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The Impact of Decision Style on Decision Quality

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THE IMPACT OF DECISION STYLE ON DECISION QUALITY

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ABSTRACT

This thesis focuses on the study of decision style and the effects each styles characteristics has on decision quality.

Each personality style exhibits specific characteristics unique to that particular style. These characteristics in conjunction with the decision makers cognitive abilities form a unique problem solving or decision style. Characteristics of each style have been operationalized by the Myers-Biggs Type Indicator.

Decision quality is measured, for purposes of this paper, in terms of the impact the decision maker's style has on the decision outcome. Decision quality is measured separately from decision success since successful decisions require more than good decisions.

This paper evaluates current research in the areas of personality type, decision making styles and their effects on various aspects of the decision process.

Results of this evaluation provide considerable evidence to suggest that the hypothesis be accepted and conclude that decision makers have within their decision style unique biases that affect their decision outcome.

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Chapter 1

INTRODUCTION

Today's decision maker faces countless structured and unstructured decisions that present themselves in different ways. The effect the decision maker has on the outcomes of these issues impact both the organizations' effectiveness and financial stability. These outcomes may also impact the decision makers future effectiveness within the organization.

The way each decision maker perceives and identifies problems, processes information and makes judgements based on gathered data is unique and defines the decision makers personal management style. Each individual perceives and gathers information differently, therefore the basis on which judgements are made vary depending on personal style. Differences in perceiving and gathering information can positively or negatively affect the problem solving process and resulting judgement. The final result of this process may lead to variations in decision outcomes.

Several variations in decision style have been proposed and described by recent research. Watkin

developed the concept of 'Field Dependence' which is the ability to separate a phenomenon (object) from its environment (235-238). Individuals exhibiting field dependence prefer fundamental relationships, analyze details and are more global and intuitive in their problem solving.

Watkin's concept of field dependence is similar to Huysman's (2) description of ways individuals reason and choose between divergent courses of action. He describes two types of people; 'analytic' individuals who establish or compare relationships of data and 'heuristic' individuals who emphasize pragmatic solutions or base solutions on previous experience or knowledge.

Doktor describes the analytic-heuristic style of decision making as a function of the physiology of the brain. His studies of electroencephalagrams of executives taken in the process of decision making were analyzed as they worked on problems that were best solved by using analytic and heuristic methods of resolution. His results demonstrate that executives have a preferred style of decision making (23).

Driver and Mock describe decision styles in terms of abilities of individuals to process information. They propose four independent styles based on the number of solutions and the amount of information used

by the decision maker. These styles include; 'decisive' individuals who show a preference for a single solution using minimal data; 'flexible', who prefer multiple solutions using minimal data; 'hieratic', show a preference for single solutions using maximum data and 'integrative' style whose preference is for maximum data leading to multiple solutions (493-494).

Another decision style framework is proposed by McKeeny and Keen who emphasize two methods of information gathering and evaluation. These methods are: perceptive and receptive styles (83). A perceptive person uses relationships, concepts and models to filter data. The receptive individual uses detailed information and is very sensitive to stimuli when evaluating information.

Jung's Personality Theory proposes people develop two dominant personality preferences for obtaining data and two ways they evaluate the data. These dominant preferences define four personality types: Intuition-Thinking, Sensation-Thinking, Sensing-Feeling and Intuition-Feeling (132-133). Each personality type is defined by the method each perceives, gathers,

evaluates information and makes judgments based on the collected data. Many people exhibit several or all personality types during the process of perceiving and judging but most individuals have one dominant or preferred style which is used most often; especially when the problem structure is ill defined and ambiguous.

A Jungian structure of decision style is proposed by (Mason and Mitrof 479-480) similar to McKeeny and Keen. This style is also based on how information is gathered and evaluated by the decision maker . The information gathering methods are characterized at one extreme by sensation-oriented individuals and at the other by intuitive-thinking individuals.

A sensing person prefers detailed, structured problems and is patient with precise repetitive work. At the other extreme, the intuitive individual prefers unstructured problems, dislikes routine and detailed work.

The evaluative mode focuses on the way information is evaluated. The feeling person considers values an important criteria and considers individuals' feelings and emotions. The thinking person tends to be

exceptionally impersonal in his/her approach to information evaluation, and uses logic to generalize and explain actions.

The two methods, thinking-feeling and sensing-intuition approaches to information evaluation and acquisition are proposed to be independent and are combined in to four basic decision styles; Sensation-intuition (ST), Sensation-feeling (SF), intuition-thinking (NT), and intuition-feeling (NF). No one style is dominant or superior but each has unique strengths and weaknesses (23).

