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# Capacity for complexity, intelligence and personality.

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# Capacity for Complexity, Intelligence and Personality

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A research report submitted to the Faculty of Humanities
University of the Witwatersrand
In partial fulfilment of the requirements for the degree of
Masters of Arts in Organisational Psychology
2012

**Declaration**

I hereby declare that this research report is my own independent work, and has not been presented for any degree at any other academic institution, or published in any form.

It is submitted in partial fulfilment of the requirements for the degree of Masters of Arts in Organisational Psychology at the University of the Witwatersrand.

_____. _____.

Signed by Yael Comaroff Date

This work is dedicated to my late brother, Gregg Comaroff, who lived by three very powerful words - “just for today!”

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# CHAPTER ONE:
## Introduction and Rationale

Assessments are utilized within numerous fields in order to gain an understanding of individual characteristics and, based upon their results, make decisions, including those within organisational environments (Weiner & Greene, 2008). Their main purpose is to reveal different attributes such as personality, interests, ability, skill, aptitude, neuropsychological functioning, mental state, attitudes and beliefs, intelligence and social functioning (Erasmus, Swanepoel, van Wyk & Schenk, 2003; Tredoux, Foster & Allen, 2006); all of which give unique insight into individuals. Regardless of the settings in which they are used or their specific purpose, one crucial aspect is to make an informed decision about which assessment instrument is most accurate and hence best suited in order to gain specific information about individuals, and hence answer important questions (Weiner & Greene, 2008). One of the challenges of choosing the best method in an organisational setting is that assessments are used for several purposes – for recruitment and selection (Cropanzano, Bowen & Gilliland, 2007), to examine work performance, to analyze certain skills and abilities, for promotional decisions, and, importantly, for training and development – all of which impact upon employees (Simons & Roberson, 2003).

In today's fast-paced, continuously changing, and ambiguous environment, organisations are being faced with a variety of challenges that impinge upon their functioning. Even though such instability affects multiple hierarchical levels within organisations which need to be addressed, much pressure lies in the hands of the leaders and managers, who have to be able to function to the best of their abilities under changing circumstances and have to ensure that the decisions they make result in organisations thriving in unstable times. Based on this notion, it appears that managers today need to have the capacity to deal with complexity, where complexity does not imply difficulty, but rather implies instability and ambiguity. If organisations are able to assess which factors predict one's capacity for complexity, it would therefore allow them to recruit employees who have such skills and to train and develop staff to possess such qualities.

The term ‘career pathing’ was traditionally perceived as the hierarchical progression of one’s career, whereby employees followed an upward linear direction that was structured toward promotion, mainly in bureaucratic spheres (Baruch, 2004). This implies that career pathing was purely based upon climbing the corporate ladder, and was hence equated with gaining higher positions and receiving advancements in one’s salary (Baruch, 2004). Today’s knowledge era, however, paralleled by developments in technology, alterations in production and consumption (Baruch, 2004), globalisation, and even socio-political factors (Cacioppe, 1998), has created uncertainty that calls for more flexible and transitional career pathing and therefore a more multi-linear approach (Baruch, 2004). What is now known as ‘dynamic employment and boundaryless careers’ (Arthur, 1994, p.297) have taken the forefront, and have resulted in new approaches and methods for career pathing. Such shifts impact on the role of leadership, as leadership now calls for immense flexibility, as well as the need to cope with very unstable and uncertain environments.

Organisations therefore need to be able to assess both their potential and current employees (particularly those who will hold positions of leaders) in order to attain a measure of how different individuals cope in highly unstable and ambiguous environments. Futhermore, organisations need to make careful decisions about what assessments they choose to utilize, as assessments are costly and organisations need to be assured that the financial expense results in valid and reliable measures of attributes such as one’s capacity for handling complexity.

In order to assess employees’ capacity for handling complexity and how individuals cope in such constantly changing environments, organisations need to make the best decisions possible about which assessment techniques they choose to implement. Therefore, this research intends to explore three different assessment measures: the Career Path Appreciation (CPA), the Wechsler Adult Intelligence Scale III (WAIS-III) and the California Psychological Inventory (CPI).

The CPA is an interview assessment technique which claims to measure ‘managerial potential and job-related problem solving abilities’ as well as ‘a person’s ability to cope with the cognitive complexity required for effective work decision-making’ (Kitching, 2005, p.18) in complex environments. The CPA is a multifaceted

instrument that has been shown to have strong psychometric properties however it is also an extremely costly instrument to use, mainly because it consists of a one-on-one interview and requires a highly trained and skilled practitioner who meticulously understands how to use the CPA technique (Stamp, 1989). Furthermore, in South Africa the cost of training practitioners as well as the shortage of skilled practitioners adds to the expense of implementing such an assessment technique (E. Kruger, personal communication, 25 March, 2011). Even though the CPA appears to directly measure one's capacity for complexity, using other assessment techniques such as the WAIS-III or the CPI, which are both extensively used in organisational assessment already, could prove to be more affordable and easier to implement within South African organisations.

Therefore this study intends to evaluate the three assessments in order to see whether more practical and less specialised measures of intelligence (via the WAIS-III) and/or personality (via the CPI) are in any way associated with one's capacity for managing complexity (CPA), and, if so, if either the CPI or the WAIS-III or both can be used to predict one's capacity for complexity. More specifically, this research intends to explore whether the CPA assesses anything distinctly different from the CPI and the WAIS-III and to what extent these might be used to predict capacity to manage complexity in place of the CPA. Such research will provide an understanding for organisations about the different assessment techniques used, and which assessment techniques are most effective in finding out about an individual's capacity for complexity. This will aid organisations in choosing the most appropriate assessment technique for their purposes, as well as provide insight for organisations in terms of what qualities their leaders need to function in complex environments.

Furthermore, this research will show the extent to which these assessments overlap, and to what extent both personality and intelligence are linked to one's capacity for managing complexity. The results of this research will therefore contribute to theory, in that they will allow for a greater understanding of how these constructs relate. If no relationships between the measures are found, this could potentially suggest that personality and / or intelligence do not predict capacity for managing complexity, and therefore the CPI and the WAIS-III cannot be used in place of the CPA. If, however, an association does exist, such results will allow organisations to isolate specific

personality and intelligence variables that are reflected in handling complexity and therefore which factors organisations should look for in potential leaders.

Apart from the practical importance of such research, no previous research on this topic in South Africa could be sourced and it therefore could potentially provide much national insight and contribute to knowledge in the field of organisational psychology.

# CHAPTER TWO:
# Literature Review

Today's constantly changing and evolving world brings about an excessive amount of environmental uncertainty in comparison to that previously experienced, as organisations across the globe are continuously facing challenges due to the economy, globalisation (Hitt, Keats & DeMarie, 1998), technological advancements (Hitt et al., 1998), socio-political factors (Cacioppe, 1998), and competitive dynamism (Grant, 1996). Due to such shifts and fluctuations, organisations need to be as equipped as possible to effectively cope with such instability and uncertainty. Therefore, in organisations, employees holding upper level positions play an extremely crucial role as they need to possess the skills and abilities to aid organisations in facing the challenging marketplace of today (Uhl-Bien, Marion & McKelvey, 2007).

## Leaders versus Managers

Upper level employees are generally referred to as 'leaders' or 'managers', and research over the past few decades has been highly inconsistent as the terms have often been used interchangeably. Kotter (2001) believes that leadership and management are 'two distinctive and complementary systems of action' (p.2). Drukker (1998, as cited in Taggart, 2009), on the other hand, explains that the interconnectedness of managers and leaders should not be separated in any way; as even though the two concepts possess different characteristics, both are critical for managers in organisations today. Taggart (2009) similarly views the link between management and leaders as highly crucial, due mainly to the need for managers to deal with discontinuous change. Even though such research makes the distinction in order to explain that employees other than managers can become leaders, the link between managing and leading is of crucial importance in organisations as those in management positions need to be able to embrace leadership roles in order to be as effective as possible. For the purpose of this study upper level managers will be equated with leaders, where high organisational positions call for them to act as leaders as well as managers.

The term 'leadership' refers to a concept that is constantly being re-examined and re-defined (Winston & Patterson**,** 2006). Traditionally, two overarching leadership

perspectives comprise the literature. Firstly, leadership has been defined as influencing more than one person to achieve goals (Jones & Jones, 2006; Smith, Jones & Hall, 2006), not via authority and power but rather through providing a vision and guidance for followers (Nicholls, 1987). Secondly, leadership has been defined in terms of being able to manoeuvre organisations into becoming successful, by achieving goals and facing change and uncertainty with confidence (Nicholls, 1987). Both perspectives of leadership give insight into the expectations of leaders, as well as foregrounding leadership as a concept which numerous theories are built upon.

Trait theories of leadership which focused on the leader's innate characteristics marked the predominant theoretical approach until the 1940's (Judge, Piccolo & Kosalka, 2009). This was followed by the behavioural style theories from the mid 1940's which emphasized the importance of specific behaviours displayed by leaders (Judge et al., 2009; Robbins, Judge, Odendaal & Roodt, 2009). From the late 1960's onwards, popular contingency theories took the forefront; they proposed there was more to leadership than traits and behaviours, and focused rather on leaders' styles combined with situational factors (Robbins et al., 2009). In the 1980's what was known as 'new leadership' came to the forefront (Parry & Bryman, 2006). The new leadership theories were dominated by transformational leadership, where leaders were perceived as being able to inspire, motivate and encourage followers to be inventive and even risk-takers via persistent behaviours (Bass, 1985; Northouse, 2010). By the 1990's the neo-charismatic leadership theories had emerged as the most prevalent model of leadership (Robbins, Odendall & Roodt, 2007). The 'new leadership' theories of the 1980's have continued to develop and contribute to the conceptualization of leadership well into the 21st century.

Clearly, a plethora of leadership literature exists and arrays of leadership theories have been developed over the past century. The environment of today, however, is classified as a knowledge era impacted by globalization, technology, an increase of diverse skilled workers and competitive dynamism as a few of the common workplace challenges (Cooper, 2005; Grant, 1996). Such environmental elements create a vastly complex and uncertain environment for organisations to operate in (Morgan, 2006; Uhl-Bien & Marion, 2008). Therefore leadership theories have evolved and adapted to cope with the rapid changes and uncertainty that characterise the world in the 21st

century. The concept of complexity theory and complexity leadership theory moves the literature away from bureaucratic notions of leadership which rely on predictability, certainty and control within the organisational context (Morgan, 2006; Uhl-Bien & Marion, 2008). Rather the construct of leadership is one dominated by adaption, uncertainty and complexity within the realm of complexity theory (Lichtenstein, Uhl-Bien, Marion, Seers, Orton & Schrieber, 2006).

Complexity Theory

Complexity Theory (CT) developed in the 1980's as a paradigm based on previous science whilst simultaneously embodying new shifts (Schneider & Somers, 2006). Systems previously classified by traditional relationships, hierarchical structures, and inter-dependence, as well as possessing the characteristics of open systems, began transforming due to instability, complexity and uncertainty (Schneider & Somers, 2006). Schneider and Somers (2006) explain that the foundation of CT rests upon three interrelated concepts or theories – non-linear dynamics, chaos theory, and adaption and evolution. Simply stated, non-linear dynamics are 'systems in state of extreme instability' (Schneider & Somers, 2006, p.354). CT further believes that the systems and environment interact and through such inter-dependency both adaption and emergent behaviours occur (Schneider & Somers, 2006). Based on the above, it becomes apparent that such environments are highly complex and unstable, constantly changing, and full of turmoil and hence require a shift in the way in which leaders operate in organisations.

Complexity Leadership Theory

Complexity leadership theory evolved in order to show how leaders function in today's knowledge era which is dominated by continuous change. The importance of this theory is that it is able to reflect new ways of thinking about leadership and leaders' roles in organisations due to environments in which they operate. Leaders are currently being faced with new paradigms which involve functioning within diverse, unstable, dynamic, and highly complex organisational environments (Uhl-Bien & Marion, 2009). This type of leadership is about leading in what is known as 'complex adaptive systems' or CAS (Uhl-Bien & Marion, 2009). Regardless of the field, the focus is on assessing how a system and an environment interact with one another (Choi, Dooley & Rungtusanatham, 2001).

Complex Adaptive Systems

Complex Adaptive Systems (CAS) have been described as '…neural-like networks of interacting, interdependent agents who are bonded in a cooperative dynamic by common goal, outlook, need, etc… They are changeable structures with multiple, overlapping hierarchies' (Uhl-Bien et al., 2007, p.299). The primary characteristics that exist in a CAS are the internal mechanism; the environment; and co-evolution (Choi et al., 2001). The internal mechanisms are made up of agents and schema, self-organisation and emergence, networked connection, and dimensionality (Choi et al., 2001). An agent is some type of unit that dominates a system and takes part in the continuous change of a system (Choi et al., 2001). These agents have their own schema, which can be classified as shared mental models, which are collective ideas that each agent shares which forms the basis of their functioning (Choi et al., 2001). Lichtenstein and Plowman (2009) explain how agents interact with the environments:

> *'The agents in the system recognize the meaning of a given exchange, and adjust their own behavior as their response to that meaning within the system. As they do so the system changes: it is not the same system as it was before. That is, when an agent adjusts to new information, the agent expands his/her own behavioral repertoire, which, in effect, expands the behavioral repertoire of the system itself… This complexity view suggests that influence processes – including leadership – tend to occur continuously, in different degrees, throughout the system'* (p.619).

Based on this explanation, it becomes apparent that agents react to the changes occurring around them, which results in emergent patterns of behaviour, organisation and functioning. Dimensionality is the differing levels of autonomy and control an agent is given, which is crucial in affecting the way in which the agent functions (Choi et al., 2001). The environment of a CAS varies due to the way a CAS is classified, which is based on what exactly the agent represents (Choi et al., 2001). Furthermore, one of the only constant aspects of CAS is change; as stability and certainty result in CAS's non-existence (Choi et al., 2001).

The concept of CAS is highly complex in itself, mainly because it represents a theoretical model that needs to be applied and adapted to different entities. One of the main reasons why classifying specific systems as 'complex adaptive systems' is challenging is that CAS can take many forms. For example, Dooley (1996) explains

that CAS can be seen in ecologies, the economy, social organisations, cultures, and even traffic. For the purpose of this research, the concept of CAS needs to be equated with that of an organisation, and hence needs its own unique application.

The numerous explanations of CAS by previous researchers (Kotter, 2001; Lichetenstein & Plowman, 2009; Schneider & Somers, 2006; Ulh-Bien & Marion, 2007; 2009) do not make it clear whether CAS are equated with organisations functioning today. Such links need to be postulated. For the purpose of this research, the system would be the organisation itself; the agents would be the managers; and the environment would be the world in which these functions range from a micro- to a macro- level.

The role of managers in this model would be to respond effectively to the constantly changing work environments in which they are based by making good decisions, and hence handling complexity profitably. This does not merely involve top-down processing, but rather calls for managers to be more fluid and adaptive, where they interact in broad networks that constantly allow for the development of new ways to function (Uhl-Bien et al., 2007). Hitt et al. (1998, as cited in Ulh-Bien et al., 2007) explain that organisations of the twenty-first century are faced with globalisation, intense technological changes, knowledge advancement and economic shifts which will have a large impact on organisations and the ways in which they function. Work environments extend to the macro-level where politics, the economy, globalisation, technology, advanced knowledge, diverse cultures, customer needs and values are facets which force organisations and their management into new strategies (By, 2005; Patel, 2006; Robbins et al., 2009; Scott, 2009). Due to such instability in the environment, the role of leadership in complexity theory is '…to disrupt existing patterns of behaviour, to promote innovation through encouraging nonlinear interactions and novel ideas, and to interpret change for others, instead of trying to create change' (Ardichvili & Manderscheid, 2008, p.625).

Handling Complexity

Complexity is an underlying element of daily working lives and it impinges upon effective decision making, which is an essential component of successful organisations (Lipshitz & Strauss, 1997). Literature concerned with decision-making

is dominated by concepts such as risk, ambiguity, uncertainty and instability (Lipshitz & Strauss, 1997). The prominence of these concepts is based on naturalistic environments whereby decision-making is undoubtedly faced with some type of uncertainty and complexity (Lipshitz & Strauss, 1997). Therefore, one of the main aspects of handling complexity is about being able to make effective decisions in uncertain, unstable and complicated environments. Yuksel (2011) explains that:

> *'Increasing uncertainty and intensive competition have forced companies to focus on developing their core competencies to increase their competitive advantage… The main sources of such specific organizational core competences or capabilities are effective technology, organizational learning, strategic flexibility and innovative capacity - which are founded upon people management and individual competencies.' (p.104)*

Based on the above explanation, it appears that managers need to possess certain qualities in order to cope with complexity and uncertainty. According to Miliken (1987), there are three types of uncertainties about the environment that managers operate in. 'Effect uncertainty is an inability to predict the nature of the effect of a future state of the environment on the organisation' (Butchko, 1994, p.411); whereas response uncertainty is the failure to be able to predict the potential consequences of one's chosen response (Butchko, 1994). Finally, state uncertainty or perceived environmental uncertainty occurs when managers believe that the environment in which they are immersed is unpredictable (Butchko, 1994). These types of uncertainty can be linked closely to one of the main focal areas within this research, known as 'complexity'.

The term 'complexity' does not possess the typical simple meaning of a task being difficult or intricate. Rather '…complexity is a function of the number of variables operating in a situation, the ambiguity of these variables, the rate at which they are changing, and the extent to which they are interwoven so that they can be unravelled in order to be seen' (Jacques & Clement, 2002, p.22, as cited in Grobler, 2005). Miliken (1987) defines complexity as '…an individual's perceived inability to predict something accurately' (p. 136). This explanation of complexity stresses the importance of an individual, and outlines that uncertainty is subject-specific (Geersbro

& Ritter, 2010). Individuals therefore have unique perceptions of uncertainty in similar situations and unique mechanisms for coping with complexity.

Selecting and managing employees who can handle more challenging, more volatile and uncertain environments has become of great importance for organisations (Yuksel, 2011). Organisations need to commit to making informed decisions about the use of psychological assessments, so that they are able to attain the most competent and competitive managers and leaders (Yuksel, 2011).

Psychological Assessments

Psychological assessments are '…designed to evaluate psychological variables in a systematic fashion and are intended to eliminate or reduce the biases in errors inherent in subjective judgement and the confounding influence of extraneous variables' (Tredoux et al., 2006, p.76). The origin of assessments is one that stretches as far back as ancient times of the Bible (Foxcroft & Roodt, 2005). After centuries, the field of assessment, and more specifically psychological assessments, developed extensively from the early twentieth century due to advances in human behaviour studies, improved statistical techniques and the expansion of psychology in a variety of settings (Foxcroft & Roodt, 2005). Initially, two Frenchman, Simon and Binet, developed the very first measure of intelligence which was eventually found to be highly problematic as the tests norms and standardization were established based on the French population, and were hence context specific (Foxcroft & Roodt, 2005).

Multi-culturalism quickly became an influential factor when developing and using psychological assessments, and test adaption hence became of primary importance (Foxcroft & Roodt, 2005). All literature on assessments is dominated by test user standards, and an emphasis on the appropriate design of tests, standardisation, objectivity, reliability, validity, administration by qualified examiners, consistent testing conditions, reducing bias and increasing fairness (Anastasi 1961; Anastasi 1988; Foxcroft & Roodt, 2005; Miller, McIntire & Lovler, 2011). All of this makes it evident that psychological testing is exceptionally intricate, and requires both social and ethical considerations (Anastasi, 1988). Furthermore, the specific context of South Africa brings about unique facets and challenges for the use of psychological testing.

The majority of psychological assessments in South Africa were created during a period dominated by racial segregation and the unfair distribution of resources based on race (Foxcroft & Roodt, 2005). Tests were originally imported into South Africa as a result of colonialism by the British, and were based on intelligence and aptitude (Foxcroft & Roodt, 2005). However, they were not altered or changed to suit the South African context which resulted in the organisation of the society by race, and hence the exclusion of those categorised as 'non-White' from being treated as normal members of society (Stones, 2001). Psychological assessments mimicked Apartheid policies and were often utilized to support political policies that intended to implement racial segregation, mainly via showing racial distinctions based on intelligence tests standardised for whites only (Foxcroft & Roodt, 2005).

The history of psychological testing in South Africa is one rife with controversy and criticisms, which ultimately impacted positively on the post-Apartheid government's awareness of the problems posed by psychometric testing and the need to address these (Stones, 2001). Many laws have been passed since 1994 that have addressed previous inequalities, such as the Constitution, the Labour Relations Act, and, importantly for psychological assessment usage in the organisational context, the Employment Equity Act which disallows discriminatory assessment practices in the workplace (Foxcroft & Roodt, 2005).

Assessments in South Africa are still widely used today in numerous fields, and in organisations are used to make informed decisions about a variety of attributes of potential employees such as intelligence, skills and abilities, aptitude, neuropsychological functioning, mental state, attitudes and beliefs, personality, and social functioning (Erasmus et al., 2003; Kaplan & Saccuzzo, 2008; Miller et al., 2011; Tredoux et al., 2006;). More specifically, companies utilize assessments for selection and recruitment, to assess performance levels, as well as for organisational research (Miller et al., 2011). As previously discussed, due to the current environment organisations need to be able to select and recruit leaders and managers who possess the capabilities to handle complexity. One of the most popular psychological assessments used to assess individual capacities for complexity in managers and leaders is the Career Path Appreciation (also known as the CPA).

The Career Path Appreciation (CPA)

The CPA is an interview-based technique that is used to balance both the abilities and careers of employees with the needs of the organisation so that both parties are mutually benefitted (Stamp, 1989). The CPA 'provides an indication of an individual's capability to generate, understand and act in contexts where prior knowledge and experience may no longer be applicable' (Kitching, 2005, p.18). The term 'appreciation' in itself addresses the mutual respect between employee and employer whereby '…the word implies mutual recognition of the current scope of a person's ability to make decisions, of the likely rate at which that ability will grow and of the steps that could ensure the realisation of that potential' (Stamp, 1989, p.2). Extensive work done by Elliot Jacques and Gillian Stamp underpins the CPA and therefore needs to be discussed.

Elliot Jacques' Stratified Systems Theory

Elliot Jacques was interested in the ways in which managers function and chose to focus specifically on the positions that they held in organisations and the level of complexity under which they were working (Kitching, 2005). Even though organisations of today are more fluid than they used to be, hierarchies to some extent exist as they give structure to organisational functioning (Grobler, 2004). The problem with any hierarchy that exists is deciding which levels different employees fall under, and choosing how many levels there should be (Grobler, 2004). Failure to do so properly can result in managerial leadership ineffectiveness and therefore needs much consideration. Based on the combination of organisational hierarchies and unstable work environments, Jacques believed that layering in an organisation was of crucial importance (Grobler, 2004).

To Jacques, work was defined as '…the exercise of discretion and judgement in decision making in carrying out tasks; it is driven by values and brings skilled knowledge into play' (Kitching, 2005, p.13). In addition, he saw work as being made up of two primary factors: firstly, that work is always goal-directed, and secondly, that all work requires some level of discretion whereby an employee needs to use their own judgement skills to the best of their abilities in order to be as effective as possible in reaching their goals (Gould, 1986). Therefore, work can be seen as simple in stable environments whereby knowledge and experience aid in making the best decisions.

However in complex and uncertain environments, a person becomes highly dependent upon their discretion (or judgement) in order to make good decisions (Kitching, 2005). Hence the degree of complexity (and hence the level of abstraction) affects the degree of discretion, whereby heightened complexity calls for an individual to make greater judgement calls.

Jacques formulated the 'time span of discretion' which can be defined as the single longest period of time given to an employee to complete a specific task by their manager (Gould, 1986). Based on this, Jacques developed the concept of strata - the idea that organisations are made up of different levels or layers of work, that vary based on the work's complexity and the time frame of discretion (Gould, 1986). Seven stratum were identified (please refer to Table 1 below for more information) where time frames vary from three months to one year, two years, five years, ten years, twenty years, and fifty years (Grobler, 2004). A managerial leader's role in an organisation is based upon the complexity level at which they are operating and their unique time frame. The role of executive in different organisations might possess similar labels (director, manager, CEO), but their complexity levels across organisations differ as larger organisations are inevitably more complex and require more complex roles (and higher discretion) due to more complex decisions needing to be made. This implies that each organisation creates their own unique strata suited for their specific functioning.

*Table 1: Stratum Description based on Stratified Systems Theory*

| Stratum | Description |
|---|---|
| 1<br><br>1 day to 3 months | **Shaping concrete things.**<br>Work is concrete and goals are completely specifiable. Tasks are carried out one at time, and work is anchored in rules. The nature of the work is 'touch and feel' and contact with the object of the work is maintained at all times. People working at this level are required to exercise discretion about how to go about their work, by what means and in what priority, but not about what to do. People at the top of this level often act as supervisor to aid a manager in leading and operating the work unit. |
| 2<br><br>3 months to 1 year | **Reflective articulation about concrete processes.**<br>Work at this level requires the capacity to reflect about the work and articulate how the work is to be done. A person must be able to work on several problems at one time, and to deal with goal ambiguity. Work is still anchored in rules, but requires assessments of individual cases to determine appropriate action. Managers at this level are in continual direct contact with their unit. There is a noticeable increase in ambiguity over Stratum 1 work. This is the level of first-line managerial, professional, and technical work. |
| 3<br><br>1 to 2 years | **Linear extrapolation in concrete systems.**<br>The work involves going beyond the case-by-case of Stratum 2, to a need to see beyond the specific and to envision a continuing sequence of situations. It involves problem-solving, the development of systems, the capacity to extrapolate from given rules, adjusting and modifying the work system to cope with changing trends and maintaining production targets. Emphasis is on anticipating changes and the need for adaptation. This is the level of departmental management and independent professional work in which direct contact with a mutual recognition unit of the organization is still possible. |
| 4<br><br>2 to 5 years | **Alternative concrete systems.**<br>This is the general manager level involving responsibility for development of new products or services, production or provision of products, services or sales, and in the public sector, maintaining contact with community needs. The possibility for direct contact is lost. Work at this level requires the application of intuitive judgement to detect gaps in services, to compare known systems with one another, but not to develop as yet unknown systems. There is a substantial increase in uncertainty over Stratum 3. The work is oriented toward exceptions, representative cases viewed as trends, and the need for modifications in policy. |
| 5<br><br>5 to 10 years | **Shaping of whole systems from within.**<br>This level requires the capacity to re-define the rules, to change the boundaries of the organization, and to engage in strategic development. It is characterized by the shaping of whole complex social institutions or general theories from the inside. The work domain has become universalized, requiring the individual to work in a mode unconstrained by existing words, ideas or theories. It is the level of dual roles: one as manager of a Stratum 5 business unit working within the corporate collegium and one as entrepreneur able to re-define and shape the organization. |

| | |
|---|---|
| 6<br><br>10 to 20 years | **Reflective articulation of whole systems in a world environment.**<br>A dramatic change occurs over the ten-year boundary such that the individual moves from working within a complex institution or general theory to working in a world-wide environment, overseeing and changing institutions from the outside. This individual must be competent in networking with key people in many fields on an international level. |
| 7<br><br>20 to 50 years | **Linear extrapolative development of whole systems.**<br>The work at this level is of constructing institutions and theories, placing them into society, influencing the environmental context, and setting and maintaining the organization's value system. Jaques also characterizes this level as 'the full corporate arena' concerned with managing a system which is responsible for the development, formation and construction of complex Stratum 5 institutions or the transformation of existing institutions. |

*(taken from Gould, 1986, p.9-10)*

Importantly, as the time frame of a task gets longer, the task gets more complex and hence an individual has more processing to do and needs to be able to function cognitively on a higher level (Grobler, 2004). This implies that the more complex the tasks at hand, the higher cognitive abilities need to be. Cognitive abilities can be defined as the way in which a human being takes in information from the environment around them, analyses it, and utilizes it to make sense of the world (Thompson, 2010). Managerial leaders with high cognitive ability differ from those with low cognitive ability, as they are more easily able to process large amounts of information given to them, work well in complex environments, and can handle high levels of instability and uncertainty (Thompson, 2010). Therefore, those individuals with higher cognitive abilities function better in exceedingly complex environments, and are hence the individuals who usually attain high positions in organisations.

Jacques' concept of 'Requisite Organisation' manifests fully when organisational hierarchies match his theory of strata, when employees simultaneously understand what is expected of them and are hence able to fulfil their highest potential (Grobler, 2004). The SST and the idea of requisite organisation laid the foundation for the work of Gillian Stamp, one of Jacques' colleagues. Stamp created the Matrix of Working Relationships Model based on SST, which led to the assessment tool known as the Career Path Appreciation which is widely used today.

Gillian Stamp's Theory

Gillian Stamp's Theory, which is often referred to as The Matrix of Working Relationship Model or MOW, was created based on the work previously done by Jacques, hence SST forms this theory's foundation. Stamp's focus, however, was mainly on that of wellbeing of employees in organisations, which she saw as fundamental in affecting the ways in which they functioned (Stamp & Stamp, 1993).

The MOW '…explores the relationship between an individual at work, the organisation and the environment within which the organisation needs to function' (Kitching, 2005, p.22). This model defines the seven levels of work which are used in the CPA, based on an individual's capability (Stamp & Stamp, 1993). Her understanding of the term capability had a similar meaning to the way it was conceptualised by Jacques, but, according to Kitching (2005), Stamp saw capability as being threefold, based on:

1. Current potential capability – the maximum way in which a person functions on any given task (a baseline type of capability).
2. Current applied capability – the current capability being utilized in their current job
3. Future potential capability – the calculated capability levels of a person in the future.

