with increased age.
- The sample group studied was also not very diverse in the South African context. Aspects such as gender, interest and learning exposure may therefore also have acted as catalysts to determine cognitive approach.
- Correlations and regressions may not be the best techniques to analyse highly complex data such as presented in this research. Dynamic techniques (especially when applied to a much larger database) may be more useful to meaningfully indicate the complex relationship between personality preference and cognitive functioning. A qualitative analysis may for example indicate that individuals with excessively high N scores or IN scores (as compared to the other MBTI dimensions) retain a much stronger right brain cognitive orientation than those with average or lower scores on all the MBTI dimension.

## **7.2 CONCLUSION**

This dissertation focused on the relationship between cognitive styles and personality types.

Research conclusions are subsequently formulated with regard to the literature survey and the empirical study for each of the research aims stated in point 1.3.

### **7.2.1 Literature survey**

The *first aim*, namely to conceptualise cognitive style, was achieved in chapter 2.

From the conceptualisation in chapter 2 it was confirmed that the cognitive psychology is still a developing science, and that theorising in cognitive psychology is complex due to the multifaceted nature of mental processes.

Cognitive style was defined as a construct that is involved in cognitive processes and contributes to individual differences in a collection of cognitive, perceptual and personality variables. Cognitive styles are thus regarded as individual preferences regarding the manner of perceptually organising and conceptualising the environment as well as reacting or adapting thereto.

The *second aim*, namely to conceptualise personality type, was achieved in chapter 3.

From the conceptualisation in chapter 3 it was confirmed that personality theory is complex but well established in the field of psychology. In the study of organisational behaviour, personality theories can assist in explaining and predicting individual responses in various situations.

It is evident that assessments of type can give greater insight into the value of behavioural differences. Such differences are to be accepted as potential gifts of diversity and serve to guide in improved knowledge of human behaviour.

The *third aim*, namely to determine whether a theoretical relationship exists between personality type and cognitive style, was discussed in chapter 4.

From the literature it was demonstrated that cognitive styles are part of personality organisation, while the individual dimensions generally appear to be independent constructs relevant only to cognition. Cognitive styles are however, not limited to specific situations with cognitive task

requirements, but rather, should be conceived as an integral part of personality organisation. Individuals are continually processing information in the course of their daily activities and interactions with others, so that cognitive style is actually to a great extent a determinant of behaviour (Richter, 1992).

Carl Jung's personality theory can therefore also be viewed as a theory of cognitive styles, because it is a holistic view of individual functioning. From a systems perspective, personality and cognition are inextricably linked to one another and are independent – a feature which is characteristic of the Jungian typology. How a person thinks, perceives, selects and carries out any of the processes involved in daily living or problem solving, is influenced by that person's unique personality characteristics.

### **7.2.2 Empirical study**

The *first aim* in the empirical study was to ascertain a possible relationship between the cognitive styles and personality types of a group of Information Technology employees who manage projects at either technical or managerial level, while *the second aim* was to determine whether cognitive styles can act as a possible predictor of personality types and vice versa.

From the research conducted, no initial relationship between cognitive styles and personality types was identified.

A *secondary aim*, namely to conduct a factor analysis between the instrument measuring cognition (CPP) and the instrument measuring personality (MBTI), was completed. This step was included as the MBTI also measures an element of cognition.

From this analysis it became clear that certain individual styles had significant correlations with the MBTI style categories.

### 7.3 RECOMMENDATIONS

Against the background of the above, the following recommendations can be formulated with regard to the use of psychometric measures of preferred cognitive and personality styles:

- Additional research is required to examine a possible relationship between cognitive styles and personality types. By exploring broader sample groups stronger results may be obtained.
- Further research should also be conducted with regard to a possible relationship between the optimal level of functioning (level of work) as measured by the CPP and the MBTI.
- Research should be continued in a variety of work settings by possibly considering the use of appropriate psychometric instruments to measure cognitive and personality preferences.
- Myers (1962) does confirm that the type indicator is no substitute for good judgement. Being a self-report instrument, in any given case it could be wrong, no matter how high the score. Myers (1962) adds that the safe and proper way to use the indicator is as a stimulus to the user's insight. The real existence of the types is assumed as part of the working hypothesis, but there is no intent to claim that all persons classified by the indicator as a given type, actually are that type.
- The result of this study has implications for the use of the MBTI in selection and research. At this point, practitioners would be well advised to avoid over-interpreting relationships between MBTI scores and criterion measures by inferring broad perceptual or cognitive style-related traits from MBTI scores.
- Further research is needed to determine whether the MBTI scales are related to other cognitive style dimensions such as ambiguity, tolerance and dogmatism.
- As long as the CPP and/or the MBTI are not used in isolation of other psychometric processes and instruments, they can be used successfully in a variety of fields such as cognitive development, team building, selection and career guidance.

## **7.4 CHAPTER SUMMARY**

Within this, the final chapter, possible limitations to this research were listed, followed by conclusions made in terms of both the literature survey and the empirical study. This chapter was concluded by a few recommendations derived from this investigation into a potential relationship between cognitive styles and personality types.

