Intuitive Cognitive Style and Biases in Decision Making

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ABSTRACT

The purpose of this paper is to examine the relationship between biases and the cognitive styles. Intuitive decision making has been discouraged because it is heavily associated with bias.The aim of this research is to show that biases affect both analytic cognitive style and intuitive cognitive style in the same measure. The study also examines the relationship between cognitive style and extroversion. The Behavioural Decision theory, Classic Dual Process Theory of Human Cognition and the Rational Decision Making Model were used as the basis for the research. Two hypotheses were tested.

The study subjects were conveniently sampled from the Eastern Mediterranean University in North Cyprus. 165 students from different ages, majors of study, nationality and gender were sampled. A survey comprising of 90 questions divided into 5 parts were presented to the students. The parts measured cognitive style, extroversion and biases. Measures of central tendancy, t-test, ANOVA analyses and correlation analyses were carried out to test the hypotheses.

The main findings were that biases affect both analytic cognitive style and intuitive cognitive style. Extroversion and cognitive style were found to be negatively correlated. The main practical implication for this study is that individuals should be encouraged to use both analytic cognitive style and intuitive cognitive style in decision making for optimum results. The present study is designed to support the case for intuitive decision making alongside rational decision making by proving that biases affect both cognitive styles.

Keywords: cognitive style, extroversion, biases, rational, intuitive, analytic

ÖZ

Bu tezin amacı bilişsel tarz ile önyargıların veya eğilimlerin arasında olası ilişkiyi incelemektir. Sezgisel karar verme önyargıların etkisinde olduğu inancı ile genellikle tavsiye edilmemektedir. Bu çalışmanın hedefi önyargıların hem sezgisel hem de analitik bilişsel tarzı eşit şekilde etkilediğini ortaya koymaktır. Çalışma aynı zamanda bilişsel tarz ile kişilik özellikleri arasında ilişkileri incelemektedir. Davranışsal Karar Kuramı, Klasik Çift Süreç Kuramı ve Rasyonel Karar Verme kuramı temel kuramsal çerçeveyi oluşturmaktadır. İki hipotez test edilmiştir.

Çalışma katılımcıları kolayda örneklem yöntemi ile KKTC Doğu Akdeniz Üniversitesi öğrencileri arasından seçilmiştir. Farklı yaşlardan, bölümlerden ve uluslardan 165 öğrenci örneklemde yer almıştır. 5 başlıkta sorulan 90 sorudan oluşmakta olan anket formu ile veri toplanmıştır. Formda bilişsel tarz, dışa dönük kişilik özelliği ve önyargıları ölçen sorular kullanılmıştır. Sonuçlar ANOVA ve korelasyon analizleri ile değerlendirilmiştir.

Sonuçlar önyargıların her iki bilişsel tarzı da etkilediğini ortaya koymuştur. Çalışma sonuçları kişilerin özellikle sezgisel bilişsel tarzı kullanmaktan kaçınmaması gerektiğini göstermektedir.

Dedicated to my parents and grandfather

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Chapter 1

INTRODUCTION

1.1. Background of Study

Rational decision making processes have always been placed above intuition. It is usually argued that these processes can always be tested and re-tested and gauged on account of reliability. The fact that intuition has no evidence of how a decision was arrived at has made it seem unreliable. It is assumed that many of these decisions are based on biases or heuristics. Many researchers support the theory that intuitive thinkers are biased and analytic thinkers are not. As a result, most people are encouraged to think logically and make rational decisions.

In the past, people were encouraged to use logic and rationale in making decisions. They were required to back up their decisions with research and analyses. The world today is very different. Decision making has also changed. This can be attributed to a changing of priorities and a generation that consists of individuals taught to believe and trust themselves and make decisions based on what they feel is right.

In today's society, rational thought and logical processes of decision-making are falling short of achieving goals. This is because there is an increase in time pressure; the limited time given to make decisions has led to less and less time to research and obtain sufficient information to make a rational decision. Organizations are also looking to cut costs. Information search is a costly activity requiring a lot of

man hours and finances that could be used in other ways (Sinclair and Ashkanasy, 2005).

In the perspective of managerial decision making, the organizations face 50% success by executing the rational decision making strategies. There are many of the requisities for the rationality which is bounded. These requirements are not sufficient enough for satisfying results. In order to have the success approaches in the organizations, the managers must have to execute the holistic approaches, These approaches must be implemented for the non-programmed decisions (Sinclair and Ashkanasy, 2005).

Sinclair and Ashkanasy (2005), argue that in this world of dynamic changes and globalization, companies are looking for the methods of executing new approaches to decision making. Under the increasing organizational pressures and ambiguity, the implementation of the rational means of making decisions are not at all giving the satisfactory results.

There is a need to investigate an alternative. Fast paced change, especially technological and economical change, means that there is less time to make decisions. These factors affecting the execution of decision making, in the organizations and in other areas, have led researchers to place importance on the need for intuitive decision making.

However, people will not embrace intuitive thinking given the evidence that it is hinged on biases. The cost of errors in decision making is high. This includes irreversible and even damaging results. Thus, people go to great lengths to avoid such costs. As a result, intuitive thinking is welcomed in major decision making, if accepted in decision making at all.

Does that mean that analytic decision making is not plagued by biases and heuristics? Would it be correct to say that analytic thinkers are completely unbiased? To err is human. Considering this, is it possible that humans can be absolutely unbiased in their thinking? As long as the human element is included in any process, and especially the thinking process, biases are bound to affect the decisions. Perhaps the degree to which biases affect the different cognitive styles is what differs.

1.2. Problem statement:

Today's complex social and economic environment may not be suited to the System 2 (the rational and logical decision making) approach and may require decision makers to use more of the System 1 (intuitive and holistic decision making).

1.3. Objectives of the study

The goal of the study is to demonstrate that biases, not only influences those that have a more intuitive cognitive style, but also those that have an analytical cognitive style. The present study explores the role of biases in cognitive style, so as to add to current knowledge on cognitive style and biases. This study will also find out how cognitive style and cognitive bias influence decision making.

1.4. Research questions

The research questions that will shape this analysis are as follows:

1. What are the problems with analytic cognitive styles in decision making?
2. Does intuitive thinking contribute to biases in decision making?
3. Do biases influence both intuitive and analytic cognitive styles?
4. What influences our use of intuition or analysis in decision making? Personality? Situations?
5. Is there a relationship between personality and the use of System 1 or System 2?

Chapter 2

THEORETICAL FRAMEWORK

This chapter proposes to examine issues relevant to intuitive cognitive style and cognitive bias in decision making. At the end of the discussion the chapter proposes a conceptual model as framework for investigating the influence of intuitive cognitive style in decision making.

2.1. Personality Type

Personality is defined as the computation of habits in which an individual reacts to others and his dealings with others. It is the measurable traits that a person exhibits (Robbins, 2005). Personality is something that is inherent in all individuals. It can be modified by interactions with others and the environment one is in. Personality, though stable, can change in different situations.

The definitions of personality began with 4 temperaments of Sanguine Choleric, Melancholic and Phlegmatic. Researchers modified these temperaments and there are many classifications of personality. Jung's typology has become the basis of present day personality type classifications.

Jung (1923) defined a personality type as, " a characteristic model of a general attitude occurring in many individual forms." Jung was exploring individual differences. He eventually came up with a test for gauging individual's personalities - The Jung Typology Test. This test is used today as a personality-assessment instrument.

Myers et al., (1998) say that individuals are classified according to how or where the source of their energy is or where they focus their energy to; externally from/to the environment [extroverted (E)] or internally from within or towards the individual [introverted (I)]. They identified another category based on perceptions, that is, how individuals gather information; by sensing or intuition (S or N). Individuals are also categorized by how they make decisions and reach conclusions; by thinking or feeling (T or F). Finally individuals' orientations to the outer world were used as a classification category; judging or perceiving (J or P) (Isaksen et al., 2000).