Muller and Stumpf proposed six approaches to organizing and interpreting information. These are: identifier, sorter, selector, unilateral discriminator, evolver, and searcher (61-62). In their research, each style is contrasted with the personality type sensing-intuition and feeling-thinking. Similar to the Jungian styles, few people exhibit only one style but most have a dominant preference.

Each framework has unique and common features. Jung, Driver and Mock, and McKenny and Keen are similar in their approaches by each having a style categorized or defined as pragmatic, people-oriented and

unsystematic in their information analysis with an opposite style preferring a systematic, logical and impersonal analysis.

Myers operationalized the Jungian framework by developing the Myers-Biggs Type Indicator (51). This test provides more information on personality type than any other psychological indicator (Haley and Stumpf 479) and is referenced extensively in research in combination with Jung's Personality Theory to categorize decision styles. The four basic styles identified by Jung; sensing-thinking, sensing-feeling, intuition-thinking and intuition-feeling, are the basis for defining decision style characteristics in this paper.

To supplement this definition, decision style can also be defined as the underlying different cognitive abilities of individuals to incorporate, evaluate and interpret information needed to appraise and classify a problem situation. Smart and Vertinsky indicate, "Cognitive abilities are the abilities of the decision unit to interpret information, generate option creativity, calculate and make choices between alternative courses of action"(641). This cognitive

make-up is thought to influence the selection among alternative courses of action (Mason and Mitroff 481-482). Holsti also shows impaired cognitive abilities of individuals may result in an inability to predict the consequences of various alternative courses of action.

Types of Organizational Problems

Managers face diverse problems daily characterized by varying amounts of available information, time constraints, and evaluation criteria to arrive at a decision. Four categories of problems are generally found in business and research: strategic, operating, human relations and technical problems; each having unique characteristics.

Human relation problems typically are characterized as psychological or social problems involving relations with individuals, usually subordinates. These problems are generally complex, unstructured, elusive or ambiguous and require a degree of feeling and intuition to resolve (Lyles and Mitroff 114-115).

Technical problems apply to the design and

manufacture of products or services and are typically well structured or procedurally defined within the organization (Cowan 465).

Operating problems include those dealing with courses of action involving the organizations immediate future and actions people take to achieve goals and objectives. (Kilmann 58) These problems are more structured than strategic problems. The distinction between operating and strategic level problems contrast long term organizational concerns with those which are mostly day-to-day.

Problems concerned with the organizations purpose, objectives, goals and/or its alignment between organization and its environment are strategic problems. These problems are characterized by their ambiguity and unstructured nature; to the degree, there is no obvious means for resolving them. They are "non-routine and have far-reaching consequences" (Moorehead and Griffin 529). Because they are non-routine, they must be treated as 'new' problems for which there is no previously learned solution or response.

Executives envision strategic problems differently from operating problems because of the degree of

structure and the level in the organization in which each is experienced. Well structured problems are delegated downward because their problem resolution is also well structured through standard operating procedures, company policy and heuristics.

Human relation problems differ from technical problems also because of their degree of structure. This difference is not attributable to their level in the organization but rather where attention is directed (Simon 46).

How the decision maker envisions problems as structured or non-structured affects how the problem is understood. Well structured problems are generally linked to executives' problem-type experience with similar problems and are resolved through successful decision experiences. "Problem situations that are conceived of as ill structured were linked to decision style, since cognitive preferences such as these are thought to be employed to inform one's reactions and responses when clear alternatives are not readily available"(Cowan 470).

If the problem situation is well structured, the executive relies heavily on his experience when the

technology for resolving a problem exists. When the problem is not well structured, the decision maker relies on his cognitive abilities to interpret ambiguous and non-routine situations to a degree of understanding that allows him to take action. Ill structured problems require more personal interpretation and creativity to assimilate and evaluate enough information to make judgements than structured types. These personal abilities describe the function of decision styles; "decision styles are habitual differences between people in their decision making".(Driver 59).

Since decision style impacts problem formulation, it exemplifies individual characteristics of the managers information processing required to conceptualize and interpret the problem situation (Cowan 470).

Decision Quality:

The objective of the decision process is to maximize a single objectives function, i.e., obtain maximum profits for a company or maintain costs at minimum for a department or company while maintaining

consistency with organizational environmental limitations. These limitations establish the framework in which the decision process takes place and influences the final decision either positively or negatively.