## REFERENCES

- Anastasi, A. (1990). *Psychological testing*. (6th ed.). New York: Macmillan.
- Barger, R.R. & Hoover, R.L. (1984). Psychological type and the matching of cognitive style. *Theory into Practice*, 23, 56-63.
- Barr, L. & Barr, N. (1989). *The leadership equation: Leadership, Management and the Myers-Briggs*. Texas: Eakin.
- Benfari, R. (1991). *Understanding your management style – Beyond the Myers-Briggs Type Indicator*. Massachusetts: Heath.
- Bootzin, R.R. (1985). Affect and cognition in behavior therapy. In S. Reiss & R.R. Bootzin (Eds.), *Theoretical issues in behavior therapy* (pp. 35-45). New York: Academic Press.
- Botha, W. (1994). *'n Ondersoek na die verband tussen die Myers-Briggs type indicator en Belbin se indeling van spanrolle*. Unpublished Masters dissertation. Stellenbosch: University of Stellenbosch.
- Briggs, K.C. & Myers, I.B. (1977). *Myers-Briggs Type Indicator – Form F Booklet*. Palo Alto, CA: Consulting Psychologists Press.
- Brown, A.L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), *Advances in instructional psychology* (Vol 1, pp. 77 - 165). Hillsdale, NJ: Erlbaum.
- Burger, D. (1992). *Action profiling and Myers-Briggs Type Indicator: An application to Managerial Communication*. Unpublished Masters dissertation. Pretoria: University of South Africa.

- Cantor, N. (1981). A cognitive-social approach to personality. In N. Cantor & J.F. Kihlstrom (Eds.), *Personality, cognition and social interaction*. Hillsdale, NJ: Erlbaum.
- Cantor, N. & Kihlstrom, J.F. (1987). *Personality and social interaction*. Hillsdale, NJ: Prentice-Hall.
- Carey, J.C., Fleming, S.D. & Roberts, D.Y. (1989). The Myers-Briggs Type Indicator as a measure of aspects of cognitive style. *Measurement and evaluation in counseling and development*. 22, 94-99.
- Carlson, J.G. (1985). Recent assessments of the Myers-Briggs Type Indicator. *Journal of personality assessment*, 49(4), 356-365.
- Carlyn, M. (1977). An assessment of the Myers-Briggs type indicator. *Journal of personality assessment*, 41(5), 461-473.
- Casas, E. (1996, September). *Jungian typology and the appreciation of cultural differences*. Paper presented at the 4th International Type User Organisation conference, Johannesburg.
- Cattell, R.B. (1978). *The scientific use of factor analysis in behavioral and life sciences*. New York: Plenum.
- Child, D. (1986). Cognitive styles: Some recent ideas of relevance to teachers. In C. Bagley & G.K. Verma (Eds.), *Personality, cognition and values* (pp 171-195). Calgary: University of Calgary.
- Coetzee, M. (1996). *The relationship between career patterns and personality types*. Unpublished Masters dissertation. Pretoria: University of South Africa.
- Cohen, G. (1983). *The psychology of cognition*. (2<sup>nd</sup> ed.). London: Academic Press.

- Conradie, D. (1996, September). *Different managerial profiles in banking: Implications*. Paper presented at the 4th International Type Users Organisation conference, Johannesburg.
- Davis, D.L., Grove, S.J. & Knowles, P.A. (1990). An experimental application of personality type as an analogue for decision-making style. *Psychological Reports*, 66, 167-175.
- Dellarosa, D. (1988). A history of thinking. In R.J. Sternberg & E.E. Smith (Eds.), *The psychology of human thought* (pp. 1-18). Cambridge: Cambridge University Press.
- Draper, N.R. & H. Smith. (1966). *Applied regression analysis*. New York: Wiley.
- Fahlman, S.E. (1981). Representing implicit knowledge. In G.E. Hinton & J.A. Anderson (Eds.), *Parallel models of associative memory* (pp. 145-263). Hillsdale, NJ: Erlbaum.
- Farquharson, O.J. (1998). *Die verband tussen probleemoplossingsvermoë en akademiese prestasie*. Unpublished Masters dissertation: University of Pretoria.
- Ferguson, J. & Fletcher, C. (1987). Personality type and cognitive style. *Psychological Reports*, 60, 959-964.
- Fourqurean, J.M., Meisgeier, C. & Swank, P. (1990). The link between learning style and Jungian psychological type: A finding of two bipolar preference dimensions. *Journal of Experimental Education*, 58(3), 225-237.
- Frazer, M. (1996, September). *A South African validation of the MBTI*. Paper presented at the 4<sup>th</sup> International User Type Organisation conference, Johannesburg.
- Frisbie, G.R. (1990). Cognitive styles; An alternative to Keirsey's temperaments. *Journal of psychological type*, 16, 13-21.
- Garret, R.M. (1989). Problem-solving and cognitive style. *Research in Science & Technological Education*, 7, 27 - 44.