Extroverted individuals are said to be outgoing, sociable, and assertive. Introverts are quiet and shy. Sensers are practical and prefer routine and order. They focus on details. Intuitive types rely on unconscious processes and look at the "big picture". Thinkers use reason and logic to handle problems. Feelers rely on their personal values and emotions. Judging types want control, and prefer their world to be ordered and structured. Perceivers are flexible and spontaneous (Robbins 2005).

These classifications are then combined into 16 personality types. These types are ESTJ, ENTJ, ESFJ, ENFJ, ESTP, ENTP, ESFP, ENFP, ISTJ, INTJ, ISFJ, INFJ, ISTP, INTP, ISFP, INFP. The 16-grouping are the complete personality of an individual. For example INTJs are said to be visionaries. They usually have original minds and great ambition. ESTJs are organizers. They like to run activities. ENTP type is a conceptualizer - attracted to entrepreneurial ideas (Robbins 2005).

Myers-Briggs Type Indicator (MBTI) is another instrument designed to measure psychological type. It is based the above Jungian categories and other Jungian principles. It groups individuals into 1 of the 16 categories as well. It is used widely in marriage, career counseling and for increasing self awareness. In spite of

its popularity, its validity as a measure of personality is in question. Most of the evidence suggests it is not (Robbins 2005).

The Big Five Model, also known as the Five-Factor Model of personality describes 5 basic dimensions in human personality. The Big Five factors are extroversion, agreeableness, conscientiousness, emotional stability and openness to experience. Extroversion captures one's ability to relate. Agreeableness refers to the propensity to differ with others. Conscientiousness measures reliability. Emotional stability evaluates a person's ability to withstand stress. Openness to experience looks at a person's interest and fascination with novelty. Many researchers provide strong support to these five dimensions (Robbins 2005).

This research focuses on the extroversion aspect of personality. Extroversion is the personality trait of seeking fulfillment from sources outside the self or in community. Extroversion captures one's ability to relate (Robbins 2005)

Extroverts tend to be very social. Myers et al., (1998) say that extroverts focus their energy to the environment the source of their energy is from the environment, that is, outside themselves. Extroverted individuals are said to be outgoing, sociable, and assertive.

Introverts prefer to work on their projects alone. They have their source of energy internally or from within themselves and focus energy towards themselves (Myers et al., 1998). Introverts are quiet and shy.

2.2. Cognitive Style

Cognitive Style refers to a psychological dimension representing consistencies in an individual's manner of cognitive functioning (Ausburn & Ausburn, 1978). It is a term used in cognitive psychology to describe the way individuals think, perceive and remember information. Cognitive style has been

defined as consistent individual differences in preferred ways of organizing and processing information and experience (Allinson and Hayes, 1996). Accoridng to Sadler-Smith, (1999) the cognitive style is the persistent differences of the induividuals in a systematic way for organizing and processing the experiences and information.

Cognitive style is also defined as the way that individuals collect, process and evaluate information. Cognitive style is treated similar to personality type and is believed to be stable. Alinson and Hayes (1996) study cognitive style on a dimension ranging from analytic to intuitive. Those individuals who process information sequentially, focusing on the details and reaching conclusions using logic are labeled as “analytic” and those that perceive information holistically and reach conclusions based on intuitions or gut feelings are labeled as “intuitive”.

The particular mode of decision-making that an individual employs is influenced by the task at hand and can be arranged on a continuum reflecting the extent to which intuitive or rational processes are likely to be utilized (or relied upon). Acknowledging the influence of both intuitive and rational processes during decision-making, researchers have shifted from attempting to articulate when decision makers should choose one mode over the other, to exploring the contexts under which either strategy leads to a more optimal outcome (Sadler-Smith, 2008). When decision makers choose one mode over the other, it is paramount to explore the contexts under which either strategy leads to a more optimal outcome.

Sadler-Smith (1999) identified a number of assumptions relating to cognitive style: (1) It is concerned with the form rather than the content of information processing; (2) It is a pervasive dimension that can be assessed using psychometric techniques; (3) It is steady over time; (4) It is bipolar; (5) It may be value

differentiated. Cognitive styles describe different rather than better thinking processes.

Whether intuitive or analytic decision-making is more optimal, in particular circumstances, requires an individual to assess the trade-offs. The closer the match between the decision-making mode and task properties, the more optimal the decision making is. Intuition has been shown to lead to more optimal decisions during conditions involving multi-attribute choices and relatively complex tasks. For example, relying on intuition led to better decisions among a set of items to purchase compared to participants who relied on deliberation. When considering a multi-attribute choice, participants who relied on intuition utilized a more "holistic" evaluation strategy that resulted in more compensatory weighting of attributes (Monga et al., 2011).

2.3. Analytic Cognitive Style

Analytic cognitive style is usually used interchangeably with rational cognitive style or rational thinking. Analysis is often presented as the converse of intuition. To analyze is to reveal an object or system components, setting (or context) and organization (Sadler-Smith (1999).

Alinson and Hayes (1996) define analytic style as "characteristic of the left brain orientation… The left hemisphere emphasizes a primarily linear mode of operation with information being processed sequentially, and is mainly responsible for logical thought, especially in verbal and mathematical functions… Analysis (left-brain dominant) tends to be more compliant, favor a structured approach to problem solving and depend on systematic methods of investigation." They define analysis as judgments based on mental reasoning and a focus on detail.

According to Spicer and Sadler-Smith (2005), a logical advance incorporates exploring for facts and data to sustain decision making. Rational decision makers would prefer to tackle problems instead of avoiding them or decisions they encounter. They are more prone to thinking things through and clearly bearing in mind the substitutes.

Allinson and Hayes (1996) argue that analytic decision makers may prefer to pay attention to detail, focus on solid data, adopt a step-by-step approach to learning and are self-reliant. They prefer to incorporate information from a variety of sources such as books, reports and videos. Those who are mostly analytic are not impulsive/decisive. They are inclined to consider and weigh-up all the possibilities before making a decision.

So when is rational decision making most appropriate for use? Some researchers argue that for the best possible outcomes, rational decision making should be used all the time, almost exclusively. When faced with unfamiliar tasks, people are more likely to use a rational approach to decision making, where they employ analysis to support a new decision choice. Decisions that involve major monetary spending are not likely to take place without some analysis based on rationale (Spicer and Sadler-Smith, 2005).

In summary, it can be concluded that decisions whose outcomes influence a large number of people, decisions that have irreversible consequences and decisions that have long-lasting effects are usually analyzed and assessed using rational approaches. This is because these are the decisions that most people are not willing to take chances on. However, rational decision making is something that requires time. It cannot be done quickly. As such, they are less appropriate (or more challenging) when under time pressure.

2.3.1. Bounded Rationality

Perfect rationality refers to a decision approach that is entirely up to date, flawlessly coherent and geared toward utmost gain. US Nobel-laureate economist Herbert Simon in his 1982 book *Models Of Bounded Rationality And Other Topics In Economics* argues that perfect rationality is not practically feasible. He proposes the notion that decision makers, regardless of their height of acumen, labor under three inescapable constraints: (1) restricted and frequently undependable information is presented concerning probable alternatives and their costs, (2) the human brain has restricted capability to assess and sort out the existing material, and (3) a restricted quantity of time is available to make a conclusion.

Decision-makers lack the skill and capital to arrive at the most advantageous solutions. Instead, they apply their rationality only after having wholly cut down the choices available. Therefore, persons, even those that intend to make choices based on reason, are bound to make satisficing, rather than maximizing or optimizing, choices in complex situations. These limits or bounds on rationality make it nearly impossible to make decisions that cover every unforeseen event, necessitating dependence on rules of thumb, intuition or biases.

2.4. Intuitive Cognitive Style

In his book, The Power of Intuition, Gary Klein (2004) suggests that 90 per cent of our decisions are intuitive. Myers' result on intuitive thinkers asserts that intuitive thinkers represent only about five percent of the population (Robbins 2005).

Intuitive thinking is a sense that does not use rational process such as facts and data, but comes from many years of experience. It is the capability to attain understanding without assumption or application of rationale. Sadler-Smith et al (2008) conceive intuition in such terms as "affectively charged judgments that arise

through rapid, non-conscious and holistic associations" and as "operating beyond the realms of rational process and encompass(ing) affective elements".