A framework of a successful decision is proposed by Trull (273) which establishes the components of total decision success. This framework establishes total decision success as a function of decision quality and implementation where each interacting part is not mutually exclusive. Successful decisions require more than good decisions. The decision, once made, must be carried out efficiently, so that its effect may be obtained in such a fashion as to satisfy the original problem. (Maier 48-50).

Total Decision Success = Decision Quality + Implementation

Even if a good decision is made and successfully implemented, it may have a bad out come. If this occurs, the decision will ultimately be viewed as a 'bad decision'. For this reason, decision quality will be viewed separately from its relationship to decision

out-come or decision success.

Decision quality depends on the characteristics of the decision makers ability to handle four general influences : environmental constraints, time constraints, information processing flows and the decision makers cognitive abilities.

Other factors affecting success of the decision but considered part of the implementation process include: political influences, risk and uncertainty, conflicts of interest, and the communication. The attributes affecting implementation will not be considered here except where those influences directly contribute to the relationship between decision style and decision quality.

The process of making strategic decisions is not explicitly defined but is reached through a series of ill-defined interacting events, occurring over a period of time. Likewise, the determination whether a decision is successful is not always immediately clear. From the decision maker's perspective, successful decisions are dependent upon two important frames of reference. These include the decision variables that influence and are influenced by the decision maker, and

those factors affecting implementation. Once a decision is made, for it to be successful, it must be carried out.

Variables that have an influence on or by the decision maker affect decision quality. These include the ability of the decision maker to absorb and evaluate information, interpret risk and uncertainty and the cognitive abilities of the decision maker.

"Generally, there is some support for the intuitively reasonable notion that 'good' information leads to 'good' decision making" (Reiley 756). The quality of information input into the decision process depends on the ability of the decision maker to absorb information flows. This ability to assimilate information prevents overload and reduces noise in the information channels.

"Quality" of information used by the decision maker is reflected in attributes of accuracy, reliability, timeliness, and specifics of the problem. Ideally, the decision maker selects information with these characteristics in mind but the term quality information is not an objective characteristic. It is subjective, therefore not all users of information

evaluate it as "quality" information because of individual distortion due to perceptual differences of the decision maker.

Decision quality is also influenced by variations in cognitive abilities of decision makers, specifically, in their ability to interpret and evaluate information. This variation depends on their ability to determine if enough information exists to make a decision, if he has sufficient knowledge of the potential decision outcomes, the ability to make choices between alternative courses of action and the ability to handle stress.

Decision quality also depends on the decision makers ability to absorb information flows. These flows may be interrupted by several influences . If the amount of data received in a given period of time is sufficiently large, the decision maker may be unable to process information necessary to make an informed decision. This condition is called information overload. "Since people can think of only so many things at one time...effective managers [must be] adept at "collapsing" the issues they face into categories" (Isenberg 94).

In order to reduce the vast amount of unknowables and minimize the complexity of the decision process, decision makers use the organizing or filtering device, heuristics. Heuristics are short cuts or rules of thumb used by the decision maker to identify and manage the day to day unknowables.

Cognitive abilities are the abilities of the decision maker to interpret information, generate options creatively, calculate and make choices between alternative courses of action. A change in cognitive ability can be attributed to stress. A moderate amount of stress may be beneficial to the decision making process but as the level of stress increases, the decision makers cognitive processes narrow, behavior becomes less adaptive, rigidity in problem solving and narrowing of communication channels is promoted (Smart and Vertinsky 643). Stress changes or impairs the ability of the decision maker to process information effectively and thereby directly affects the quality of the decision.

Summary

Decision styles proposed in current research literature have similarities of structure and form, many based on the Jungian framework. The majority are based on how the decision maker processes, evaluates and gathers information before making judgements. The differences between the methods used define the decision maker styles and this has been operationalized by the Myers-Biggs Type Indicator.

Problem structure affects the impact decision style has on the decision making process. Well structured problems are generally resolved using established problem solving procedures, i.e., company policy, standard operating procedures. Un-structured problems, similar to those found in strategic decisions, require personal interpretation, creativity and the decision makers cognitive abilities to evaluate the available information before arriving at a decision.

The resulting decision success or failure may not be measured by the characteristics of the effects imposed by the decision maker. Decision style influences decision quality more than implementation because of outside influences on the implementation

process. If the decision is not implemented or is executed poorly, the decision may have an undesirable or unsuccessful outcome.

Decision quality will be measured for the purpose of this paper in terms of the impact the decision maker has on the decision. This impact is determined by the cognitive abilities of the decision maker, his ability to focus on problem objectives, and his ability to absorb information flows. This study focuses on the relationship between individual decision style characteristics and decision quality in the unstructured decision process.