- Goldstein, K.M. & Blackman, S. (1978). *Cognitive Style – Five approaches and relevant research*. New York: Wiley.
- Green, K.E. & Schroeder, D.H. (1990). Psychometric quality of the verbalizer-visualizer questionnaire as a measure of cognitive style. *Psychological Reports*, 66, 939-945.
- Hammer, A.L. (1993). *Introduction of type and careers*. Palo Alto: Consulting Psychologists Press.
- Hays, W. L. (1963). *Statistics*. New York: Holt, Rinehart & Winston.
- Heinen, J.R. (1980). Psychological theory: Evaluation and speculations. *Journal of Psychology*, 106(2), 287-301.
- Helson, R. (1982). Critics and their texts: An approach to Jung's Theory of cognition and personality. *Journal of Personality and Social Psychology*. 43(2), 409-418.
- Hirsh, S.K. & Kummerow, J.M. (1989). *Life types*. New York: Warner.
- Hopcke, R.H. (1989). *A Guided tour of the collected works of C.G. Jung*. Boston: Shambhala.
- Horn, J.L. (1986). Intellectual ability concepts. In R.J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (Vol. 3, pp. 35-77). Hillsdale, NJ: Erlbaum.
- Hunt, R.G., Krzystofiak, F.J., Meindl, J.R. & Yousry, A.M. (1989). Cognitive styles and decision making. *Organisational behaviour and human decision making*, 44, 436 - 453.
- Hunter, F. & Levy, N. (1982). Relationship of problem-solving behaviors and Jungian personality types. *Psychological Reports*, 51, 379-384.

- Huysamen, G.K. (1988). *Inferensiële statistiek en navorsingsontwerp: 'n Inleiding*. Pretoria: Academica.
- Isachsen, O. & Berens, L.V. (1991). *Working together: A personality centered approach to management*. (2<sup>nd</sup> ed.) Coronado, CA: Newworld.
- Jacobi, J. (1968). *The psychology of C.G. Jung: An introduction with illustrations*. London: Routledge.
- Jung, C.G. (1959). *The collected works of C.G. Jung, Vol. 9*. Princeton: Princeton University Press.
- Jung, C.G. (1960). *The structure and dynamics of the psyche. The collected works. Vol. 8*. London: Routledge & Kegan Paul.
- Jung, C.G. (1969). *The structure and dynamics of the psyche*. Princeton: Princeton University Press.
- Jung, C.G. (1971). *Psychological Types*. Princeton: Princeton University Press.
- Kagan, J. & Kogan, N. (1970). Individuality and cognitive performance. In P.H. Mussen (Ed.), *Carmichael's Manual of Child Psychology* (Vol.1 - pp.1273-1365). New York: Wiley.
- Kainz, R.I. (1989). *Myers-Briggs type indicator preference scores and age*. Michigan: Microfilms International.
- Keirsey, D. & Bates, M. (1984). *Please understand me: Character and temperament types*. Del Mar, CA: Prometheus Nemesis.
- Keppel, G. (1973). *Design and Analysis: A researcher's handbook*. Englewood Cliffs, NJ: Prentice-Hall.

- Kerlinger, F. N. (1986). *Foundations of behavioral research* (3rd ed.). New York: Holt, Rinehart & Winston.
- Kihlstrom, J.F. (1981). On personality and memory. In N. Cantor & J.F. Kihlstrom (Eds.), *Personality, cognition and social interaction*. Hillsdale, N.J.: Erlbaum.
- Kirk, R. E. (1968). *Experimental design: procedures for the behavioral sciences*. Belmont: Brooks/Cole.
- Kirton, M.J. & de Ciantis, S.M. (1986). Cognitive style and personality: The Kirton adaption-innovation and Cattell's sixteen personality factor inventories. *Personality and Individual Differences*. 7 (2), 141-146.
- Koehler, J.W., Anatol, K.W.E. & Appelbaum, R.L. (1981). *Organizational communication: behavioural perspectives*. New York: Holt, Rinehart & Winston.
- Kogan, N. (1973). Creativity and cognitive style: A lifespan perspective. In P.B. Baltes & K.W. Schaie (Eds.), *Life-span development psychology: Personality and socialisation* (pp. 145-178). New York: Academic press.
- Krahe, B. (1990). *Situation cognition and coherence in personality: An individual-centred approach*. Cambridge: Cambridge University Press.
- Kreitler, H. & Kreitler, S. (1976). *Cognitive orientation and behavior*. New York: Springer.
- Kreitler, H. & Kreitler, S. (1982). The theory of cognitive orientation: Widening the scope of behaviour prediction. In: B.A. Maher & W.B. Maher (Eds.), *Progress in experimental personality research* (Vol. 11). New York: Academic Press.
- Kuchinskas, G. (1979). Whose cognitive style makes the difference? *Educational Leadership* 36, 269-271.