Intuition can also be defined as the skill to capture a thought or to formulate a decision about motivation properties without being capable to submit plainly to the information or inferences core to the result (Chua et al., 2008). Basing a decision upon intuition is perceived, in stark contrast to rationality, as an unreliable impulse based on illogical information and devoid of veridical knowledge (Epstein et al.,1996). However, there is an inconsistency with this argument. Intuition can be based on experience which can be more reliable than some information.

Robbins (2005) defines intuitive decision making as an inanimate course of action fashioned out of distilled familiarity. He says that instinct can be a commanding power in judgment creation. For instance, in chess, "The expert's experience allows him or her to recognize the pattern in a situation and draw on previously learned information associated with that pattern to arrive at a decision choice quickly. The result is that the intuitive decision maker can decide rapidly based on what appears to be very limited information" (Robbins 2005).

There is a dearth of literature demonstrating the reliability of rational judgments. For the greater part of the twentieth century, experts alleged that the application of intuition by decision makers was illogical or unproductive and extremely biased. This view has since changed. In certain instances, relying on intuition can actually improve decision making (Robbins 2005). However, the components and function of intuitive decision-making are not as clearly understood.

Nonetheless, limited research on the reliability of intuition does suggest that intuitive judgments can reliably (above chance) guide decision-making. According to Sinclair and Ashkanasy (2005) , there are not many researches conducted on the

intution reliability. The few that are conducted show that inituitive judgement is reliable.

When are people most likely to use intuitive decision making? Eight considerations have been identified by Robbins (2005): (1) when an elevated level of ambiguity exists; (2) when there is little instance to illustrate; (3) when variables are less technically conventional; (4) when "facts" are incomplete; (5) when facts do not obviously position the approach; (6) when logical facts are of modest use; (7) when there are more than a few credible substitute solutions from which to select, with superior opinions for every one and (8) when time is inadequate and there is difficulty to move toward the accurate conclusion.

It should be noted that there are different sources of intuitive thinking. Those brought from emotions (emotion-driven intuition), those that result from experience (experience-driven intuition) and those that result from learning or skill (skill-driven intuition) (Sadler-Smith et al. 2008). It is usually the emotion-driven intuition that results in irrational decisions. Thus, they define intuition as "a manifestation of expertise, and the ability of experts to exercise fast, non-conscious pattern recognition and pattern matching".

In the same line of thought, Zerbe et al., (2008) contribute to the examination of the role of emotion in decision-making through the lenses of intuition. They regard intuition as affectively charged judgments that occur through rapid, non conscious, and holistic associations and as functioning beyond the realms of rational processes and include(ing) affective elements.

2.5. Cognitive Biases and Errors in Decision-Making

Kahneman (2011) treats cognitive biases as a phenomenon that all individuals are influenced by. Human beings have been faced with situations for a very long

period in their history that required quick decision making where the cost of delays was greater than the accuracy of the decisions (Frensch et al, 2002).

Monga et al., (2011) define cognitive bias as action taken in a given situation or a decision made resulting from a flaw or weakness in the processing of information available. With a positive stress, depending on the situation, the action will be flight or fight: one is to avoid the danger that threatens or to fight the obstacle that confronts (Hess et al.,2012). The author argues that biases are used only when individuals feel threatened or are under pressure. Biases restore balance and psychologically cause a feeling of well-being and satisfaction.

The term bias refers to an error (malfunction) and has been committed, in a relatively systematic manner, during in the mechanisms involved in cognitive processing, applied to the wrong situation. People prone to cognitive biases are led to believe that the event will happen again. Monga et al., (2011) further explain that biases are the outcomes of situations of intense stress. Memory recall of details becomes difficult and thus the mind imposes a bias in judgment on the situation. The decision is based solely on the information available immediately, without seeking to acquire any new information about the situation. This leads one to take decisions on the basis of heuristics (Hayes et al., 2003).

It is important to differentiate between biases and heuristics. Even though the words are used interchangeably in psychology, they are different in meaning. Workman (2012) defines a heuristic as a non-rational decision process. He goes on to call it a rule of thumb as opposed to a formal, specific rule. Using heuristicts is an informal strategy or approach that works under some circumstances, for some of the time. It is not guaranteed to yield the correct decision. Moreover, using heuristics as a form of educated guessing is prone to distortions, inaccuracies, and omissions

(Workman, 2012). It is important to understand that the heuristics are systematic biases in information processing. They are differentiated from the error that is random (Zerbe et al., 2008).

According to Khaneman, (2012) cognitive biases decision making are those decisions that require less cognitive effort where the decision maker uses heuristics or biases (System1) and those decisions that use logic and systematic evaluation thus requiring a greater cognitive effort (System2).

All components of using biases lie in the brain and are organized into three circuits:

1) The original circuit examines the essential elements of a dangerous situation; it does not examine the details (Richard, 1997). It aims to prepare well before the danger of understanding the nature of the threat. This is a very fast but not very precise (intuition).
2) In the next phase, the brain seeks to refine its response by comparing the situation to stressful situations previously experienced. This process generates a clearer and more detailed view of the situation. It is here that the cognitive biases can hide.
3) The final circuit considered by many as the most powerful circuit is conscious (Hess et al.,2012). This is an enhanced version of the supervision system and is the headquarters of the decision. At this level of consciousness, decisions between potential circuits are made rationally.

Monga et al., (2011) established that humans normally use three biases when making decisions under uncertainty. These methods, although legitimate, lead to systematic errors. These biases are: representativeness, availability and anchoring.

The representative bias is usually used when people have to estimate the probability of an object or event occuring. The mistake is not taking into account the degree of representativeness of the samples being considered (Monga et al., 2011). According to Sinclair and Ashkanasy (2002), the representative bias is based on the similarity of a trait between persons to infer other traits. An example is that it is believed that high quality products are expensive. Therefore, if something is expensive it must be of high quality. However, there are expensive wines that are pretty bad and expensive cars of lower quality than others that are less expensive. In short, in the representative bias, judgments are being made about people or things based on generalization of a trait. For example people assume that tall, slender, fashionably dressed females are models. This bias tends to assess the likelihood of an occurrence by trying to match it with a preexisting category. The representative bias is similar to stereotyping.

The anchoring bias is an inclination to center on initial information obtained or given at the beginning. Once set, it becomes thorny to sufficiently regulate for successive information. For that reason, the brain appears to give a lopsided amount of prominence to the primary information it receives. Thus, initial impressions, thoughts, prices, and estimates carry unnecessary influence relative to information established afterward (Robbins 2005). Workman (2012) defines anchoring as, "using a subjective reference point or focusing on one aspect of an event over other important aspects" (Workman, 2012). The anchor is usually influenced by initial information given, the magnitude and how the information is framed.

The availability bias is the tendency for people to base their judgments on information that is readily available to them. Events that evoke strong emotions, are particularly vivid, or have occurred more recently, tend to be more easily available to

memory. As a result, people are prone to overestimating unlikely events, such as a plane crash. Managers, for example, tend to give more weight to recent behaviors of an employee than those behaviors of six or nine months ago, when carrying out performance appraisals (Robbins 2005).

However, one must be careful when using biases and framing effects in decision-making. The decisions taken using these variables can have very undesirable consequences.

2.6. Costs of Errors in Decision Making

Monga et al., et al (2011) explains that biases lead individuals to overestimate or underestimate the impact of the outcomes of their decisions. This is what makes many people react negatively to the use of biases in decision making. It is important to understand that the heuristics are systematic biases in information processing; that is to say, they lead one to make less valid judgments (Zerbe et al., 2008).

According to Hess et al, (2012), decision making is the sensitive and critical process which must be taken accurately in order to get through any type of error (Hess et al., 2012). If the decision making process is executed ineffectively then the outcomes can be disasterous for the society, businesses, families, governmnetal institutions and also individuals. decision making must be taken in such a way that it benefits all of them. the main reason of errors in the decision making is because of the baisess that are involved while making decisions.