Furthermore, for Stamp 'capability' includes competencies of an individual and more specifically how comfortable one is when required to make a decision in highly complex environments (Kitching, 2005). Being comfortable making decisions in ambiguous situations means that one has to rely on one's discretion and judgement, and be comfortable doing so. Challenges which arise in organisations require that those in upper level positions need to possess the capabilities to cope and function successfully, and hence possess the ability to rely on their discretion (Stamp, 1989). It is important for organisations to try to find some type of balance, where capabilities of the individuals match that of the environment in which they are functioning (Stamp, 1989). This is because if an individual's capability exceeds challenges or the challenges exceed capabilities, negative outcomes will result, such as a loss of resources and other financial penalties (Stamp, 1989).

Stamp believed that as an individual moved higher up the hierarchy in an organisation simultaneously both responsibility and complexity would increase (Kitching, 2005). Based on this assumption, Stamp's model formed seven themes of work (please refer to Table 2 below, which outlines the different work levels and their unique meanings)**,** where higher themes involved higher levels of complexity, and hence required having higher capacities for handling complexity.

*Table 2: Gillian Stamp's Seven Themes of Work*

| **Levels** | **Description** |
|---|---|
| Level 1 Quality | Making or doing something that can be fully specified beforehand, has a concrete or direct output and an immediate impact on viability |
| Level 2 Service | Responding to the requirements of particular situations or people in such a way that people at Level 1 are supported by expertise, response to customer / client is complete, the purpose of the organisation is exemplified |
| Level 3 Good practice | Constructing, implementing and fine-tuning the systems and procedures to cope with both stability and change, and to engage with the future. |
| Level 4 Strategic Development | Underpinning the future by addressing what does not exist but is needed for advantageous positioning; bringing it into being within three to five years. |
| Level 5 Strategic Intent | Providing a view of the organisation that is completely separate from its operational activities, and fully connected with the socioeconomic context and viable for the next seven to ten years. |
| Level 6 Corporate Citizenship | Reading with economic, social, political and technological contexts to alert and protect Level 5 strategic units and represent the group in national and trans-national arenas |
| Level 7 Corporate Prescience | Sustaining viability for future generations by defining values and designing contexts for contributions up to twenty-five years ahead. |

*(taken from Stamp & Stamp, 1993, p.8-9)*

Level One (known as Quality) involves doing very specific tasks which are specified and outlined, and which have a direct and immediate outcome, and hence no uncertainty whatsoever (Kitching, 2005). This level of work can be seen in employees who are first-line workers who carry out production tasks that are highly monotonous (Kitching, 2005). Level Two (known as Service), which is one step up in the hierarchy, calls for an employee to respond to certain people or situations in order to make sure that Level One has the support they require (Kitching, 2005). Hence, this level could be considered to be represented by a supervisor who watches over their subordinates and has to deal with a very small amount of uncertainty (which is more than Level One). Both Level One and Two can be greatly contrasted to Levels Six (Corporate Citizenship) or Seven (Corporate Prescience), whereby uncertainty is the only guarantee and the unstable environment is a vital factor affecting work tasks (Kitching, 2005). Task time is also undefined and far from instantaneous, as tasks stretch over years. Furthermore, task boundaries for Level Six can be seen within national parameters, whereas Level Seven has almost no parameters and stretches into international relations (Kitching, 2005).

Ultimately, the lower levels of work known as Quality, Service and Good Practice are focused around operational functioning of the organisation and involve more concrete tasks and hence have little uncertainty (Kitching, 2005). On the other hand, high levels of work such as Strategic Development, Strategic Intent, Corporate Citizenship and Corporate Prescience involve work tasks that require strategic planning for the organisation's future and hence individuals need to be able to cope in an environment of much uncertainty and constant change (Kitching, 2005).

It must be made clear that even though Stamp (1989) created a hierarchical structure within her levels, whereby lower levels are more stable and concrete and higher levels are ambiguous and uncertain, she did not believe that any level was more important than another, as the strength of the hierarchy is about the functioning of all the levels simultaneously (Kitching, 2005). The process of assessing an organisation and applying the MOW model is known as 'organisational mapping' (Stamp & Stamp, 1993). Through this process, organisations are able to see that if they have matched employees according to the levelled hierarchy and hence provide their organisation

with a rigid structure. This will distribute decision making appropriately and allow employees to work more effectively with uncertainty (Stamp & Stamp, 1993).

Based on the shift in organisational functioning, Gillian Stamp developed the CPA. According to Stamp and Stamp (1993), the CPA identifies four types of individual capability:

1) Current capacity on the job to make decisions under uncertainty.
2) The rate at which capacity will grow, and potentially be realised.
3) One's approach to using information when required to make a decision.
4) One's capacity for aiding others to make effective decisions in the work spheres in which they are functioning.

The CPA focuses on three main aspects of career pathing: known as Capability (the employee's current level in accordance with Table 2), Mode (understanding where their future potential lies in accordance with Table 2), and Style (their individual approach to work) (Stamp, 1989).

CPA Capability and Mode

In order to see the likely development of an individual's Capability, the CPA uses an array of capability growth curves based on Jacques' work in order to find out an individual's future potential or Mode (Stamp & Stamp, 1993). Figure 1 below illustrates the array of curves which were initially derived from work by Jacques (1961) that highlighted that an increase in earning could be related closely to an increase in capability. Hence, these growth curves are formed around the belief that as an adult develops within his/her job and is required to tackle more challenging tasks, complexity increases. The growth curves show an individual's current capability and their potential capability for the future based on their age or capabilities over time (Stamp & Stamp, 1993). This means that when individuals are assessed using the CPA, their age is taken into consideration because it impacts upon predicting their growth processes. This is important because if all factors (included in Figure 1 below) are taken into consideration when undergoing a CPA, then an organisation is able to balance the capabilities of their employees with the challenges they are required to face and hence provide mutual benefit to the organisation and individual (Stamp &

Stamp, 1993). Therefore when interpreting the results of the CPA the practitioner needs to account for age in order to attain an accurate Mode for each individual.

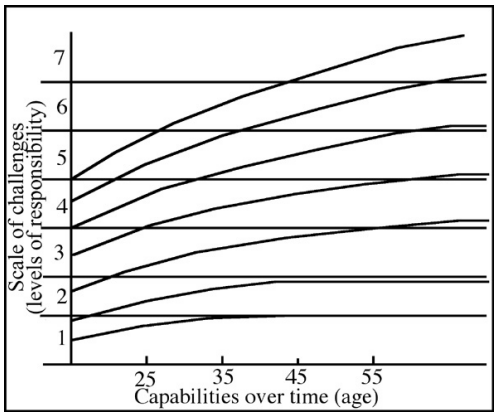



*Figure 1: Array of Capability Growth Curves*
*(taken from Stamp & Stamp, 1993)*

CPA Style

Style is made up five different preferred approaches a person would use to carry out a specific task under normal circumstances; these include: Pragmatic Intuition (Type A); Pragmatic Analysis (Type B); Analytical Intuition (Type C); Conceptual Analysis (Type D); and lastly Intuitive Analysis (Type E) (Stamp, 1981). Styles have been identified as ranging from concrete and data driven (Types B and D) to intuitive (A and E), with C being both data driven and intuitive (Stamp, 1981).

Type A Styles follow their own intuition to solve problems; do not find patterns or meanings in problems; look for concrete or discrete solutions to problems; like to be in close contact with tasks; and prefer to use knowledge in action (Stamp, 1981). People using this approach to work like to be in close contact with work as it progresses through different stages whilst paying close attention to details and making sure things are completed one after the other (Stamp, 1981). Type B Styles prefer concrete and factual information; they like to think about various options and an array of different solutions and go about a trial-and-error process to learn and grow (Stamp, 1981). People who prefer this style work flexibly and do not like to be tied down to assess the data they have gathered (Stamp, 1981). Type C Styles use a mixed method approach whereby they blend gathering concrete information and forming integrated

concepts about the problems at hand (Stamp, 1981) . People preferring this style are able to use ideas presented by others in order to engage in knowledge in action and knowledge in reflection (Stamp, 1981). Type D Styles use positives and negatives in order to make sense of what is happening, and factual information is tested against the conceptual framework within which they are operating (Stamp, 1981). Furthermore, these individuals emphasise details and utilize abstract analysis in order to make a decision (Stamp, 1981). Lastly, Type E Styles avoid relying on their own experiences and rather seek abstract ways to solve problems which stem from their intuition (Stamp, 1981). They seek to explore knowledge in reflection which is not based on their own experience; they can be classified as very entrepreneurial and do not fit into the constraints of organisations well (Stamp, 1981).

The CPA Format

A Career Path Appreciation assessment can take up to three hours to conduct and can be divided into four parts: 1) responses to nine sets of phrase cards; 2) a problem solving task via symbol cards; 3) a career history interview; and 4) a feedback session with the interviewee. These four parts create the CPA, which is a conversation between the practitioner and the respondent involving a discussion about how a person currently tackles job tasks, giving tasks to the respondent and watching how they approach them, as well as listening to a detailed work life history of the individual (Stamp, 1989). The entire process is then interpreted by the practitioner according to Gillian Stamp's Matrix of Working Relationship Model (Kitching, 2005).

In part one the interviewee is showed nine sets of phrase cards, each having six different phrases on the card (Stamp & Stamp, 1993). These are used to extract information about the ways in which the individual approaches their current work (Stamp & Stamp, 1993). Stamp and Stamp (1993, p. 11) give an example of one of the sets of phrase card which holds the following statements:

- Handle ambiguity by developing opposing points of view.
- Allot a specific amount of time to each task.
- Transform the task to create uncertainty.
- Expect that a task will be transformed while it is in progress.

- Tolerate uncertainty.
- Use your common sense.

Based on the phrase cards the interviewee is asked to do three specific things. Firstly, they need to select the card which they feel most likely resembles the way in which they would approach a specific task at work. Secondly, they need to discuss their selection with the interviewer. Lastly, they need to provide examples in order to illustrate their selection (Stamp & Stamp, 1993). The main purpose of the phrase cards is for the interviewer to gain insight into '…the current level of work capability in relation to the current level of work expected of that person, as well as the likely rate of growth of their capability' (Kitching, 2005, p.38).

Part two involves symbol cards which present the interviewees with actual tasks to carry out. The interviewer can observe how the interviewees work by asking them to make a rule for sorting a pack of cards ranging in different colours, shapes and sizes (Kitching, 2005). The main purpose in this stage is for the interviewer to watch the process a person goes through in order to try to define the task, to see the different methods they attempt and utilize, and also to watch the ways in which they handle the unknown and the uncertainty of the task (Kitching, 2005). Therefore, this stage gives insight into their capacity to handle complexity and the ways in which individuals approach their work (Kitching, 2005).

Part three is a career history interview, where the interviewee is asked to give a very detailed description of their entire working life (Stamp & Stamp, 1993). They are encouraged to give specific work examples in which they felt underused, overused, and where they felt their responsibilities matched their capabilities (Stamp & Stamp, 1993). Furthermore, they are asked to describe how they handled the different work situations that they were in (Stamp & Stamp, 1993). Finally the interview concludes with a focus on their future plans and goals. The interviewer pays very careful attention to everything expressed by the respondent in order to use the Matrix of Work Model to score the individual on a scale of one to seven, which should reflect the person's current level of capacity to handle complexity (Kitching, 2005).

The feedback session can either take place directly after the Appreciation, or at a later stage (Stamp & Stamp, 1993). This part of the CPA process provides insight to the interviewee about what conclusions were made based on the CPA, and it is emphasised that the CPA is about understanding and giving meaning to the person's working life (Stamp & Stamp, 1993). The CPA results are then documented in a written report which only gets passed on to the organisation once the respondent has seen it first and has addressed anything within the report that they feel is inaccurate and needs to be changed (Stamp & Stamp, 1993).

Based on the CPA as a whole, one can see that the assessment is not only about one's capacity for complexity, but also is about one's ability to make good decisions and how one adapts to change, therefore about one's ability to handle complexity. It is therefore not an instrument that measures one aspect but rather measures complexity by assessing a person's conceptual capacity and their ability to appreciate the career pathing process. The value of such an instrument in organisations is that it is a tool that allows the assessment of an employee's capability to handle the decision-making process in unstable and complex environments (Stamp, 1989; Stamp & Stamp, 1993). This is important for organisations in recruitment, and especially when selecting employees for promotion (Kitching, 2005). Employees might possess the necessary skills, abilities and knowledge to gain higher positions but might be lacking the cognitive abilities to cope in highly complex circumstances and hence might not be able to function as well as other employees who manage to cope in complex circumstances (Grobler, 2004). Futhermore, the precise assessment of individuals is crucial for organisations as it enables them to see where an employee is situated currently in terms of their job and the growth rate at which they can develop, hence saving money for organisations on a long-term basis. Simultaneously it has individual benefits as it gives the employee work that is suitable for them to handle (Kitching, 2005) hence allowing them to be 'in flow in their working life' (Stamp & Stamp, 1993, p.14).

Using the CPA in South Africa

The context of South Africa brings up other considerations which impinge upon the CPA as an assessment tool. The Apartheid era has left a legacy whereby people have experienced bounded educations, where there is a great skills shortage, and where

experienced workers are hard to find (Anastasi, 1997; Kitching, 2005). This in itself poses great difficulty for organisations, especially in terms of recruitment and selection, as well as in promotion. Therefore, using an assessment technique that allows organisations to assess individuals' current and future potential is of great significance for optimal organisational functioning. Furthermore, previous research suggests that when utilised appropriately, the CPA is a psychometrically sound instrument in the South African context that is reliable, valid and relatively unbiased (Kitching, 2005).

Using the CPA in South Africa, however, is costly as it requires a highly trained practitioner who has extensive understanding and experience of the usage of CPA, and who in the two hour interview is able to gain an accurate portrait of the person undergoing the assessment (Stamp, 1993). In terms of training, becoming a registered CPA practitioner involves many strict criteria and costs approximately R41 500 for two weeks of training (E. Kruger, personal communication, 26 September, 2011). Custodian training is also available for non-practitioners at a cost of approximately R5000 which helps an individual understand the process and interpretation of the data (E. Kruger, personal communication, 26 September, 2011). The CPA test material includes a set of phrase cards and symbol cards, as well as a downloadable version of the CPA. These materials cost approximately R160 and the CPA interview process takes approximately three hours and costs R2 870 (E. Kruger, personal communication, 26 September, 2011). Finding practitioners is extremely difficult and a great financial expense for companies as hiring such expertise is costly. Furthermore, being able to fully rely on practitioners requires ensuring that they have extensive training and are able to successfully utilise this assessment technique**.**

Thus even though the CPA is a valuable tool that is used in South Africa, there are numerous potential downfalls for this particular assessment technique - the difficulty of administering and interpreting it as well as the expense involved in using it (Kitching, 2005). Furthermore, the extent to which the CPA provides distinct useful information is debatable as one's capacity for complexity might be reflected in other assessment techniques which are more accessible, easier to implement and not as costly. Organisations in South Africa could therefore potentially benefit from using

other techniques where practitioners do not need such extensive training and experience but are still able to assess ability to handle complexity sufficiently. On the other hand, if it can be shown that alternate assessments are not able to provide the same level of information, this would support the use of the CPA despite the cost involved, particularly given its psychometric and theoretical strengths.

This highlights the need to explore which other aspects of human functioning are related to the ability to handle complexity and which specific alternate available assessments might provide similar information. For the purpose of this research, two other assessment techniques will be analyzed in order to see if they have any association with the CPA based on their potential theoretical links to complexity, as well as their more practical administration for the South African context.

Leaders and managers have become a focal point for organisational literature and recent research focuses on specific traits which impact leadership emergence and, more specifically, on personality and intelligence (Reichard, Riggio, Guerin, Oliver, Gottfried & Gottfried, 2011). From a theoretical as well as a practical perspective, there are a variety of reasons why intelligence and/or personality could be expected to be related to leadership and one's capacity for handling complexity.

Intelligence

Intelligence is a concept of critical importance and the use of assessment techniques to measure intelligence has become a crucial element in technologically advanced countries around the world (Grieve & van Eeden, 2010). Intelligence can be defined as one's overarching capacity to act persistently and firmly, to think sensibly and realistically and to effectively deal with one's environment (Kaplan & Saccuzzo, 2008). This explanation appears to relate closely to how a person functions in the uncertain environment in which he or she operates (Kaplan & Saccuzzo, 2008). Theoretically, there is a solid foundation for relating intelligence to capacity for complexity.

Schmidt and Hunter (1998, as cited in Judge, Colbert & Ilies, 2004) found that intelligence was the strongest predictor of job performance, and that this was further emphasized in complex jobs, hence supporting the basis that leaders who possess

higher intellectual abilities are able to cope better with complexity. Locke (1999) explains that leaders need to be able to collect, assemble, and interpret vast quantities of information due to the complex environment in which they function, which requires leaders to possess strong cognitive abilities. Judge, Colbert and Ilies (2004, as cited in Reichard et al., 2011) explain that '…intelligence is important for leadership due to the following: (1) the complexity of the leadership position requires higher levels of intelligence, (2) intelligent leaders are better problem solvers, and (3) intelligent leaders are more creative and also motivate their followers to be more creative' (p.437). Upper level managers (leaders in this research) need to be able to strategise, solve problems, assist employees and constantly scan the environment for new developments and advancements - such responsibilities require specific intellectual functions which are often discovered via intelligence testing. For this reason, assessing intelligence may potentially prove to predict the same overall construct as the CPA.

Intelligence was defined by Wechsler (1958) as '…the aggregate or global capacity of a person to act purposefully, to think rationally, and to deal effectively with his environment' (p.7). Even though definitions of intelligence have over time been re-examined and re-conceptualised, this definition has become the predominantly accepted one and clearly indicates why intelligence, as the ability to deal with one's environment effectively, emerges as an important variable to consider in relation to the concept of complexity and the CPA (Coon, Mitterer, Brown, Malik & McKenzie, 2010).

Wechsler (1958) regarded intelligence as being made up of a variety of different elements that could each be defined and measured, but were simultaneously interrelated to one another (Kaplan & Saccuzzo, 2008). This understanding formed the basis for his assessment technique known as the Wechsler Adult Intelligence Scale, which is made up of a variety of elements which are each unique, but are combined to form an overall intelligence measure (Kaplan & Saccuzzo, 2008). 'Theoretically, by measuring each of the elements, one can measure general intelligence by summing the individuals' capacities on each element' (Kaplan & Saccuzzo, 2008, p.253).

Wechsler was not influenced by any assessment theory when he first introduced his scale; rather it was based on general theories of intelligence which drove him to formulate an adult measure of intelligence (Frank, 1986; Kaufman & Lichtenberger, 1999; Wechsler, 1958). Wechsler gained his knowledge to develop his own assessment via observing and examining other forms of intelligence assessments. He therefore did not offer any validation or justification for the use of his scales (Frank, 1986). Wechsler's view of intelligence and the underpinning of his assessment are therefore seen as being a more general approach to intelligence as viewed in everyday life (Aston, 2006). Furthermore, research conducted for the advancement of the third revision supported the idea that intelligence consists of more than simply verbal and performance factors (Leckliter, Matarazzo & Silverstein, 1986, as cited in Wechsler, 1997). Due to such beliefs, developers of the WAIS-III sought to improve the scale by adding new subtests to measure other contributing factors to intelligence. Even though the WAIS-III is to some extent perceived as lacking a strong theoretical foundation, it is still one of the most widely utilised intelligence measures internationally (Aston, 2006; Foxcroft & Aston, 2006; Silva, 2008). This is mainly due to research conducted using the WAIS-III which has shown highly successful results. The WAIS-III is even widely used in South Africa, although the context of the country plays a crucial role.

The context of South Africa plays a significant role in terms on intelligence testing. The first intelligence scale for adults in South Africa was the South African Wechsler-Bellevue Adult Intelligence Scale (SAW-B) but this intelligence assessment was poorly standardised (Grieve & Eeden, 2010; Kaplan & Saccuzzo, 2008). By 1955, Wechsler made revisions to this scale and created the Wechsler Adult Intelligent Scale (WAIS), followed by a range of revisions which eventually led to the WAIS-III version in 1997, which has become the most widely used intelligence assessment in South Africa (Grieve & Eeden, 2010; Kaplan & Saccuzzo, 2008). Even though the WAIS-III was originally developed in the United States in English, it has been adapted to appropriately fit the context of South Africa and since 1997 a newer version known as the WAIS-IV has also been formulated although this is not yet widely available (Foxcroft & Roodt, 2005). Therefore, for the purpose of this research intelligence was measured using the Wechsler Adult Intelligence Scale III (WAIS-III).

The WAIS-III is a one-on-one assessment that requires a skilled practitioner who allows the respondent to answer as many items as possible in the time allowed (Kline, 2003). The assessment is only complete once a certain number of items for each subtest have been incorrectly answered (Kline, 2003). The WAIS-III yields an overall score known as Full-scale IQ (FSIQ), which is broken down into subtests according to verbal IQ (VIQ) and performance IQ (PIQ) (Kline, 2003). The verbal subscale of the WAIS-III is made up of 1) vocabulary, 2) similarities, 3) information, 4) comprehension, 5) arithmetic, 6) digit span, and 7) letter number sequencing (Kaplan & Sarccuzzo, 2008). These seven subtests can be further categorised into the Verbal Comprehension Index (VCI) made up of the first four subtests listed, and the Working Memory Index (WMI) which is made up of the latter three (Kline, 2003).

For the VCI, the four subtests are unique. Vocabulary involves asking respondents to define given words, which is known to be one of the best measures of verbal performance as it is known to be the most stable element over time (Kaplan & Sacuzzo, 2008). It measures one's knowledge of words and how one conceptualises the understandings of different words (Reynolds & Kamphaus, 2003). Similarities involves asking a respondent to identify the similarities between fifteen paired items, which range in difficulty as more challenging examples require abstract thinking (Kaplan & Sacuzzo, 2008). This subtest requires that an individual points out the similarities between very dissimilar objects (Kaplan & Sacuzzo, 2008). Information is similar to general knowledge questions, asking respondents twenty-eight questions orally about historical people, events and places which measure long-term memory (Reynolds & Kamphaus, 2003). Comprehension consists of sixteen questions confronting problematic daily scenarios which require interpretation (Reynolds & Kamphaus, 2003). It therefore assesses an individual's common sense, verbal reasoning and abstract thinking (Reynolds & Kamphaus, 2003).

The WMI is made up of the last three verbal subtests, known as arithmetic, digit span, and letter number sequences. Arithmetic involves mathematical problems, requiring respondents to add or subtract based on a given arithmetic problem without the use of pencil or paper (Kaplan & Saccuzzo, 2008; Tulsky, 2003). Digit span requires a respondent to listen to a list of digits and repeat what has been told to them in a specific sequence (Reynolds & Kamphaus, 2003). Letter number sequencing requires

respondents to listen to a list of numbers and letters and repeat the numbers in ascending order and the letters in alphabetic order (Reynolds & Kamphaus, 2003).

The performance subtests of the WAIS-III are also further divided into two sub-indices known as the Perceptual Organisation Index (POI) and the Processing Speed Index (PSI). The POI is made up of picture completion, block design, and matrix reasoning (Kaplan & Saccuzzo, 2008). Picture completion is made up of an array of pictures that have parts missing and the respondent is given twenty seconds to identify what is missing - this measures individuals' visual perceptions (Tulsky, 2003). Block Design requires constructing actual three dimensional cube structures based on given two dimensional images on a stimulus card (Tulsky, 2003). Matrix reasoning consists of twenty-six different items which require the respondent to use problem solving and reasoning skills, as well as mental manipulations (Tulsky, 2003). This subtest requires that the respondent be able to approach the items in different ways in order to come to a conclusion (Tulsky, 2003).

The final two subtests, which form the PSI, are digit-symbol coding and symbol search (Kaplan & Saccuzzo, 2008). Digit symbol coding involves a set of numbers that are matched to a set of symbols and requires a respondent to associate numbers with the symbols and complete tasks based on the given coding (Tulsky, 2003). Symbol search presents the respondent with a set of paired groups, each pair being made up of a target group and a search group, whereby the examinee is asked to 'decide whether either of the target symbols is in the search group, a group of five search symbols' (Tulsky, 2003, p.84). This subtest examines how fast a person can process information (Tulsky, 2003).

Lastly, the WAIS-III does allow for a final optional choice between picture arrangement and object assembly based on the standardisation of the assessment. Picture arrangement involves a range of picture cards in a random order and requires the respondent to turn the cards into a chronological story (Tulsky, 2003). Object assembly involves putting puzzles together as quickly as possible and these are scored based on accuracy as well as speed (Tulsky, 2003).

Once the WAIS-III has been administered to a respondent and the practitioner has recorded all the answers as raw scores it is necessary for the scores to be converted into actual intelligence scores. Kline (2003) explains:

> *'Raw scores for each subtest are converted to standard scores… Once the subtests are standardized a table in the manual converts the verbal subtest scores into verbal IQ, the performance subtest scores into performance IQ, and all of the subtests scores into Full IQ… Research with these three IQ scores suggests that they do not adequately represent intelligence; instead, grouping the subtests differently into four indexes (verbal comprehension, perceptual organisation, working memory, and processing speed) has more empirical support' (p.321).*

Based on the above explanations of the different subscales and facets of the WAIS-III, practical links between such an assessment and the CPA seem evident. Firstly, the WAIS-III is made up of scales and subscales which are all centred on problem-solving and individuals' capabilities based on different groupings of items. Such scales are used in order to see a range of specific abilities, many of which can be linked to abilities assessed in the CPA.

Verbal abilities measure a persons' acquired knowledge, their verbal reasoning, verbal expression and fluency, and comprehension and proficiency of verbal information (Kaplan & Saccuzzo, 2008; Reynolds & Kamphaus, 2003). As verbal performance encompasses these aspects, it is likely that a person who scores high on verbal performance is likely to do better when undergoing the CPA because their verbal skills enable them to confront the assessment more proficiently and communicate with the interviewer using language to express their knowledge, experience and discretion in the best way possible. More specifically, subscales such as Similarities and Comprehension require a respondent to apply their abstract thinking, common sense and verbal reasoning skills in order to respond to the best of their ability (Kaplan & Saccuzzo, 2008; Reynolds & Kamphaus, 2003). Comprehension requires a person to confront a problematic daily scenario which needs to be interpreted and solved in the most fitting way which links directly to the idea of managers needing to be able to cope with complexity and uncertainty daily as best as they possibly can (Reynolds & Kamphaus, 2003). Information requires an individual to recall previously attained knowledge, which managers would need to be able to do in order to make effective judgements on current problems. Digit Span involves attention span and

concentration, which managers need in order to be mentally alert for tasks they have to complete; they also often have to undertake multiple tasks at once. Even though Arithmetic appears to be purely about numerical abilities, such skills are necessary for managers as they often need to analyse information and use their judgement and discretion in order to make a decisions, which is likely to result in increased profitability for the organisation.

The Performance subtests of the WAIS-III are focused on spatial processing, attention to detail and visual-motor integration and are therefore quite different to the verbal measures, especially in relation to the CPA (Kaplan & Saccuzzo, 2008; Tulsky, 2003). In terms of the performance subtests, a respondent needs to tackle the POI subtests by confronting the items in a variety of ways in order to come to the best conclusion possible (Tulsky, 2003). Environments of rapid and unpredictable change call for managers to rely on their own judgement and discretion in order to choose the most appropriate course of action as 'right' or 'wrong' is simply unknown. Therefore, an individual who is able to continuously approach these items in the WAIS-III in diverse ways and with an assortment of strategies is likely to be someone who possesses the capacity to handle the intricacies of complexity measured by the CPA. The PSI, on the other hand, allows the interviewer to assess how fast a person can process information (Tulsky, 2003), which is a skill that managers require as they are bombarded with information that needs to be incorporated when making decisions and functioning on a daily basis.

The WAIS-III is based on extensive research, and its psychometric properties are very sound (Reynolds & Kamphaus, 2003). It would therefore seem practical and sensible to potentially use the WAIS-III instead of the CPA if the WAIS-III could yield similar information. Apart from the WAIS-III being based on research with sound psychometric properties, it is also widely used in South Africa and it is not as costly or as difficult to implement as the CPA (although its shortcomings in the context of South Africa also need to be addressed). Therefore, one of the questions this research intends to explore is whether intelligence, as measured by the WAIS-III, is associated with or potentially predicts one's capacity for handling complexity, as measured by the CPA.

The WAIS-III in South Africa

Despite its potential for being used in place of the CPA if it should be related, the WAIS-III does have certain problems when utilised in the South African context that should be acknowledged. The primary reason for needing to adapt the WAIS-III for the South African context is that items need to be added or adapted in order for the measurement to be more appropriate for the context of South Africa, and also to '…develop norms for English-speaking South Africans from the four main cultural groups, namely, blacks, coloureds, Indians, and whites' (Foxcroft & Aston, 2006, p.98).

In South Africa there are eleven official languages - English, Afrikaans and nine African languages such as IsiZulu, Sesotho and Setswana. Language in South Africa plays a vital part in daily life, in that most children are taught in their home language until Grade Four and then generally learn in English. In business and industry, however, English is the by far the most predominant language. When trying to apply language to the WAIS-III in South Africa a complex debate arises. Koch (2005, as cited in Foxcroft & Aston, 2006) explains that many psychologists believe that the WAIS-III should be in English regardless of whether it is a first or second language, as respondents should be able to display their abilities on a test based on the language that they will use in the workplace. However, this brings about many issues as it implies scores can be compared across language groups and ignores that English-speaking people are likely to perform better. Aston (2006, as cited in Foxcroft & Aston, 2006) found that IsiXhosa and Afrikaans-speaking respondents found instructions confusing for many of the subtests of the WAIS-III which impacted on their approach to answering the subtests and hence their scoring, which did not accurately reflect their ability.