- Lee, C. (1998). *Alternatives to cognition: A new look at explaining Human Social Behavior*. London: Erlbaum.
- Lynch, A.Q. (1985). The Myers-Briggs Type Indicator: A tool for appreciating employee and client diversity. *Journal of Employment Counselling*, 22(3), 104-109.
- Mattoon, M.A. (1981). *Jungian Psychology in perspective*. New York: Free Press.
- McCaulley, M.H. (1981). Jung's theory of psychological types and the Myers-Briggs Type Indicator. In McReynolds, P. (Ed.), *Advances in Psychological Assessment* Vol. 5. San Francisco: Jossey-Bass.
- McCaulley, M.H. (1990). The Myers-Briggs Type Indicator: A measure for individuals and groups. *Measurement and Evaluation in Counselling and Development*, 22, 181-195.
- McCrae, R.R. & Costa, P.T. (1989). Reinterpreting the Myers-Briggs Type Indicator from the perspective of the five-factor model of personality. *Journal of Personality*, 57 (1), 17-40.
- McCroskey, J.C. (1976). *Introduction to human communication*. Boston: Allyn & Bacon.
- McKenna, F.P. (1984). Measures of field dependence: Cognitive style or cognitive ability. *Journal of personality and social psychology*, 47(3), 593-603.
- Messick, S. (1969). Measures of cognitive styles and personality and their potential for educational practice. In K. Ingekamp (Ed.), *Developments in educational testing*, 329-341.
- Messick, S. (1976). Personality consistencies in cognition and creativity. In S. Messick & Associates (Eds.), *Individuality in learning* (pp. 4-22). San Francisco: Jossey-Bass.
- Messick, S. (1984). The nature of cognitive styles: Problems and promise in educational practice. *Educational Psychologist*, 19, 59-74.

- Meyer, W.F., Moore, C. & Viljoen, H.G. (1988). *Persoonlikheidsteorieë –Van Freud tot Frankl*. Johannesburg: Lexicon.
- Mischel, W. (1981). Personality and cognition: Something borrowed, something new. In N. Cantor & J.F. Kihlstrom (Eds.), *Personality, cognition and social interaction*. Hillsdale, NJ: Erlbaum.
- Mitroff, I.I. (1983). Archetypal social systems analysis: On the deeper structure of human systems. *Academy of Management Review*, 8, 387-397.
- Möller, A. (1995). *Perspectives on personality*. Durban: Butterworths.
- Morrison, D. F. (1967). *Multivariate statistical methods*. New York: McGraw-Hill.
- Mouton, J. & Marais, H.C. (1990). *Basic concepts in the methodology of the social sciences*. Pretoria: HSRC.
- Mulaik, S.A. (1972). *Foundations of factor analysis*. New York: McGraw-Hill.
- Myers, I.B. (1962). *Manual: The Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I.B. (1980). *Gifts differing*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I.B. & Kirby, L.K. (1994). *Introduction to type: Dynamics and development - Exploring the next level of type*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I.B. & McCaulley, M.H. (1985). *Manual: guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.
- Myers, I.B. & McCaulley, M.H. (1992). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.

- Newman, J. (1996, September). *Type and the human brain*. Paper presented at the 4<sup>th</sup> International Type User Organisation conference, Johannesburg.
- Peterson, C. & Scott, W.A. (1975). Generality and topic specificity of cognitive styles. *Journal of research in personality*, 9, 366-374.
- Phares, E.J. (1991). *Introduction to Personality* (3<sup>rd</sup> ed.). New York: HarperCollins.
- Pratt, J. (1980, July). The effect of personality on subjects information processing: A comment. *The Accounting Review*, 55 (3) 501-506.
- Prinsloo, S.M. (1992). *A Theoretical model and empirical technique for the study of problem solving processes*. Unpublished Doctoral thesis. Johannesburg: Rand Afrikaans University.
- Prinsloo, S.M. (1995). *Cognitive process profile – Marketing document*. Johannesburg: Cognadev.
- Prinsloo, S.M. (1998). *Cognitive process profile – Training manual*. Johannesburg: Magellan.
- Prinsloo, S.M. & Voss, P. (1996). *Cognitive process profile – Training manual*. Johannesburg: Cognadev.
- Reber, A.S. (1995). *The penguin dictionary of psychology*. Middlesex: Penguin.
- Reed, S.K. (1992). *Cognition* (3rd ed.). California: Brooks/Cole.
- Richter, R. (1992). *A critical evaluation of cognitive style assessment*. Pretoria: HSRC.
- Royce, J.R. & Powell, A. (1983). *Theory of personality and individual differences: Factors, systems and processes*. New York: Prentice-Hall.

- Salthouse, T.A. (1982). *Adult cognition: An experimental psychology of human aging*. New York: Springer.
- SAS User's Guide (1985). *Statistics* (5<sup>th</sup> ed.). Cary, NC: SAS Institute.
- Schlecker, T.M. & Togli, M.P. (1985). Ecological directions in the study of cognition. In T.M. Schlecker & M.P. Togli (Eds.), *New directions in cognitive science* (pp. 1-16). Norwood, NJ: Ablex.
- Sigel, I.E. & Cocking, R.R. (1977). *Cognitive development from childhood to adolescence: A constructivist perspective*. New York: Holt, Rinehart & Winston.
- Simon, H.A. (1979). Information processing models of cognition. *Annual review of psychology*, 30, 363-396.
- Smit, R. (2000). *Construct validity of the CPP*. Johannesburg: Magellan Consulting.
- Sparrow, P.R. (1994). The psychology of strategic management: Emerging themes of diversity and cognition. *International Review of Industrial and Organisational Psychology*, 9, 148-181.
- Sperry, R. (1993). The impact and promise of the cognitive revolution. *American Psychologist*, 48, 878-885.
- Sperry, R. (1995). The future of psychology. *American Psychologist*, 50, 505-506.
- Sternberg, R.J. (1977). *Intelligence, information processing and analogical reasoning*. Hillsdale, NJ: Erlbaum.
- Sternberg, R.J. (1979). Intelligence research at the interface between differential and cognitive psychology: Prospects and proposals. In R.J. Sternberg & D.K. Detterman (Eds.), *Human Intelligence* (pp. 33-59). Norwood, NJ: Ablex.