Statement of Purpose

This paper will explore, in a strategic decision environment, the effects decision style characteristics have on decision quality.

Chapter II

LITERATURE REVIEW

Today's research describing problem solving and decision styles attempts to understand factors in which 'styles' affect both organizational and managerial performance.

The relation between decision style and information processing in the strategic decision situations results in identification of four distinct styles in Driver and Mock's study. These styles are: Flexible, Hierarchic, Integrative, and Decisive and are based on each style's ability to process simple to complex data and handle information input and load (494-496).

The study was conducted using 54 first year MBA students, previously tested by the Integrative Style Test (IST) to determine decision style. Styles were confirmed using the test-retest method and categorized based on variations in decision times and information usage in a strategic problem simulation.

Characteristics of each style are based on preferences for values, planning, goals, organization and communication (497).

Mullem and Stumpf identified six management styles through extensive observation of managers participating in two behavioral simulations. Researchers noted how managers consider and analyze those issues ignored and adopted by the participants. The participants were volunteer middle and senior level managers in an executive development program. The study determined if managers selectively identify and consider different agendas, conceptualize issues more broadly or narrowly or involve different groups in the decision process (60-61).

Each participant's style was evaluated by examining the language used by managers as they participated in ill-structured problem simulations. The six styles are identified: identifiers, sorters, selectors, unilateral discriminators, evolvers, and searchers. Each style has distinctive characteristics with individuals exhibiting a dominant style; only a few exhibiting attributes of more than two styles. These styles parallel Jung's study of his four personality functions, comparing their relationship with techniques used by individuals to perceive and formulate judgements (66-67).

Carl Jung's Personality Theory is widely accepted as the standard used in decision style research and when combined with Myers and Biggs Type Indicator measures extrovert and introvert orientations as well as psychological functions of individuals.

Major characteristics of Jung's Personality Theory associated with decision style research include: the behavior of an individual is influenced by his past as well as his goals and aspirations for the future; personal development is possible through individual growth and potential for change; personality consists of numerous interacting subsystems which can be receptive to inputs and exchanges between each; and personality or subsystems can change as a result of these inputs and exchanges.

Different decision styles are defined in terms of the decision maker's use of conscious or unconscious tendencies to use one problem solving style more than another.

Jung proposed two basic types of personality orientations: extrovert and introvert. Both types are opposing orientations and present in individuals usually with one being dominant. The dominant form

exists in the conscience mind while the subordinate exists in the unconscious mind. The introvert attitude is:

> ..normally characterized by a hesitant, reflective, retiring nature that keeps to itself, shrinks from objects, is always slightly on the defensive and prefers to hide behind untrustful scrutiny. (Wehr 64-65)

The extrovert attitude is characterized:

> ...by an outgoing, candid, and accommodating nature that adapts itself easily to a given situation, quickly forms attachments, and setting aside any possible misgivings, will often venture forth with careless confidence into unknown situations. (Wehr 64-65)

Most people exhibit both characteristics but vary to the degree they are introverted or extroverted (Hellriegel and Slocum 30). A manager characterized by an emphasis on functions of intuition and sensation in the conscious mind may emphasize characteristics of thinking and feeling in the unconscious mind. This form of compensation, where one subsystem compensates for another, is a key principle in Jung's personality theory and prevents the personality from becoming neurotically unbalanced (Hall and Lindzey, 90-91).

Since a manager's role involves identifying and solving problems through other individuals, a certain degree of extroversion is likely to be functional. Managers who exhibit extremes of introversion or extroversion are unlikely to be effective because of dysfunctional characteristics associated with each extreme. For example, an introverted manager may choose a course of action based on personal rather than external factors; which may not fit the situation, while the extroverted manager may become immersed in his work at the cost of other concerns (Hellriegel and Slocum 31).

Extroversion and Introversion account for differences in managers problem solving styles, and psychological functions also can operate within each orientation. Jung proposed two pairs of psychological functions: feeling-thinking and sensation-intuition. They describe how individual decisions are made based on each function's influence on evaluation of information. Judgements are made based how individuals perceive their environment and evaluate information.

Psychological functions are paired opposites and can be thought of as existing on a straight line where

each functional pair is at opposite ends and intensity ranging along this continuum. Sensation and intuition are paired opposites describing how individuals perceive environmental influences around them. Perception is defined as mental images helping individuals understand things, people and situations around us. Thinking-feeling function also represents extreme opposite types describing characteristics preferred by individuals in decision making processes.