According to Driver (1990), the decision making cost of the suboptimal level has been augmented after the evolution of decision biases commenced. The significance of the optimal decision making has been increased as compared to the suboptimal decision making. In every area, every one is required to make some sort of decisions and these people have no option left but to make a biased decision (Hess

et al.,2012). This is because the world is surrounded by numeorus information, time pressures, numerous choices and many other restrictive hurdles in the way of taking rational decisions. The biased decision making has a negative impact on things which can be affected by that decision (Driver, 1990).

Workman (2012) contributes by adding that, "managers and other key decision-makers sometimes fall victim to biases that lead them to making poor business decisions or become indecisive, especially when faced with problems involving multiple subjective views about solutions. Biases cause decision makers to overestimate or underestimate the risks or probabilities of success" (Workman, 2012).

According to Hammond (1996), intuition implicitly aggregates diffuse informational cues and rarely results in precise responses. Intuitive decision-making does not involve a comprehensive consideration of all aspects of a judgment but is sensitive to specific features of the stimulus. It is possible that intuition may be more functional in a hypothesis generation context and in indicating which knowledge representations require further processing before they are considered accurate. Thus biases result in inaccurate outcomes.

Therefore, because intuitive decisions are less likely than analytic ones to be based on systematic bias, errors during intuitive decision making are not likely to be large. On the other hand, rational decision-making involves specific manipulation of stimulus information by explicitly weighting certain stimulus features more heavily than others. Therefore, making errors during rational decision-making is thought to be more costly psychologically.(Henson, 2003).

Workman (2012) gives an example where anchoring bias can be disastrous.

When financial resources are strained during difficult economic times, there is a strong temptation to wrongly continue to escalate commitment down a path that may not bear fruit. Based on the information initially received, a person might be resolute in sticking to the original plan, even where there is evidence that it may not succeed.

2.7. Theories and Models

2.7.1. Behavioral decision theory

This theory as discussed by Workman (2012), incorporates both rational and non-rational processes in decision-making. It recognizes biases and the subjective weights given in decision matrices. It includes the bias that past successes are a good predictor of future ones. This explains the irrational commitment to decisions regardless of the costs. With computational decision models, the probabilities of future outcomes are computed. However, people often do not trust the computations, especially when they are under emotional and/or physiological pressure. Under those conditions, people often switch to heuristic reasoning and may draw wrong conclusions even in the face of disconfirming evidence (Workman, 2005).

2.7.2. Classic Dual Process Theory of Human Cognition

The classic dual process theory of human cognition characterizes the distinction between conscious and unconscious information processing as starting with feature detection and pattern recognition. Information classified as relevant to current mental operations is then transferred to working memory for further analysis. At this point, cognition is experienced consciously. Then perceptual information is combined with information retrieved from long-term memory and processed only while it is actively rehearsed via working memory. Based on analysis of the stimulus input, a particular response is generated and a memory trace is encoded into long-term memory for future reference (Chua et al., 2008). Within this model, the

unconscious is characterized as the early retentive perceptual processes that go unattended, remain unrehearsed, and are displaced from working memory before being encoded in long-term memory.

Cohen et al., (1955) suggest that the classic view, by implying that those remaining percepts make no contact with higher mental operations, leaves "little or no room" for the unconscious to influence cognition. More contemporary Dual Process models such as the Adaptive Control of Thought model and the Parallel Distributed Processing model characterize the unconscious as a more active and integral part of mental operations.

2.7.2.1. Adaptive Control of Thought model

In the ACT Model, activation spreads from one cognitive unit to another unit along associative links while simultaneously activating other nodes along the network. Conscious awareness depends on the amount of conceptual activation by the stimulus currently being processed, including unconscious processing. However, unconscious processing is not available to introspection under any context (Epstein, 1996).

2.7.2.2. Parallel Distributed Processing Model

The PDP model characterizes information processing as the result of a large number of processing units each specialized on a specific task. When activated, each unit excites or inhibits other units along a network of associative links. Mutual interaction of the units continues until the entire system achieves a steady state of activation. Once the steady state is achieved, the complete representation of the information being processed reaches conscious awareness. In the PDP model, consciousness is measured as the time to a steady state; instead of the amount of activation as in the ACT model.

This model provides a theoretical framework for the dynamic interaction of dual processes, suggesting that conscious deliberation is a result of slow and serial processing whereas unconscious processing is a result of faster, parallel processing. Conscious deliberation gives rise to a rational mode of deliberation and unconscious processing gives rise to an intuitive mode (Khaneman, 2012).

"System 1" encompasses the procedures of "interactional intelligence" – or those procedures that is more routine, largely inanimate, and moderately unchallenging of cognitive exertion. Monga et al., (2011) notes that System 1 dispensation conjoins properties of automaticity and heuristic processing. System 2, on the other hand, is comprised of the various characteristics that have been viewed by most as typifying controlled processing. This system accounts for the processes of "analytic intelligence" examined by information-processing theorists. The most important difference between the two systems, according to Adahi et al., (2011) is that they tend to lead to different types of task construal.

2.7.3. The Rational Decision-Making Model

The Rational Decision-Making Model argues that the optimizing decision maker is rational. That implies that the individual makes consistent value-maximizing choices within specified limitations. These choices are made using a six-step Rational Decision-Making Model, as presented by Robbins (2005)**;** 1) Defining the problem. A problem exists when there is an inconsistency between an existing and a desired state of affair. 2) Identifying the decision criteria that will be important in solving problem, that is, what is relevant in making the decision (interests, morals, and individual preferences). Any criteria not acknowledged in this step are measured immaterial. 3) Weighing the formerly recognized criteria in order to give them the accurate precedence in the decision. 4) Generating potential alternatives that might

do well in resolving the dilemma. No appraisal of alternatives is done, only listing. 5) Critical analysis and evaluation of alternatives on each criterion. That is, the strengths and weaknesses of each alternative compared with the criteria and weights established in steps 2) and 3). 6) Selecting the best alternative by evaluating each alternative against the weighted criteria and selecting the alternative with the highest total score.

This model assumes that the problem is clear and unambiguous and that the decision maker has complete information regarding the decision situation. He can identify all the relevant criteria as well as list all the viable alternatives and he is fully aware of all the possible consequences of each alternative. The model assumes that the criteria and alternatives can be ranked and weighted to reflect their importance. The specific decision criteria are constant and that the weights assigned to them are constant over time. It is also assumed that there are no time or cost constraints and therefore full information about criteria and alternatives can be obtained. As a rational decision maker, the individual will choose the alternative that yields the highest perceived value (Robbins 2005).

The reality, however, is very different. Human beings are not rational beings. Sometimes individuals choose the alternatives that are most convenient to them, those that cost the least or the most or even those that are based on intuition. Choosing an alternative is also dependant on the mood at the time that the choice is being made. In other cases, the assumptions made are not present. As a result, this model has been found to be very good theoretically, but difficult to follow in practice.

Chapter 3

HYPOTHESIS DEVELOPMENT

3.1. Relationship between Personality and Cognitive Style

Some researchers argue that cognitive style is a choice. A person can decide when to be intuitive and when to be analytic. Personality, on the other hand, in an inherent trait. It is stable over time. It cannot be changed from day-to-day or from situation to situation. Thus to say that personality determines one's cognitive style would be a fallacy. Others disagree.

A research on cognitive style and personality, carried out by Riding and Wigley (1996), suggested that cognitive style and personality sources are not the same. The correlations between them were found to approximate to zero. The results let the researchers to conclude that there is no relationship between cognitive style and personality.

Martinsen and Kaufmann (1999) stated that cognitive style can be positioned at the junction between persona and cognition. They see persona and cognition as autonomous constructs, with cognitive style overlapping both (Isaksen et al., 2003). Grigorenko (1997) described cognitive style as representing "a bridge between what might seem to be two fairly distinct areas of psychological investigation: cognition and personality" (Sadler-Smith 1999).

Riding and Wigley (1997), in their research on the relationship between cognitive style and personality in further education students concluded that since cognitive style affects the ways in which an individual thinks about and internally

represents situations in the external world, it is reasonable to expect that it might also be related to aspects of social behavior and personality.