- Sternberg, R.J. (1985). Cognitive approaches in intelligence. In B.B. Wolman (Ed.), *Handbook of intelligence*. (pp. 59-118). New York: Wiley.
- Super, D.E. (1994). A life span, life space perspective on convergence. In M.L. Savivkas & R.W. Lent (Eds.), *Convergence in career development theories* (pp. 63-74). Palo Alto: Consulting Psychologists Press.
- Swart, J. & Van Vuuren, L.J. (1998). Cognitive style and the interpretation of organisational change. *Journal of Industrial Psychology*, 24(3), 22-31.
- Taylor, T.R. (1987). The future of cognitive assessment. Pretoria: HSRC.
- Tiberghien, G. (1989). *Advances in cognitive science. Vol 2: Theory and Applications*. New York: Halsted.
- Tiedemann, J. (1989). Measures of cognitive styles: A critical view. *Educational Psychologist*, 24(3), 261-275.
- Van Rooyen, J. & De Beer, J. (1994). *Myers-Briggs Type Indicator – Training Manual*. Johannesburg: Van Rooyen.
- Vernon, P.E. (1973). Multivariate approaches to the study of cognitive styles. In J.R. Royce (Ed.), *Multivariate analysis and psychological theory*. (pp. 125-148). New York: Academic Press.
- Vernon, P.E. (1984). Intelligence, cognitive styles, and brain lateralization. *International journal of psychology*, 19, 435-455.
- Verster, J.M. (1982). *A cross-cultural study of cognitive processes using computerized tests*. Unpublished Doctoral thesis. Pretoria: University of South Africa.
- Weinman, J. (1987). Non-cognitive determinants of perceptual problem-solving strategies *personality and individual differences*, 8, 53-58.

Winer, B. J. (1971). *Statistical principles in experimental design* (2nd ed.). Tokyo : McGraw-Hill.

Witkin, H.A. (1976). Cognitive styles and academic performance in teacher-student relations. In S. Messick & Associates (Eds.), *Individuality in learning*. (pp. 38-72). San Francisco: Jossey-Bass.

**Appendix 1:** *Correlation analysis - Cognitive styles (Pearson Correlation Coefficients) (n=123)*

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15
C1	1,00000	0,32280	0,10760	0,08538	0,03052	-0,37011	0,24582	0,04757	-0,10450	0,01734	0,02246	0,07167	0,48678	-0,25093	0,04853
Explorative	0,0	0,0003	0,2362	0,3478	0,7375	0,0001	0,0061	0,6013	0,2500	0,8490	0,8052	0,4309	0,0001	0,0051	0,5940
C2	0,32280	1,00000	0,91233	0,85534	0,53417	0,58395	0,91098	0,81082	-0,91658	0,82982	0,82423	0,76517	0,91532	-0,95366	0,44580
Analytical	0,0003	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C3	0,10760	0,91233	1,00000	0,90669	0,62817	0,75583	0,89753	0,88835	-0,95037	0,89152	0,85349	0,80966	0,82823	-0,92533	0,53664
Structured	0,2362	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C4	0,08538	0,85534	0,90669	1,00000	0,74627	0,77013	0,92831	0,93739	-0,94253	0,94607	0,85349	0,90260	0,81446	-0,88310	0,69423
Holistic	0,3478	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C5	0,03052	0,53417	0,62817	0,74627	1,00000	0,63539	0,64879	0,85610	-0,66071	0,71855	0,75671	0,82680	0,54021	-0,55948	0,61702
Intuitive	0,7375	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C6	-0,37011	0,58395	0,75583	0,77013	0,63539	1,00000	0,65985	0,76773	-0,77261	0,81246	0,81535	0,77913	0,42261	-0,60919	0,41354
Memory	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C7	0,24582	0,91098	0,89753	0,92831	0,64879	0,65985	1,00000	0,86754	-0,94584	0,88602	0,84208	0,85113	0,92889	-0,94039	0,56186
Logical	0,0061	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C8	0,04757	0,81082	0,88835	0,93739	0,85610	0,76773	0,86754	1,00000	-0,90799	0,90722	0,90018	0,88307	0,78073	-0,85611	0,65716
Integrative	0,6013	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C9	-0,10450	-0,91658	-0,95037	-0,94253	-0,66071	-0,77261	-0,94584	-0,90799	1,00000	-0,93607	-0,88795	-0,88874	-0,84981	0,93803	-0,55727
Random	0,2500	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001
C10	0,01734	0,82982	0,89152	0,94607	0,71855	0,81246	0,88602	0,90722	-0,93607	1,0000	0,89471	0,90878	0,76783	-0,86162	0,60082
General	0,8490	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001	0,0001
C11	0,02246	0,82423	0,85349	0,90132	0,75671	0,81535	0,84208	0,90018	-0,88795	0,89471	1,00000	0,88610	0,72121	-0,81233	0,56265
Learning	0,8052	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001	0,0001
C12	0,07167	0,76517	0,80966	0,90260	0,82680	0,77913	0,85113	0,88307	-0,08884	0,90878	0,88610	1,00000	0,71251	-0,75654	0,57562
Quick Insight	0,4309	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001	0,0001
C13	0,48678	0,91532	0,82823	0,81446	0,54021	0,42261	0,92889	0,78073	-0,84981	0,76783	0,72121	0,71251	1,00000	-0,93956	0,47235
Reflective	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001	0,0001
C14	-0,25093	-0,95366	-0,92533	-0,88310	-0,55948	-0,60919	-0,94039	-0,85611	0,93803	-0,86162	-0,81233	-0,75654	-0,93956	1,00000	-0,52265
Impulsive	0,0051	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0	0,0001
C15	0,04853	0,44580	0,53664	0,69423	0,61702	0,41354	0,56186	0,65716	-0,055727	0,60082	0,56265	0,57562	0,47235	-0,52265	1,00000
Metaphoric	0,5940	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0001	0,0