One of these four functions is dominant but is supported by one function from another set of opposites. If the thinking function is dominant, it may be supported by intuition or sensation may be supported by feeling. The thinking-sensation function is "...regarded as most characteristic of modern man in Western industrialized societies" (Hellriegel and Slocum 31).

Characteristics of the four functions are described in Table 1. These characteristics describe dominant individual preferences in the manner data is gathered and evaluated, alternatives generated, and judgements made. These preferences may be viewed as heuristics; habitually imposed by the decision maker

during the entire decision making process. Heuristic is defined as a 'rule of thumb' or short cut used to reach a decision by collapsing data or simplifying complex issues. These preferences may also evolve to a form of bias in the individual decision maker (Barnes 129).

TABLE 1

CHARACTERISTICS OF PSYCHOLOGICAL FUNCTIONS

THINKING TYPE

1. Unemotional and uninterested in people.
2. Likes analysis and putting things in order.
3. Able to reprimand or fire people when necessary.
4. Tend to relate well only with other thinking types.(Myers-Biggs)
5. Tendency to fit problem/solutions into standardized formulas.
6. Attempt to make activities and decisions dependent on intellectual processes.
7. Applies external data and impersonal formulas to decisions; often forgetting to consider their own welfare.
8. May neglect health, finances, family or other interests.(Boyatzis, 184)

FEELING TYPE

1. Aware of other people and their feelings.
2. Likes harmony.
3. Needs occasional praise.
4. Dislikes telling people unpleasant things.
5. Tends to be sympathetic.
6. Relates well to most people (Myers-Biggs).
7. Inclined to be conformists who accommodate

themselves to others.

8. Tends to make decision that will win approval of peers, subordinates and superiors.
9. Tends to avoid problems that will result in disagreements.
10. When disagreements are not possible to avoid, they are prone to change positions to one more acceptable to others.
11. Establishment or maintenance of friendly relations may even supersede or possibly interfere with achievement, effectiveness and sound decisions.
12. In sum - Feeling types emphasize affective and personal processes in decision making.

SENSATION TYPE

1. Dislikes new problems unless there are standard ways to solve them.
2. Likes an established routine
3. Unusually likes to work all the way through a problem to conclusion.
4. Show patience with routine details.
5. Tend to be good at precise work.
6. Dislikes unstructured problems which contain considerable uncertainty that required a degree of judgment.
7. Has preference for concrete reality, not inclined toward personal reflection and introspection.
8. Experience anxiety over the circumstances inherent in making decision in grey areas because their orientation to realism, external facts and concrete experiences.

INTUITION TYPE

1. Likes new problems.
2. Dislikes doing the same thing over and over.
3. Jumps to conclusions.
4. Is impatient with routine details.
5. Tends to perceive the whole external environment.

6. Dislikes taking time for precision.

SOURCE: Business Horizons. Compiled from "Managerial Problem Solving Styles," by D. Hellriegel and J. Slocum (1975).

Since these four psychological functions are definitions of extremes of decision making and perceptual orientations, a more realistic view of a decision style reflects individual combinations of these extremes. Decision style is defined by individual dominant psychological preferences in both decision making and perceptual orientations. These preferences lie on the continuum between thinking or feeling and sensation or intuition. Characteristics of combined orientations are listed in Table 2.

Henderson and Nutt studied the influence decision styles have on decision behavior. Decision style was measured using the Myers-Biggs Type Indicator and was conducted using simulated decision scenarios constructed of objective and subjective information. The participants were experienced decision makers who assessed each scenario indicating likelihood of adopting proposed projects and their perceptions of risk involved. Results of this study indicate decision

style is a function of each decision makers psychological type (374).

TABLE 2

CHARACTERISTIC OF COMBINED FUNCTIONS

SENSATION - FEELING

1. Rely on intuition for perception and feeling for purpose of decision making.
2. Like facts that can be collected and verified by the senses.
3. Approach facts with personal and human concerns (more interested in facts about people than things).
4. Prefer organizations with well defined hierarchy and set rules that exist for the benefit of the people.

INTUITION - FEELING

1. Rely on intuition for perception and feeling for purposed of decision making.
2. Focus on new projects, new approaches, new truths.
3. This approach is in terms of meeting or serving the personal or social needs of people in general.
4. Avoids specifics, focus on broad themes that revolve around human relations.
5. Emphasize long term goals and desire organizations that are flexible.
6. Prefer organizations with decentralized, flexible and loosely defined lines of authority, few rules and standard operating procedures.