According to Fajkowska (2008), personality plays a significant role in determining one's cognitive style. Personality has an impact on the decision making of the person. For example, it is assumed that a person high in extroversion, is more easily influenced by others or uses biases more than a person low in extroversion. The person's personality dimension affects the cognitive decision making.

A study by Gadzella (1999) on the differences among cognitive-processing styles groups on personality traits showed that the right hemispheric group (intuitive thinkers) showed more extraversion (that is they were largely extroverted) and then the left hemispheric group (introverts)

Therefore, the following hypothesis is presented:

H_1: *People who are more extroverted in personality are more likely to have intuitive cognitive style, while those who are more introverted in personality are more likely to have analytic cognitive style.*

3.2. Relationship Between Cognitive Style and Biases

Can individuals overcome weakness or biases in decision making styles and develop effective decision making? Spicer and Sadler-Smith (2005) suggest that individuals need to be aware of their own preferred decision making styles in order to overcome biases in decision making. This suggests that biases are not part and parcel of cognitive styles. However, biases affect cognitive style.

Biases and errors occur during both intuitive and rational decision-making. The source of biases associated with intuitive decision-making when relying upon heuristics (that is, representativeness, availability and anchoring) is well documented

in the behavioral economics literature (Hodgkinson, 2008). Workman (2012) argues that people will continue to rely on heuristics and biases to some extent in their decision making about strategic initiatives. Even though both decision-making modes produce errors, the types of errors produced by intuition and rationality tend to differ (Hodgkinson, 2008). Thus, biases affect both approaches to decision making. Therefore my hypothesis is that:

> *H_2: There will be no relationship between a person's cognitive style and how much they are influenced by biases in decision making*

Chapter 4

METHODOLOGY

The study was carried out during the summer in Eastern Mediterranean University. A total of 200 questionnaires were distributed and 165 questionnaires were returned. This represents an 82.5% response rate. A small sample was chosen because of the expected difficulty of obtaining English Speaking respondents during summer break.

4.1. Sampling

The sampling was done conveniently.. The sample comprised of 165 students from the Eastern Mediterranean University. The students represented undergraduate, graduate and 6 postgraduate programmes of study in order to increase generalizability of findings. They represented different majors of study categorized into 5 major groups – Social Sciences, Technical Sciences, Business Studies, Arts and Communication and Medical Sciences. The participants were from different countries to increase the generalizability of the study. The sample consisted of males and females . The ages of the sample varied. All participants volunteered for the study.

4.2. Materials and Measures

The research study was carried out using a survey form. The survey was a pencil-and-paper form. It consisted of 90 questions divided into 5 sections. The form was designed to assess preferences for information processing, extroversion and to measure biases.

Cognitive Style Measure

Part A was the Cognitive Style Index questionnaire (Alinson and Hayes 1996). It distinguishes between the two cognitive styles. It consisted of 38 questions using 3-point rating: True, uncertain and false. The questions were used to assess the position of the sample on each of the two style dimensions. The theoretical maximum score was 76. The higher the score, the more analytic the respondent's style.

Extroversion Measures

To increase the reliability of measures, three extroversion tests were done. Part B consisted of an edited version of the Jung Typology Test (1923) – Extroversion (J). This instrument is a common measure of personality type. It consists of 72 questions on a 2-point rating: True and false. This assessment asks respondents how they generally feel or perform in particular situations. On the foundation of the responses persons present to the assessment, they are categorized as extroverted or introverted (E or I), sensing or intuitive (S or N), thinkers or feelers (T or F), and judging or perceiving (J or P). These categories are then pooled into 16 personality types. However, for the purposes of this research, the test was edited. Only the questions that pertained to the Extroversion or Introversion aspects were asked. The questions were 13 on a 2-point rating scale: a) and b). Respondents were asked to circle that which described them more.

Part C had questions derived from the Eysenck Personality Mini-test (Eysenck & Eysenck 1994) – Extroversion (E). This test consists of 15 questions on a 5-point rating scale:1 (not at all), 2 (a little), 3 (neutral), 4 (much) and 5 (very much). On the basis of answers given, respondents are classified into the three

categories of extraversion, neuroticism and psychoticism. For the purpose of this research, only the questions pertaining to extraversion were analyzed.

Part D was an edited version of the Big Five Personality Test – Extroversion (B). This test consists of 50 questions on a 5-point rating scale: 1 (disagree), 2 (slightly disagree), 3 (neutral), 4 (slightly agree), 5 (agree). The respondents are then grouped into the Big Five Personality Types of extroversion, agreeableness, conscientiousness, neuroticism and openness to experience. For the purposes of this research, only the questions pertaining to extroversion were used. Thus the test consisted of 10 questions on the same 5-point rating scale.

Biases Measure

Part E consisted of questions and statements formulated from Kahneman & Tversky (1974). There were 14 questions in this section. Some questions required respondents to choose from choices and others required them to fill-in-the-blanks. The questions were repeated to gauge if respondents were biased the first time. The second set of questions confirmed the presence of biases. This was also in order to increase the reliability of measures.

Demographic Information

Participants self-reported age, gender, major of study, country of origin (nationality) and level of education.

4.3. Procedure

The sample received the assessment forms in a period of 4 days. The forms took approximately15 minutes to fill out. The students were contacted separately and their permission was taken for the contribution to the study. The surveys were distributed to them and they were told about the aims of the study. The respondents were briefed about the survey process. After conclusion, the surveys were looked

over to ensure that no point was left unanswered. Participants were appreciated for their time and assistance.

4.4. Analysis

The Cognitive Style Index by Allinson and Hayes (1996) was used to measure Cognitive style. The test consists of 38 questions using 3-point rating: True, uncertain and false. Answers that were "True" score 1, "Uncertain" scores 0 and "False" scores 2. However, some questions were reverse scored with answers that were "True" scoring 2, "Uncertain" scoring 0 and "False" scoring 1. The total scores were added for each individual. The theoretical minimum score was 0 and the maximum score was 76. The higher the score, the more analytic the respondent's style. Scores between 0 and 38 represent intuitive cognitive style and scores between 39 and 78 represent analytic cognitive style.

Extroversion was measured using the Jung Typology Test (1923), the Eysenck Personality Mini-test (Eysenck & Eysenck 1994) and the Big Five Personality Test. The Extroversion (J) test consisted of 13 questions on a 2-point rating scale: a) and b). All answers that were "a)" scored 0 and "b)" scored 1. The theoretical minimum score was 0 and the maximum score was 13. Scores between 0 and 6 represent introversion and scores between 7 and 13 represent extroversion.

The Extroversion (E) test consisted of 15 questions on a 5-point rating scale:1 (not at all), 2 (a little), 3 (neutral), 4 (much) and 5 (very much). All answers that were "1" scored 1, "2" scored 2, "3" scored 3, "4" scored 4 and "5" scored 5. The totals for Questions 1, 4, 8, 11 and 13 were added. The theoretical minimum score was 5 and the maximum score was 25. Scores between 5 to 10 implied the respondent was introverted and scores between 20 to 25 implied the respondent was, extroverted.

The Extroversion (B) Test consisted of 10 questions on a 5-point rating scale: 1 (disagree), 2 (slightly disagree), 3 (neutral), 4 (slightly agree), 5 (agree). The scores were analyzed as:

20 + (1) ___ - (2) ___ + (3) ___ - (4) ___ + (5) ___ - (6) ___ + (7) ___ - (8) ___ + (9) ___ - (10) ___.

The theoretical minimum score was 0 and the maximum score was 40. High scorers (between 21 and 40) tend to be extroverted while low scorers (between 0 and 20) are introverted. The biases were analyzed with each question having its own set of scores. The theoretical score minimum score was 0 and the maximum score was 9.

The possible relationship between cognitive style and extroversion and between the cognitive styles and biases were analyzed in terms of single forms using correlation and also by means of analysis of variance to consider the possible interactive effects of the two style dimensions on the extroversion and bias measures.

Chapter 5

FINDINGS

All analyses were carried out using the Statistical Package for the Social Sciences (SPSS for Windows Version 16.0).