**Appendix 2: Correlation analysis – Personality preferences****(Pearson Correlation Coefficients) (n=123)**

	EI	SN	TF	JP
EI	1,00000	-0,16908	0,12145	0,00359
	0,0	0,0616	0,1809	0,9686
SN	-0,16908	1,00000	-0,10672	0,45153
	0,0616	0,0	0,2401	0,0001
TF	0,12145	-0,10672	1,00000	0,10213
	0,1809	0,2401	0,0	0,2610
JP	0,00359	0,45153	0,10213	1,00000
	0,9686	0,0001	0,2610	0,0

**Appendix 3: Comparison of Myers-Briggs Type Indicators by Preference type (Extraversion and Introversion separated) with regard to mean scores of Cognitive Style factors: One-way Anova F-tests on mean scores (n=123)**

Cognitive style variable	Extraversion/Introversion by Judgement/Perception			P-value of F-test
	STJ	NTJ	NTP	
	(n=44)	(n=29)	(n=28)	
Explorative	61,18	61,55	58,32	0,248
Analytical	64,61	67,06	64,07	0,703
Structured	62,77	62,68	62,60	0,997
Holistic	60,70	62,68	61,50	0,751
Intuitive	57,88	60,89	58,42	0,527
Memory	56,97	59,75	59,75	0,461
Logical	64,59	68,10	64,57	0,592
Integrative	63,63	65,79	64,71	0,827
Random	38,00	36,00	37,60	0,768
General	55,43	56,48	56,03	0,897
Learning	61,38	65,68	62,85	0,211
Quick Insight	60,68	64,34	61,82	0,306
Reflective	65,52	66,55	63,57	0,490
Impulsive	37,06	36,51	37,96	0,801
Metaphoric	56,25	56,55	57,03	0,958
EAL	63,46	65,57	62,32	0,516
SMR	61,75	63,00	61,97	0,836
ILQ	59,98	63,64	61,03	0,292
HIG	59,92	61,65	60,75	0,818
RI	37,53	36,25	37,78	0,814
META	56,25	56,55	57,03	0,958

**Appendix 4: Comparison of Extraversion/Introversion by Sensing/Intuition with regard to Cognitive Style factors: One-way Anova F-tests on mean scores (n=123)**

Cognitive style variable	Extraversion/Introversion by				P-value of F-test
	Sensing\Intuitive				
	IN (n=19)	EN (n=42)	IS (n=33)	ES (n=29)	
Explorative	60,84	59,30	59,27	60,72	0,824
Analytical	69,10	65,83	64,48	65,37	0,761
Structured	65,05	62,78	63,81	61,89	0,730
Holistic	64,68	62,66	62,27	60,00	0,562
Intuitive	60,42	60,80	61,90	55,34	0,126
Memory	61,47	60,92	59,48	56,86	0,464
Logical	70,36	66,78	65,96	64,00	0,627
Integrative	68,73	65,85	66,57	61,75	0,439
Random	33,26	36,47	36,24	39,24	0,445
General	59,15	56,52	56,30	55,58	0,662
Learning	65,78	65,00	62,93	60,96	0,330
Quick Insight	65,05	63,90	62,90	59,13	0,187
Reflective	67,57	64,95	64,93	65,89	0,784
Impulsive	34,73	37,28	37,00	36,79	0,749
Metaphoric	57,89	57,16	59,66	52,93	0,103
EAL	66,77	63,97	63,24	63,36	0,721
SMR	64,70	62,88	62,74	61,55	0,732
ILQ	63,75	63,23	62,58	58,48	0,197
HIG	64,19	61,68	61,71	59,11	0,546
RI	34,00	36,88	36,62	38,01	0,626
META	57,89	57,16	59,66	52,93	0,103

**Appendix 5: Comparison of Extraversion/Introversion by Judgement/Perception with regard to Cognitive Style factors: One-way Anova F-tests on mean scores (n=123)**