Furthermore, education has been identified as another factor affecting performance scores on the WAIS-III, as it is linked to language and culture. Work by Shuttleworth-Edwards, Kemp, Rust, Muirhead, Hartman and Radloff (2004) showed that English first language speakers obtained higher IQ scores for Full Scale IQ, Verbal IQ, and Performance IQ. Similarly, Foxcroft and Aston (2006) found differences between English first-language speakers on Verbal IQ and Full Scale IQ. Based on such research, there is a possibility that the WAIS-III scores for English speakers might

differ from those of other languages and this needs to be taken into consideration when analyzing results from the WAIS-III.

Despite these problems, the WAIS-III provides psychometrically sound verbal, performance and overall intelligent quotient scores for an individual. Furthermore, this version of the scale is praised for its 'ease of administration and … psychometric excellence in norming, reliability, and validity studies' (Richard & Huprich, 2009, p.59). If the WAIS-III is found to be associated with and able to potentially predict CPA scores, it could enable organisations to use the WAIS-III instead of the CPA, which would be more cost and time effective for South African organisations, hence the first research question of this study.

Measuring intelligence on its own, however, might not be sufficient or fully reflect all aspects of an individual's capacity for handling complexity. Due to this, personality will be examined as well in order to see whether there are any other individual factors which illustrate one's complexity capabilities.

Personality

Personality is another individual trait which appears to have a strong theoretical link to capacity for complexity. The term personality has been coined by psychologists for approximately a century. Due to the vast amount of research and literature based on different approaches to personality, defining it in one sentence is close to impossible. Traditional approaches range from psychoanalytic, trait and biological to humanistic, behavioural and cognitive perspectives (Burger, 2010). This array of approaches view personality as being based upon and influenced by different factors, hence they do not all agree on one definition but do concur that personality is '…consistent behaviour patterns and intrapersonal processes originating within the individual' (Burger, 2010, p. 16). This explanation makes it apparent that, regardless of the view from which personality is being looked at, it is unique to an individual, and the interaction of an individual's personality and the environment is also unique (Vogt, 2008).

Initially, the structure of personality was studied via the lexical approach whereby researchers created extremely dense lists of terms (sometimes up to 18000) that they believed represented different factors of personality (Vogt, 2008). This approach

formed the foundation for research such as that carried out by Allport and Cattell, who began to create their personality models which laid the path for numerous personality assessments to be formed (Vogt, 2008).

Lanyon and Goodstein (1997) explain that personality assessments are '…the process of gathering and organizing information about another person in the expectation that this information will lead to a better understanding of the person. Understanding the personality of another individual typically involves making some rather specific predictions about the future behaviour of that person…' (p.49). One very important aspect of personality assessments is making sure the best technique is implemented in order to arrive at the outcome needed (Weiner & Greene, 2008). Today, there are numerous personality instruments used such as the 16 Personality Factors, the NEO-PI-R, and the MMPI.

Personality measures are frequently used to make person-environment fit decisions (Foxcroft & Roodt, 2005). Foxcroft and Roodt (2005) explain that personality assessments are used '…to identify an individual's salient personality characteristics and to match these characteristics to the requirements of occupations' (p.171). Therefore, personality traits can be used to reveal stable tendencies to behave in particular ways (Foxcroft & Roodt, 2005). An individual's capacity for handling complexity could also potentially be linked to their personality, as personality affects how a person makes decisions and behaves in general (Vogt, 2008). Personality traits (mainly via the Five Factor Model) have been explored in relation to specific leadership theories such as transformational leadership, and certain traits have been found to better predictors of leaders than others (Barrick & Mount, 1991; Judge & Bono, 2000; Kirkpatrick & Locke, 1991). For the purpose of this research, leaders who are upper level managers will be assessed in order to see whether they have specific capabilities to handle the unstable environment in which they operate. Therefore, it appears to be very sensible to assess whether personality predicts similar outcomes as the CPA, as individuals who can cope with complexity are likely to possess specific traits which allow them to function effectively.

Unlike most studies which emphasize the use of the Five Factor Model, this study will use the California Psychological Inventory (CPI) which is an objective measure of

personality in managers. This is a theoretical model and not a classic model as it assesses organisational personalities by providing a representation of the individual on both a professional and personal level (Weiner & Greene, 2008). The motivation behind using the CPI in this study is because it is a personality model which is specifically suited to organisational contexts as it takes work and the ways people tackle their tasks at work into consideration (Donnay & Elliot, 2003). This is unlike the other personality models which are more general and rather give a clinical basis to the different personality characteristics.

More specifically, the CPI will be used in order to see if any of the twenty subscales of personality it assesses are related to one's capacity for complexity, which is likely as certain personality factors enable individuals to function better under extremely uncertain circumstances. Again, identifying specific personality factors associated with capacity for complexity may allow for specific subscales of the CPI to be used in place of the CPA. This assessment is not widely used in South Africa, and therefore exploring it using a South African sample may provide insight into this specific context of use. Similarly to the WAIS-III, the CPI is a standard psychometric assessment that would be easier and more cost-effective to administer.

The original construction of the CPI was carried out by Harrison Gough in 1951, who initially contributed to subscales in the MMPI (Donnay & Elliot, 2003). Due to extensive revision and re-working, the CPI used in this research is made up of four hundred and thirty-four items based on work by Gough (1987, as cited in Gough, 2000). This inventory is based on what Gough called 'folk concepts' which he believed are human qualities that all people can describe in their own language (Boyle, Matthews & Saklofske, 2008). The twenty folk concepts are: Dominance; Capacity for Status; Sociability; Social Presence; Self Acceptance; Independence; Empathy; Responsibility; Socialisation; Self-control; Good Impression; Communality; Well-being; Tolerance; Achievement via Conformance; Achievement via Independence; Intellectual Efficiency; Psychological Mindedness; Flexibility; and Femininity/Masculinity (Boyle et al., 2008).

These twenty folk concepts are grouped into four broad dimensions (please refer to Table 3 below for more information). The first dimension focuses on self confidence

and social effectiveness, and is called interpersonal style (Gough & Cook, 1996). The second dimension focuses on socialisation, responsibility, maturity and self-control and is classified as personal values and social judgement (Gough & Cook, 1996). The third dimension focuses on issues related to achievement-oriented behaviour and intellectual efficiency and is classified as achievement and thinking (Gough & Cook, 1996). Lastly the forth dimension focuses on conceptual and intellectual styles and is known as role preference (Gough & Cook, 1996). Table 3 below describes each of the folk concepts and also classifies them into the four different dimensions.

*Table 3: The CPI Folk Concepts and Dimensions*

| **The Four Dimensions** | **Brief Descriptions of the 20 Folk Concepts** |
|---|---|
| Interpersonal Styles | **Dominance (Do):** how comfortable with, having a preference for, and taking charge of people and things a person is able |
| | **Capacity for Status (Cs):** how much an individual desires a high status and hence being ambitious |
| | **Socialabiltiy (Sy):** how a person seeks and enjoys interactions with others |
| | **Social Presence (Sp):** how comfortable a person is being the centre of attention in social gatherings |
| | **Self Acceptance (Sa):** how confident a person is in their choice of decision making, and how well they are able to assert their point of view |
| | **Independence (In):** how self sufficient without needing to rely on others for help or support |
| | **Empathy (Em):** how warm and empathetic a person is towards others |
| Personal Values and Social Judgment | **Responsibility (Re):** how persistent an individual is, even when faced with unstimulating tasks which result in no personal gain |
| | **Socialisation (So):** how a person functions under authority. High scores imply a person conforms to rules and norms, whereas low scores imply finding it difficult to stick to strict regulations |
| | **Self Control (Sc):** how impulsive a person is, and whether they |

| | |
|---|---|
| | consider their actions before carrying them out |
| | **Good Impression (Gi):** how an individual takes care and monitors their own behaviour in order to make a good impression on others |
| | **Communality (Cm):** how conventional a person is. High scores imply a person does not see themselves as different, whereas low scores display a person sees themselves as being different |
| | **Well-being (Wb):** how happy or the extent of their wellbeing |
| | **Tolerance (To):** how open minded towards others, and is accepting of others in a positive way |
| Achievement and Thinking | **Achievement via Conformance (Ac):** how well a person performs in a structured environment |
| | **Achievement via Independence (Ai):** how well a person can perform in an unstructured setting where they need to show independence |
| | **Intellectual Efficiency (Ie):** how a person uses their intelligence, and whether it is in an efficient way or not |
| Role Preference | **Psychological Mindedness (Py):** how well a person is able to view behaviours and actions of others with a psychological eye and understanding |
| | **Flexibility (Fx):** how comfortable a person is with ambiguity and complexity |
| | **Feminity/Masculinty (F/M):** how feminine or masculine a person is; high scores imply one is sensitive, whereas low scores imply one is more tough-minded |

*(taken from Gough & Cook, 1996)*

Of the twenty CPI scales there are validity scales in the CPI which assess faking good (Good Impression), faking bad (Wellbeing), and the degree to which answers are random (Communality) (Groth-Marnat, 2009; Van Hutton, 1990). An individual's responses and overall profile are called into question if there is a deviation on one of the three validity scales (Van Hutton, 1990). Therefore, the length of the CPI is beneficial in that faking answers becomes more difficult, particularly since each item loads on two or three scales (S.A.B., 2006).

In addition to the folk concepts and the four dimensions, using a factor analysis Gough found two overarching factors: 1) interpersonal behaviour and style, and 2) intrapersonal values and beliefs (Gough & Cook, 1996). Based on these two main factors, Gough created vector scales where the x-axis represents vector one, which classifies a person based on internality versus externality (how extraverted or introverted they are), and the y-axis represents vector two, which classifies a person in terms of norm-favouring or norm-doubting (based on a person's level of social conformity, self-control, and discipline) (Boyle et al., 2008). The purpose of this vector is to create a graph made up of an x and y axis, and classify an individual into one of the four quadrants (Boyle et al., 2008). Each quadrant represents one of four broad personality types outlined by Gough, which he called Alpha, Beta, Gamma, and Delta – where each is given a vector rating out of seven which shows their optimal or minimal development (Boyle et al., 2008).

Alpha type personalities can be classified as people who are interpersonally oriented, task focused, productive and hence ambitious (Gough, 2000). They have an overarching view that societal norms are important to follow and therefore they take responsibility for leading or managing other people (Gough, 2000). Betas, on the other hand, are more introverted and prefer privacy and they seldom question norms or values imposed by society (Gough, 2000). This implies that they would be better followers but are still extremely dependable and reliable, and are able to put others first. Gammas are interpersonally focused and yet appear to make judgements with mainly themselves in mind as they are unable to put others first like Betas (Gough, 2000). They also often question traditional norms and values. Deltas, like Betas, are internally focused and choose to keep their goals or future intentions to themselves (Gough, 2000). They might be seen as detached and do not enjoy attention and therefore often go unnoticed (Gough, 2000). It must be made clear that these descriptions form a very basic understanding of the different personality types, and that because each type has a potential for self realisation that none are more important than any other (Gough, 2000).

The potential for realisation is illustrated via a third and final vector. This is represented by the x-axis and y-axis which range from one to seven, where one means a person has a very poor realisation of their personal attainment and personal type,

and where seven means a person has a superior understanding of what they have achieved and who they are (Boyle et al., 2008). Therefore each different personality type has an optimal or minimal functioning where an individual either displays advanced functioning due to such realisation or the opposite. Based on the numerous scales and vectors in the CPI, much research has been done in terms of its validity.

Numerous studies have been done in order to assess the relationship between test scores of the CPI and measures of criterion work performance (hence concurrent validity research). Fussey and Cook (1990) did a small study on thirty participants which showed that a relationship between CPI scale scores and rating of leadership and overall performance existed. On a much larger scale, Gough (1990) carried out a study on a sample of seven thousand three hundred and thirty-one managers undergoing a leadership development programme in order to find out if the CPI predicted leadership potential. This research found that managers who had high scores of leadership had higher scores than the general population for scales of dominance, sociability, self acceptance, independence and empathy (Gough, 1990). Gough and Bradley (1992) used the CPI to identify both delinquent and criminal behaviour. In their research Gough and Bradley (1992) compared six hundred and seventy-two delinquent and criminal men and woman to a control of over three thousand people. It was found that a portion of the sample had correlations between socialisation and delinquent or criminal behaviour.

In another study by Jacobs (1992), entry level managers were given the CPI during a three-day assessment process. This study focused on assessing predictive validity of the CPI as it was longitudinal and thirteen years later seventy people from the original sample gave information regarding their current careers (Jacobs, 1992). Based on the data gathered, it was found that the CPI was the single best measure employed, as some of the scales predicted levels of management success much better than other assessment techniques used such as cognitive ability tests (Jacobs, 1992).

Based on previous research, it is apparent that CPI can be used in different fields and that it is useful in predicting a variety of variables. When looking at using the CPI to explain managers' and leaders' roles, Bass and Bass (2008) explain that leaders in terms of the CPI appear to be extroverts and are also 'ambitious, enterprising and

resolute… and [are accepting of] norms' (p.36). This implies that leaders or managers are likely to posses a variety of folk concepts, some in high levels and others in low levels. To explore whether this model of personality is associated with capacity to handle complexity, it is necessary to look at which folk concepts could practically relate to the idea of complexity.

Of the twenty folk concepts, flexibility appears to be the most likely concept to relate to complexity, as this concept classifies how comfortable a person is in functioning in highly ambiguous and uncertain environments (Gough, 1996). Hence, people who possess high levels of flexibility should be those who have higher capacities to handle complexity as they function well with instability and vagueness. Apart from the most obvious of concepts, low scores on responsibility and socialisation might be linked to capacity for complexity. This is because individuals who posses low levels of such concepts are those who seek exciting and new interests, who are not willing to follow mundane tasks or chores, who resist structures and rules, and who are less disciplined and organised, and hence might be able to adapt quickly to changing circumstances (Groth-Marnat, 2009). Those who posses high responsibility and high achievement for conformance, however, are those who prefer structure and working according to specific plans or guidelines (Groth-Marnat, 2009). Such individuals may not be able to cope as well with uncertainty and instability, as they are reliant on structure to guide them. Furthermore, individuals who posses high achievement for independence are those who thrive in environments that are uncertain, and are able to take control and work independently even when things are unknown (Gough, 2000). Furthermore, individuals who display low levels of dominance and high good impression are people who might be well liked by others but are sometimes unable to take responsibility and face challenges head on (Groth-Marnat, 2009).

Based on the above, it is evident that there is potential for at least some of the CPI scales to relate to the CPA. If this research establishes a relationship between the CPI scales and the CPA, it could be useful as it would allow organisations to assess specific individual qualities that relate to one's capacity for managing complexity, and hence the CPI could possibly be used in place of the CPA. The importance of this is that it may assist organisations to recruit managers who possess qualities which link to the ability to handle complexity, as well as outline certain qualities which could better

training and development of their current employees. However, if no relationship is established this research could still be useful as it would suggest that the CPI and CPA assess separate aspects of corporate functioning and therefore organisations need to include both types of assessment.

The Current Study

Investigating whether personality and/or intelligence is associated with one's capacity for complexity could provide both researchers and practitioners with highly useful information for the purpose of recruitment, selection, training, and development; and understanding based on empirical evidence regarding which facets of the three assessments are directly related. If the two concepts are associated with the CPA, organisations would be able to predict capacity for complexity without having to directly measure this using the CPA, but rather using the CPI and/or the WAIS-III instead. Moreover, the study hopes to establish to what extent the CPA provides any information that is markedly different to or distinct from what can be measured by the WAIS-III and/or the CPI. If the two concepts provide little overlapping information or are not predictive, this would provide additional support for the use of the CPA in the South African context despite its cost and lack of practicality and add to the growing body of evidence supporting its psychometric and theoretical validity. Based on this, this study will explore the nature of the relationship between scores on the CPA, CPI and WAIS-III, as well as the theoretical links between capacity for complexity, personality and intelligence. It will also aim to establish to what extent intelligence and/or personality scores can be used to predict capacity to handle complexity.

# CHAPTER THEE:
# Methodology

This chapter provides information on the methods used in order to find answers for the proposed questions. It includes information on: the research design, sample, instruments used, procedure, ethics, and data analysis.

## Research Design

The study was based on archival data. Archival data is operational data that has been obtained and stored in a database that can be accessed if needed (Olsen, 2008). Using archival data has a variety of advantages and disadvantages which need to be explored. On one hand, archival data is easy to obtain, cost effective, typically much larger thereby allowing for newer and more complex statistics, and organisations are often more opened-minded about sharing existing data than allowing individuals to collect new data (Shultz, Hoffman & Reiter-Palmon, 2001). On the other hand, archival data can create many challenges for the researchers utilising it. Researchers do not have any control over how the data was collected and therefore have to rely on others who collected the data for it to be accurate and complete (Jex & Britt, 2008). Furthermore, it is often difficult to gauge the quality of the data and detecting errors can be highly complex (Shultz et al., 2001). Such shortcomings are relevant for this research as the reliance on others to collect the data resulted in a lack of demographic details which could have provided insight into the results attained in relation to gender, race, education, qualifications and income earning ability. In addition, information provided in the archival database was based on interpretation by those who administered the assessments, which could have potentially impacted on those undergoing the testing, however no definite information about those who administered the tests was provided. Despite this, Shultz et al. (2001) explain that what is most important is '…the quality of the research questions, and the ability of the data to answer those questions... Hence, I-O researchers may not need to collect new data to answer important research questions if existing data are available to do so' (p.35). Therefore even though certain information was lacking in relation to archival data which could have been valuable, what was most important was that the data obtained could be used to answer the proposed core research questions.

Due to the study being based on archival data, it was quantitative, correlational, cross-sectional and non-experimental in design as there was no manipulation of the variables, no control group and no random assignment (Leedy, 1989). It must be noted that non-experimental research involves no manipulation whatsoever but rather looks at assessing the relationships between variables (Leedy, 1989). Non-experimental research, like any other research design, presents one with different strengths and weaknesses. The advantages of non-experimental research are that it is a method that is both cost and time-effective for obtaining data and results, as well being a straightforward means for a researcher to complete their research (Leedy, 1989). The disadvantages include: no control group, which means that research only allows a potential relationship or prediction to be seen; no manipulation of the variables, which means that direction cannot be well established; and, lastly, no random assignment, which means that non-spuriousness cannot be established and hence there is a potential for internal validity threats (Leedy, 1989). Based on these three disadvantages it is evident that causal inferences cannot be made, which is probably the greatest disadvantage of non-experimental research (Leedy, 1989).

Sample

The study was conducted using archival data obtained from a sample of 315 managers from a large, international manufacturing organisation situated in South Africa. However, the original database contained incorrect coding procedures and incomplete archives for 49 of the result sets provided. These were removed in full from the sample in order to ensure accuracy and hence the final sample size used was 266.

This sample was a non-probability purposive sample (Babbie, 2008), as current employees of the organisation had already completed assessments which included the CPA, the WAIS-III and CPI. These employees gave permission to the company to store their scores in an archival database, and furthermore the company gave permission to access their archival data. Records in the database which were complete and accurate were used for the purpose of this research. Unfortunately specific demographic information regarding the managers, such as race, gender, ethnicity and educational background, was not captured as part of the archival data, which constituted a major limitation of the current research. However, discussions with the

company indicated that the pool of managers employed by them generally were reasonably diverse in terms of these characteristics.

Instruments: Psychometric Properties

All three instruments were administered as per the recommended guidelines by a qualified psychometric tester within the context of a larger assessment conducted for each manager. The number of different testers was not recorded in the data provided. Additionally, the CPA is a verbal interview heavily reliant on interpretation and hence the tester is likely to impact the individual undergoing such an assessment, yet no information about the testers was attained.

Unfortunately due to the lack of demographic information and detail available it was not possible to examine the psychometric properties of the CPA, CPI or WAIS within the context of the current study. Thus the utility of the instruments for measuring the constructs they purport to measure in a consistent manner can only be judged based on previously available data about the psychometric properties of each. The need for assessing such properties is based on the requirements laid out by the South African Employment Equity Act, which specifies that the three most important characteristics in relation to any assessment device are adequate reliability, validity, and a lack of bias (Nel, Swanepoel, Kirsten, & Erasmus, 2005). The Act also highlights that the procedures used also have to be fair whereby fairness refers to the need for the device to comply with the three requirements (Nel et al., 2005).

Reliability and validity of an instrument are vital aspects of assessments as they allow a researcher to know whether the instrument being used measures what it claims to measure, and whether it is relatively free from measurement errors (Leong & Austin, 2006). Reliability is about the consistency of measurement of an instrument which can be established with different forms such as test-retest reliability, spilt-half reliability, and internal consistency reliability (Mauer, 2000). These techniques result in an estimate as a correlation coefficient ranging from 0 to 1, whereby 0.70 is usually acceptable but in essence it depends on what the test is measuring (Leong & Austin, 2006). An instrument should, wherever it possibly can, demonstrate all three of the main forms of reliability (Mauer, 2000).

Validity outlines whether a test measures what it is supposed to measure (Leong & Austin, 2006). Concurrent and predictive validity are both forms of criterion-related validity, which look at whether the scores taken at one point in time reflect or predict what they claim to predict at a later stage (Leong & Austin, 2006). Construct validity seeks to establish the strength and direction of the relationships between variables (Mauer, 2000). Face validity addresses to what extent an instrument appears to measure what it is intended to measure (Mauer, 2000). The different forms of validity are important as they give insight into whether a test actually measures what it claims to measure.

Demographics

In terms of demographic details about each participant, the database only provided the age of the managers; no other demographics were made available.

Career Path Appreciation (CPA)

The Career Path Appreciation (CPA) focuses on three main aspects of career pathing, known as capability (current level), mode (understanding where future potential lies), and style (individual approach to work) (Stamp, 1989). The CPA assessment consists of a one-on-one interview lasting approximately two to three hours. Stamp & Stamp (1993) describe the interview as being divided into four parts: phase cards, symbol cards, history of working life and feedback. There are nine sets of phrase cards, each possessing six phrases which are used to find out how a person confronts their work (Stamp & Stamp, 1993). The symbol cards give the participant a task to complete and allow the practitioner to watch how they actually perform the task (Stamp & Stamp, 1993). The third aspect entails the practitioner listening carefully to a detailed work history of the participants, including how they approach their work regularly and what their future work goals and plans are (Stamp & Stamp, 1993). Lastly, feedback involves giving an initial understanding of the participant, followed by a full report later compiled and sent to them (Stamp & Stamp, 1993). This helps the participant and the practitioner to gain a deeper understanding and analysis of their working life, often in a way the participant has never seen before (Stamp & Stamp, 1993).

CPA: Reliability, Validity and the South African Context

Establishing whether the CPA is a reliable assessment technique is extremely important as it forms one of the major aspects of this research. Even though establishing reliability based on the specific archival data used was not possible, looking at previous research which does so is greatly valuable. Inter-rater reliability can be seen as one of the best forms of reliability for the CPA based on its complex format. Extensive research carried out on US Army soldiers found coefficients ranging between 0.79 and 0.81 (Lewis, 1993). Such reliability scores can be considered extremely high based on the complexity of the scoring procedure that is used for the CPA (Lewis, 1993). Other research conducted by Rossan and Topham (1996) entailed using the percentage of agreement between judges as a means for establishing inter-rater reliability. It was found that the 'mean absolute agreements for current level of work was 95%, 90% for current level of capability, and 94% for likely growth capability' (Lewis, 1993, as cited in Mauer, 2000, p.1). Furthermore, in a study based on 74 CPA protocols for workers in Botswana '…a 100% agreement in mode placement was found between two raters… Taking the inter-mode placements into account, the percentage agreement was 91%...' (BIOSS, 2007, p. 158). Test-retest reliability refers to repeating the same test at a different time and attaining the same results (Anastasi, 1988). The CPA has been administered to various groups of people either twice or a third time across the world, as well as in South Africa. Such reliability co-efficients have ranged between 0.71 and 0.95 (BIOSS, 2005). BIOSS (2005) explains that there is more than a sufficient amount of research on the CPA which proves high inter-rater and test re-test reliability.

One of the ways used to establish internal consistency reliability for the CPA is to use each of the nine sets of cards as if they were items in order to estimate Cronbach's Alpha Coefficient. Mauer (2000) explains that research was conducted in South Africa on a sample of 420 individuals who had completed the CPA over a five-year time span. Participants included individuals from the Public Service, banking, transportation, manufacturing and commerce; and their ages ranged from 22 to 63 years (mean 15.45, standard deviation 8.75). The resulting Cronbach Alpha coefficient for internal consistency reliability was 0.89 when all sets of cards were taken in consideration, which is very high (Mauer, 2000).

Predictive validity studies have also been conducted in order to assess whether CPA scores relate to one's actual level of current performance (Leong & Austin, 2006). This was validated in two studies for the CPA, which obtained validity coefficients of 0.71 and 0.79, both being acceptable (Kitching, 2005). This was also investigated in a study based on two British companies and one South African company which was composed of 362 individuals – males and females both black and white (Bioss, 2007). The study was conducted in 1985 and again 4 to 15 years later, whereby a correlation coefficient of 0.89 was attained between the level predicted by the CPA and the actual level achieved. The results proved to be very high, hence confirming predictive validity (Bioss, 2007).

Research conducted by McIntrye, Jordan, Mergen, Hamill and Jacobs (1993) on a sample of 286 graduates between the ages of 18 and 61 sought to explore construct validity, and hence the relationships between the CPA curves and a vast range of variables. Significant correlations were found between the CPA and creativity (0.69); intelligence (0.35); problem solving ability (0.26); the NEO-PI-R neuroticism scale (-0.35); the NEO-PI-R openness scale (0.22); MBTI intuiting (0.27); and MBTI perceiving (0.29).

An important aspect of validity of the CPA for this study is its use in South Africa. Studies done in other countries have claimed that there are no differences between genders, races and education levels in terms of CPA results (Mauer, 1997, as cited in Kitching, 2005). BIOSS (2007) outlines studies conducted in South Africa which help to establish a lack of bias. In one study conducted on 8054 workers, no differences between gender or race groups on the CPA Modes were found (BIOSS, 2007). Another South African study of 486 managers indicated no differences between race groups and gender on CPA scores (BIOSS, 2007). Unfortunately further details on these studies are not provided by BIOSS (2007). Kitching (2005) explored the use of CPA in South Africa and looked at how the outcomes of the CPA differed between employees from different cultural backgrounds. Kitching (2005) found no significant differences in genders, population groups and occupational levels and hence concluded that the CPA was relatively culturally unbiased. The work of Kitching (2005) has shown that 'there is no reason to believe that this instrument disrespects cultural diversity and that it is in conflict with assessment standards' (p.51).

These studies provide evidence that the CPA appears to be a culturally fair instrument as it does not discriminate between gender, race, or culture (BIOSS, 2005). Futhermore, there is a plethora of evidence of good internal consistency reliability, inter-rater reliability, and construct, concurrent and predictive validity. Even though the majority of the results are based on studies from around the world, BIOSS (2005) explains that the CPA has been proven to be reliable and valid in the Southern African region.

The Wechsler Adult Intelligence Scale III (WAIS-III)

The Wechsler Adult Intelligence Scale III (WAIS-III) is a one-on-one, verbally-administered assessment used to measure intelligence. As previously discussed, the WAIS-III is broken down into three main IQ scores - Full Scale IQ (FSIQ), Verbal Intelligence IQ (VIQ), and Performance Intelligence IQ (PIQ) – these are obtained from completion of between eleven and thirteen subtests. Furthermore, the VIQ and the PIQ can be further divided into four indices. VIQ is divided into the Verbal Comprehension Index (VIQ) and the Working Memory Index (WMI) and PIQ is further divided into the Perceptual Organisation Index (POI) and the Processing Speed Index (PSI). These four indices constitute subcategories of Verbal and Performance IQ and are made up of a set of subtests; however standardisation of the WAIS-III for the context of South Africa has had a vital role in dictating which subtests are included and which are excluded in any given assessment.

Firstly, in terms of VIQ, the WAIS-III in South Africa does not typically include the vocabulary subtest which forms part of the VCI. The main reason behind excluding this subtest is due to South Africa being a highly diversified nation whereby numerous languages and cultures impact on this subtest specifically (Stewart, 2008). Research in South Africa has shown that vocabulary has lower correlations with overall Verbal IQ, and that vocabulary showed significant racial differences due to the vast majority of South Africans not speaking English as a first language (Stewart, 2008). Secondly, in terms of PIQ, the WAIS-III does allow for a choice between using picture arrangement and object assembly. Again, research has shown that object assembly has a lower correlation with overall IQ, and, again, that there are vast gaps between racial groups' means. Therefore, picture arrangement is used instead of object assembly.

This means that the VIQ subscale is made up of the information, similarities, and comprehension subtests (forming the VCI); and the arithmetic, digit-span, and letter-number frequencing subtests (forming the WMI). The PIQ is made up of the picture completion, block design and matrix reasoning subtests (forming the POI); and lastly the digit symbol coding, symbol search, and picture arrangement subtests (forming the PSI).

The WAIS-III: Reliability, Validity and the South African Context

Wechsler (1997) closely assessed the accuracy, regularity and consistency of the WAIS-III (Anastasi & Urbina, 1997). One of the major purposes of the revision of the WAIS-R (which preceded the WAIS-III) was to increase the content validity of the scale. Therefore the revision was based on the thematic content of the subtests and their items, whereby developers successfully achieved greater content validity in the WAIS-III (Wechsler, 1997). Concurrent validity assesses the WAIS-III in comparison to other intelligence assessments. Correlations between WAIS-III and WAIS-R ranged from 0.76 to 0.90 for the verbal subtests; 0.50 to 0.77 for the performance subtests; and 0.93 to 0.94 for IQ scores (Wechsler, 1997). Correlations between the WAIS-III IQ scores and the Stanford-Binet Intelligence Scale Fourth Edition ranged from 0.78 to 0.89 (Wechsler, 1997). These high correlations are indicative of good overall concurrent validity.