SENSATION - THINKING

1. Emphasize external, factual details and specifics of a problem.

2. Facts are analyzed in a step-by-step process from cause to effect.
3. Problem solving style tend to be practical and matter of fact.
4. Concerned with realistic, limited short term goals.
5. Prefer organizations that are extreme forms of bureaucracy characterized by extensive rules and regulations, well defined hierarchy, emphasis on control, specificity and certainty.

INTUITION - THINKING

1. Approach all possibilities through impersonal analysis.
2. Consider possibilities from a more technical or theoretical rather than the human element.
3. Enjoy positions that are loosely defined, requiring abstract skills, such as long range planning, market research, and searching for new goals.
4. Prefer organization that are impersonal and conceptual, goals are consistent with environmental needs (pure air, clean water, etc.,). Needs of organizations personal are considered but in an abstract or impersonal frame of reference.

SOURCE: Complied from: Journal of Management Studies. "Cognitive Trails in Strategic Decision Making: Linking Theories of Personalities and Cognitions," by U. Haley and S. Stumpf (1989) and Business Horizons. "Managerial Problem-solving Styles" by D. Helliegel and J. Slocum (1975).

Hellriegel and Slocum's study developed and differentiated problem solving styles of managers based on Jung's personality functions. Their model describes

Jung's four functions in relation to problem solving characteristics (33-35). These four personality types were linked to cognitive biases found in strategic decision process. These biases are identified as distinct heuristic in data collection and evaluation of alternatives (477-478).

Stumpf and Dunbar explored the effects of decision style on choices made in strategic decision situations. This study is similar to Haley and Stumpf's and proposes managers with different personality preferences exhibit styles associated with specific biases. The results of Stumpf and Dunbar's study identified relationships between personality types (Sensing-Thinking, Intuition-Feeling, etc.,) and patterns of action reflecting specific biases. These biases are more prevalent in ill-structured decision situations, e.g., strategic decisions.

The study reinforces results found in research identifying specific biases associated with similar personality types. These personality types suggest various styles affecting the way information is processed and judgements are formulated.

Cowan's study of relationships between problem

formulation and decision style proposes problem formulation processes associated with well structured problems, i.e., operational or technical, is more likely associated with decision makers experience than decision style. A corollary proposes that problem formulation processes of ill structured problems are more likely associated with decision style than experience.

The study was conducted using sixty middle and upper level executives enrolled in an M.B.A. program at a mid-western university. Each participant's decision style was determined using Myers-Biggs Type Indicator. Each was asked to write a narrative describing a strategic, technical, human-relation and operating problem detailing the problem solving process. Words and phrases describing the problem formulation process were statistically compared to each decision style.

The results of this study support his proposition; thinking about problems whether structured or un-structured are associated with decision style more than problem type experience (475).

Jung's personality theory suggests people have preferences for ways of becoming aware of things,

people, or ideas and how they judge and come to conclusions about what they perceive. Preferences in perceiving and judging determine how individuals understand themselves, the problems they face and associated external influences. Differences in personality type preferences suggest these styles affect managerial information processing and choices.

Research in decision style suggests various forms of heuristics are used by decision makers when confronting complex, novel, and ill-structured decision situations. Since these situations are often faced by decision makers, it suggests they simplify characteristics and interpretations of decision situations based on decision style. The influences heuristics and biases impose in decision processes may affect the resulting decision quality.

Decision makers in problem situations develop perceptions of potential outcomes based on available data and information. These perceptions are based on the immediacy, uncertainty, and importance of the issues (Dutton 502), individual cognitive differences, i.e., decision styles (Cowan 464) and experience (Lyles and Mitroff 111).

Factors of immediacy, uncertainty and importance of issues are developed by the decision makers' cognitive ability to formulate problems by helping conceptualize and interpret data and information regarding problem situations.

Problem type boundaries defined by this study are limited to those characteristics relying on the decision makers cognitive abilities. These problem types, referred to as unstructured decision process, have not been encountered in the same form and which there is no prescribed or established response.

> The strategic decision process is characterized by novelty, complexity, and open-mindedness, by the fact that the organization usually begins with little understanding of the situation it faces. These decisions .... must be identified in the stream of ambiguous, largely verbal data that decision makers receive. (Mintzberg 250-253)

Problem types affecting organizational purpose, objectives, goals, and having significant influence on organizations as a whole are generally defined as strategic problems. They are typically characterized as ill-structured by nature because of difficulties defining problems as well as their solution.

Similar unstructured problem types exist in human-relation problems, and are characterized as ill defined, complex and ambiguous because their solutions are non-routine and their structures have unbounded limits.