5.1. Demographics

The sample comprised of 165 students from the Eastern Mediterranean University. The students represented 128 undergraduate (77.6%), 19 graduate (11.5%) and 6 postgraduate (3.6%) programmes of study. They represented 34 different majors of study categorized into 5 major groups – 29 in Social Sciences (17%), 49 in Technical Sciences (28.8%), 53 in Business Studies (31.2%), 22 in Arts and Communication (12.9%) and 4 in Medical Sciences (2.4%). The participants were from 27 countries. The sample consisted of 55 females (33.3%) and 106 males (64.2%).

Measures of central tendency were computed to summarize the data for the age variable. Measures of dispersion were computed to understand the variability of scores for the age variable. The following are the results of this analysis; N = 165, M = 23.27, SD=3.231. When you look at the mean, it appears that most students were of traditional college age. Based on the small standard deviation, the ages did not vary much. The ages of the sample ranged from 16 years to 35 years.

Table 1: Demographic Variables Frequencies

VARIABLES	PARTICIPANTS	PERCENTAGE
Gender		
Male	106	64.2
Female	55	33.3
Age		
Below 20	16	9.7
20 – 30	133	80.6
Above 30	4	2.4
Nationality		
Nigeria	81	49.1
Cameroon	10	6.1
Azerbaijan	8	4.8
Turkey	8	4.8
Others	51	31
Majors		
Social science	29	17.6
Technical Science	49	29.7
Business Sciences	53	32.1
Arts & Communication	22	13.3
Medical Sciences	4	2.4
Education Level		
Prep School	4	2.4
Undergraduate	128	77.6
Masters	19	11.5
PhD	6	3.6

5.2. Variables

Cognitive Style

The scores for cognitive style ranged from 4 to 69. 1 respondent scored 4 and 1 scored 69. The mean score was 42.66 with SD = 10.66. Thus most of the respondents (117 respondents representing 70.9%) were mostly analytic in their cognitive style, scoring above 38. 48 respondents (29.1%) scored below 38.

Biases

The scores for biases ranged from 0 to 9. Only 2 respondents were completely unbiased. The mean score was 5.48 with SD = 1.62. Majority of the respondents (24.2%) scored 6 in the biases. 2 respondents (1.2%) scored 1 and 3 respondents (1.8%) scored 9.

In the availability bias, 147 respondents (89.1%) were biased and 13 respondents (8.1%) were not biased. For the representative bias, 144 respondents (87.3%) were biased and 15 respondents (9.1%) were not biased. For the anchoring bias, 147 respondents (89.2%) were biased and 3 respondents (1.8%) were not biased.

When categorised, majority of respondents (99 respondents – 60%) fell in the "biased" category. This was followed by 45 respondents (27.3%) "very biased", then the "somewhat biased" category had 16 respondents (9.7%).

Extroversion

The mean score for the Extoversion (J) Test was 6.01 with SD = 2.35. The minimum score was 0 and the maximum 12. Majority of respondents (27 respondents representing 16.4%) scored 5 (introverted personality). 1 respondent scored 0 and 2 respondents scored 12.The participants who scored between 0 and 6 (introverted personality) were 96 (58.9%). Those who scored between 7 and 13 (extroverted personality) were 67 (41.1%).

The mean score for the Extroversion (E) Test was 16.25 with SD = 4.12. Majority of respondents (25 respondents representing 15.2%) scored 16. The minimum score was 4 (1 respondent) and the maximum score was 25 (3 respondents = 1.8%). Introverted individuals, that is, those who scored between 5 and 10, were 13

respondents (8.5%). The extroverted individuals, those that scored between 20 and 25, were 37 respondents (22.3%).

The Extroversion (B) tests had an average score of 19.74 with SD=7.01. The minimum score was 2 (1 respondent) and the maximum score 40 (2 respondents – 1.2%). Majority of the respondents (16 participants – 9.7%) scored 21 (extroverted personality). The participants that were introverted, scoring between 0 and 20, numbered 96 (58.5%). Those that were extroverted, scoring between 21 and 40, were 68 (40.9%).

In total, when all three tests were combined and the results categorized, it was found that 87 respondents (52.7%) were introverted and 78 respondents (47.3%) were extroverted.

Table 2: Scale Variable Summary Frequencies

VARIABLES	**Participants**	**Percentage**
Cognitive Style		
Analytic	117	70.9
Intuitive	48	21.9
Extroversion		
Introverted	87	52.7
Extroverted	78	47.3
Biases		
Not Biased	2	1.2
A Little Biased	16	9.7
Biased	99	60
Very Biased	45	27.3

Table 3: Scale Variable Frequencies

VARIABLES	MEAN	SD	Minimum	Maximum
Cognitive Style	42.66	10.66	4	69
Extroversion (J)	6.08	2.36	0	12
Extroversion (E)	16.26	4.12	4	25
Extroversion (B)	19.74	7.01	2	40
Availability Bias	1.62	.831	0	3
Representative Bias	1.86	.931	0	3
Anchoring Bias	2.07	.929	0	4
All Biases	5.48	1.7	0	8

5.3. Cross Analysis and Correlations

5.3.1. Scale Variables

Correlations were done between scale variables. A Pearson product-moment correlation coefficient was computed to assess the relationship between extroversion scale variables and biases scale variables.

For the extroversion variables, results showed that the Extroversion (J) is closely related to Extroversion (B) with $r = 0.437$, $n = 162$ at $p = 0.000$. The same result was computed for Extroversion (J) and Extroversion (E) with $r = 0.258$, $n = 162$, $p = 0.001$. Similar results were found between Extroversion (B) and Extroversion (E) with $r = 0.471$, $n = 164$ at $p=0.000$. These findings were to be expected since the three tests measure extroversion.

For the biases variables, there was no significant correlation between representative, anchoring and availability biases.

Table 4: Correlations Summary

	1	2	3	4	5	6	7	8
1. COGNITIVE STYLE	1							
2. JUNG	-.174*	1						
3. EYSENCK	.046	.258**	1					
4. BIG FIVE	-.143	.437**	.471**	1				
5. AVAILABILITY BIASES	.129	-.111	-.052	-.157*	1			
6. REPRESENTATIVE BIAS	.093	-.069	.063	.055	-.027	1		
7. ANCHORING BIAS	-.008	-.029	-.029	-.048	.136	-.089	1	
8. AGE	-.099	.020	.053	.059	.022	-.160	-.112	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

5.3.2. Demographic Variables and Scale Variables

ANOVA was applied to ascertain the relationship between the demographic variables and scale variables. The five demographic variables include: age, education level, nationality and programme of study. The scale variables consist of three quantitative criteria: cognitive style, extroversion and bias.

One-way Analysis of Variance (ANOVA) was used in comparing the means of cognitive style, extroverted personality and bias scores by gender, majors, education level, nationality and age. There was no significant effect of gender, majors, education level and age on scale variables at the $p<.05$ level for the three conditions.

The following results were obtained when a Pearson product-moment correlation coefficient was computed to assess the relationship between the demographic variables (age, educational level and gender) and scale variables. There was a significant negative correlation between age and biases, $r = - 0.171$, $n = 152$, p

= 0.036. Thus increase in age lead to a decline in biases scores.

There was also a significant negative correlation between extroversion and biases. To be specific, there was a negative correlation between extroversion (B) test and the availability bias, r = - 0.157, n = 160, p = 0.048.

5.4. Hypothesis Testing

Relationship between Extroversion and Cognitive Style

An independent-samples t-test was conducted to compare analytic styles in extroverts and introverts. There was no significant difference in the scores for extroverts (M=42.96, SD=10.811) and introverts (M=42.39, SD=10.569) conditions; t (163) = -.343, p = .732. These results suggest that extroversion does not have an effect on cognitive style. Specifically, the results suggest that there is no cause-and-effect relationship between extroversion and cognitive style.

A Pearson product-moment correlation coefficient was computed to assess the relationship between personality (introversion and extroversion) and rating of cognitive style. There was a negative correlation between the two variables of extroversion (J) and cognitive style, r = -0.174, n = 165, p = 0.026.