Cognitive style variable	Extraversion/Introversion by				P-value of F-test
	Sensing/Intuitive				
	IJ (n=35)	IP (n=17)	EP (n=25)	EJ (n=46)	
Explorative	59,22	61,11	56,96	61,47	0,148
Analytical	63,54	71,58	63,76	66,67	0,275
Structured	62,71	67,47	62,12	62,58	0,313
Holistic	61,48	66,58	62,00	61,34	0,402
Intuitive	60,25	63,64	59,24	58,21	0,425
Memory	59,40	61,88	61,68	57,95	0,513
Logical	64,74	73,41	64,28	66,39	0,279
Integrative	65,20	71,82	65,28	63,58	0,311
Random	36,74	31,88	37,56	37,63	0,411
General	56,02	60,05	56,88	55,73	0,467
Learning	62,71	66,58	63,24	63,41	0,657
Quick Insight	62,57	66,00	62,24	61,80	0,568
Reflective	64,25	69,29	63,32	66,43	0,207
Impulsive	37,48	33,47	37,80	36,69	0,377
Metaphoric	58,20	60,70	56,64	54,78	0,230
EAL	62,50	68,70	61,66	64,84	0,187
SMR	62,12	66,21	62,37	62,32	0,458
ILQ	61,84	65,41	61,57	61,14	0,528
HIG	60,90	66,15	61,38	60,22	0,363
RI	37,11	32,67	37,68	37,16	0,406
META	58,20	60,70	56,64	54,78	0,230

**Appendix 6: Comparison of Sensing/Intuitive by Judging/Perceiving with regard to Cognitive Style factors: One-way Anova F-tests on mean scores (n=123)**

Cognitive style variable	Sensing/Intuitive by Judgement/Perception				P-value of F-test
	SJ (n=51)	SP (n=11)	NP (n=31)	NJ (n=30)	
Explorative	59,92	60,09	58,12	61,50	0,479
Analytical	63,94	69,36	66,06	67,66	0,608
Structured	62,45	65,09	64,00	62,96	0,834
Holistic	60,27	65,54	63,25	63,33	0,395
Intuitive	57,98	62,81	60,38	61,00	0,502
Memory	57,56	61,45	61,87	60,30	0,387
Logical	63,82	70,72	67,00	68,83	0,443
Integrative	63,09	70,00	67,19	66,30	0,456
Random	38,37	34,27	35,61	35,33	0,594
General	55,15	59,72	57,61	57,06	0,465
Learning	61,33	65,18	64,38	66,13	0,217
Quick Insight	60,43	64,45	63,51	65,03	0,231
Reflective	64,68	68,63	64,70	66,86	0,544
Impulsive	37,49	34,18	36,70	36,26	0,696
Metaphoric	55,90	59,36	57,90	56,86	0,746
EAL	62,56	66,72	63,73	66,00	0,502
SMR	61,56	65,06	63,52	63,37	0,614
ILQ	59,91	64,15	62,76	64,05	0,267
HIG	59,50	65,09	62,68	62,23	0,420
RI	37,93	34,22	36,16	35,80	0,652
META	55,90	59,36	57,90	56,86	0,746

**Appendix 7: Comparison of Extraversion/Introversion, Sensing/Intuition & Judging/Perceiving with regard to mean scores of cognitive style factors: One-way Anova F tests on mean scores (n=123)**

COGNITIVE STYLE VARIABLE	EXTRAVERSION/INTROVERSION BY THINKING/FEELING			SENSING/INTUITIVE BY THINKING/FEELING			THINKING/FEELING BY JUDGEMENT/PERCEPTION		
	ET (n=65)	IT (n=45)	P-VALUE OF F-TEST	ST (n=53)	NT (n=57)	P-VALUE OF F-TEST	TJ (n=73)	TP (n=37)	P-VALUE OF F-TEST
Explorative	60,24	61,08	0,585	61,26	59,96	0,392	61,32	59,13	0,170
Analytical	65,69	65,80	0,970	65,88	65,59	0,918	65,58	66,02	0,883
Structured	62,32	64,02	0,377	63,41	62,64	0,686	62,73	63,56	0,680
Holistic	61,44	62,55	0,608	61,67	62,10	0,841	61,49	62,70	0,591
Intuitive	58,64	60,48	0,412	59,09	59,68	0,790	59,08	60,02	0,686
Memory	58,93	58,71	0,917	57,86	59,75	0,380	58,08	60,35	0,318
Logical	65,49	67,15	0,592	65,96	66,36	0,894	65,98	66,54	0,864
Integrative	64,15	66,64	0,397	65,07	65,26	0,948	64,49	66,51	0,509
Random	37,63	35,86	0,448	37,03	36,78	0,913	37,20	36,32	0,716
General	55,84	56,86	0,583	56,26	56,26	0,999	55,84	57,08	0,524
Learning	63,46	62,95	0,802	62,13	64,29	0,276	63,09	63,56	0,823
Quick Insight	62,15	62,66	0,793	61,56	63,10	0,424	62,13	62,81	0,741
Reflective	65,29	66,22	0,624	66,30	65,08	0,516	65,93	65,16	0,697
Impulsive	37,29	36,15	0,484	36,39	37,22	0,603	36,84	36,78	0,969
Metaphoric	55,23	58,86	0,087	56,64	56,78	0,944	56,36	57,40	0,642
EAL	63,81	64,68	0,685	64,37	63,97	0,852	64,30	63,90	0,857
SMR	62,18	62,98	0,650	62,52	62,49	0,985	62,25	63,02	0,672
ILQ	61,42	62,03	0,751	60,93	62,36	0,453	61,43	62,13	0,730
HIG	60,48	62,02	0,496	61,00	61,21	0,927	60,61	62,09	0,528
RI	37,46	36,01	0,456	36,71	37,00	0,879	37,02	36,55	0,815
META	55,23	58,86	0,087	56,64	56,78	0,944	56,36	57,40	0,642