Structured problem types such as technical and operational contrast ill-structured types by their orientations. Task orientated and day-to-day problems concerning technical aspects of work are generally well defined in relation to structure of problem resolutions. Solutions follow well defined formulas, policies or operating procedures and require learned abilities or experience for their resolution. Cowan describes technical problem types in terms of particular technological applications while operating problems are conceived of according to job and job relations, calling for more specific courses of action (469).

Cowan's study relates descriptions of structured and ill-structured problem types to decision style, decision function and level of experience with each problem type. He links well structured problems to executive experience because through experience

decision makers learn which potential solutions are expected to work best (469-470). Conversely, ill-structured problem types are linked to decision style, since cognitive faculties enable individuals to interpret ambiguous and uncertain situations to sufficient degree of understanding enabling action to be taken (470).

Bass found managers have difficulty explaining which techniques are used in solving ill-structured problems because they are not consciously aware how they make them. These decisions require more judgement and creativity (13-15) and help define decision styles as "...habitual differences between people and their decision making" (Driver 59).

Trull investigated factors determining total decision success by analyzing one hundred case studies of decision reaching processes from industrial, military, medical, political and commercial areas. In nearly all decisions analyzed, decision processes were not explicit or involved in a series of interacting events over a period of time.

Close examination of each case demonstrated 'clustering' of key variables appearing common in

decision making processes. Inexplicit clusters proposed by Trull include: compatibility with existing operating constraints, nearness of optimum time for decision, optimum amount of information, problem solvers influence on the decision, avoidance of conflict of interest, reward-risk factor and degree of understanding. Each of these clusters have numerous interacting sub-clusters; the total depending on complexity of decision parameters (273-274).

Witte's study of decision making in complex decision processes determines that phases in decision process exist and follow specific sequences. He proposes five phases in the process: problem recognition, gathering information, development of alternatives, evaluation of alternatives and choice. The decision process is divided into ten equal time intervals. The activity level is documented at each interval during the decision process.

Results of his study find decision processes consisting of complex, multiple subsystems rather than the simplistic five phases proposed (180).

Mintzberg, Raisinghani and Theoret's study of strategic decision processes, at several major

organizations, describe decision processes in flow chart form. Many of these flow charts are completed after decision processes are finalized with their structures based on post decision interviews with the decision makers.

Forty eight decision processes were flow charted in detail in which twenty-five were chosen for analysis based on completeness and detail of decision processes. These twenty-five were placed into three categories based on: stimuli, solution and process.

Decision stimuli range from opportunity decisions, voluntarily imposed to improve an existing situations at one extreme, to 'crisis' decision at the other extreme. Crisis decision situations demand immediate action while opportunities may take years to develop. The 'problem' decision lies in the middle of this continuum and is evoked by milder pressures than crisis (251).

Second, decisions in Mintzberg, Raisinghani and Theoret's study are classified by their solutions; four are described. These include solutions fully developed at the start of the process, solutions ready made or fully developed during the process, custom made

solutions specifically developed for the decision, and finally ready made solutions modified to fit a particular decision (253).

The third category in which twenty-five flow charts were categorized is 'process'. This category is subdivided into seven types: simple impasse decisions, political design decisions, basic search and modified search, basic design, blocked design and dynamic design. These categories are based on types of solutions and dynamic factors encountered in the decision process (268).

Problems are classified as either structured or unstructured based on complexity and how the problem solutions are defined. Structured problems are clearly defined and solutions follow specific formulas or procedures. Ill-structured problems are characterized by ambiguity and complexity.

Solutions of structured problems are resolved through decision makers experience or learned abilities. Ill-structured problems are linked to decision style since they require creativity and judgment for their resolution.

Most individuals have and are influenced by

their own bias's, for example, overconfidence; believing that they will not be involved in accidents or become ill. Individuals also have optimistic biases, believing they possess control over events affecting their lives. Managers are not immune to these influences. Top managers are responsible for major strategic decisions and psychological biases are likely to affect their decisions.

The list of psychological biases affecting decision makers is extremely large and has only recently been investigated in relation to decision style and cognitive decision theory.

Jung's personality theory proposes that people develop one or two dominant preferences for information used in perceiving their world and one or two dominant ways of judging information to reach decisions and take actions. These preferences for perceiving and judging data define four personality types: sensing-thinking, intuition-thinking, sensing-feeling and intuition-feeling. Jung's personality topology indicates these behavioral preferences persist for different

decision situations.

Using a large scale simulation of a hypothetical commercial bank, Haley and Stumpf's study explored links between personality types and input and output bias. Participants in the study included 43 senior managers from four corporations. They were asked to manage a simulated bank and solve ill-defined, unstructured problems using precise and critical information given them. Each played a specific role in the organization and all participants did not share identical information.