When utilising an intelligence scale, there are cautions for applying predictive validity. Intelligence is not a stable construct and can change and develop over time which explains why the WAIS-III has not undergone predictive validity testing (Santrock, 2005). The main reason behind this is the vulnerability to its capacity to predict what future states of intelligence may be as well as other outcomes related to intelligent behaviour.

Test-retest reliability which assesses whether an individual scores the same if the test is administered twice, was reported based on two age categories, from 25-34 and from 45-54 (Leong & Austin, 2006). These reliability coefficients ranged from 0.67 to 0.94. The 0.67 reliability coefficient was for the object assembly subtest for ages

ranging from 45-54 and the 0.94 was for the information subtest for the age group 45-54. Full Scale IQ had a reliability coefficient of 0.95 for the age category of 25-34, and 0.96 for the age category 45-54. VIQ had a reliability coefficient of 0.94 for ages 25-34, and 0.97 for ages 45-54. PIQ had a reliability coefficient of 0.89 for ages 25-34, and 0.90 for ages 45-54. Average subtest reliability scores range from 0.70 to 0.93 (Wechsler, 1997). The reliabilities on the WAIS-III indicated a marked improvement from reliabilities found when validating the WAIS-R (Wechsler, 1997).

Other published work, such as that of Kaufman and Lichtenberger (2006), outlines test-retest and split-half reliability for each of the subtests and each of the indexes, as well as the three overall IQ scores (please refer to Table 4 in Appendix A). Based on the reliability coefficients, it appears that reliability of the scales varies, ranging from 0.69 (picture arrangement) to 0.98 (performance IQ). Based on the values of these coefficients, it appears that all the subtests are acceptable and that some are extremely satisfactory as they are higher than 0.80 (Leong & Austin, 2006).

In South Africa bias is often questioned in relation to psychological assessments due mainly to the potential variances in performance from test-takers who have the same ability but who come from different ethnic, national, gender, cultural, age or religious groups (Aston, 2006). Therefore one of the main aims of the WAIS-III was to eliminate any potential biases that were present in the WAIS-R. Items which were perceived as biased were either revised or removed in order to ensure better construct validity within the subtests and overall scale (Wechsler, 1997). Furthermore, the development of appropriate and rigorous norms contributes to the fairness of the scale and indicates its ability to assess a variety of cultural, educational and age groups. The WAIS-III is available in different languages in different countries around the world, including an array of African languages in South Africa. Even though the standardization process of the WAIS-III did not account for religion which could impact negatively on test scores when the test is applied in countries that have very different religious beliefs and values to that of America, the scale has been objectively and fairly modified to match the needs of the diverse cultures in which it is utilised (Silva, 2008; Wechsler, 1997). The WAIS-III is widely used throughout South Africa where examiners need to be aware that individuals who have had less exposure to psychometric evaluations may perform lower on the WAIS-III, which should not

result in a biased view of their intellectual capacity (Aston, 2006). With this said, the WAIS-III is seen as an extremely valuable tool for assessing different employees for a range of different needs.

The California Psychological Inventory (CPI)

The California Psychological Inventory (CPI) is a valid self-report method used by organisations to measure both personality and behaviour, which differs from other personality measures in that it outlines individual professional styles (Goldfinger & Pomerantz, 2010). Overall, the CPI is made up of 434 questions which follow a 'true or false' format and can be split into twenty scales. The scales are as follows: Dominance; Capacity for Status; Sociability; Social Presence; Self Acceptance; Independence; Empathy; Responsibility; Socialisation; Self-control; Good Impression; Communality; Well-being; Tolerance; Achievement via Conformance; Achievement via Independence; Intellectual Efficiency; Psychological Mindedness; Flexibility; Femininity/Masculinity (Goldfinger & Pomerantz, 2010). The way in which the subscales are scored and interpreted may be seen in Table 5 in Appendix A.

Furthermore, the CPI classifies the twenty scales into four main dimensions: 1) interpersonal style, 2) personal values and social adjustment, 3) achievement and thinking, and 4) role preference. Each dimension can be further assessed on the basis of seven levels, which reveal to what extent an employee has realised the potential of their personality type. It must be noted, however, that the archival data used only provided scoring for the twenty scales for each individual and no information about the four dimensions was given.

The CPI: Reliability, Validity and the South African Context

Since the original creation of the CPI there has been a vast array of research assessing both the reliability and validity in numerous settings which relate personality to other outcome variables (Atkinson, 2007, as cited in Stewart, 2008). The CPI manual by Gough (1975, as cited in Stewart, 2008) gives a breakdown of the validation studies conducted on the CPI. Test-retest estimates have shown that the CPI is a highly consistent assessment, whereby individual scales have all been proven to have acceptable correlation coefficients (Stewart, 2008). In addition test-retest reliabilities for individual scales have ranged between a low median result of 0.53 for Empathy to

a high median of 0.80 for Self-Control; whereas overall median reliability was reported to be 0.70 (Groth-Marnat, 1999). Measures of internal consistency reliability have indicated variability among the different subscales, but that scale constructions are adequate overall (Groth-Marnat, 1999). Furthermore, in a study conducted on 6000 men and women, reliabilities ranged from 0.62 for psychological mindedness to 0.84 for well-being with an average reliability for all twenty scales of 0.75 (Beutler & Groth-Marnat, 2003). The Alpha Coefficients for the three vector scales have been reported as 0.82, 0.77 and 0.82 respectively (Beutler & Groth-Marnat, 2003). Numerous studies have aided in revisions of the CPI which have impacted on the validity of the scale positively (Stewart, 2008). While the CPI is not based on pre-existing theory, when comparing the CPI to alternative measures of personality, such as the 16PF, the MMPI and constructs such as the big five personality traits, correlations are high (McCrae et al., 1993). It is therefore evident that the CPI measures certain key aspects of personality.

In terms of validity, scales are built into the CPI in order to assess faking good, faking bad and random responses. Questions are framed in a subtle manner, thus demonstrating low levels of face validity (Butcher, 2009). Other literature on validity has been dominated by predictive validity. Importantly, work by Megargee (1972, as cited in Groth-Marnat, 1999) assessed whether CPI was related to individuals' intellectual ability. It was found that Tolerance, Achievement via Conformity, Achievement via Independence, Intellectual Efficiency, Psychological Mindedness, and Flexibility are highly related to one's intellectual level, and hence high scores of these CPI facets are related to interest in intellectual activities and good overall intelligence (Groth-Marnat, 1999). Other predictive validity studies have shown significant results between specific subscales and high school achievement, college achievement, and vocational training programmes (Groth-Marnat, 1999).

It must be noted that the CPI is becoming popularly used in South African organisations. Personal communication with JVR Consultants indicated that the CPI is becoming an accepted and more widely-used means for developing successful leaders as well as promoting teamwork as the CPI provides insight into individuals' workplace personalities. The CPI is hence becoming popular in South Africa even though most of the research conducted on the CPI is based abroad. This means that

the norms for the CPI which were established based on an inclusive and representative of the American population are being used within the South Africa context as normative data of the CPI in South Africa is currently unattainable (Van Hutton, 1990). Organisations in South Africa, however, often develop situation-specific norms where individuals are compared in terms of job requirements as opposed to demographics (Paterson & Uys, 2005). The underlying assumption is that predictive validity is facilitated through such norming - this provides organisations with a justification in terms of selection and promotion, based on specific job requirements regardless of demographics (Paterson & Uys, 2005). It is most likely that organisations in South Africa using the CPI are using this technique in order to ensure some form of norming. Based on the above, it is evident that research on the CPI in South Africa is extremely necessary in order to make sure the assessment is both reliable and valid for use within this context.

Procedure

All information for the purpose of this research was accessed via an archival database. A large, international organisation which had an already existing database was approached for permission to utilise the information coded therein. The database was created based on employee permission to store their scores from company-required assessments in an accessible form**.** Permission was granted to access this database for research purposes provided that the identity of the company was disclosed only to the researcher, supervisor, and the University of the Witwatersrand for the purpose of consent to conduct the research. Therefore, all forms were presented in the initial proposal only and are not presented in this final document in order to fulfil the request of both confidentiality and anonymity of the company.

As permission was granted to conduct the study, the spreadsheet containing the relevant data was obtained from the company and the statistical analyses carried out. However, due to using a pre-exiting archival database it meant being completely reliant and trusting data which had already been coded. In addition, crucial information such as demographic details of the participants and details regarding the specific assessments such as the number of different assessors and the timing across which the tests were administered was unavailable. The company was able to provide a general indication of the type of people employed who had undergone such

assessments however no specific details regarding the make-up of those likely to have taken the tests was attained.

Ethics

As the study was based on archival data, there was no direct human participation and thus no direct risks or benefits to employees. Permission was obtained from the participants to store the test results to use for research purposes at the time the archive as created. Permission was also obtained from the company to utilise the archival data on the condition that the identity of the company was disclosed to only the researcher, supervisor and the University for the purpose of attaining consent based on the proposal (hence no documentation disclosing the name of the company is presented in this research report). Thereafter, it was agreed that no company identity would be disclosed within any published documents (including the final research report) and that any further publication would require no direct or identifiable acknowledgement of the company.

All steps have been taken to ensure anonymity and confidentiality are preserved and a summary of the final results will be provided to the company to circulate in whatever manner they feel appropriate. As the data is already archived, it will continue to be stored after completion of the study. The copy of the data provided to the researcher was anonymous (no identifying details of employees or the company were included), and was pass-worded. It will be kept securely for as long as needed and then destroyed.

Data Analysis

In order to decide on the appropriate statistical techniques for this research, the scoring for the CPA, the CPI, and the WAIS-III was assessed to ensure certain assumptions were fulfilled. The CPI, WAIS-III, and CPA Capability and Mode yielded interval scale scores for all the subscales, scores, and dimensions, whilst the CPA yielded nominal categories for Style. Based on the scoring of the CPA, CPI and the WAIS-III, descriptive statistics were outlined in order to describe the data such as the frequencies, means, minimum and maximums, standard deviations, as well as Kolmogorov-Smirnoff scores to assess normality. Descriptive statistics were used for classifying, summarizing and describing the quantitative data collected (Leedy, 1989).

Normality for this research was assessed via the use of Kolmogorov-Smirnov tests as well as histograms. The Kolmogorov-Smirnoff test is similar to that of a Chi-Squared as it 'compares observed and expected frequencies to determine whether observed results are in accord with a stated null hypothesis' (Churchill & Iacobucci, 2010, p.362). The p-values of the Kolmogorov-Smirnoff test were calculated, where values indicating $p > 0.05$ were classified as normal (Dancey & Reidy, 2004). It was found that most of the data in the sample was not normally distributed except for two subscales of the WAIS-III. However, due to the high level of sensitivity of Kolmogorov-Smirnov as a test of normality, an additional evaluation of the histograms was conducted (Churchill & Iacobucci, 2009). Histograms were assessed in order to see whether the majority of the scores fell towards the centre of the distribution, which indicated that all variables appeared to be sufficiently normally distributed to allow for certain parametric analyses to be carried out (this judgement was confirmed by a qualified statistician).

After assessing and establishing normality, specific statistical techniques were chosen to investigate the main research questions. To answer the two main research questions about whether capacity for complexity (as represented by capability, mode and style) was related to intelligence and/or personality, an array of statistical methods were used. Firstly, in order to assess whether both Capability and Mode were in any way related to intelligence or personality, appropriate correlation analyses were carried out. Given the nature of the data, both Pearson's Correlation Coefficients (parametric) and Spearman's Rank Correlation Coefficients (non-parametric) were carried out and the pattern of results compared to establish whether they indicated similar relationships (Dancey & Reidy, 2004). Both types of correlations show whether there is a linear relationship between capability, mode and the other variables based on a value given that falls between -1 and +1 (Vaughan, 1998). The sign of the correlation co-efficient explains the direction of the relationship, and the closer to 1 the stronger the relationship between the two variables (Vaughan, 1998). Given that no differences in the pattern of relationships was seen, non-parametric Spearman's Rank Correlations were reported as the Kolmogorov-Smirnov results indicted that the data was not strictly normally distributed.

In order to assess the relationship between style and intelligence and/or personality non-parametric Chi-Squared Tests of Association were used as style was categorical (nominal data) (Black, 2010). In order to carry out this analysis, CPI and WAIS-III scores had to be converted to nominal categories. This was done by dividing each person into either 'high' or 'low' based on whether they scored above or below the median score in the sample, known as a median split (Black, 2010).

Moreover, a Spearman's Rank Correlation was conducted to assess the relationship between Capability and Mode in order to see how closely the two CPA constructs were linked and Chi-Squared Tests of Association were conducted in order to assess the associations between Style and Capability and Mode respectively (with converted nominal data for each using median splits).

The last research question sought to establish to what extent the various aspects of intelligence and personality could predict ability to cope with complexity, and thus suitable linear model-based methods were used. Conducting correlational analyses indicates if certain variables are associated however via multiple regression analysis one may understand more specifically how the variables are associated (Howell, 1997). 'Multiple regression is a data analysis technique that enables the analyst to examine patterns of relationships between multiple independent variables and a single dependent variable…" (Spicer, 2005, p.90). The validity of this technique is highly dependent on a range of assumptions which need to be fulfilled which include: normality, interval data, equality of variance, linearity, measurement error and multicollinearity (Howell, 1997; Spicer, 2005). Each of these assumptions was thoroughly considered prior to conducting multiple regression analyses in order to address the final research question in the study.

Based on the results of the multiple regressions, a series of two-way ANOVAs was also carried out to assess the difference between main effects and interaction effects (Black, 2010). Two-way ANOVAs are used to see whether there are differences between variables which range from two or more categories, as well as determining whether interactions between numerous variables exist (MacFarland, 2012). Therefore, two-way ANOVAs answer whether or not there is a difference between

variables due to them either acting independently or interacting with one another to affect a dependent variable (MacFarland, 2012).

# CHAPTER 4:
# Results

This chapter presents a comprehensive analysis of the statistical results of the archival data used in this research. It begins with a brief examination of the descriptive statistics in order to describe the sample. These include the means, standard deviations, minimum and maximum values and Kolmogorov-Smirnov results, which were used to evaluate normality of the data. This is followed by the results which assessed the relationships between variables - correlations conducted on the interval data and Chi-Squared tests on the nominal data. Subsequently results for the multiple regressions and two-way ANOVAs are outlined which conclude the results section of this research.

It must be noted that all statistical analyses conducted were carried out using SAS Enterprise Guide 4.2 (Statistical Analysis Software Institute, 2002).

Statistical Abbreviations

For ease of reference, a key of the abbreviations is utilised in certain parts of the results section where the size of tables is insufficient to hold lengthy information. Table 6 provided below can be referred to when necessary.

*Table 6: Summary of Abbreviations for Key Variables*

| Test | Variable | Abbreviation |
|---|---|---|
| **CPA** | Capability (current Level) | Cap |
| | Mode (future potential) | Mode |
| | Style (preferred approach to work) | Sty |
| **WAIS_III** | Picture Completion | PC |
| | Digit Symbol Coding | DSC |
| | Similarities | SIM |
| | Block Design | BD |
| | Arithmetic | AR |
| | Matrix Reasoning | MR |
| | Digit Span | DS |

| | | |
|---|---|---|
| | Information | INFO |
| | Picture Arrangement | PA |
| | Comprehension | COM |
| | Performance IQ | PIQ |
| | Verbal IQ | VIQ |
| | Full Scale IQ | FSIQ |
| **CPI** | Dominance | Do |
| | Capacity for Status | Cs |
| | Sociability | Sy |
| | Social Presence | Sp |
| | Self Acceptance | Sa |
| | Independence | In |
| | Empathy | Em |
| | Responsibility | Re |
| | Socialisation | So |
| | Self Control | Sc |
| | Good Impression | Gi |
| | Communality | Cm |
| | Wellbeing | Wb |
| | Tolerance | To |
| | Achievement via Conformance | Ac |
| | Achievement via Independence | Ai |
| | Intellectual Efficiency | Ie |
| | Psychological Mindedness | Py |
| | Flexibility | Fx |
| | Femininity/Masculinity | F/M |

**Descriptive Statistics**

Descriptive statistics are presented separately below for age and for each of the different instruments used; for each the means, standard deviations, minimum scores, maximum scores and Kolmogorov-Smirnov results are outlined. Furthermore, histograms are presented in Appendix B in order to illustrate how the data was distributed for each of the different instruments and their subscales.

The only biographical information attained was for age, which ranged from 24 to 62 years with a mean of 33.47 and a standard deviation of 6.16, as seen in Table 7 below.

*Table 7: Descriptive Statistics for Age*

| Variable | Mean | Std Dev. | Minimum | Maximum | K-S p-value |
|---|---|---|---|---|---|
| **Age** | 33.47 | 6.16 | 24 | 62 | <0.01 |

Table 8 below presents the descriptive statistics for the CPA. These showed that the range of capability fell between 2 and 11 with a mean of 5.86 and a standard deviation of 1.62; and mode fell between 4 and 18 with a mean of 9.08 and a standard deviation of 2.55. The range for mode, representing individuals' future potential, was expected to be higher according to the CPA growth curves (Stamp, 1981).

*Table 8: Descriptive Statistics for the CPA*

| Test | Subtest | Mean | Std Dev. | Minimum | Maximum | K-S p-value | N |
|---|---|---|---|---|---|---|---|
| **CPA** | **Cap** | 5.86 | 1.62 | 2.00 | 11.00 | <0.01 | 266 |
| | **Mode** | 9.08 | 2.55 | 4.00 | 18.00 | <0.01 | 266 |

In terms of Style, frequency distributions, as well as the Table 9 below, indicate that the majority of the sample were either Styles B (n = 113, 42.5%) or C (n = 98, 36.8%) in terms of their approach to work, with far fewer individuals falling into Style A (n = 28, 10.5%) or Style D (n = 26, 9.8%), and only one person being classified as Style E (n = 1, 0.4%).

*Table 9: Frequency and Percentages for CPA Style*

| Style | A | B | C | D | E |
|---|---|---|---|---|---|
| **Frequency** | 28 | 113 | 98 | 26 | 1 |
| **Percentage** | 10.5% | 42.5% | 36.8% | 9.8% | 0.4% |

Table 10 below presents the descriptive statistics for the WAIS-III for the overall scale and subscales. The Full Scale IQ scores ranged from 83 to 167 with a mean of 118.53 (SD = 16.65). The histogram showed few individuals falling in the very low range and a large portion falling in the upper range of IQ scores. The Performance IQ

range was from 43 to 150 with a mean of 93.7 (SD = 27.86). The histogram showed that many individuals fell in the lower range or in the upper range with few in the middle, spreading the sample in an uneven manner. Verbal IQ score ranged from 40 to 150 with a mean of 97.7, yet the histogram illustrated very few individuals in the lower range and many more towards the middle to upper range of scores. Hence, the average Verbal IQ score was higher than the Performance IQ score. In terms of the subscales, the highest means were seen for Digit Symbol Coding (M = 77.38; SD = 14.84), followed by Block Design (M = 40.45; SD = 12.38), Comprehension (M = 24.97; SD = 3.87), and Similarities (M = 24.29; SD =3.53). The lowest averages were seen for Picture Arrangement (M = 13.09; SD = 4.27) and Arithmetic (M = 14.22; SD = 3.66).

*Table 10: Descriptive Statistics for the WAIS-III*

| Test | Subtest | Mean | Std Dev. | Min. | Max | K-S p-value | N |
|---|---|---|---|---|---|---|---|
| **WAIS_III** | **PC** | 20.76 | 4.97 | 8.00 | 89.00 | <0.01 | 265 |
| | **DSC** | 77.38 | 14.84 | 11.00 | 121.00 | >0.15 | 265 |
| | **SIM** | 24.29 | 3.53 | 9.00 | 32.00 | <0.01 | 265 |
| | **BD** | 40.45 | 12.38 | 9.00 | 67.00 | >0.15 | 265 |
| | **AR** | 14.22 | 3.66 | 6.00 | 22.00 | <0.01 | 264 |
| | **MR** | 19.99 | 3.60 | 6.00 | 26.00 | <0.01 | 264 |
| | **DS** | 18.65 | 4.29 | 4.00 | 30.00 | <0.01 | 264 |
| | **INFO** | 18.86 | 4.53 | 5.00 | 27.00 | <0.01 | 264 |
| | **PA** | 13.09 | 4.27 | 2.00 | 23.00 | <0.01 | 264 |
| | **COM** | 24.97 | 3.78 | 13.00 | 33.00 | <0.01 | 264 |
| | **PIQ** | 93.70 | 27.86 | 43.00 | 150.00 | <0.01 | 264 |
| | **VIQ** | 97.70 | 22.64 | 40.00 | 150.00 | <0.01 | 264 |
| | **FSIQ** | 118.53 | 16.65 | 83.00 | 167.00 | <0.01 | 266 |

As seen in Table 11 below, each of the CPI subscales clearly had quite a broad range; the lowest score was for Femininity / Masculinity (7.00) and the highest was 89.00 for Empathy. However the means listed illustrate that the majority of the sample fell within the upper range of each subscale and hence more scores were closer to the maximum score compared to the minimum score. Histograms for the CPI showed that

Dominance, Sociability, Communality, Wellbeing and Achievement via Conformance in particular fell predominantly towards the maximum end of the spectrum. On the other hand, the rest of the CPI scales appeared to be reasonably symmetrical with most of the sample falling closely around the mean and evening out towards the minimum and maximum scores. Despite this, Kolmogorov-Smirnov tests indicated that none of the scales were distributed normally.

*Table 11: Descriptive Statistics for the CPI*

| Test | Subtest | Mean | Std Dev. | Min. | Max. | K-S P-value | N |
|---|---|---|---|---|---|---|---|
| **CPI** | **Do** | 64.35 | 5.19 | 47.00 | 73.00 | <0.01 | 266 |
| | **Cs** | 60.25 | 7.42 | 34.00 | 80.00 | <0.01 | 266 |
| | **Sy** | 59.04 | 6.80 | 40.00 | 73.00 | <0.01 | 266 |
| | **Sp** | 56.09 | 8.00 | 34.00 | 77.00 | <0.01 | 266 |
| | **Sa** | 59.61 | 6.54 | 32.00 | 74.00 | <0.01 | 266 |
| | **In** | 60.09 | 6.08 | 43.00 | 75.00 | <0.01 | 266 |
| | **Em** | 58.66 | 8.51 | 38.00 | 89.00 | <0.01 | 266 |
| | **Re** | 59.84 | 7.47 | 35.00 | 74.00 | <0.01 | 266 |
| | **So** | 57.46 | 6.70 | 28.00 | 71.00 | <0.01 | 266 |
| | **Sc** | 56.25 | 9.23 | 23.00 | 76.00 | <0.01 | 266 |
| | **Gi** | 63.46 | 9.54 | 34.00 | 83.00 | <0.01 | 266 |
| | **Cm** | 55.42 | 6.59 | 18.00 | 64.00 | <0.01 | 266 |
| | **Wb** | 58.33 | 5.86 | 38.00 | 66.00 | <0.01 | 266 |
| | **To** | 56.03 | 9.13 | 34.00 | 77.00 | <0.01 | 266 |
| | **Ac** | 63.54 | 7.11 | 32.00 | 75.00 | <0.01 | 266 |
| | **Ai** | 56.54 | 7.47 | 39.00 | 72.00 | <0.01 | 266 |
| | **Ie** | 57.49 | 7.14 | 23.00 | 75.00 | <0.01 | 266 |
| | **Py** | 58.38 | 7.40 | 32.00 | 75.00 | <0.01 | 266 |
| | **Fx** | 48.82 | 8.51 | 29.00 | 76.00 | <0.01 | 266 |
| | **F/M** | 46.37 | 10.75 | 7.00 | 71.00 | <0.04 | 266 |

The majority of the Kolmogorov-Smirnov scores for the CPA, the WAIS-III and the CPI were less than 0.01, which meant the p-values fell below 0.05 and hence

normality could not be established (Dancey & Reidy, 2004). However, Kolmogorov-Smirnoff is known as a highly stringent means for establishing normality and therefore a closer examination of the histograms for all the variables was conducted. This indicated that many of the variables were distributed in a roughly symmetrical form which indicated a sufficient degree of normality to conduct certain parametric analyses (this view was verified by a qualified statistician).

## Correlations

Before selecting which test to use to analyse the data, the nature of the data was assessed in order to decide whether certain assumptions for parametric tests were fulfilled such as interval data and normality (Dancey & Reidy, 2004). The data was interval for the CPA (except for Style), the WAIS-III and the CPI. However, based on the Kolmogorov- Smirnoff results and analysis of the histograms, both Pearson's Correlation Coefficients and Spearman's Rank Correlation Coefficients were carried out to measure the strength, direction and significance of the relationships between the variables. The pattern of the relationships established using both techniques was then compared and no differences in the patterns between the two sets of results were found. Spearman's Rank Correlation Coefficients are therefore reported below as per the Kolmogorov-Smirnov results indicating that the data was not strictly normally distributed.

### WAIS-III, CPI and CPA Capability and Mode

In order to assess the relationship between WAIS-III scores, CPI scores, CPA Capability scores and CPA Mode scores, a series of correlations were conducted and the results are tabulated below in Table 12 and Table 13.

When looking specifically at the WAIS-III results presented in Table 12, it is evident that four of the subscales were significantly and positively correlated with Capability; specifically Picture Completion ($r = 0.16$; $p = 0.006$), Digit Symbol Coding ($r = 0.016$, $p = 0.01$), Similarities ($r = 0.33$, $p < .0001$) and Block Design ($r = 0.27$, $p < .0001$). Of these, Similarities was the only correlation which showed a moderate relationship whereas all the others were weakly related. In addition, Digit Span was significantly and negatively correlated with Capability ($r = -0.13$; $p = 0.03$).

Mode followed a different pattern, whereby significant, positive relationships could be seen with Picture Completion (r = 0.16, p = 0.008), Digit Symbol Coding (r = 0.26, p <.0001), Similarities (r = 0.39, p <.0001), Block Design (r = 0.37, p<.0001) and Comprehension (r = 0.13, p = 0.05). Of these, only Similarities and Block Design were related moderately whilst the others were weakly related. The overall IQ scores (VIQ, PIQ and FSIQ) were not significantly related to CPA capability or mode and the relationships seen between these were extremely weak, suggesting no linear relationships.

*Table 12: Spearman's Rank Correlation Co-efficients for WAIS-III and CPA Capability, and WAIS-III and CPA Mode*

| Test | Subtest | CPA Cap | CPA Mode |
|---|---|---|---|
| WAIS_III | PC | 0.17 | 0.16 |
| | | 0.006* | 0.008** |
| | DSC | 0.16 | 0.26 |
| | | 0.01* | <.0001** |
| | SIM | 0.33 | 0.39 |
| | | <.0001** | <.0001** |
| | BD | 0.27 | 0.37 |
| | | <.0001** | <.0001** |
| | AR | -0.02 | 0.02 |
| | | 0.70 | 0.74 |
| | MR | -0.05 | -0.02 |
| | | 0.38 | 0.70 |
| | DS | -0.13 | -0.05 |
| | | 0.03* | 0.41 |
| | INFO | 0.008 | -0.003 |
| | | 0.89 | 0.97 |
| | PA | -0.01 | -0.08 |
| | | 0.81 | 0.21 |
| | COM | 0.08 | 0.13 |
| | | 0.23 | 0.05* |
| | PIQ | 0.11 | 0.08 |
| | | 0.08 | 0.19 |
| | VIQ | -0.01 | 0.007 |
| | | 0.87 | 0.90 |
| | FSIQ | -0.02 | 0.05 |
| | | 0.80 | 0.41 |

* Significant at p < 0.05

** Significant at p < 0.01

As shown in Table 13 below, of the twenty CPI subscales, fifteen were significantly and strongly related to both Capability and Mode (p < 0.01). Looking at Capability

first, the strongest correlation was with Achievement via Independence (r = 0.42, p <.0001); followed by Independence (r = 0.37, p < .0001); then Empathy (r = 0.34, p <.0001) and Social Presence (r = 0.34, p <0.001) and lastly Capacity for Status (r = 0.32, p <.0001) and Flexibility (r = 0.32, p <.0001). For Mode, the strongest correlation was with Flexibility (r = 0.42, p <0.001); followed by Social Presence (r = 0.39, p <.0001) and Achievement via Independence (r = 0.39, p <.0001); Intellectual Efficiency (r = 0.36, p <.0001); and lastly Sociability (r = 0.33, p <.0001) and Empathy (r = 0.33, p <.0001).

*Table 13: Spearman's Rank Correlation Co-efficients for CPI and CPA Capability, and CPI and CPA Mode*

| Test | Subtest | CPA Cap | CPA Mode | Subtest | CPA Cap | CPA Mode |
|---|---|---|---|---|---|---|
| **CPI** | **Do** | 0.28 | 0.21 | **Gi** | -0.08 | -0.13 |
| | | <.0001** | 0.0005** | | 0.17 | 0.03* |
| | **Cs** | 0.32 | 0.30 | **Cm** | 0.11 | 0.13 |
| | | <.0001** | <0.0001** | | 0.07 | 0.04* |
| | **Sy** | 0.30 | 0.33 | **Wb** | 0.25 | 0.16 |
| | | <.0001** | <.0001** | | <.0001** | 0.0087** |
| | **Sp** | 0.34 | 0.39 | **To** | 0.31 | 0.27 |
| | | <.0001** | <.0001** | | <.0001** | <.0001** |
| | **Sa** | 0.25 | 0.29 | **Ac** | 0.07 | -0.04 |
| | | <.0001** | <.0001** | | 0.24 | 0.60 |
| | **In** | 0.37 | 0.29 | **Ai** | 0.42 | 0.39 |
| | | <.0001** | <.0001** | | <.0001** | <.0001** |
| | **Em** | 0.34 | 0.33 | **Ie** | 0.27 | 0.36 |
| | | <.0001** | <.0001** | | <.0001** | <.0001** |
| | **Re** | 0.23 | 0.16 | **Py** | 0.26 | 0.20 |
| | | <.0001** | 0.006** | | <.0001** | 0.0012** |
| | **So** | 0.06 | 0.06 | **Fx** | 0.32 | 0.42 |
| | | 0.34 | 0.33 | | <.0001** | <.0001** |
| | **Sc** | -0.04 | -0.15 | **F/M** | -0.13 | -0.16 |
| | | 0.56 | 0.01* | | 0.04* | 0.01* |

* Significant at p < 0.05

** Significant at p < 0.01

Based on the correlations reported above, it is evident that specific WAIS-III and CPI variables were significantly related to both CPA Capability and Mode.