There was no significant correlation between cognitive style and the extroversion (B) and extroversion (E) measures. There was a strong, negative correlation between personality (introversion and extroversion) and rating of cognitive style. Increases in cognitive scores were correlated with decreases in personality rating of extroversion.

Therefore we do not reject H1.

H1: People who are more extroverted in personality are more likely to have intuitive cognitive style, while those who are more introverted in personality are more likely to have analytic cognitive style

Table 5: Summary Analysis Of Variance

VARIABLES	COGNITIVE STYLE	JUNG	EYSENCK	BIG FIVE	AV. BIASE	REP. BIAS	ANC.BIAS
Gender							
Male	42.42	6.17	16.39	19.79	1.63	1.87	2.03
Female	43.60	6.13	16.29	19.75	1.61	1.87	2.19
F	**4.65**	**0.14**	**0.21**	**0.02**	**.028**	**.001**	**1.017**
Sig.	**.496**	**.906**	**.885**	**.968**	**.867**	**.975**	**.315**
Nationality							
Nigeria	43.51	5.91	16.49	17.93	1.76	1.76	2.00
Turkey	40.29	7	18.57	30.29	1.14	1.14	2.00
Cameroon	45.2	6.6	15.9	20.2	1.90	1.90	2.50
Azerbaijan	47.12	6.75	15.62	21.75	1.62	1.62	1.75
Ghana	43.88	5.88	14.75	20.75	1.75	1.75	2.75
Others	40.93	6.42	16.26	21.19	1.38	1.38	2.07
F	**.825**	**.671**	**.782**	**5.292**	**2.076**	**.073**	**1.606**
Sig.	**.534**	**.646**	**.564**	**.000**	**.071**	**.996**	**.162**
Majors							
Social science	41.62	6.67	17.34	21.24	1.79	1.86	2.41
Technical Science	44.92	6.12	15.94	19.71	1.48	2.02	2.08
Business Sciences	42.75	6.21	16.45	19.28	1.65	1.65	2.02
Arts & Communication	42.00	6.33	16.32	19.82	1.45	2.14	1.91
Medical Sciences	33.25	6.25	14.25	19.25	2.25	2.25	2.50
F	**1.45**	**.032**	**.850**	**.365**	**1.465**	**1.695**	**1.394**
Sig.	**.219**	**.998**	**.495**	**.823**	**.216**	**.154**	**.239**
Education Level							
Prep School	46.25	8.50	17.50	21.50	1.33	2.00	2.00
Undergraduate	42.57	6.06	16.24	19.45	1.65	1.83	1.83
Masters	42.79	6.83	17.26	22.37	1.44	2.22	2.22
PhD	45.17	5.50	15.00	19.83	1.50	1.83	1.83
F	**.261**	**2.170**	**.687**	**1.006**	**.479**	**.954**	**4/938**
Sig.	**.853**	**.094**	**.561**	**.392**	**.697**	**.416**	**.003**
Age							
Below 20	44.88	6.62	15.81	19.44	1.80	2.13	1.73
20 - 30	42.47	6.19	16.45	20.11	1.60	1.86	2.18
Above 30	44.00	4.75	16.50	19.75	1.75	1.75	1.00
F	**.389**	**1.045**	**.177**	**.066**	**.444**	**.620**	**4.612**
Sig.	**.678**	**.345**	**.839**	**.937**	**.642**	**.539**	**.011**

Relationship between Cognitive Style and Biases

A Pearson product-moment correlation coefficient was computed to assess the relationship between cognitive style and biases. There was no significant correlation between cognitive style and any of the measures of biases (availability, anchoring and representative bias.

An independent-samples t-test was conducted to compare bias in analytic thinkers and intuitive thinkers. There was no significant difference in the scores for intuitive thinkers (M=5.13, SD=1.695) and analytic thinkers (M=5.61, SD=1.677) conditions; t (163) = -.343, p = .732. These results suggest that cognitive style does not have an effect on bias.

Therefore we do not reject H2:

H2: There will be no relationship between a person's cognitive style and how much they are influenced by biases in decision making

Chapter 6

DISCUSSION AND CONCLUSION

The purpose of this study was to examine the relationship between biases and cognitive style in order to build a case for the use of intuitive decision making alongside analytic decision making.

6.1. Findings

Most of the respondents who took part in the survey had analytic cognitive style. This was to be expected considering that most of the participants were students of higher education. Institutions most often encourage student to make rational decisions. However, since the sample contained a significantly higher number of males than females, the results could stem from the disparity in gender.

One of the more significant findings to emerge from this study is that majority of the respondents were biased. This is in contradiction with the assumptions of Spicer and Sadler-Smith (2005) that analytic thinkers think things through and consider all alternatives. The respondents were mostly influenced by availability bias. The expectation was that representative bias (stereotypes) would have the highest number of respondents. It ranked the least.

Thus, Herbert Simon's bounded rationality theory seems to hold water. It is not feasible for individuals to be absolutely rational in decision making. Interestingly, most of the respondents during the follow-up questions believed that they had used "logic" in making their choices.

In measuring the relationship between cognitive style and biases, the findings gave support to the first hypothesis that there is no significant relationship between a person's cognitive style and how much they are influenced by biases in decision making. Both analytic decision makers and intuitive decision makers are prone to being biased in equal measure when making decision. The results also disputed the studies of Fajkowska (2008) that a person high in extroversion is more easily influenced by biases. Biases affected both introverted individuals and extroverted individuals in equal measure.

The respondents were distributed almost equally in extoversion. The majority of respondents were analytic in their cognitive style. It, however, cannot be concluded that introverts are analytic in nature.

Returning to the second hypothesis at the beginning of this study, it is now possible to state that people who are more extroverted in personality are more likely to have intuitive cognitive style, while those who are more introverted in personality are more likely to have analytic cognitive style.

Individuals in the higher levels of study were more analytic than those in their first year of study. This suggests that the environment shaped the cognitive styles. Education teaches people to use logic and rationale in decision making. Age had a similar effect.

6.2. Implications

The aim of this study was to demonstrate that biases not only influence those that have a more intuitive cognitive style, but also those that have an analytical cognitive style. This was in order to encourage the use of intuitive thought alongside analytic thought for optimal results in decision making. Many researchers, and

indeed many individuals, have hailed analytic cognitive style above intuitive cognitive style, usually on the premise that intuitive thinking is mostly biased.

Cognitive style can be changed and learned over time. It is not inherent in individuals as presented by Alinson and Hayes (1996). This research has shown that the environment an individual is placed in can shape the individual's cognitive style. An implication of this is the possibility that individuals can learn to use intuition or rationale when making decisions.

Caution should be taken when making conclusions that the extroversion and cognitive style have a cause-and-effect relationship. The relationship between them implies that both are good indicators of the presence of each other. That is, cognitive style is a good indicator of extroversion and extroversion is a good indicator of cognitive style.

The study has gone some way towards enhancing our understanding of biases, extroversion and cognitive style and how they relate to each other.

6.3. Limitations

A number of important limitations need to be considered. First, the project used a convenience sample that was obtained from a university during the summer break. This resulted in a small sample which was significantly gender imbalanced. With a small sample size, caution must be applied, as the findings might not be transferable to the general population.

The current study was unable to sufficiently analyze gender as a variable which could have affected the measurements of cognitive style. It is assumed that males are more analytic in their cognitive style and females are more intuitive in their cognitive style. Analysis based on gender could not be adequately carried out.

One source of weakness in this study, which could have affected the measurements of extroversion, was the difficulty in finding a measurement for extroversion. Measurements of extroversion had to be modified to suit this study. As a result, the questionnaire was lengthy.

The sample also consisted of a majority of 1 nationality – Nigeria. This might have also affected the results of the study.

6.4. Further Studies

A number of possible future studies using the same experimental set up are apparent. It is suggested that the association of extroversion and cognitive style is investigated in future studies. A cause-and-effect relationship could be examined.

Further research in this field, regarding the role of biases would be of great help in enhancing understanding on why individuals continue to use biases in decision making, in spite of the errors attributed to biases.