**Appendix 8: Comparison of personality preferences with regard to mean scores of cognitive style factors: One-way Anova F-test on mean scores (n=123)**

COGNITIVE STYLE VARIABLE	MBTI PREFERENCE			MBTI PREFERENCE			MBTI PREFERENCE		
	SENSING (n=62)	INTUITION (n=61)	P-VALUE OF F-TEST	JUDGING (n=81)	PERCEIVING (n=42)	P-VALUE OF F-TEST	EXTRAVERSION (n=71)	INTROVERSION (n=52)	P-VALUE OF F-TEST
Explorative	59,95	59,78	0,913	60,50	58,64	0,242	59,88	59,84	0,978
Analytical	64,90	66,85	0,476	65,32	66,92	0,577	65,64	66,17	0,849
Structured	62,91	63,49	0,754	62,64	64,28	0,394	62,42	64,26	0,318
Holistic	61,20	63,29	0,309	61,40	63,85	0,257	61,57	63,15	0,448
Intuitive	58,83	60,68	0,380	59,09	61,02	0,386	58,57	61,36	0,190
Memory	58,25	61,09	0,181	58,58	61,76	0,155	59,26	60,21	0,662
Logical	65,04	67,90	0,338	65,67	67,97	0,465	65,64	67,57	0,522
Integrative	64,32	66,75	0,383	64,28	67,92	0,214	64,18	67,36	0,259
Random	37,64	35,47	0,336	37,24	35,26	0,404	37,60	35,15	0,283
General	55,96	57,34	0,441	55,86	58,16	0,221	56,14	57,34	0,505
Learning	62,01	65,24	0,091	63,11	64,59	0,464	63,35	63,98	0,747
Quick Insight	61,14	64,26	0,101	62,13	63,76	0,420	61,95	63,69	0,370
Reflective	65,38	65,77	0,832	65,49	65,73	0,898	65,33	65,90	0,758
Impulsive	36,90	36,49	0,791	37,03	36,04	0,546	37,08	36,17	0,562
Metaphoric	56,51	57,39	0,657	56,25	58,28	0,330	55,43	59,01	0,071
EAL	63,30	64,84	0,454	63,83	64,51	0,754	63,72	64,53	0,700
SMR	62,18	63,45	0,455	62,23	63,92	0,344	62,34	63,46	0,514
ILQ	60,66	63,39	0,140	61,44	63,12	0,392	61,29	63,01	0,361
HIG	60,50	62,46	0,362	60,51	63,31	0,218	60,63	62,62	0,362
RI	37,27	35,98	0,492	37,14	35,65	0,452	37,34	35,66	0,376
META	56,51	57,39	0,657	56,25	58,28	0,330	55,43	59,01	0,071

**Appendix 9: Correlational analysis between cognitive styles and personality type categories**

	<b>EI</b>	<b>SN</b>	<b>TF</b>	<b>JP</b>
<b>Explorative</b>	0,03420	0,08770	0,18395	0,20674
	0,7073	0,3347	0,0417	0,0218
<b>Analytical</b>	-0,08025	-0,14597	-0,03791	-0,00757
	0,03776	0,1072	0,6772	0,9338
<b>Structured</b>	-0,16553	-0,14138	-0,10726	-0,05562
	0,0673	0,1188	0,2377	0,5412
<b>Holistic</b>	-0,15794	-0,19045	-0,08955	-0,06686
	0,0810	0,0349	0,3246	0,4625
<b>Intuitive</b>	-0,18885	-0,12130	-0,03203	-0,02915
	0,0364	0,1814	0,7251	0,7490
<b>Memory</b>	-0,09941	-0,24913	-0,17671	-0,11637
	0,2739	0,0055	0,0506	0,1999
<b>Logical</b>	-0,11127	-0,15687	-0,05026	-0,03497
	0,2205	0,0831	0,5809	0,7010
<b>Integrative</b>	-0,18341	-0,17455	-0,06036	-0,06595
	0,0423	0,0535	0,5072	0,4686
<b>Random</b>	0,16159	0,19376	0,08156	0,05309
	0,0742	0,0318	0,3698	0,5597
<b>General</b>	-0,11966	-0,16525	-0,12470	-0,09306
	0,1874	0,0678	0,1694	0,3059
<b>Learning</b>	-0,11614	-0,21182	-0,07371	-0,02825
	0,2008	0,0187	0,4178	0,7564
<b>Quick Insight</b>	-0,15157	-0,21557	-0,07236	-0,03121
	0,0942	0,0166	0,4264	0,7318
<b>Reflective</b>	-0,06983	-0,06100	0,00444	0,04598
	0,4428	0,5027	0,9611	0,6135
<b>Impulsive</b>	0,10306	0,10381	0,05485	0,01453
	0,2566	0,2532	0,5468	0,8732
<b>Metaphoric</b>	-0,22699	-0,10769	-0,01956	-0,05442
	0,0116	0,2358	0,8300	0,5499