CPA Capability and Mode

A Spearman's Correlation Coefficient was also calculated in order to assess the relationship between CPA Capability and Mode. Table 14 below proves that Capability and Mode were significantly and strongly positively related ($r = 0.67$, $p < .0001$). This suggests that an individual's current capability was strongly related to their future potential.

*Table 14: Spearman's Rank Correlation Co-efficient for CPA Capability and Mode*

| | **CPA Capability** |
|---|---|
| **CPA Mode** | 0.67 |
| | <.0001** |

* Significant at $p < 0.05$

** Significant at $p < 0.01$

## Chi-Squared Tests of Association

The Chi-Squared Test of Association is used to determine whether a systematic association exists between different variables which are comprised of nominal categories. The test works as long as each cell exceeds five participants (Gerstman, 2008). As only one individual in the sample was found to be Type E Style, the Chi-Squared analyses were run excluding this Style in order to ensure that a minimum of five people were found in each cell.

Style, Intelligence and Personality

A series of Chi-Squared tests were conducted in order to assess the association between CPA Style and the numerous CPI and WAIS-III variables (please refer to Appendix C). Due to the requirement for nominal data in order to carry out Chi-Squared tests, median splits were applied to the interval data in order to transform the data into 'higher' and 'lower' categories. Of all the WAIS-III subscales and overall scales, only three showed evidence of a significant relationship with Style. In Appendix C Tables 15, 16 and 17 illustrate that Digit Symbol Coding ($p = 0.02$), Similarities ($p = 0.0069$) and Block Design ($p < .0001$) were significantly related to Style. Of the twenty CPI scales, five proved to be significantly associated with CPA Style: Empathy ($p = 0.03$), Tolerance ($p = 0.01$), Achievement via Independence ($p =$

0.01), Intellectual Efficiency ($p < .0001$) and Psychological Mindedness ($p = 0.02$), which can be seen in Appendix C in Tables 18, 19, 20, 21 and 22.

Style, Capability and Mode

In order to assess the association between CPA Style and CPA Capability and Mode Chi-Squared Tests of Association were also carried out (please refer to Appendix C). There appeared to be no significant association between CPA Capability and Style ($p = 0.30$) as shown in Table 23; whereas there was a significant association between CPA Mode and Style ($p = 0.03$) which can be seen in Table 24. These results suggest that CPA Style is related to one's future potential for handling complexity but not one's current ability to do so.

## Multiple Regression

Having established the relationships between the variables in the study, the third research question attempted to establish the extent to which intelligence and/or personality (as represented by scores on the WAIS and CPI) could be used to predict CPA Capability and Mode. To address this, multiple regression was used after careful consideration of the assumptions which needed to be fulfilled. Furthermore, it must be noted that in the following section both intelligence and personality are referred to as independent variables, whilst the CPA variables are referred to as dependent variables. Even though such terminology may appear to be inaccurate as it is not supported by the non-experimental design of this research, statistically the research examined the ability to predict CPA Capability and Mode within the regression based on intelligence and personality factors. Therefore, statistically the CPA functions as a dependent variable whilst both intelligence and personality function as independent variables.

## Assumptions of Multiple Regression

Basic Assumptions:

Firstly, normality was established via a close assessment of the histograms which were deemed to be sufficiently symmetrical to allow for multiple regression to be conducted. Secondly, the data was interval for all of the WAIS-III and CPI variables and two of the CPA variables (CPA Capability and Mode) (Dancey & Reidy, 2004).

Homoscedasticity:

Homoscedasticity can be labelled as equivalent to establishing equality of variance. This assumption is about ensuring that the predictability in scores for one variable is roughly the same as all values of another variable (Tabachnick & Fidell, 2007). In a multiple regression, differences between values can be detected via an assessment of the shape of the residuals scatterplot. Patterns appeared to be mainly rectangular in the residuals plot with the majority of scores concentrated across the centre, and points falling predominantly between -2.00 and +2.00 standard deviations. The points were thus evenly distributed which meant that the assumption of equality of variance could be established in this research (Dancey & Reidy, 2004).

Multi-collinearity

Multi-collinearity can be defined as the size or extent to which independent variables are related or correlated to one another (Miles & Shevlin, 2001). Miles and Shevlin (2001) explain that when correlations between independent variables are very high then the variables can be considered to be multi-collinear. Therefore, Spearman Rank Correlation Co-efficients were analysed in order to assess the relationship between the CPI variables and the WAIS-III subscales and overall scales (please refer to Appendix D, Table 25). As expected, certain variables in the CPI and subtests of the WAIS-III proved to be significantly correlated. Similarities, for example, was correlated with ten CPI variables such as Capacity for Status ($r = 0.12$, $p = 0.05$), Sociability ($r = 0.18$, $p = 0.003$), Empathy ($r = 0.18$, $p = 0.004$), Responsibility ($r = 0.22$, $p = 0.0004$), Communality ($r = 0.16$, $p = 0.009$), Tolerance ($r = 0.25$, $p < .0001$), Achievement via Independence ($r = 0.29$, $p < .0001$), Intellectual Efficiency ($r = 0.30$, $p < .0001$), Psychological Mindedness ($r = 0.16$, $p = 0.009$), and Flexibility ($r = 0.20$, $p = 0.002$). However, within the correlation matrix (please refer to Appendix D) it could be seen that any variables which were correlated had correlation coefficients which were lower than 0.32 and were hence weakly correlated.

This meant that the independent variables within this study could be used within the same multiple regression equations as they represented relatively independent constructs from one another (this judgement was supported by a qualified statistician), and hence were not highly multi-collinear. In addition, the overall WAIS-III scores (PIQ, VIQ, and FSIQ) proved to be uncorrelated to the CPI variables except for Full

Scale IQ and Independence ($r = 0.16$, $p = 0.009$), which also had a weak correlation coefficient. Therefore, the condition indices of multi-collinearity were assessed and appeared to be unproblematic (Hill & Lewiki, 2006).

Based on the establishment of all assumptions, backward stepwise multiple regressions were used to understand which WAIS-III and CPI variables were the best predictors of both CPA Capability and Mode. The backward stepwise multiple regression method was selected as it analyses each variable individually to find a model with the best regression equation, such that the CPI and WAIS-III variables which are the best predictors of CPA Capability and Mode could be outlined (Hill & Lewiki, 2006). Regressions were conducted both including and excluding age in order to also assess the role of age in predicting CPA Capability and Mode. As age proved to be a significant predictor in each of the regressions carried out, all regressions reported and tabulated included age as a variable.

**CPA Capability**

The first set of regression analyses conducted used CPA Capability as the dependent variable.

In the first regression, the independent variables used in the analysis were age, the CPI variables and Full Scale IQ (see Table 26 below). A significant relationship could be seen between CPA Capability and eight predictor variables, including: age, Dominance, Self Acceptance, Responsibility, Good Impression, Communality, Achievement via Independence and Flexibility (R-square = 0.36 , $F_{6,259} = 24.65$, $p < .0001$). The adjusted R-square value showed that 34% of the variance in Capability was explained by the eight predictor variables, and hence a strong predictive relationship was established. Furthermore, standard estimates were used in order to assess which of the independent variables were the strongest predictors via interpreting scores as if they were correlations but ignoring the sign. The standard estimates showed that Achievement via Independence (0.39) and Good impression (-0.34) were the only moderate predictors of Capability, whereas the other independent variables were only weak predictors.

*Table 26: CPI subscales and FSIQ (with age)*

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 6 | 255.28866 | 42.54811 | 24.64 | <.0001 |
| **Error** | 259 | 447.28277 | 1.72696 | | |
| **Corrected Total** | 265 | 702.57143 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.31414 | **R-Square** | 0.3634 |
| **Dependant Mean** | 5.85714 | **Adj R-Square** | 0.3486 |
| **Coeff Var** | 22.43651 | | |

| **Variable** | **Parameter Estimates** | **Standard Error** | **Type II SS** | **F Value** | **Pr > F** | **Standard Estimates** |
|---|---|---|---|---|---|---|
| **Intercept** | -4.92672 | 1.25979 | 26.41184 | 15.29 | 0.0001 | 0 |
| **Age** | 0.04217 | 0.01323 | 17.55422 | 10.16 | 0.0016 | 0.16 |
| **CPI_Do** | 0.04976 | 0.01781 | 13.48052 | 7.81 | 0.0056 | 0.16 |
| **CPI_In** | 0.02872 | 0.01581 | 5.69613 | 3.30 | 0.0705 | 0.11 |
| **CPI_Gi** | -0.05785 | 0.01021 | 55.45426 | 32.11 | <.0001 | -0.34 |
| **CPI_Wb** | 0.05669 | 0.01839 | 16.41415 | 9.50 | 0.0023 | 0.20 |
| **CPI_Ai** | 0.08484 | 0.01278 | 76.06108 | 44.04 | <.0001 | 0.39 |

In the second regression, the independent variables used were age, the CPI scales and Performance IQ and Verbal IQ (please see Table 27 below). A significant relationship could be seen between CPA Capability and seven predictor variables, including: age, Self Acceptance, Independence, Responsibility, Good Impression, Wellbeing and Achievement via Independence (R-square = 0.37, $F_{7,254}$ = 21.17, $p < .0001$). The adjusted R-square value showed that 35% of the variance in Capability was explained by the seven predictor variables, and hence a strong predictive relationship was established. The standard estimates further indicated that Achievement via Independence (0.36) and Good Impression (-0.34) were the only moderate predictors of Capability, whereas the other variables were only weak predictors.

*Table 27: CPI subscales and PIQ and VIQ (with age)*

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 7 | 254.80029 | 36.40004 | 21.17 | <.0001 |
| **Error** | 254 | 436.78750 | 1.71964 | | |
| **Corrected Total** | 261 | 691.58779 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.31135 | **R-Square** | 0.3684 |
| **Dependant Mean** | 5.87023 | **Adj R-Square** | 0.3510 |
| **Coeff Var** | 22.33897 | | |

| Variable | Parameter Estimates | Standard Error | Type II SS | F Value | Pr > F | Standard Estimates |
|---|---|---|---|---|---|---|
| **Intercept** | -5.12720 | 1.28056 | 27.56739 | 16.03 | <.0001 | 0 |
| **Age** | 0.04583 | 0.01332 | 20.36871 | 11.84 | 0.0007 | 0.17 |
| **CPI_Sa** | 0.03484 | 0.01402 | 10.61983 | 6.18 | 0.0136 | 0.14 |
| **CPI_In** | 0.03452 | 0.01526 | 8.79328 | 5.11 | 0.0246 | 0.13 |
| **CPI_Re** | 0.02771 | 0.01460 | 6.19866 | 3.60 | 0.0588 | 0.13 |
| **CPI_Gi** | -0.05840 | 0.01167 | 43.03969 | 25.03 | <.0001 | -0.34 |
| **CPI_Wb** | 0.04862 | 0.01925 | 10.97300 | 6.38 | 0.0121 | 0.17 |
| **CPI_Ai** | 0.07947 | 0.01314 | 62.87752 | 36.56 | <.0001 | 0.36 |

In the third regression, the independent variables used to predict Capability were age, the CPI scales and the WAIS-III subscales (please refer to Table 28 below). A significant relationship could be seen between CPA Capability as the dependent variable and nine predictor variables, including: age, Dominance, Sociability, Independence, Good Impression, Wellbeing, Achievement via Independence, Similarities and Block Design (R-square = 0.44, $F_{9,245}$ = 20.97, p. < .0001). The adjusted R-square value showed that 41% of the variance in Capability was explained by the nine predictor variables, and hence a strong predictive relationship was found. Standard estimates showed that Achievement via Independence (0.30) was the only moderate predictor of Capability, whereas all other variables were only weak predictors.

*Table 28: CPI and WAIS subscales (with age)*

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 9 | 289.99465 | 32.22163 | 20.97 | <.0001 |
| **Error** | 245 | 376.41319 | 1.53638 | | |
| **Corrected Total** | 254 | 666.40784 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.23951 | **R-Square** | 0.4352 |
| **Dependant Mean** | 5.82745 | **Adj R-Square** | 0.4144 |
| **Coeff Var** | 21.27016 | | |

| Variable | Parameter Estimates | Standard Error | Type II SS | F Value | Pr > F | Standard Estimates |
|---|---|---|---|---|---|---|
| **Intercept** | -7.78387 | 1.32198 | 53.26513 | 34.67 | <.0001 | 0 |
| **Age** | 0.05928 | 0.01318 | 31.07622 | 20.23 | <.0001 | 0.22 |
| **CPI_Do** | 0.03715 | 0.01866 | 6.08864 | 3.96 | 0.0476 | 0.12 |
| **CPI_Sy** | 0.02646 | 0.01379 | 5.65829 | 3.68 | 0.0561 | 0.11 |
| **CPI_In** | 0.02957 | 0.01522 | 5.80016 | 3.78 | 0.0532 | 0.11 |
| **CPI_Gi** | -0.04075 | 0.01050 | 23.13580 | 15.06 | 0.0001 | -0.24 |
| **CPI_Wb** | 0.03384 | 0.01847 | 5.15757 | 3.36 | 0.0681 | 0.12 |
| **CPI_Ai** | 0.06501 | 0.01295 | 38.73615 | 25.21 | <.0001 | 0.30 |
| **WAIS_SIM** | 0.08217 | 0.02429 | 17.58289 | 11.44 | 0.0008 | 0.18 |
| **WAIS_BD** | 0.01978 | 0.00748 | 10.74669 | 6.99 | 0.0087 | 0.15 |

**CPA Mode**

The second set of regression analyses conducted used CPA Mode as the dependent variable.

In the first regression, the independent variables were age, the CPI variables and Full Scale IQ, which can be seen in Table 29 below. A significant relationship could be seen between CPA Mode and eight predictor variables, including: age, Dominance, Self Acceptance, Responsibility, Good Impression, Communality, Achievement via Independence and Flexibility (R-square = 0.43 , F8,257 = 24.65, p < .0001). The adjusted R-square value showed that 41% of the variance in Mode was explained by the eight predictor values. Standard estimates indicated that age (-0.32) and Achievement via Independence (0.33) were the only moderate predictors of Mode, whereas all the other variables were only weak predictors.

*Table 29: CPI subscales and FSIQ (with age)*

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 8 | 752.93490 | 94.11686 | 24.65 | <.0001 |
| **Error** | 257 | 981.24555 | 3.81808 | | |
| **Corrected Total** | 265 | 1734.18045 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.95399 | **R-Square** | 0.4342 |
| **Dependant Mean** | 9.08271 | **Adj R-Square** | 0.4166 |
| **Coeff Var** | 21.51330 | | |

| Variable | Parameter Estimates | Standard Error | Type II SS | F Value | Pr > F | Standard Estimates |
|---|---|---|---|---|---|---|
| **Intercept** | -3.57319 | 2.32081 | 9.05063 | 2.37 | 0.1249 | 0 |
| **Age** | -0.13151 | 0.01984 | 167.79856 | 43.95 | <.0001 | -0.32 |
| **CPI_Do** | 0.07185 | 0.02858 | 24.13211 | 6.32 | 0.0125 | 0.15 |
| **CPI_Sa** | 0.03875 | 0.02240 | 11.43006 | 2.99 | 0.0848 | 0.10 |
| **CPI_Re** | 0.03976 | 0.02174 | 12.77494 | 3.35 | 0.0685 | 0.12 |
| **CPI_Gi** | -0.05942 | 0.01674 | 48.11481 | 12.60 | 0.0005 | -0.22 |
| **CPI_Cm** | 0.04479 | 0.01873 | 21.82841 | 5.72 | 0.0175 | 0.12 |
| **CPI_Ai** | 0.11267 | 0.02311 | 90.78128 | 23.78 | <.0001 | 0.33 |
| **CPI_Fx** | 0.05523 | 0.01871 | 33.26373 | 8.71 | 0.0035 | 0.18 |

In the second regression, the independent variables were age, the CPI scales and Performance IQ and Verbal IQ, which can be seen in Table 30 below. A significant relationship could be seen between CPA Mode as the dependent variable and eight predictor variables, including: age, Dominance, Self Acceptance, Responsibility, Good Impression, Communality, Achievement via Independence and Flexibility (R-square = 0.43, $F_{8,253}$ = 24.02, p < 0001). The adjusted R-square value showed that 41% of the variance in Mode was explained by the seven predictor values. Standard estimates showed that age (-0.32) and Achievement via Independence (0.34) were the only moderate predictors of Mode, whereas the other variables were only weak predictors.

*Table 30: CPI subscales and PIQ and VIQ (with age)*

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 8 | 736.84531 | 92.10566 | 24.02 | <.0001 |
| **Error** | 253 | 970.13561 | 3.83453 | | |
| **Corrected Total** | 261 | 1706.98092 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.95820 | **R-Square** | 0.4317 |
| **Dependant Mean** | 9.08779 | **Adj R-Square** | 0.4137 |
| **Coeff Var** | 21.54755 | | |

| Variable | Parameter Estimates | Standard Error | Type II SS | F Value | Pr > F | Standard Estimate |
|---|---|---|---|---|---|---|
| **Intercept** | -3.80567 | 2.35755 | 9.99198 | 2.61 | 0.1077 | 0 |
| **Age** | -0.13051 | 0.01992 | 164.55427 | 42.91 | <.0001 | -0.32 |
| **CPI_Do** | 0.06396 | 0.02910 | 18.52218 | 4.83 | 0.0289 | 0.13 |
| **CPI_Sa** | 0.04683 | 0.02298 | 15.91966 | 4.15 | 0.0426 | 0.12 |
| **CPI_Re** | 0.04534 | 0.02213 | 16.09015 | 4.20 | 0.0415 | 0.13 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **CPI_Gi** | -0.06167 | 0.01688 | 51.15942 | 13.34 | 0.0003 | -0.23 |
| **CPI_Cm** | 0.04392 | 0.01895 | 20.59962 | 5.37 | 0.0213 | 0.11 |
| **CPI_Ai** | 0.11587 | 0.02325 | 95.24815 | 24.84 | <.0001 | 0.34 |
| **CPI_Fx** | 0.05303 | 0.01898 | 29.92860 | 7.81 | 0.0056 | 0.17 |

Lastly for CPA Mode, a regression was carried out in which the independent variables were age, the CPI scales and the WAIS-III subscales (please refer to Table 31 below). A significant relationship could be seen between CPA Mode as the dependent variable and nine predictor variables, including: age, Dominance, Social Acceptance, Good Impression, Achievement via Independence, Flexibility, Similarities, Block Design and Comprehension (R-square = 0.50 , $F_{9,245}$ = 26.77, p < .0001). The adjusted R-square value showed that 48% of the variance in Mode was explained by the nine predictor variables. Again, standard estimates followed the same pattern for mode whereby Achievement via Independence (0.30) was the only moderate predictor of mode, closely followed by age (-0.26), with the rest of the variables being only weak predictors of Mode.

*Table 31: CPI and WAIS subscales (with age)*

| **Analysis of Variance** | | | | | |
|---|---|---|---|---|---|
| **Source** | **DF** | **Sum of Squares** | **Mean Square** | **F Value** | **Pr < F** |
| **Model** | 9 | 834.41667 | 92.71296 | 26.77 | <.0001 |
| **Error** | 245 | 848.57941 | 3.46359 | | |
| **Corrected Total** | 254 | 1682.99608 | | | |

| | | | |
|---|---|---|---|
| **Root MSE** | 1.86107 | **R-Square** | 0.4958 |
| **Dependant Mean** | 9.06275 | **Adj R-Square** | 0.4773 |
| **Coeff Var** | 20.535441 | | |

| **Variable** | **Parameter Estimate** | **Standard Error** | **Type II SS** | **F Value** | **Pr > F** | **Parameter Estimates** |
|---|---|---|---|---|---|---|
| **Intercept** | -6.89416 | 2.20511 | 33.85532 | 9.77 | 0.0020 | 0 |
| **Age** | -0.10694 | 0.01960 | 103.06906 | 29.76 | <.0001 | -0.26 |
| **CPI_Do** | 0.08159 | 0.02723 | 31.10471 | 8.98 | 0.0030 | 0.16 |
| **CPI_Sa** | 0.04656 | 0.02192 | 15.61900 | 4.51 | 0.0347 | 0.12 |
| **CPI_Gi** | -0.03928 | 0.01466 | 24.85640 | 7.18 | 0.0079 | -0.15 |
| **CPI_Ai** | 0.09931 | 0.02260 | 66.86524 | 19.31 | <.0001 | 0.30 |
| **CPI_Fx** | 0.04839 | 0.01785 | 25.45384 | 7.35 | 0.0072 | 0.16 |
| **WAIS_SIM** | 0.12883 | 0.03647 | 43.20850 | 12.48 | 0.0005 | 0.18 |
| **WAIS_BD** | 0.02844 | 0.01099 | 23.19985 | 6.70 | 0.0102 | 0.13 |
| **WAIS_COM** | 0.06984 | 0.03126 | 17.28295 | 4.99 | 0.0264 | 0.10 |

**Two-way ANOVAs**

Due to age forming part of each of the significant regressions carried out, a series of two-way ANOVAs were carried out in order to assess the interaction effect of age with each of the significant independent predictors of Capability and Mode. In terms of Capability and Mode, a series of two-way ANOVAs were conducted with each of the significant predictors based on the regression results, looking at the interaction effect of age (please refer to Appendix E). Dominance ($p = 0.0006$), Sociability ($p = 0.0002$), Independence ($p < .0001$), Wellbeing ($p = 0.0009$), Achievement via Independence ($p < .0001$), Similarities ($p < .0001$) and Block Design ($p < .0001$) all proved to have significant main effects on Capability, yet no interaction effect was found with age for any of these (please refer to Appendix E, Tables 32-38). For Mode, significant main effects were found for Self Acceptance ($p = 0.00016$), Achievement via Independence ($p < 0.0001$), Flexibility ($p < .0001$), Similarities ($p < .0001$) and Block Design ($p < .0001$), however no interaction effects with age were found (please refer to Appendix E, Tables 39-43). Therefore no significant interaction effects were found and no significant main effects were found for age for either Capability or Mode.

# CHAPTER 5:
# Discussion

This section aims to critically address the results of this study with regard to the conceptual framework explored earlier in the research. The main objective of this research was to investigate whether intelligence and/or personality is associated with one's capacity for handling complexity as measured via the CPA; and hence discover whether the CPA measures anything fundamentally different from the WAIS-III and the CPI. For the purpose of this chapter, an initial discussion of the sample via a close look at the descriptive statistics will be carried out. This will be followed by a discussion of the results obtained from the correlations, Chi-Squared tests, multiple regressions and two-way ANOVAs; all of which in some way address the overarching research questions which were laid out earlier.

## The Sample of Managers

Descriptive statistics were included in the previous chapter as they were considered beneficial to the study in that they provided a context within which the results could be interpreted. They were used in the current study mainly as a means of describing the sample's only biographical information obtained (age). However, descriptive statistics for the instruments used also provide information about the highly specific sample of managers.

In terms of age, the sample ranged from ages 24 to 62 with the average individual falling around 33 years of age. Based purely on this as the only biographical information obtained, the histogram for age (please see Appendix B) illustrated that the majority of the sample fell just above the mean. As expected, this showed that those who held managerial positions had been working for several years and hence that experience could play a factor in them having attained such positions.

Beyond the biographical information obtained, the descriptive statistics for the CPA, WAIS-III and the CPI also provided interesting information about the sample.

When looking at the CPA in terms of Capability, the current potential of managers ranged from Level One (Quality) to middle Level Four (Strategic Development) at the

time of assessment; the majority of the sample fell into Level Two (Service). People within the Service level are likely to make a substantial contribution to work within Level One (Quality), yet their most crucial contribution falls within their own level as they try to attain pre-determined goals outlined for themselves (Stamp & Stamp, 1993). Importantly, within the Service level (into which the majority of the sample fell), the major judgement theme is known as *accumulating* – providing a service to people by making knowledge explicit and responding to the needs of the customers. Individuals are required to make judgements in accordance to customer needs, whereby outcomes of their judgements are only realised months later due to customer feedback (Stamp & Stamp, 1993). Furthermore, the theme of Service is mainly about exercising cost control via lower cost options. These individuals therefore have to operate by making certain judgement calls, which partially explains the complexity of their jobs.

When contextualising these individuals into an organisational sphere it makes sense that most of the managers fell into this category within the organisation used, which focuses on distributing products both locally and internationally to a wide variety of individuals. First line managers in this context need to be able to control costs in order to produce and serve as best as they possibly can (Stamp, 2003). Such managers are extremely important because they find themselves in an array of different circumstances and need to respond in the best possible way for the customers, their employees and suppliers; they also need to make sure that the cost and feasibility of that response is linked directly to the core purpose of the organisation (Stamp, 2003). Therefore, having the majority of the managers within this sample falling into Level Two appears to relate specifically to the company used and what is required of their managers in particular. However, it is likely that in most organisations a certain number of managers will need to fall into this category in order to be able to fulfil the Service Level needs of the organisation.

CPA Mode, on the other hand, differs greatly as it predicts future potential for handling complexity (Stamp & Stamp, 1993). Individuals within the sample were found to fall between Level Two (Service) and Level Seven (Corporate Prescience), with the majority of the sample predicted to reach upper Level Three (Good Practice)**.** This shows that individuals were expected to progress from where they were

comfortable in terms of functioning at the time of assessment to where they would feel comfortable in the future and that the majority of the sample was expected to feel comfortable in Level Three (Good Practice). The main judgement theme for Level Three is known as *connecting* – which entails scanning the environment to search for new ideas and innovations in order to direct the organisation into new states for the future (Stamp, 1981). This level is about coping with both stability and change within the two years following the assessment and engaging with unknown future prospects; therefore it involves looking at the bigger picture and paying close attention to complexity facets within the environment.

As the future potential of most managers in the sample fell within this range, one expects them to have been seen as able to handle a heightened sense of complexity over time and to function successfully doing so (Stamp, 1981). Such managers are those which organisations typically want to select and retain. The theme of practice is extremely important, as it is about ensuring cost effectiveness (Stamp, 1993). Even though people seem to be believe that the *higher* the level the more important the role in an organisation, the overall efficiency of the entire organisation depends on the practice level and how effectively and economically resources are utilized at this level (Stamp, 2003). Therefore, organisations should desire their managerial staff to fulfil their capabilities in Level Three, as Levels Four and Five might be able to outline the use of existing resources but are unable to make the decisions which produce maximum efficiency in practice (Stamp, 1993).

In terms of CPA Style, managers were found to be predominantly Style B and Style C, with a minimal number falling into Styles A and D, and only one individual classified as Style E. With so few individuals being classified as Styles A and E, one can see that the majority of managers did not follow an intuitive approach. Rather, the majority of the sample was classified as B and C; B being those whose styles have been identified as moving from concrete to data-driven and C being those who are a mix between both data-driven and intuitive (Stamp, n.d.). Interestingly, one might have expected that managers who are in positions where much complexity dominates their working life would be those who would use some intuition and would not feel the need to rely as heavily on concrete and factual information. However those classified as Style C use an integrative approach and gather factual information but

are guided to solve problems with their intuition in certain circumstances (Stamp, n.d.).

In terms of intelligence, overall IQ scores as assessed by the WAIS-III are standardized with a mean of 100 and a standard deviation of 15 (Wechsler, 1997). From the descriptive statistics, one can see that the average Full Scale IQ within the sample was approximately 119, which can be classified within the above average IQ score range. Very few individuals fell in the below average IQ range, whilst quite a large part of the sample could be classified as having superior or very superior IQ. As the complexity and ambiguity of managing organisations continues to develop, managers are required to have higher levels of cognitive abilities, to be able to learn more at a faster rate than other people and to be able to adapt and meet the demands of the environment in which they operate (Harvey, Novicevic & Kiessling, 2002). Therefore, it was expected that because the sample was made up of managers they would be likely to have better cognitive abilities, and hence it made sense that the majority of the sample had superior IQ scores (Harvey et al., 2002).

For the descriptive statistics for the WAIS-III subscales, the highest mean scores were seen for Digit Symbol Coding, Similarities, Block Design and Comprehension. Each of these subscales assesses an individual's abstract thinking and reasoning skills to some extent. On the other hand, the lowest scores were found for Picture Arrangement, which requires structuring a story into chronological order; and Arithmetic, which requires verbal answers to mathematical questions. As explained above, the complexity and ambiguity of the work that managers are faced with everyday requires having higher cognitive abilities and hence being able to think and strategize effectively on a daily basis (Harvey et al., 2002). When seeking to find such human abilities within an assessment measure like the WAIS-III it was therefore not surprising that a managerial sample scored high on tasks assessing more abstract thinking and reasoning skills (as they need to be able to constantly update their thought processes and plans) (Harvey et al., 2002), and scored lower on scales which required more structured and rigid thinking which would be expected of individuals who do not have to face such complexity in their jobs.