Future research should therefore concentrate on the investigation of the degree to which biases affect or influence analytic or intuitive cognitive style. Large randomized controlled trials could provide more definitive evidence

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APPENDIX

APPENDIX A : SURVEY

This questionnaire is intended to measure information processing style and decision making as a part of a master's thesis in the department of business administration in EMU. The questionnaire should take no longer than 15 minutes of your time to complete. This is not a test of your ability, and there are no right or wrong answers. Simply choose **the one** response which comes closest to your own opinion. Work quickly, giving your first reaction in each case, and make sure that you respond to every statement.
Thank you.

PART A

Below are 38 statements designed to identify your own approach. If you believe that a statement is true about you, place an (X) under the "T" column. If you believe that it is false about you, place an (X) under the "F"column. If you are uncertain whether it is true or false, place an (X) under the "? column".

	T	?	F
1. In my experience, rational thought is the only realistic basis for making decisions.			
2. To solve a problem, I have to study each part of it in detail.			
3. I am most effective when my work involves a clear sequence of tasks to be performed.			
4. I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.			
5. I am careful to follow rules and regulations at work.			
6. I avoid taking a course of action if the odds are against its success.			
7. I am inclined to scan through reports rather than read them in detail.			
8. My understanding of a problem tends to come more from thorough analysis than flashes of insight.			
9. I try to keep to a regular routine in my work.			
10. The kind of work I like best is that which requires a logical, step-by-step approach.			
11. I rarely make 'off the top of the head' decisions.			
12. I prefer chaotic action to orderly inaction.			
13. Given enough time, I would consider every situation from all angles.			
14. To be successful in my work, I find that it is important to avoid hurting other people's feelings.			
15. The best way for me to understand a problem is to break it down into its constituent parts.			
16. I find that to adopt a careful, analytical approach to making decisions takes too long.			
17. I make most progress when I take calculated risks.			
18. I find that it is possible to be too organized when performing certain kinds of task.			
19. I always pay attention to detail before I reach a conclusion.			
20. I make many of my decisions on the basis of intuition.			
21. My philosophy is that it is better to be safe than risk being sorry.			
22. When making a decision, I take my time and thoroughly consider all relevant factors.			
23. I get on best with quiet, thoughtful people.			

24. I would rather that my life was unpredictable than that it followed a regular pattern.			
25. Most people regard me as a logical thinker.			
26. To fully understand the facts I need a good theory.			
27. I work best with people who are spontaneous.			
28. I find detailed, methodical work satisfying.			
29. My approach to solving a problem is to focus on one part at a time.			
30. I am constantly on the lookout for new experiences.			
31. In meetings, I have more to say than most.			
32. My 'gut feeling' is just as good a basis for decision making as careful analysis.			
33. I am the kind of person who casts caution to the wind.			
34. I make decisions and get on with things rather than analyze every last detail.			
35. I am always prepared to take a gamble.			
36. Formal plans are more of a hindrance than a help in my work.			
37. I am more at home with ideas rather than facts and figures.			
38. I find that 'too much analysis results in paralysis'.			

PART B

Circle the most appropriate answer

1. When you meet new people do you:

A. Talk as much as you listen

B. Listen more than you talk

2. Do you prefer a social life that includes:

A. Many friends and acquaintances

B. A few people that you feel close to

3. If a heavy snowfall keeps you from going to school or work, do you:

A. Wonder what you're missing

B. Enjoy the unexpected time alone

Which statement are you more likely to make:

4.

A. I usually think on my feet, as I'm talking

B. I usually reflect on what I'm going to say before I say it

5.

A. People who know me are generally aware of what's important to me

B. I don't talk about what's important to me unless I feel close to someone

6.

A. I get restless when I'm alone too long

B. I get restless when I don't have enough time to myself

7.

A. When I'm having a good time with others, I get energized and I keep on going

B. When I'm having a good time with others, my energy runs out and I need space

When you're on vacation, are you more likely to:

8.

A. See famous landmarks

B. Spend time in museums and quieter places

Which word best describes the way you see yourself:

9. A. Open	B. Reflective
10. A. Expansive	B. Intense
11. A. Well-rounded	B. Deep
12. A. Straightforward	B. Reserved

Would you rather:

13.

A. Be admired for your work, even though you're not satisfied with it yourself

B. Create something of lasting worth, but remain unknown

PART C

Answer the following questions with a mark (X) where appropriate:

5 (very much), 4(Much), 3(neutral), 2(a little), 1 (not at all),

	1	2	3	4	5
1. Do you have many different hobbies?					
2. Do you stop to think things over before doing anything?					
3. Does your mood often go up and down?					
4. Are you a talkative person?					
5. Would being in debt worry you?					
6. Do you ever feel "just miserable" for no reason?					
7. Do you lock up your house carefully at night?					
8. Are you rather lively?					
9. Would it upset you a lot to see a child or animal suffer?					
10. Do you often worry about things you should not have done or said?					
11. Can you usually let yourself go and enjoy yourself at a					

lively party?					
12. Are you an irritable person?					
13. Do you enjoy meeting new people?					
14. Do you believe insurance plans are a good idea?					
15. Are your feelings easily hurt?					

PART D

In the table below, for each statement (No.1-10) mark how much you agree with on the scale 1-5, in the box to the left of it.

1=disagree, 2=slightly disagree, 3=neutral, 4=slightly agree 5=agree

I…..	1	2	3	4	5
1. Am the life of the party.					
2. Don't talk a lot.					
3. Feel comfortable around people.					
4. Keep in the background.					
5. Start conversations.					
6. Have little to say.					
7. Talk to a lot of different people at parties					
8. Don't like to draw attention to myself.					
9. Don't mind being the center of attention.					
10. Am quiet around strangers.					

PART E

Please answer the following questions with the first answers that come to mind. Circle the most appropriate answer and fill in the blanks where required

1. Approximately how high is Mt. Everest?
    a) Above 6500m / 21,325feet
    b) 6500m / 21, 325 feet
    c) Below 6500m/21, 325feet

2. Which of the two groups of words are more common:
    a) Words that begin with the letter "R" or "K" or
    b) Words that have the letter "R" or "K" in the third position

3. Susan is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, she has a need for order and structure, and a passion for detail. Susan is a
    a) Librarian
    b) Teacher
    c) Lawyer

4. What would you guess is the population of Iraq?

    _____

5. Which is a more spoken language in the world?
    a) English or
    b) Chinese?

6. A certain town is served by two hospitals. In the larger hospital, about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. As you know, about 50 percent of all babies are boys. However, the exact percentage varies from day to day. Sometimes it may be higher than 50 percent, sometimes lower. For a period of 1 year, each hospital recorded the days on which more than 60 percent of the babies born were boys. Which hospital do you think recorded more such days?
    a) The larger hospital
    b) The smaller hospital
    c) About the same (that is, within 5 percent of each other)

7. An average person should consume:
    a) More than 8 litres of water a day
    b) Less than 8 litres of water a day
    c) 8 litres of water a day

8. Approximately how high (in metres or feet) do you think Mt. Everest is?

    _____

9. Do more Americans die from
    a) Homicide and car accidents, or
    b) Diabetes and stomach cancer?

10. Linda is 31 years old, single, outspoken and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations. Which of the following is more probable?
    a) Linda is a bank teller
    b) Linda is a bank teller and active in the feminist movement

11. What is the approximate population of Iraq?
    a) Above 12 million
    b) 12 million
    c) Below 12 million

12. How many litres of water can an average person drink in a day?

    _____

13. Pick a number between 1 and 9.

    _____

14. How much would you say (in US$) a new Bugatti costs?

    _____

DEMOGRAPHIC INFORMATION

Please give details about yourself.

AGE:_____

GENDER: MALE_____ FEMALE:_____

NATIONALITY:_____

PROGRAMME OF STUDY

(MAJOR):_____

LEVEL OF EDUCATION: PREP SCHOOL_____

UNDERGRADUATE_____MASTERS_____PHD_____

YEAR OF STUDY: 1_____ 2_____3_____4_____ 5_____