Groth-Marnat (1999) explains that managers "…might vary on the extent to which they: need to take control, carefully consider all options in solving a problem, achieve individually or through confirming to some outside structure, are comfortable with their co-workers, are aware of details and are flexible… points on their CPI results can help with understanding and elaborating on the differences in managerial style" (p.386). This explanation addresses the potential difficulty in a discussion of managerial overall scores as each and every individual attains a different score for different facets, and thus overviews of an entire sample may not provide much useful information. Regardless, interpreting the values of the means (which is done in accordance to Table 11), indicates high averages for Dominance, Capacity for Status, Good Impression, Wellbeing and Achievement via Conformance. Moderately high means can be seen for Independence, Empathy and Achievement via Independence. With these subscales showing the highest means, it is important to think about what type of people the sample was made up of.

Individuals high on Dominance are those who express opinions freely, are highly assertive, have excellent abilities to plan, define their goals and work consistently towards them and are outgoing, ambitious and show initiative (Groth-Marnat, 1999). Individuals high on Capacity for Status are independent, self-directed, achievement oriented and are able to adapt to the environment in order to attain goals (Groth-Marnat, 1999). High scores of Good Impression can be seen to reflect fake good profiles, people who have inflated self-images and are thus unaware of certain self perceptions, or may show an individual who has a sound level of adjustment (Groth-Marnat, 1999). High scores for Wellbeing imply individuals who have trusting interpersonal relationships and solid family backgrounds, who are dependable and responsible and self-confident (Groth-Marnat, 1999). High Achievement via Conformance illustrates those who prefer structure, organised settings and have well-defined performance goals (Groth-Marnat, 1999). Independence links closely to Dominance, and high scores suggest self-assured individuals who are capable, self-reliant and resourceful and who take initiative (Groth-Marnat, 1999). High Empathy scores can be seen in individuals who are interpersonally effective as they are perceptive, intuitive and flexible (Groth-Marnat, 1999). Lastly, Achievement via Independence refers to those who do not enjoy working under rigid rules or structures as they value creativity and originality (Groth-Marnat, 1999).

Gough (1990) found that those who possessed leadership qualities scored highly for Dominance, Sociability, Self Acceptance, Independence and Empathy. Hence, the high scores for Dominance, Independence and Empathy would be expected for a managerial sample. Interestingly, understanding a person's comfort level in terms of being a leader is related directly to their levels of Dominance, as Dominance has continuously been proven to distinguish between leaders and non-leaders (Groth-Marnat, 1999). The high mean for Dominance in the sample therefore suggests that most individuals within the sample had leadership qualities (Harvey et al., 2002).

Having used a managerial sample in today's highly complex environment, it was expected that scores for Flexibility would be extremely high in order to cope with the immense uncertainty (Groth-Marnat, 1999). However, the mean for Flexibility indicated moderately low results for the sample. This could be explained by the fact that performance within an organisation is not purely personality-related, but also reflects how an individual's personality fits into an organisation's structure, climate and culture (Groth-Marnat, 1999). Therefore, additional information about the organisation from which the sample was taken would have been extremely useful; however it was not possible to obtain this due to the archival nature of the data.

Despite the lack of specific information regarding the nature of the work conducted by this particular sample of managers, a close examination of the descriptive statistics obtained from the CPA, WAIS-III and CPI suggests that these predominantly match what would generally be expected from this type of sample.

Key Findings

Both personality and intelligence have been found to be strong predictors of job performance; but job performance can be defined as a variety of things, including overall performance, poor behaviour, competence, effectiveness, team work, creativity and effort (Maltby, Day & Macaskill, 2007). Research on intelligence and job performance (Bertua, Anderson, & Salgado, 2005; Hunter & Hunter, 1984) was conducted using several types of jobs, including managers, in which intelligence was found to be a strong predictor of job performance. Similarly, personality research has also proven to be highly consistent, showing that different facets of personality predict

different forms of job performance (Hough, 1992; Hough & Oswald, 2000; Robertson, 2001; Salgado, 2003).

In terms of this research, personality and intelligence were assessed in order to discover whether they were related to capacity for complexity, which can be classified as a form of job performance as it is concerned with the process of decision-making in the face of uncertainty and the capacity an individual has to work with increased levels of complexity and hence instability (Stamp, 2003). This research was therefore interested in discovering whether intelligence and/or personality was related to, or could predict, capacity for handling complexity as assessed by the CPA; and could thus be used in place of the CPA; or whether the three assessments actually measured three independent constructs and thus none of the assessments could replace the use of the others.

Capacity for Complexity

Firstly, it is necessary to outline that when analysing the facets of the CPA, it was found that there was a strong relationship between the components of current capacity for complexity (Capability) and future capacity for complexity (Mode). In terms of Style, no significant association between Capability and Style was found although there was a significant association between CPA Mode and Style.

Based on the work of Elliot Jacques and Gillian Stamp, which predicts the growth of individuals' capabilities over a time, one would expect that Capability and Mode should be strongly related. Previous work conducted by Homa (1967) and Jacques (1961) validated the array of capability growth curves, and based on this research it is evident that an individual's current capacity for handling complexity will impact upon what level they will be comfortable handling complexity in the future. Style, on the other hand, was only related to one's future potential for handling complexity (Mode), and hence gives insight into the Styles which are more likely to be able to handle complexity in the future. Based on the results it is likely that individuals who prefer more intuitive approaches to work are those who will be able to handle excessive complexity in Levels 5, 6, and 7. As the sample was mainly made up of data driven (Style B) and data driven and intuitive managers (Style C), it is sensible that Mode scores predominantly fell into Level Three (Practice). One can potentially predict that

if management Styles had been more intuitive (Styles A and E), Mode scores might have turned out to be predominantly in Levels 5, 6, and 7; as much more intuition is needed to function within those levels.

Intelligence and Capacity for Complexity

Intelligence indicates the ability to learn from experience as well as the capacity to be flexible and adaptable in changing situations (Sternberg, 1999). For this reason, one would expect intelligence constructs to be closely linked to capacity for handling complexity. In the business world of today, which is characterised by complexity and instability, the ability to respond to changing and uncertain circumstances is becoming a tool for survival; thus illustrating the necessity of assessing intelligence within the employee pool available for organisations (Morgan, 2006). In the unstable corporate environment that exists today, managerial jobs require the ability to be adaptive and responsive to a range of situations (Cooper, 2005). Therefore intelligence testing may allow for organisations to ensure that individuals are correctly placed and selected for specific positions, especially those in managerial positions (Aston, 2006). Because skills rapidly become extinct or redundant in the vastly changing working environment, assessing whether individuals have the intelligence to adapt to ever-changing contexts has become highly crucial in order to put those individuals who can function successfully under such circumstances in positions where they are required (Cook & Cripps, 2005).

Based on Stenberg's (1999) and Wechsler's (1958) understandings and definitions of intelligence, which incorporate being flexible and adaptable to change, one would assume that the WAIS-III would be closely related to capacity for complexity. However Verbal IQ, Performance IQ and Full Scale IQ were found to be unrelated in any way to either individual's current or future capacity to handle complexity. This was a surprising finding, especially given Wechsler's (1958) definition of intelligence, which states that intelligence is '…the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment' (p.7). This definition of intelligence closely mimics the theoretical understanding of capacity for complexity, which is why it was expected that ability to handle complexity, as measured by the CPA, and overall intelligence, as measured by the WAIS-III, would be closely related. In addition, because the CPA takes the format

of a three-hour interview process made up predominantly of verbal communication, one would expect that verbal abilities and hence Verbal IQ would be linked to performance on the CPA. However, Verbal IQ was also unrelated to either current or future potential for handling complexity.

Furthermore, the WAIS-III subscales were not found to be extensively related to handling complexity for either Capability or Mode. When assessing which aspects of intelligence were related to current capacity for complexity, Picture Completion, Digit Symbol Coding and Block Design proved to be only weakly related, with Similarities having the only moderate relationship with Capability. Future capacity for complexity, on the other hand, was found to be related to Picture Completion, Digit Symbol Coding and Comprehension but only weakly related; whereas Similarities and Block Design were found to have the only moderate relationships to Mode.

On a practical level, Similarities entails giving a participant two words for each item and asking them to explain how the two words or concepts are alike or related (Kaplan & Saccuzzo, 2008); whereas Block Design entails asking the participants to replicate designs shown with a two dimensional image, but requiring the applicant to do so with actual three dimensional cubes (Tulsky, 2003). These subscales are practically very different as one forms part of Verbal IQ and the other Performance IQ and they are both different in terms of what they require from individuals; yet they both require a high sense of abstract thinking and reasoning in order to complete the tasks successfully. Therefore, these two subscales seem sensible in terms of being related to handling complexity, which entails much abstract thinking that is not structured, planned or rigid but rather more flexible and dynamic (Harvey et al., 2002).

"Intelligence can be measured by way of abilities because what we are concerned with eventually is not the abilities themselves but what enters into or emerges from them" (Wechsler, 1958, p.15). This implies that when assessing the subscales of the WAIS-III, one needs to look deeper into what is likely to emerge from them, and not just the ability to complete the subscales effectively. With abstract thinking and reasoning being highlighted as necessary abilities for managers to possess in such unstable environments, it is not surprising that subscales of the WAIS-III such as Similarities

and Block Design were related to Capability and Mode (Harvey et al., 2002). However, it was surprising that Picture Completion was only weakly related to Capability and Mode based on the fact that Picture Completion appears to measure abstract thinking and reasoning as well. Picture Completion requires good perception, concentration and interest in the environment in order to identify missing elements and thus being able to grasp the interrelationships between the various facets of images (Tulsky, 2003; Zimmerman & Woo-Sam, 1973). On a theoretical level, this subscale implies being comfortable handling uncertainty and, regardless of the uncertainty, trying to find solutions to the problems. Similarly, one would expect Matrix Reasoning to be related to handling complexity as it involves using problem solving, reasoning skills and mental manipulations (Tulsky, 2003). Lastly, Comprehension, which involves confronting daily scenarios that require interpretation and decision-making, was only weakly related to future potential for handling complexity. One would, however, expect it to be related to both current and future capacities of handling complexity, as it requires abstract thinking and reasoning about unfamiliar scenarios that an individual is required to tackle effectively.

In terms of individuals' preferred approach, similar subscales of the WAIS-III which were found to be related to Capability and Mode were found to be related to Style as well. Digit Symbol Coding, Similarities and Block Design were found to be associated with Style based on the series of Chi-Squared Tests conducted. Since Style can be defined as the way in which a person makes sense of their environment, these subscales can be linked directly to how a person approaches tasks within their job.

Digit Symbol Coding, which involves the "…ability to master a new and essentially alien task within a brief time span" (Zimmerman & Woo-Sam, 1973, p.121), is about how an individual learns new tasks on the job. The Similarities subscale can be linked to how an individual develops and understands their own strategies for approaching different work issues (Zimmerman & Woo-Sam, 1973). On the job, Block Design appears to be related to one's practical problem solving in physical work spheres (Zimmerman & Woo-Sam, 1973). Based on these descriptions, it is expected that these subscales would be associated with CPA Style, which in essence is one's preference for approaching work-related tasks. However, it must be noted that the majority of the sample was made up of Style B (which is data-driven) and Style C (a

mix of data-driven and intuitive) and therefore perceived as managers who are 'generalists'. This therefore highlights that the WAIS-III subscales which resonated with Style are those subscales which are expected to be related to individuals who are more data driven, and hence more analytic as compared to being intuitive.

The results for intelligence in terms of current and future capacity for complexity illustrated that the WAIS-III appears to measure fundamentally distinct constructs to those assessed by the CPA, as the overall subscales were unrelated; only one subscale related to current potential to handle complexity; and only two related to future potential for handling complexity – both of which related only moderately. In addition, only three aspects of the WAIS-III appeared to be associated with Style and hence numerous aspects of the WAIS-III did not appear to overlap with preferred approach to specific tasks.

Personality and Capacity for Handling Complexity

Robbins et al. (2009) argue that managerial roles are about coping with complexity. "Good management brings about order and consistency by drawing up formal plans, designing rigid organisation structures, and monitoring results against the plans… [it is also about] coping with change… developing a vision for the future; then they align people by communicating this vision and inspiring them to overcome hurdles" (Robbins et al., 2009, p.290). This definition gives a broad outline for the role that managers play in organisations, and the types of characteristics they need to possess. Therefore, in order to cope with complexity, managers need to have specific personality qualities which enable them to do so effectively.

Of the twenty CPI variables, several appeared to be positively related to individuals' current potential for handling complexity. Moderate relationships could be seen between current capacity for complexity and Capacity for Status, Sociability, Social Presence, Independence, Empathy, Tolerance, Achievement via Independence and Flexibility. Very similarly, moderate relationships could be seen between future potential for handling complexity and Sociability, Social Presence, Empathy, Achievement via Independence, Intellectual Efficiency and Flexibility. Facets of personality that were related to current capabilities for handling complexity and future potential for handling complexity were nearly equivalent, aside from Intellectual

Efficiency which appeared to be related moderately to future potential only. The personality traits which were found to relate to handling complexity appear to be qualities which would be expected of managers functioning in today's business environments (Harvey et al., 2002).

From a close look at the definitions of each of the personality traits that were related to handling complexity it is evident that each of them plays a crucial role in functioning today as a manager. Capacity for status implies having the characteristics and desire to occupy a high status and ambition for a challenge (Beutler & Groth-Marnat, 2003). Sociability is about being outgoing, comfortable with being surrounded by others, and hence connecting and communicating with individuals (Craig, 1999). Social Presence is about feeling at ease with attention and recognition as well as personal worth and accomplishment (Beutler & Groth-Marnat, 2003; Craig, 1999). Independent individuals are self-sufficient and are able to work autonomously to achieve goals (Beutler & Groth-Marnat, 2003; Craig, 1999). Empathetic managers have the ability to respond to the needs of others and hence their subordinates and work colleagues (Beutler & Groth-Marnat, 2003). Tolerance is displaying respect toward others and being open-minded (Beutler & Groth-Marnat, 2003). Achievement via Independence is having the potential to perform in an unstructured environment and hence being able to perform regardless of uncertainty and instability (Beutler & Groth-Marnat, 2003). Intellectual Efficiency encompasses one's ability for handling intellectual matters (Beutler & Groth-Marnat, 2003). Finally, Flexibility is tolerating uncertainty and ambiguity in order to function effectively (SAB 2006). With each of the personality traits outlined, it is apparent that of the twenty CPI subscales, these are facets one would expect managers to hold in order to cope with complexity.

The results of the correlation analysis also highlighted a lack of certain relationships which were expected. For example, Achievement via Conformance, which can be labelled as the opposing quality of Achievement via Independence, is about performing within a structured environment that is stable, rigid, ordered and controlled (SAB, 2006). A manager who possesses such a trait is one who would struggle to cope with dealing with complexity and instability in today's business environment. This personality trait was found to be unrelated to capacity for

complexity both currently and in the future, although a negative relationship between these would have been expected.

In addition, the variable of Femininity/Masculinity was found to be non-significantly related to both current and future capacity for complexity. Interestingly, current research on business complexity has addressed the concept of androgyny and androgynous leadership. Organisations in South Africa are currently experiencing immense diversity as an increasing number of women enter organisational spheres (DeMatteo, 1994). Due to this, an emphasis on directing approaches to leadership in the twenty-first century into a more dynamic and critical perspective is occurring, especially in terms of gender characteristics. Therefore, leaders and managers are encouraged to be androgynous - to blend and utilize both masculine and feminine traits in a flexible manner - in order to confront and deal with a variety of workplace challenges, which is a necessary skill in today's unstable world (McGregor & Tweed, 2001). Research supporting androgyny claims that the most effective leaders are those who are able to be task- and goal-oriented (originally seen as masculine) whilst simultaneously helping, supporting, and empathising with employees (originally seen as feminine) (Fateri & Kliner, 1992). The benefit of doing so is adaptability, whereby androgynous individuals have a wider range of characteristics to draw from thus allowing for greater adaptability to different situations, better handling of many diverse tasks and effective functioning within complexity (Bem & Lewis, 1975, as cited in Cheng, 2005). Thus individuals who are more androgynous in their functioning should be able to cope with complexity better than those who are predominantly feminine or masculine. The lack of a significant relationship found between Masculinity/Femininity and capacity for complexity in the sample could possibly suggest that being predominantly either one or the other is ineffective when trying to cope with complexity and rather that using a mixed approach such as androgyny is more effective.

In terms of the preferred approach a person would take to a specific task, CPI variables such as Empathy, Tolerance, Achievement via Independence, Intellectual Efficiency and Psychological Mindedness were found to be related to CPA Style. One would expect that many more facets of the CPI would relate to the way in which individuals approach job tasks, as all human characteristics and qualities would be

expected to be reflected to some extent. As the predominant Styles in the sample were B and C and hence mainly analytical with some elements of intuition, one would expect more analytical aspects of the CPI to be associated with Style. With that said, aspects of the CPI which appear to reflect an analytical Style are Achievement via Conformance and Self-Control – neither of these was seen to be related to Style in the sample. Rather, more intuitive CPI facets could be seen to be related, such as Achievement via Independence, Intellectual Efficiency and Psychological Mindedness. All of these entail some level of perception, autonomy, creativity, self-confidence and ambition (Megaree, 2009).

Overall, it appears that multiple facets of the CPI were related to current and future capacity for complexity, as well as Style. Compared to the WAIS-III, more facets of the CPI were found to be related to the different aspects of the CPA, and hence it appears that personality characteristics are related to capacity for complexity more so than aspects of intelligence. However, both the intelligence and personality factors appeared to be at most only moderately related to capacity for complexity. With this said, discussing whether any of the elements of intelligence and/or personality can predict capacity for complexity is crucial in order to see if they can be used in place of the CPA.

Intelligence and/or Personality Predicting Capacity for Complexity

In order to answer the final research question of prediction and whether intelligence and/or personality can be used to predict one's capacity for complexity, a series of regression analyses were run using different combinations of independent variables and either capability or mode as the dependent variables. Unfortunately predictors of Style could not be assessed as nominal data is not suitable for this analytical technique (Black, 2010).

In terms of the three multiple regression conducted for Capability, it was found that the regressions with the CPI variables and the WAIS-III subscales was the most predictive (R-square = 0.44, $F_{9,245} = 20.97$, $p < .0001$). Since Full Scale IQ, Performance IQ and Verbal IQ were found to be unrelated to Capability based on the results of the correlations, it was expected that the WAIS-III subscales would be more predictive than the overall scales.

Regressing the CPI variables and the WAIS-III subscales onto Capability indicated that 41% of the variance in Capability was explained by age, Dominance, Sociability, Independence, Wellbeing, Achievement via Independence, Similarities and Block Design. High values of these independent variables were associated with high values of Capability, except for Good Impression where a negative parameter estimate indicated that high values of Good Impression were associated with low values of Capability. With a closer look at the standardised parameter estimates (where values can be interpreted similarly to a correlation), it was evident which independent variables were the most predictive of Capability. These were Achievement via Independence which proved to be moderate, followed by age and then the other independent variables listed which all appeared to be weak predictors.

For Mode, it was also found that the multiple regression with the CPI variables and the WAIS-III subscales was the most predictive (R-square = 0.50, $F_{9, 245} = 26.77$, $p < .0001$), again expected because the overall WAIS-III scales were found to be unrelated to Mode in the correlation analysis. When regressing the CPI variables and the WAIS-III subscales on Mode, 50% of the variance in Mode was explained by age, Dominance, Self Acceptance, Good Impression, Achievement via Independence, Flexibility, Similarities, Block Design and Comprehension. This indicated that high values of these independent variables were associated with high values in Mode, except for age and Good Impression, where negative parameter estimates indicated that high values of age or Good Impression were associated with low values of Mode. Furthermore, the most predictive independent variable for Mode was Achievement via Independence, which proved to be moderate, followed by age and the other independent variables which all appeared to be weak predictors. With age appearing to be the second most predictive independent variable for both Capability and Mode, two-way ANOVAs were carried out in order to assess to what extent age and the interactions between age and the other independent variables on the dependent variables were significant. However, it was found that age as a main effect or as an interaction effect was not significantly related to any of the variables. Rather main effects were found for the CPI variables and WAIS-III subscales.

Therefore the key findings of the current research in answering the major prediction question indicated that Achievement via Independence was the only moderate predictor of both Capability and Mode, with all other independent variables proving to be weak predictors. Explanations of these findings are discussed in the context of the literature below.

The word *capability* describes the way in which individuals experience the world around them, which includes defining, understanding and approaching the environment one operates within. Capability therefore is about the range and complexity of the world. Stamp (1981) believes that "…a system is complex when a great many independent agents are interacting with each other in a great many ways through time" (p.1). Complexity can therefore be defined as the degree of uncertainty that people recognize and try to tolerate, their view of such uncertainty and the abilities they possess to confront challenges and find solutions (Stamp, 1981). The CPA is an assessment technique which is used to assess an individual's current capability for handling such complexity, their future potential capabilities for handling complexity and, lastly, their preferred approach for confronting tasks at work. Therefore, the multiple regressions conducted were done with the intention of finding out to what extent specific aspects of intelligence and personality could predict individuals' capacity for handling complexity both currently and in the future.

It was found that Achievement via Independence proved to be the only moderate predictor of both Capability and Mode. When Achievement via Independence was originally being constructed, it was used to predict achievement in settings where "independence, creativity, and self-actualisation were rewarded" (Megargee, 2009, p. 330). In addition, when it was being developed Gough (1972) sought to discover whether it was an inefficient measure of intelligence or whether it actually measured achievement. It was found that Achievement via Independence was less correlated with intelligence than it was to actual performance (Gough, 1972). High scores for this construct were defined as individuals who were independent and clear thinkers, with high tolerance for complexity and ambiguity, and who dealt well with abstractions (Megargee, 2009). This definition illustrates why Achievement via Independence would be expected to predict capacity for handling complexity. The extent to which a manager possesses this trait explains the extent to which they are

comfortable handling complexity, and furthermore this research suggests that Achievement via Independence relates to and can predict both their current and future potential to do so.

Aside from Achievement via Independence, other CPI were expected to be related to capacity for complexity, yet were found to not be predictive. Aspects of the CPI which were expected to be predictors of capacity for complexity included Dominance, Independence, and Flexibility.

With Dominance being known as the one CPI scale which is generally related to leadership abilities, it was expected to be related to capacity for complexity. Furthermore, individuals with high scores for Dominance are known to possess verbal fluency, persuasiveness and are likely to take control of situations, whereas those low on Dominance are uncomfortable taking charge and prefer others to find solutions to problems (Groth-Marnat, 1999). Since the CPA entails human communication and discussion between a participant and a practitioner, on a practical level the Dominance of a person within that interview process and their verbal fluency and persuasiveness would be expected to be related to how they handle themselves. Thus, individuals high on Dominance would be those who are able to show confidence in their abilities to take control of situations and confront things head on. However, Dominance was surprisingly found to be only a weak predictor of capacity for complexity.

Since Independence and Achievement via Independence are closely intertwined in terms of their meaning, one would have also expected Independence to be a stronger predictor of capacity for complexity. Independent individuals value working outside of restrictions and thus are individuals who are comfortable guiding themselves within the work sphere. Moreover, Groth-Marnat (1999) explains that independent individuals have wide vocabularies, are able to present themselves very well and hence make a good impression. Again, such facets would be expected to impact upon how an individual handles themselves within the CPA interview process and yet this was found to be only weakly related to their current capacity for complexity.

Lastly, it was expected and potentially even assumed that of all the CPI scales, Flexibility would be one of the strongest predictors of capacity to handle complexity.

This is because Flexibility is the construct which identifies individuals who are flexible, adaptable, imaginative, and who are able to change their behaviours, thinking patterns and outlook (Megargee, 2009). These characteristics seem to be crucial in terms of handling complexity and uncertainty in today's constantly changing business environment. However, it was found that Flexibility was only a weak predictor of future capabilities and in no way a predictor of current capacity for complexity. This is greatly surprising as Stamp's (1989) theory of handling complexity appears to be very closely related to the theory surrounding the CPI variable of Flexibility, suggesting that it should be the personality factor most closely linked to handling complexity.

Even though Achievement via Independence was found to be a moderate predictor of capacity for complexity (current and future), it can be seen that overall the CPI proved to be a weak predictor of capacity to handle complexity. Other constructs were found to be only weak predictors and a number of facets were not related to capacity to handle complexity at all. This means that the personality constructs which make up the CPI cannot be used effectively to predict capacity to handle complexity. Practically, this means that the CPI cannot be used in place of the CPA or used to predict an individual's abilities for handling complexity. With Achievement via Independence as the only moderate predictor of capacity for complexity of all the independent variables regressed, it is necessary to assess to what extent the different aspects of intelligence are predictors of handling complexity.

A variety of studies which have been conducted have looked into the importance of intelligence in relation to leadership (Lord, De Vader & Alliger, 1986; Rubin, Bartels & Bommer, 2002; Schmidt & Hunter, 1998). Schmidt and Hunter (1998) claimed that the relationship between intelligence and performance of leaders was stronger than other organisational positions, since leaders perform tasks which are extremely complex and are required to gather, interpret and utilise a broad variety of information which is often changing. Moreover, leaders are responsible for tasks such as developing and understanding strategies, finding solutions to problems, motivating other employees and constantly monitoring the environment one is operating within. Fiedler and Garcia (1987) believe that these leader and managerial requirements are

closely related to intellectual functions, which are either similar or indistinguishable from those functions which are assessed via intelligence tests.

In terms of this research, however, intelligence was found to be unrelated to and not predictive of capacity for complexity. None of the WAIS-III overall scales were found to predict capacity for handling complexity; and only two of the subscales in terms of Capability and three in terms of Mode were found to weakly predict capacity for complexity. Those found to be predictors were Similarities, Block Design and Comprehension – which entail abstract thinking and reasoning and were hence the most likely facets of the WAIS-III to be predictors of capacity for complexity. However, they were all found to be only weak predictors, which ultimately means that intelligence was not strongly related to or a predictor of capacity for complexity. Therefore the WAIS-III cannot be used in place of the CPA, as only very few of the WAIS-III facets were found to relate to or to be predictors of capacity for complexity; and furthermore those found proved to be only weak predictors. This suggests that capacity for complexity and intelligence are separate constructs with only a few weak overlapping links being found between the two assessments.

Nettlebeck and Wilson (2005), who conducted extensive reviews on intelligence and intelligence testing, concluded that assessments should always involve other activities and other assessments in order to gather relevant information for individuals on a variety of personal aspects and attributes. In line with their research, it can be concluded that when recruiting or selecting individuals for managerial positions, using a variety of assessments will prove to be the most effective and successful means of gaining the variety of information sought. Even though the CPA is extremely expensive within the context of South Africa, it appears that using such an assessment to assess capacity for complexity is irreplaceable and provides information which other techniques cannot compensate for. Therefore using the WAIS-III, the CPI and the CPA simultaneously in the South African context will provide the comprehensive information organisations need when hiring or selecting individuals to fulfil managerial positions. On the other hand, if one is purely interested in finding out a manager's capacity for complexity, the CPA should be the assessment technique chosen to be used, as it appears to provide extensive information about an individual's

capacity for complexity and information that cannot be gained from the WAIS-III or the CPI.

# CHAPTER 6:

## Conclusions, Limitations, Implications and Recommendations

### Conclusions

This study was primarily interested in investigating three assessments in order to see whether more practical and less specialised measures of intelligence (as assessed by the WAIS-III) and/or personality (as assessed by the CPI) were in any way associated with one's capacity for managing complexity (as measured by the CPA). More specifically, this research set out to discover whether the CPA assessed anything distinctly different from the CPI and the WAIS-III and to what extent these might be used to predict capacity to manage complexity in place of the CPA.

As Wechsler's (1958) definition of intelligence incorporates how an individual responds to the environment effectively and hence is able to flexibly adapt to one's surroundings, it was predicted that this construct would be closely related to one's capacity for handling complexity. However, the results from this research indicated that Verbal IQ, Performance IQ and Full Scale IQ were unrelated to individuals' current and future capacity for handling complexity. Even though significant associations were found between subscales of the WAIS-III and current capacity for complexity, only three subscales were found to be weakly related (Picture Completion, Digit Symbol Coding and Block Design) and only one subscale was found to be moderately related (Similarities). In addition, only a few subscales of the WAIS-III were found to be related to CPA Style. Based on these results, it is evident that the WAIS-III was not strongly associated with one's capacity for handling complexity; and hence appears to measures fundamentally distinct constructs to those of the CPA. Therefore, the WAIS-III should not be used in place of the CPA. However, if financial constraints prove to be immensely problematic, one could potentially use the above mentioned subscales in order to assess an individual's capacity for complexity but these would not provide any depth of information and would not be comparable to data obtained from the CPA.

Personality variables which were measured by the CPI, on the other hand, were found to be more strongly associated to one's capacity for complexity in comparison to intelligence. Moderate relationships were found between current capacity for

complexity and Capacity for Status, Sociability, Social Presence, Independence, Empathy, Tolerance, Achievement via Independence and Flexibility. Likewise, moderate relationships were found between future potential for handling complexity and Capacity for Status, Sociability, Social Presence, Empathy, Achievement via Independence, Intellectual Efficiency and Flexibility. Facets of personality that were related to current capabilities for handling complexity and future potential for handling complexity were nearly equivalent, except for Intellectual Efficiency which was related to future potential only. Moreover, in terms of Style, CPI variables such as Empathy, Tolerance, Achievement via Independence, Intellectual Efficiency and Psychological Mindedness were found to be related. On the whole, it appears that numerous facets of the CPI were found to be related to current and future capacity for complexity, as well as Style. More facets of the CPI were found to be related to the different aspects of the CPA in comparison to the WAIS-III, and hence it appears that personality characteristics were more strongly related to capacity for complexity than intelligence. However, with relationships only showing these personality variables to be moderately related, one needs to be careful in choosing whether to use the CPA or CPI as even though relationships exist these assessments do appear to measure unique constructs as well.

The final research question sought to find out whether intelligence and/or personality could predict one's capacity for complexity. Even though several CPI variables were found to be closely related to both Capability and Mode, only Achievement via Independence was found to be a moderate predictor of both Capability and Mode. As Achievement via Independence was followed by age as the next best predictor, the main effects of age and other CPI and WAIS-III variables, as well as their interactive effects on both CPA Mode and Capability, were assessed using two-way ANOVAs. In all of these, the interactions and main effects of age were found to be insignificant. These results suggest that using the CPA to predict one's capacity for complexity is far more effective than using the subscales of the CPI which proved to have only a moderate or weak prediction rate. As with the WAIS-III, this suggests that if necessary one could potentially use Achievement via Independence and the other above mentioned subscales to estimate capacity to handle complexity; however this would not yield the same quality of information as the CPA.

This research provides an understanding for organisations about the different assessment techniques available; and the findings indicate that the CPA assessment is the most effective tool for finding out about an individual's capacity for complexity. Even though several aspects of the WAIS-III and the CPI were found to be closely related to capacity for managing complexity and Achievement via Independence was found to be a moderate predictor of both Capability and Mode, these results were not strong enough to conclude that the WAIS-III and the CPI overlap with the constructs measured in the CPA. The CPA stands out as the most effective measurement of one's capacity for complexity and, even though it is an extremely costly assessment tool in South Africa, it is apparent that neither the WAIS-III nor the CPI can be used completely successfully in its place based on the results of the current study.

## Limitations, Implications and Recommendations

A number of limitations related to the current research and sample will now be explored. Limitations are noted in order to assess the impact they have on the validity and generalisability of the results obtained. Limitations are outlined when drawing final conclusions in order to prevent over-generalisations of the results of the study, and also to help illustrate recommendations for future research within this area of interest.

### Limitations

The research design adopted was cross-sectional, correlational and non-experimental. This type of research design means that the research only allowed for potential relationships or predictions to be seen and that directionality could not be established - there is thus a high potential for internal validity threats to affect the results (Leedy, 1989). The disadvantages of non-experimental research further illustrate that causal inferences cannot be made, which is probably the greatest disadvantage of non-experimental research (Leedy, 1989). The current study therefore does not allow for causal conclusions to be drawn and is therefore limited in only being able to describe the relationships and associations that exist between capacity for complexity, intelligence and personality. Experimental research, however, would have allowed the researcher to establish conclusions beyond relationships, and hence view causality between the variables. Even though using this type of design appears to create a

research limitation, it was necessary based on practical considerations, specifically the fact that these variables cannot be manipulated easily or at all in the real world.

A significant facet of this research which impacts on an array of potential limitations is the use of a pre-existing archival database. Using archival data meant relying fully on others to collect and interpret the data accurately and hence trusting in the organisation which was responsible for attaining the data. Furthermore no information about the psychometric testers who administered the tests was provided and no information about the demographic details of the individuals who had undergone the assessments other than age was available. Other biographical information, such as race, gender and education level, could have provided further insight into elements which impact upon one's capacity for complexity, intelligence and personality.

In addition, with not enough information provided to examine the psychometric properties of the CPA, the WAIS-III and the CPI within this research, the researcher was compelled to rely on previous research findings which outline the reliability and validity components of these assessments. Even though extensive reliability and validity information was found for all three assessments which illustrated their psychometric value, research appeared to be predominantly conducted in countries other than South Africa. Therefore being able to assess the psychometric properties of the three assessments would have proved to be greatly useful – not only for the purpose of this research, but for the context of South Africa as well. Based on the above, it is evident that the use of the archival data might have been useful and practical in terms of its ease of use as well as saving time and financial expenses, but several elements can be seen to contribute to the research limitations in this study.

Another aspect of using the archival data from a specific company meant having a sample made up of individuals from one organisation which was made up of a purely managerial sample. With a close look at frequencies and descriptive statistics of the sample, it could be seen that the sample was highly specialised and fell predominantly within a narrow age range, an upper CPA Capability and Mode range, predominantly Styles B and C in terms of approaches to work, an above average IQ range and very specific high and low ranging personality characteristics. Therefore, generalisability is complicated as the sample was made up of an extremely restricted range of

individuals. This impacts on the study and creates several limitations as the sample is not entirely representative of the population from which it was drawn. One needs to be careful about to whom the results can be applied, as the sample represented an extremely narrow range and hence population validity was limited (Johnson & Christensen, 2012). Ecological validity was also limited as the sample was made of managers from a specific company within a specific region of South Africa, and hence generalising across geographical regions would not be appropriate either (Johnson & Christensen, 2012). Therefore the results from this study at best extrapolate for what is occurring within the rest of the population, as external validity is evidently not established to a high degree.

Lastly, considering the statistical conclusion validity within the study is necessary. 'Statistical conclusion validity concerns the extent to which the researcher uses statistics properly and draws the appropriate conclusions from the statistical analysis' (Goodwin, 2010, p.185). To some extent statistical conclusion validity can be questioned based on the emphasis on the histograms as opposed to the Kolmogorov-Smirnov values when judging normality. However, this judgement was made by a qualified statistician as well as the researcher and supervisor.

**Recommendations for Future Research**

Even though the current research did not intend on challenging major theoretical viewpoints regarding the CPA, WAIS-III and the CPI, it still has numerous practical implications for future research. The limitations outlined above provide a basis for making recommendations for the future in order to improve new research. This section therefore is about highlighting important considerations for future research which are based on the key findings presented earlier.

With an emphasis on the limitations of using archival data within this research, it is evident that future research within this area of interest should gain data via other means. Future researchers should take the responsibility to gain such information themselves. Even though this may appear to be extremely timely and costly to do so, it would result in the researcher being able to rely on their own interpretation of the results, gain all biographical information required and gain insight into the psychometric properties of the assessments. This means that a researcher could use

biographical information such as race, education level and socio-economic details to give insight into the CPA, the WAIS-III and the CPI within the specific context of South Africa. In addition, assessing the psychometric properties of the three assessments within the South Africa context could be greatly valuable for organisations in that it would provide information about how reliable and valid they are in this country.

In terms of the sample itself, new research within this area should seek to use a sample with a wider range of individuals in order to attain a more representative sample of the population and hence manage to establish external validity to a greater extent. This means using an array of individuals from numerous demographic backgrounds and several different organisations in order to ensure that the sample is more representative and hence that the results of the study are more generalisable. Furthermore, the researcher could seek to find a larger sample size. The sample size, although adequate for the purposes of this research, could be improved on in order to allow for better generalisations to the South African population.

Future research can also entail using more widely varied instruments which represent different theoretical angles of the broader constructs of intelligence, personality, and capacity for complexity. This would mean engaging in the same research questions but using different assessments in order to discover which assessments are most appropriate for organisations within the context of South Africa.

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# APPENDICES

## Appendix A:

*Table 4: Reliability scores the WAIS-III*

| Name of Subtests: | Split-half reliability: | Test-retest reliability: |
|---|---|---|
| Information | 0.91 | 0.94 |
| Digit span | 0.90 | 0.83 |
| Vocabulary | 0.93 | 0.91 |
| Arithmetic | 0.88 | 0.86 |
| Comprehension | 0.84 | 0.81 |
| Similarities | 0.86 | 0.83 |
| Letter Number Frequencing | 0.82 | 0.75 |
| Picture Completion | 0.83 | 0.79 |
| Picture Arrangement | 0.74 | 0.69 |
| Block Design | 0.86 | 0.82 |
| Object Assembly | 0.70 | 0.76 |
| Digit Symbol | 0.84 | 0.86 |
| Matrix Reason | 0.90 | 0.77 |
| Symbol Search | 0.77 | 0.79 |
| Verbal Comprehension | 0.96 | 0.95 |
| Perceptual Organisation | 0.93 | 0.88 |
| Working Memory | 0.94 | 0.89 |
| Processing Speed | 0.88 | 0.89 |
| Full Scale IQ | 0.97 | 0.96 |
| Verbal IQ | 0.94 | 0.91 |
| Performance IQ | 0.98 | 0.96 |

*(Psychological Corporation, 1997, as cited in Kaufman & Lichtenberger, 2006, p.118)*

*Table 5: Scoring of the CPI*

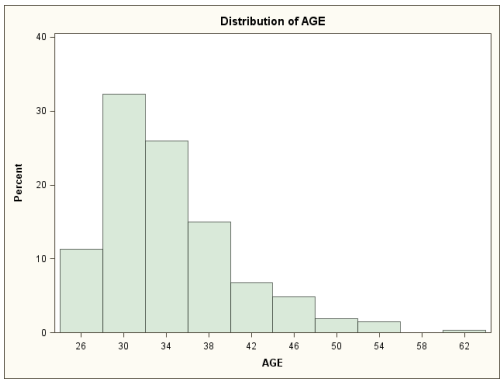
| Name of variables | No. of items | High / Moderate / Low Scores |
|---|---|---|
| Dominance | 36 items | High: T = 65 or more<br>Moderate: T = 50-65<br>Moderately low: T = 50-65<br>Low: T = 40 or less |
| Capacity for Status | 28 items | High: T = 60 or more<br>Moderate: T = 45-60<br>Moderately low: T = 35-45<br>Low: T = 35 or less |
| Sociability | 32 items | High: 60 or more<br>Moderate: 50-60<br>Moderately low: 35-50<br>Low: 35 or less |
| Social Presence | 38 items | High: 65 or more<br>Low: 40 or less |
| Self Acceptance | 28 items | High: 65 or more<br>Moderate: 50-65<br>Moderately low: 35-50<br>Low: 35 or less |
| Independence | 30 items | High: 65 or more<br>Moderately high: 55-65<br>Low: 30-45<br>Extremely Low: 30 or less |
| Empathy | 38 items | High: 65 or more<br>Moderately high: 55-65<br>Moderately low: 30-45<br>Very Low: 30 or less |
| Responsibility | 36 items | High: 60 or more<br>Moderate: 40-60<br>Low: 40 or less |
| Socialisation | 46 items | High: 65 or more<br>Moderate: 50-65<br>Moderately low: 30-45<br>Low: 30 or less |
| Self-control | 38 items | High: 60 or more<br>Moderate: 45-60<br>Moderately low: 30-45<br>Low: 30 or less |
| Good Impression | 40 items | High: 60 or more<br>Moderate: 45-60<br>Moderately low: 30-45<br>Low: 30 or less |
| Communality | 38 items | High: 60 or more<br>Low: 30 or less |
| Wellbeing | 38 items | High: 55 more<br>Moderately Low: 35-50<br>Low: 35 or less |

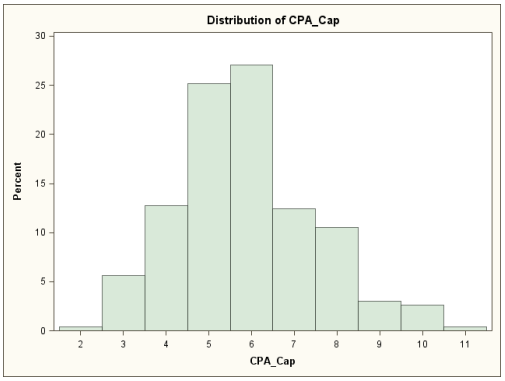
| | | |
|---|---|---|
| Tolerance | 32 items | High: 60 or more<br>Moderate: 45-60<br>Low: 40 or less |
| Achievement via Conformance | 38 items | High: 60 or more<br>Moderately high: 50-6-<br>Low: 35 or less |
| Achievement via Independence | 38 items | High: 60 or more<br>Moderate: 40-50<br>Low: 35 or less |
| Intellectual Efficiency | 28 items | High: 60 or more<br>Moderate: 40-60<br>Low: 40 or less |
| Psychological mindedness | 28 items | High: 65 or more<br>Low: 35 or less |
| Flexibility | 28 items | High: 65 or more<br>Moderate: 50-65<br>Moderately low: 35-50<br>Low: 35 or less |
| Femininity/Masculinity | 32 items | High: 70 or more<br>Moderately high: 60-70<br>Moderate: 40-50<br>Moderately low: 40 or less<br>Low: 30 or less |

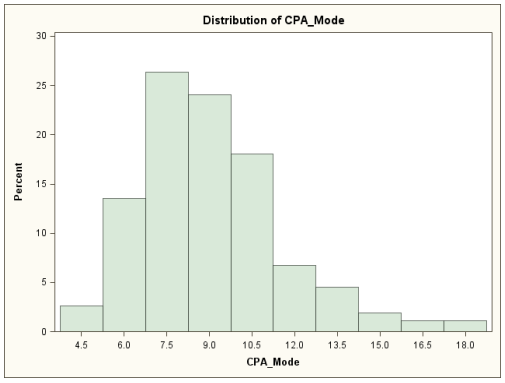
*(taken from Groth-Marnat, 1999)*

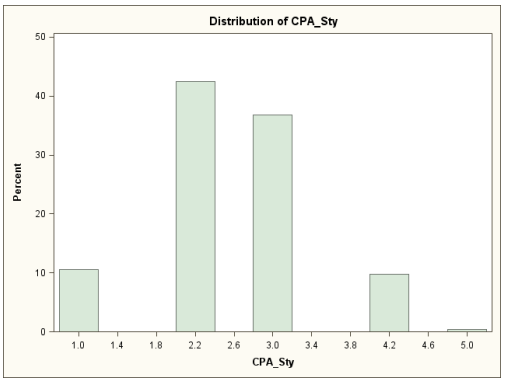
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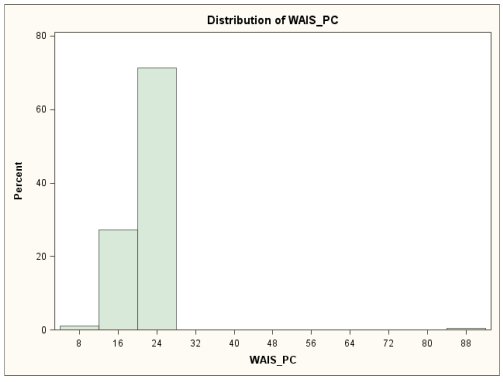
## Histograms

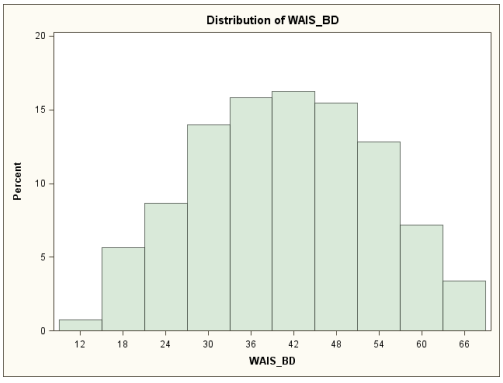


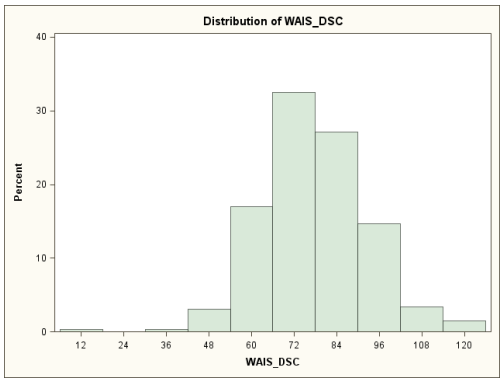



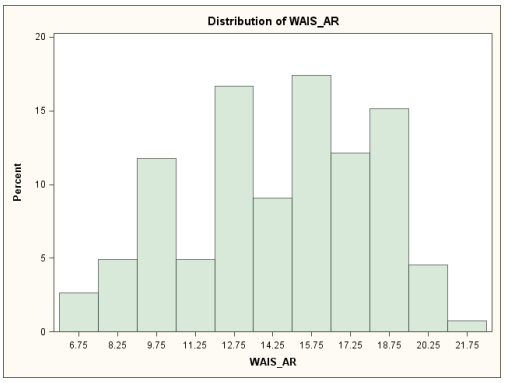



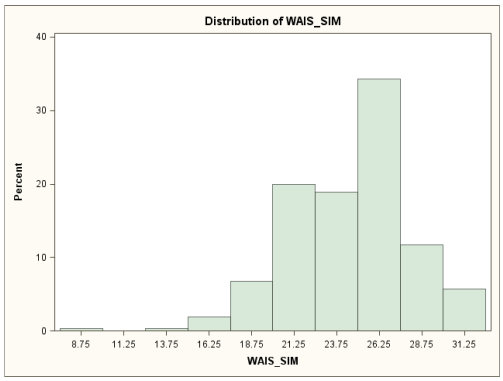



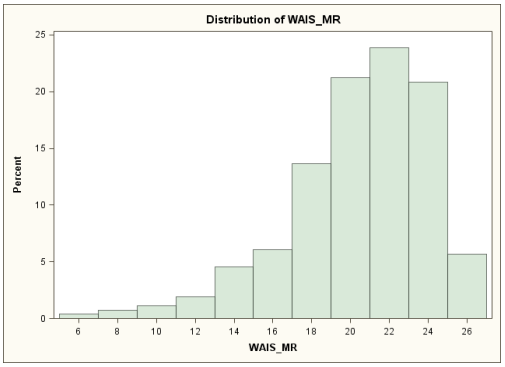



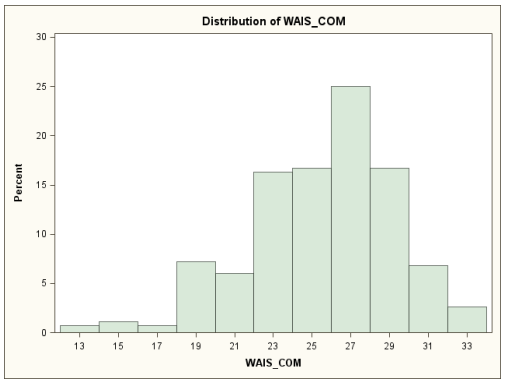



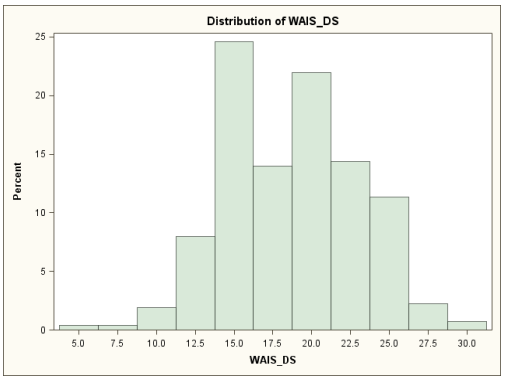

Distribution of WAIS_DSC
Percent
0
10
20
30
40
12
24
36
48
60
72
84
96
108
120
WAIS_DSC

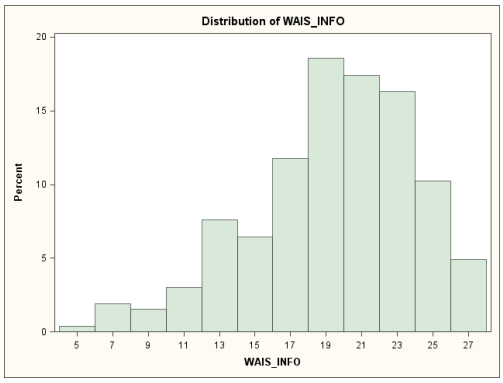

Distribution of WAIS_AR
Percent
0
5
10
15
20
6.75
8.25
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11.25
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14.25
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20.25
21.75
WAIS_AR

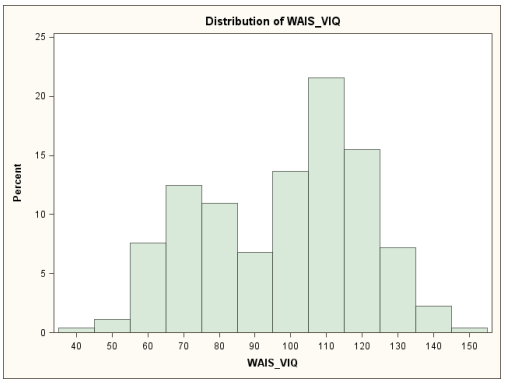

Distribution of WAIS_SIM
Percent
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28.75
31.25
WAIS_SIM

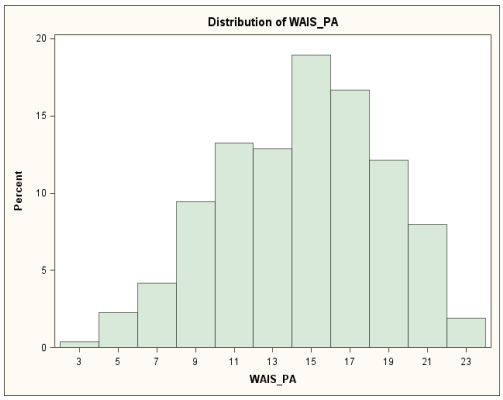

Distribution of WAIS_MR
Percent
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16
18
20
22
24
26
WAIS_MR

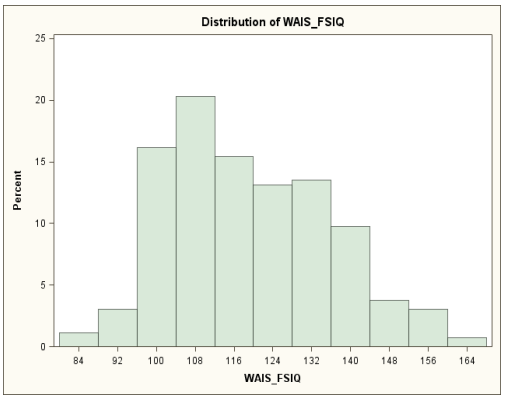

Distribution of WAIS_COM
Percent
0
5
10
15
20
25
30
13
15
17
19
21
23
25
27
29
31
33
WAIS_COM

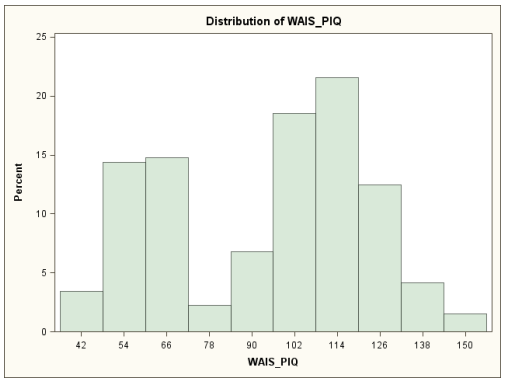

Distribution of WAIS_DS
Percent
0
5
10
15
20
25
5.0
7.5
10.0
12.5
15.0
17.5
20.0
22.5
25.0
27.5
30.0
WAIS_DS

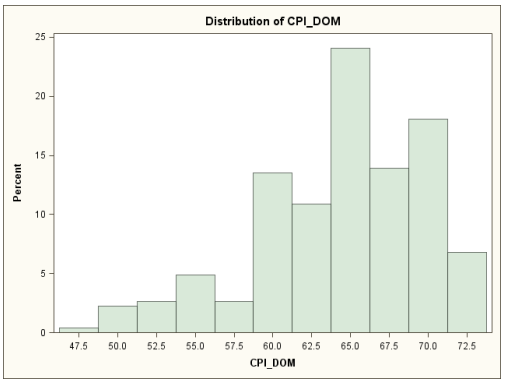

Distribution of WAIS_INFO
Percent
0
5
10
15
20
5 7 9 11 13 15 17 19 21 23 25 27
WAIS_INFO

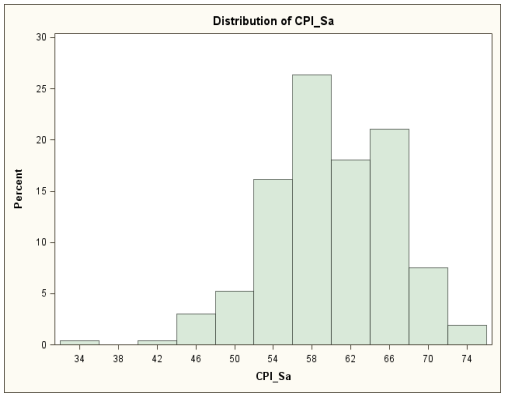

Distribution of WAIS_VIQ
Percent
0
5
10
15
20
25
40 50 60 70 80 90 100 110 120 130 140 150
WAIS_VIQ

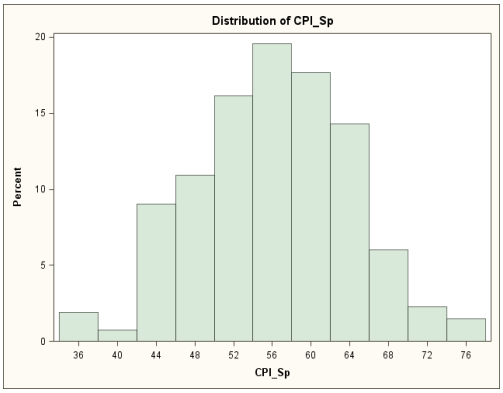

Distribution of WAIS_PA
Percent
0
5
10
15
20
3 5 7 9 11 13 15 17 19 21 23
WAIS_PA

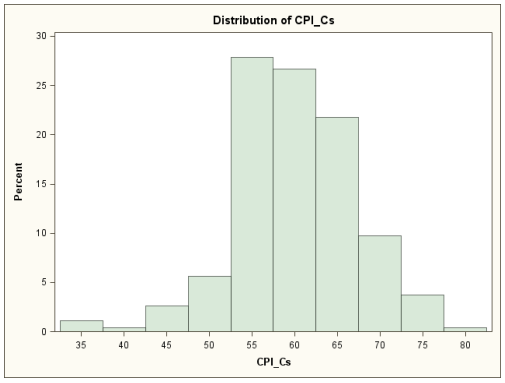

Distribution of WAIS_FSIQ
Percent
0
5
10
15
20
25
84 92 100 108 116 124 132 140 148 156 164
WAIS_FSIQ

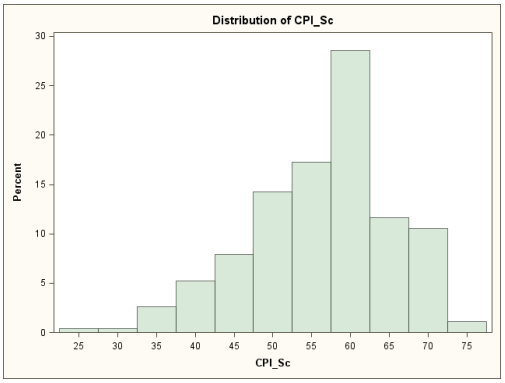

Distribution of WAIS_PIQ
Percent
0
5
10
15
20
25
42 54 66 78 90 102 114 126 138 150
WAIS_PIQ

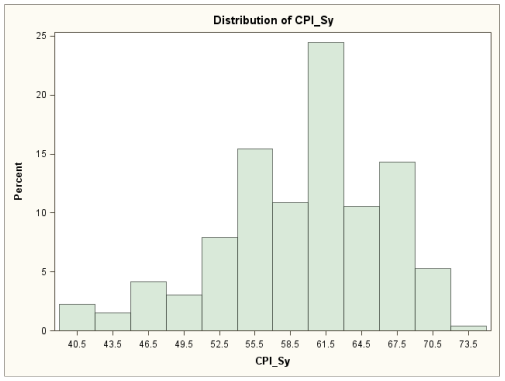

Distribution of CPI_DOM
Percent
0
5
10
15
20
25
47.5 50.0 52.5 55.0 57.5 60.0 62.5 65.0 67.5 70.0 72.5
CPI_DOM

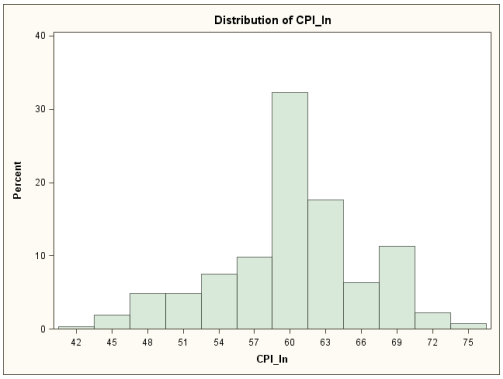

Distribution of CPI_Sa
Percent
0
5
10
15
20
25
30
34
38
42
46
50
54
58
62
66
70
74
CPI_Sa

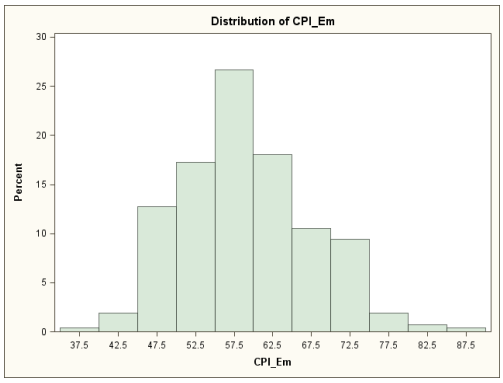

Distribution of CPI_Sp
Percent
0
5
10
15
20
36
40
44
48
52
56
60
64
68
72
76
CPI_Sp

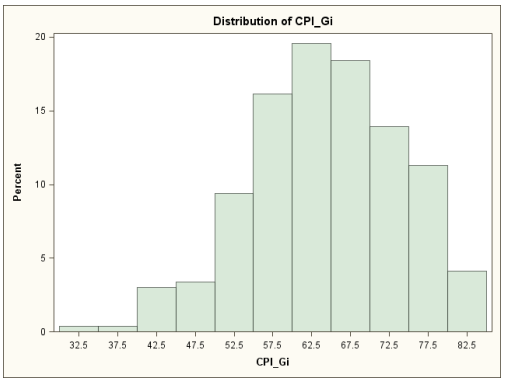

Distribution of CPI_Cs
Percent
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
CPI_Cs

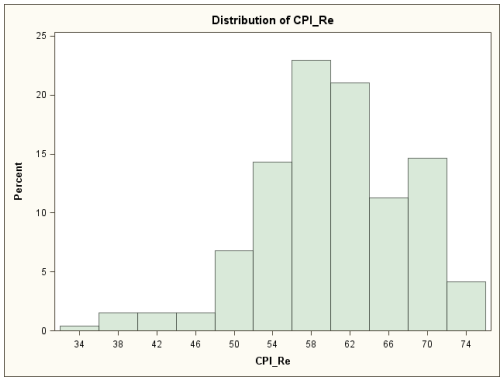

Distribution of CPI_Sc
Percent
0
5
10
15
20
25
30
25
30
35
40
45
50
55
60
65
70
75
CPI_Sc

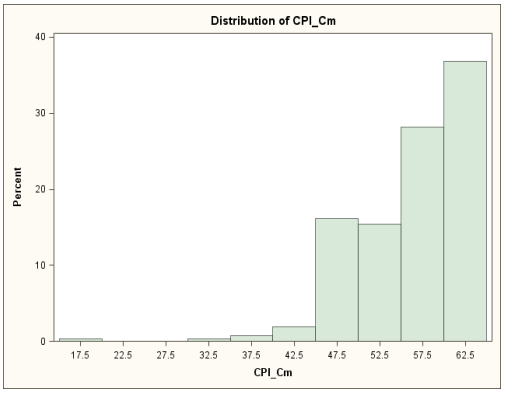

Distribution of CPI_Sy
Percent
0
5
10
15
20
25
40.5
43.5
46.5
49.5
52.5
55.5
58.5
61.5
64.5
67.5
70.5
73.5
CPI_Sy

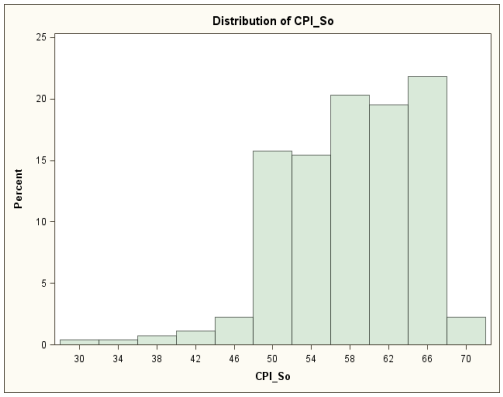

Distribution of CPI_In
Percent
0
10
20
30
40
42
45
48
51
54
57
60
63
66
69
72
75
CPI_In

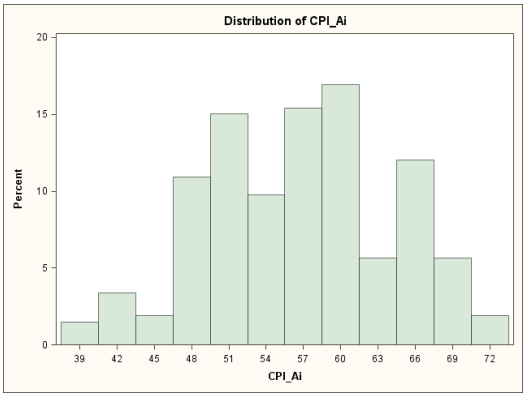

Distribution of CPI_Em
Percent
0
5
10
15
20
25
30
37.5
42.5
47.5
52.5
57.5
62.5
67.5
72.5
77.5
82.5
87.5
CPI_Em

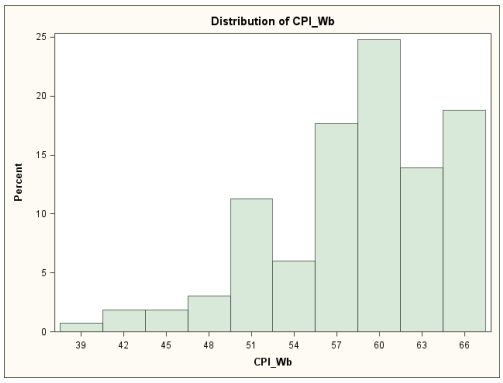

Distribution of CPI_Gi
Percent
0
5
10
15
20
32.5
37.5
42.5
47.5
52.5
57.5
62.5
67.5
72.5
77.5
82.5
CPI_Gi

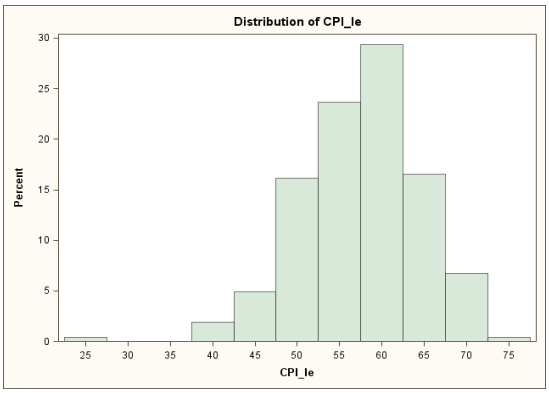

Distribution of CPI_Re
Percent
0
5
10
15
20
25
34
38
42
46
50
54
58
62
66
70
74
CPI_Re

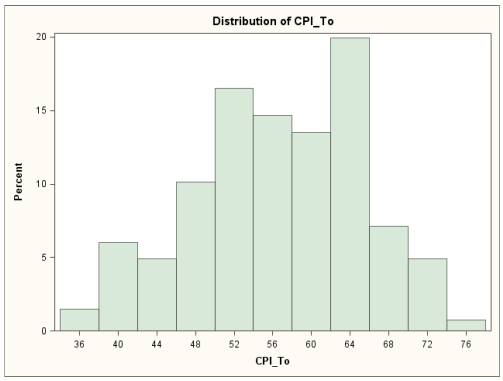

Distribution of CPI_Cm
Percent
0
10
20
30
40
17.5
22.5
27.5
32.5
37.5
42.5
47.5
52.5
57.5
62.5
CPI_Cm

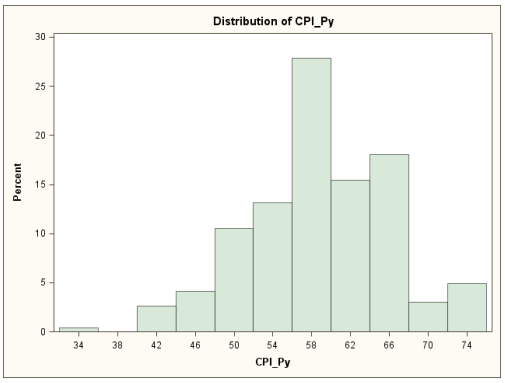

Distribution of CPI_So
Percent
0
5
10
15
20
25
30
34
38
42
46
50
54
58
62
66
70
CPI_So

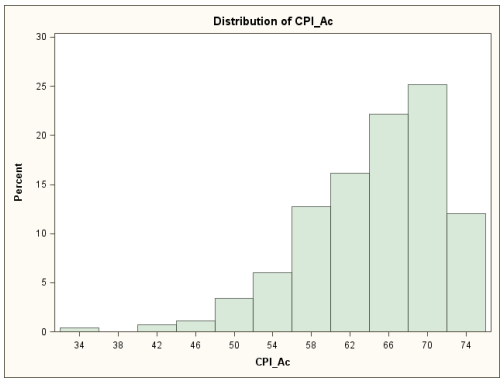

Distribution of CPI_Ai
Percent
0
5
10
15
20
39
42
45
48
51
54
57
60
63
66
69
72
CPI_Ai

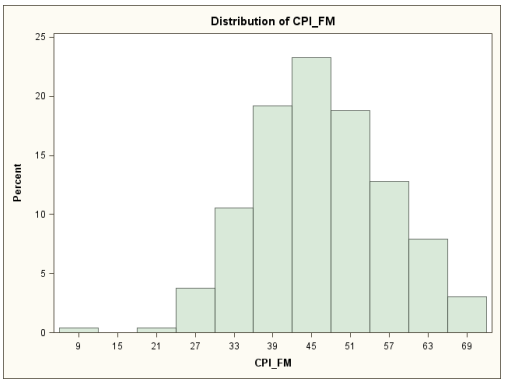

Distribution of CPI_Wb
Percent
0
5
10
15
20
25
39
42
45
48
51
54
57
60
63
66
CPI_Wb

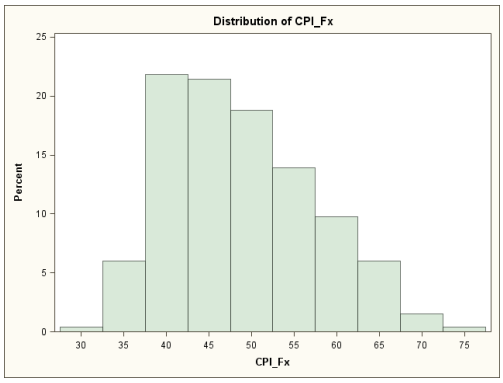

Distribution of CPI_Ie
Percent
0
5
10
15
20
25
30
25
30
35
40
45
50
55
60
65
70
75
CPI_Ie


Distribution of CPI_To
Percent
0
5
10
15
20
36
40
44
48
52
56
60
64
68
72
76
CPI_To


Distribution of CPI_Py
Percent
0
5
10
15
20
25
30
34
38
42
46
50
54
58
62
66
70
74
CPI_Py


Distribution of CPI_Ac
Percent
0
5
10
15
20
25
30
34
38
42
46
50
54
58
62
66
70
74
CPI_Ac


Distribution of CPI_FM
Percent
0
5
10
15
20
25
9
15
21
27
33
39
45
51
57
63
69
CPI_FM


Distribution of CPI_Fx
Percent
25
20
15
10
5
0
30
35
40
45
50
55
60
65
70
75
CPI_Fx

**Appendix C:**

**Chi-Squared Tests for CPA Style and WAIS-II and CPI, and CPA Capability and Mode**

*Table 15: Chi-Squared results for Style and Digit Symbol Coding*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 9.5010 | 0.0233 |
| **Likelihood Ratio Chi-Square** | 3 | 9.5762 | 0.0225 |
| **Mantel-Haenszel Chi-Square** | 1 | 7.6858 | 0.0056 |
| **Phi Coefficient** | | 0.1893 | |
| **Contingency Coefficient** | | 0.1860 | |
| **Cramer's V** | | 0.1893 | |

*Table 16: Chi-Squared results for Style and Similarities*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 12.1473 | 0.0069 |
| **Likelihood Ratio Chi-Square** | 3 | 12.4414 | 0.0060 |
| **Mantel-Haenszel Chi-Square** | 1 | 12.0650 | 0.0005 |
| **Phi Coefficient** | | 0.2141 | |
| **Contingency Coefficient** | | 0.2094 | |
| **Cramer's V** | | 0.2141 | |

*Table 17: Chi-Squared results for Style and Block Design*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 24.2878 | <.0001 |
| **Likelihood Ratio Chi-Square** | 3 | 25.1077 | <.0001 |
| **Mantel-Haenszel Chi-Square** | 1 | 23.9330 | <.0001 |
| **Phi Coefficient** | | 0.3027 | |
| **Contingency Coefficient** | | 0.2898 | |
| **Cramer's V** | | 0.3027 | |

*Table 18: Chi-Squared results for Style and Empathy*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 9.1494 | 0.0274 |
| **Likelihood Ratio Chi-Square** | 3 | 9.2171 | 0.0265 |
| **Mantel-Haenszel Chi-Square** | 1 | 1.1584 | 0.2818 |
| **Phi Coefficient** | | 0.1855 | |
| **Contingency Coefficient** | | 0.1824 | |
| **Cramer's V** | | 0.1855 | |

*Table 19: Chi-square results for Style and Tolerance*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 10.8532 | 0.0125 |
| **Likelihood Ratio Chi-Square** | 3 | 10.9432 | 0.0120 |
| **Mantel-Haenszel Chi-Square** | 1 | 7.1717 | 0.0074 |
| **Phi Coefficient** | | 0.2020 | |
| **Contingency Coefficient** | | 0.1980 | |
| **Cramer's V** | | 0.2020 | |

*Table 20: Chi-square results for Style and Achievement via Independence*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 10.6244 | 0.0139 |
| **Likelihood Ratio Chi-Square** | 3 | 10.7107 | 0.0134 |
| **Mantel-Haenszel Chi-Square** | 1 | 8.9958 | 0.0027 |
| **Phi Coefficient** | | 0.1999 | |
| **Contingency Coefficient** | | 0.1960 | |
| **Cramer's V** | | 0.1999 | |

*Table 21: Chi-square results for Style and Intellectual Efficiency*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 22.6339 | <.0001 |
| **Likelihood Ratio Chi-Square** | 3 | 23.0836 | <.0001 |
| **Mantel-Haenszel Chi-Square** | 1 | 16.4981 | <.0001 |
| **Phi Coefficient** | | 0.2917 | |
| **Contingency Coefficient** | | 0.2800 | |
| **Cramer's V** | | 0.2917 | |

*Table 22: Chi-square results for Style and Psychological Mindedness*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 9.7139 | 0.0212 |
| **Likelihood Ratio Chi-Square** | 3 | 9.7965 | 0.0204 |
| **Mantel-Haenszel Chi-Square** | 1 | 5.5433 | 0.0186 |
| **Phi Coefficient** | | 0.1911 | |
| **Contingency Coefficient** | | 0.1877 | |
| **Cramer's V** | | 0.1911 | |

*Table 23: Chi-Square test for CPA Style and CPA Capability*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 3.6702 | 0.2994 |
| **Likelihood Ratio Chi-Square** | 3 | 3.6706 | 0.2993 |
| **Mantel-Haenszel Chi-Square** | 1 | 0.2046 | 0.6510 |
| **Phi Coefficient** | | 0.1175 | |
| **Contingency Coefficient** | | 0.1167 | |
| **Cramer's V** | | 0.1175 | |

*Table 24: Chi-Square Table with CPA Style and CPA Mode*

| Statistic | DF | Value | Prob |
|---|---|---|---|
| **Chi-Square** | 3 | 9.1494 | 0.0274 |
| **Likelihood Ratio Chi-Square** | 3 | 9.2171 | 0.0265 |
| **Mantel-Haenszel Chi-Square** | 1 | 1.1584 | 0.2818 |
| **Phi Coefficient** | | 0.1855 | |
| **Contingency Coefficient** | | 0.1824 | |
| **Cramer's V** | | 0.1855 | |

**Appendix D:**

*Table 25: Spearman's Rank Correlation Co-efficient based on the CPI and WAIS-III variables*

| Variable | PC | DSC | SIM | BD | AR | MR | DSP | INFO | PA | COM | PIQ | VIQ | FSIQ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Do** | 0.04 | 0.03 | 0.08 | -0.06 | 0.008 | -0.07 | -0.09 | -0.007 | -0.01 | 0.02 | 0.07 | -0.01 | 0.0009 |
| | 0.57 | 0.62 | 0.17 | 0.36 | 0.89 | 0.28 | 0.15 | 0.91 | 0.85 | 0.79 | 0.24 | 0.88 | 0.99 |
| **Cs** | 0.06 | 0.14 | 0.17 | 0.12 | -0.09 | 0.06 | -0.02 | 0.02 | -0.03 | 0.01 | 0.02 | 0.03 | 0.02 |
| | 0.35 | 0.02* | 0.007** | 0.05* | 0.14 | 0.32 | 0.79 | 0.76 | 0.66 | 0.82 | 0.78 | 0.67 | 0.79 |
| **Sy** | 0.003 | 0.17 | 0.18 | 0.03 | -0.04 | 0.07 | -0.08 | 0.08 | 0.001 | 0.002 | 0.02 | -0.08 | -0.10 |
| | 0.96 | 0.006** | 0.003** | 0.66 | 0.55 | 0.24 | 0.20 | 0.17 | 0.99 | 0.97 | 0.78 | 0.19 | 0.12 |
| **Sp** | 0.15 | 0.20 | 0.15 | 0.18 | -0.11 | -0.01 | -0.11 | 0.04 | -0.08 | 0.03 | 0.01 | 0.02 | -0.05 |
| | 0.02* | 0.002 | 0.01* | 0.004** | 0.08 | 0.83 | 0.09 | 0.56 | 0.22 | 0.63 | 0.86 | 0.80 | 0.39 |
| **Sa** | 0.13 | 0.14 | 0.13 | 0.03 | -0.005 | -0.02 | -0.04 | 0.06 | 0.01 | -0.02 | -0.03 | -0.06 | -0.02 |
| | 0.04* | 0.03* | 0.04* | 0.66 | 0.93 | 0.80 | 0.47 | 0.34 | 0.81 | 0.69 | 0.68 | 0.36 | 0.75 |
| **In** | 0.11 | 0.10 | 0.08 | 0.09 | -0.03 | -0.04 | -0.06 | 0.01 | -0.009 | -0.004 | 0.04 | 0.11 | 0.16 |
| | 0.09 | 0.11 | 0.21 | 0.16 | 0.60 | 0.52 | 0.36 | 0.81 | 0.87 | 0.95 | 0.50 | 0.08 | 0.009** |
| **Em** | 0.04 | 0.19 | 0.18 | 0.13 | -0.03 | -0.01 | -0.05 | -0.01 | -0.08 | 0.05 | -0.03 | -0.03 | -0.06 |
| | 0.51 | 0.0025** | 0.004** | 0.03* | 0.68 | 0.87 | 0.46 | 0.82 | 0.20 | 0.45 | 0.67 | 0.63 | 0.35 |
| **Re** | 0.08 | 0.01 | 0.22 | 0.08 | -0.02 | -0.02 | 0.007 | -0.08 | -0.07 | 0.09 | 0.09 | -0.06 | -0.08 |
| | 0.19 | 0.84 | 0.0004** | 0.20 | 0.71 | 0.74 | 0.90 | 0.22 | 0.25 | 0.14 | 0.14 | 0.31 | 0.21 |
| **So** | -0.04 | 0.07 | 0.08 | 0.07 | -0.02 | 0.06 | 0.007 | 0.02 | -0.04 | 0.12 | -0.10 | 0.0007 | 0.04 |
| | 0.45 | 0.23 | 0.22 | 0.24 | 0.80 | 0.29 | 0.90 | 0.75 | 0.54 | 0.06 | 0.10 | 0.99 | 0.57 |
| **Sc** | -0.10 | -0.17 | 0.02 | -0.05 | -0.04 | -0.08 | 0.06 | -0.12 | -0.01 | -0.04 | 0.06 | -0.09 | -0.04 |
| | 0.12 | 0.007** | 0.68 | 0.41 | 0.48 | 0.21 | 0.33 | 0.06 | 0.84 | 0.52 | 0.30 | 0.15 | 0.48 |
| **Gi** | -0.12 | -0.8 | -0.01 | -0.15 | 0.008 | -0.04 | 0.04 | -0.09 | 0.01 | -0.02 | 0.08 | -0.09 | -0.02 |
| | 0.007** | 0.004** | 0.85 | 0.02* | 0.90 | 0.49 | 0.56 | 0.16 | 0.86 | 0.69 | 0.19 | 0.12 | 0.78 |
| **Cm** | 0.09 | 0.14 | 0.16 | 0.13 | 0.11 | 0.04 | 0.03 | 0.07 | 0.00069 | 0.13 | 0.07 | 0.09 | 0.05 |
| | 0.13 | 0.02* | 0.009** | 0.04* | 0.06 | 0.47 | 0.58 | 0.29 | 0.99 | 0.03* | 0.29 | 0.15 | 0.44 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Wb** | 0.13 | 0.09 | 0.16 | 0.19 | 0.02 | -0.006 | -0.07 | -0.08 | -0.04 | 0.13 | 0.03 | -0.03 | -0.03 |
| | 0.03* | 0.14 | 0.0078 | 0.002** | 0.69 | 0.93 | 0.25 | 0.19 | 0.53 | 0.04* | 0.58 | 0.65 | 0.63 |
| **To** | 0.15 | 0.14 | 0.25 | 0.21 | -0.03 | 0.05 | -0.02 | 0.02 | -0.11 | 0.06 | 0.002 | -0.09 | -0.02 |
| | 0.02* | 0.03* | <.0001** | 0.0007** | 0.65 | 0.38 | 0.76 | 0.79 | 0.06 | 0.32 | 0.97 | 0.13 | 0.70 |
| **Ac** | -0.12 | 0.01 | 0.01 | -0.05 | -0.03 | -0.03 | -0.05 | -0.09 | -0.01 | 0.03 | 0.04 | -0.01 | -0.05 |
| | 0.05* | 0.85 | 0.84 | 0.43 | 0.60 | 0.60 | 0.38 | 0.14 | 0.82 | 0.57 | 0.55 | 0.83 | 0.45 |
| **Ai** | 0.11 | 0.20 | 0.29 | 0.27 | -0.04 | -0.07 | -0.13 | -0.12 | -0.13 | 0.003 | 0.11 | -0.01 | 0.05 |
| | 0.09 | 0.001** | <.0001** | <.0001** | 0.50 | 0.21 | 0.03* | 0.05* | 0.04* | 0.96 | 0.08 | 0.83 | 0.42 |
| **Ie** | 0.17 | 0.27 | 0.30 | 0.32 | -0.03 | -0.08 | -0.06 | -0.10 | -0.17 | 0.04 | 0.11 | -0.02 | -0.03 |
| | 0.006** | <.0001** | <.0001** | <.0001** | 0.64 | 0.21 | 0.31 | 0.12 | 0.005** | 0.58 | 0.07 | 0.72 | 0.63 |
| **Py** | 0.06 | 0.04 | 0.16 | 0.14 | -0.08 | -0.06 | 0.04 | -0.09 | -0.10 | 0.05 | 0.08 | 0.01 | 0.003 |
| | 0.33 | 0.49 | 0.009** | 0.02* | 0.20 | 0.31 | 0.56 | 0.11 | 0.11 | 0.38 | 0.21 | 0.87 | 0.96 |
| **Fx** | 0.21 | 0.12 | 0.20 | 0.21 | 0.06 | -0.03 | -0.09 | 0.03 | -0.12 | -0.04 | 0.08 | -0.04 | 0.03 |
| | 0.0007** | 0.05* | 0.002** | 0.0005** | 0.31 | 0.68 | 0.13 | 0.62 | 0.05* | 0.51 | 0.20 | 0.46 | 0.67 |
| **F/M** | -0.14 | -0.15 | -0.04 | -0.15 | -0.02 | -0.12 | -0.0007 | 0.07 | 0.04 | 0.004 | 0.02 | -0.02 | 0.09 |
| | 0.02* | 0.01* | 0.56 | 0.01* | 0.70 | 0.06 | 0.99 | 0.26 | 0.47 | 0.94 | 0.72 | 0.70 | 0.13 |

* Correlations is significant at $p < 0.05$

** Correlation is significant at $p < 0.01$

## Appendix E: Two-way ANOVA Results

*Table 32: Two-way ANOVA for Capability (Age and Dominance)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 32.71 | 10.90 | 4.26 | 0.0058 |
| **Error** | 262 | 669.86 | 2.56 | | |
| **Corrected Total** | 265 | 702.57 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.05 | 27.30 | 1.60 | 5.86 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.53 | 0.53 | 0.21 | 0.65 |
| **Do** | 1 | 31.17 | 31.17 | 12.19 | 0.0006 |
| **Age X Do** | 1 | 0.34 | 0.34 | 0.13 | 0.72 |

*Table 33: Two-way ANOVA for Capability (Age and Sociability)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 36.81 | 12.27 | 4.83 | 0.0027 |
| **Error** | 262 | 665.76 | 2.54 | | |
| **Corrected Total** | 265 | 702.57 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.05 | 27.22 | 1.59 | 5.86 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.12 | 0.12 | 0.05 | 0.83 |
| **Sy** | 1 | 35.12 | 35.12 | 13.82 | 0.0002 |
| **Age X Sy** | 1 | 0.48 | 0.48 | 0.19 | 0.66 |

*Table 34: Two-way ANOVA for Capability (Age and Independence)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| Model | 3 | 54.88 | 18.29 | 7.40 | <.0001 |
| Error | 262 | 647.69 | 2.47 | | |
| Corrected Total | 265 | 702.57 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.08 | 26.84 | 1.57 | 5.86 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.20 | 0.20 | 0.08 | 0.78 |
| **In** | 1 | 44.43 | 44.43 | 17.97 | <.0001 |
| **Age X In** | 1 | 6.35 | 6.35 | 2.57 | 0.11 |

*Table 35: Two-way ANOVA for Capability (Age and Wellbeing)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 35.33 | 11.78 | 4.62 | 0.0036 |
| **Error** | 262 | 667.24 | 2.55 | | |
| **Corrected Total** | 265 | 702.57 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.05 | 27.25 | 1.60 | 5.86 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.12 | 0.12 | 0.05 | 0.83 |
| **Wb** | 1 | 28.87 | 28.87 | 11.34 | 0.0009 |
| **Age X Wb** | 1 | 3.71 | 3.71 | 1.46 | 0.23 |

*Table 36: Two-way ANOVA for Capability (Age and Achievement via Independence)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 77.53 | 25.84 | 10.83 | <.0001 |
| **Error** | 262 | 625.04 | 2.39 | | |
| **Corrected Total** | 265 | 702.57 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.11 | 26.37 | 1.54 | 5.86 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.0001 | 0.0001 | 0.00 | 0.99 |
| **Ai** | 1 | 66.95 | 66.95 | 28.06 | <.0001 |
| **Age X Ai** | 1 | 5.23 | 5.23 | 2.19 | 0.14 |

*Table 37: Two-way ANOVA for Capability (Age and Similarities)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 52.58 | 17.53 | 7.09 | 0.0001 |
| **Error** | 261 | 645.38 | 2.47 | | |
| **Corrected Total** | 264 | 697.96 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.08 | 26.88 | 1.57 | 5.85 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.02 | 0.02 | 0.01 | 0.93 |
| **SIM** | 1 | 45.01 | 45.01 | 18.20 | <0.0001 |
| **Age X SIM** | 1 | 4.03 | 4.03 | 1.63 | 0.20 |

*Table 38: Two-way ANOVA for Capability (Age and Block Design)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 42.11 | 14.04 | 5.59 | 0.001 |
| **Error** | 261 | 655.85 | 2.51 | | |
| **Corrected Total** | 264 | 697.96 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.06 | 27.10 | 1.59 | 5.85 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.05 | 0.05 | 0.02 | 0.88 |
| **BD** | 1 | 39.43 | 39.43 | 15.69 | <.0001 |
| **Age X BD** | 1 | 0.87 | 0.87 | 0.35 | 0.56 |

*Table 39: Two-way ANOVA for Mode (Age and Self Acceptance)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 92.06 | 30.69 | 4.90 | 0.0025 |

| | | | |
|---|---|---|---|
| **Error** | 262 | 1642.12 | 6.27 |
| **Corrected Total** | 265 | 1734.18 | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.05 | 27.56 | 2.50 | 9.08 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.56 | 0.56 | 0.09 | 0.76 |
| **Sa** | 1 | 63.67 | 63.67 | 10.16 | 0.001 |
| **Age X Sa** | 1 | 18.82 | 18.82 | 3.00 | 0.08 |

*Table 40: Two-way ANOVA for Mode (Age and Achievement via Independence)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 219.40 | 73.13 | 12.65 | <.0001 |
| **Error** | 262 | 1514.78 | 5.78 | | |
| **Corrected Total** | 265 | 1734.18 | | | |

| R-Square | Coeff Var | Root MSE | Mode Mean |
|---|---|---|---|
| 0.13 | 26.47 | 2.40 | 9.08 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| Age | 1 | 0.68 | 0.68 | 0.12 | 0.73 |
| Ai | 1 | 218.12 | 218.12 | 37.73 | <.0001 |
| Age X Ai | 1 | 0.42 | 0.42 | 0.07 | 0.79 |

*Table 41: Two-way ANOVA for Mode (Age and Flexibility)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 191.74 | 63.91 | 10.86 | <.0001 |
| **Error** | 262 | 1542.44 | 5.89 | | |
| **Corrected Total** | 265 | 1734.18 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.11 | 26.71 | 2.42 | 9.08 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 1.23 | 1.23 | 0.21 | 0.65 |
| **Fx** | 1 | 182.58 | 182.58 | 31.01 | <.0001 |
| **Age X Fx** | 1 | 2.13 | 2.13 | 0.36 | 0.55 |

*Table 42: Two-way ANOVA for Mode (Age and Similarities)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 184.73 | 61.58 | 10.40 | <.0001 |
| **Error** | 261 | 1545.76 | 5.92 | | |
| **Corrected Total** | 264 | 1730.49 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.11 | 26.82 | 2.43 | 9.08 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.66 | 0.66 | 0.11 | 0.74 |
| **SIM** | 1 | 160.35 | 160.35 | 27.08 | <.0001 |
| **Age X SIM** | 1 | 12.31 | 12.31 | 2.08 | 0.15 |

*Table 43: Two-way ANOVA for Mode (Age and Block Design)*

| Source | DF | Sum of Squares | Mean Square | F value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 3 | 170.71 | 56.90 | 9.52 | <.0001 |
| **Error** | 261 | 1559.78 | 5.98 | | |
| **Corrected Total** | 264 | 1730.49 | | | |

| R-Square | Coeff Var | Root MSE | Capability Mean |
|---|---|---|---|
| 0.10 | 26.94 | 2.44 | 9.08 |

| Source | DF | Type III SS | Mean Square | F Value | Pr>F |
|---|---|---|---|---|---|
| **Age** | 1 | 0.005 | 0.005 | 0.00 | 0.98 |
| **BD** | 1 | 163.53 | 163.53 | 27.36 | <.0001 |
| **Age X BD** | 1 | 1.44 | 1.44 | 0.24 | 0.62 |