Research data supports the proposition that managers with different personality styles, based on Jung's topology, diagnose issues differently and subsequently leads to systemic biases in the pattern of choices they make (491).

Blaylock and Rees' study determines that cognitive style influences decision makers preference for sources of information in a strategic decision situation. They propose 'feeling' decision styles, (NF or NT) will prefer different information items than 'sensing'

types,(SF or ST).

Fifty M.B.A. candidates were given the Myer-Biggs Type Indicator to determine psychological type. Sixteen students, four from each psychological type (i.e., 4 ST's, 4 NT's, 4 SF's and 4 NF's) were selected to participate in this study. The Larcker and Lessig Information Usefulness Questionnaire was administered to measure selection of chosen information into two components, importance and usefulness. All subjects were given a narrative describing a merger/acquisition decision and a list of fifty information items. Participants were asked to rank and write comments about the usefulness of their top 20 items.

Importance is defined as "the quality that caused a particular information set to acquire relevance to the decision maker" and usefulness refers to "the information quality that allows a decision maker to utilize the information set as an input for problem solution" (Larcker and Lessig 123).

Blaylock and Rees conclude that information

preferences of these groups are described through cognitive style and influence decision makers evaluation of an unstructured, strategic planning problem. These preferences can be explained in terms of Jung's personality type and variations in information preferences vary depending on feedback received. Theses variations are due to decision makers cognitive style in specific decision situations (Blaylock and Rees 87).

Data collected during interviews and autobiographical characteristics of senior managers, CEO's and entrepreneurs were evaluated by Hellriegel and Slocum. These characteristics and traits were measured in relation to each problem solving style and a model differentiating each style. Based on their evaluation, decision style characteristics and tendencies are identified for each style.

Stumpf and Dunbar also use Jung's personality theory topology as a framework for evaluating effects of decision style on types of choices made in the strategic decision situations. Four hundred and seven managers participated in an

interactive decision simulation in which one hundred ill structured decision situations were presented. Their resulting actions and decisions were evaluated in relationship to individual personality types. Results of their study confirm

> that managers take action suggestive of cognitive bias, and there is some tendency for managers with a specific personality type preference to take action more suggestive of some bias than others.(1064)

The pattern of choices made by individuals reflect their predispositions and specific biases contained in those predispositions. The results also show personality types will not always exhibit similar biases in all of their actions.

Haley and Stumpf conclude that biases are found in distinct heuristics appearing as cognitive trails and are habitually used by specific personality types (490-491).

Taylor describes the concept of 'cognitive strain' resulting from a breakdown of decision makers cognitive processes when subjected to a state of information overload. Overload occurs when informational demands on decision environments exceed decision makers'

information processing capabilities (409). In this sense, decision makers limited ability to handle information demands of problems forces closure of open constraints relevant to the problem. There a tendency exists to formulate problems in a restricted manner. These restrictions are inclined to take forms of either satisficing or incrementalization and shield the decision maker from cognitive strain. These modes permit him to formulate problems in a simplistic manners.

Satisficing decision makers set up feasible aspiration levels, then search for alternatives until one that achieves this level is found (418). As soon as satisficing alternatives are reached, the search is ended when the alternative is selected. This strategy represents an inappropriately simplistic perception of typically complex decision processes.

Incrementalizing relates closely to satisficing in which decision makers create successively limited comparisons between existing programs or conditions and alternative courses of action. Objectives are not considered and alternatives are generally familiar to the decision maker. Potentially important out comes,

values and alternative solutions are neglected and agreement among decision makers is sought instead of high goal attainment.

Ramaprasad and Mitroff propose a logico-mathematical' structure for improving processes of formulating a strategic problem. The structure is based on Piaget's model of development of logico-mathematical structures (LMS) and identifies components of problem solving processes and their differences. Similarities are compared between Piaget's LMS structural components and Jung's psychological functions.

Piaget's model consists of three phases; application, simple abstraction and reflexive abstraction. Managers obtain data about a problem through simple abstraction, i.e., data collection using the five senses. This data is tested for validity of the deduction by using data from observation; application. If the application does not fit the deduction, LMS is modified through reflexive induction. "This involves a mental leap from perception of data to induction of patterns and derivation of meaning of data" (598).

Ramaprasad and Mitroff equate Jung's topology, by indicating Jung's 'judging' is reflexive abstraction in Piaget's model; 'feeling' is a response to data and 'thinking' is equated with data processing. They propose typing individuals based on their preference for Jung's four functions rather than based on their dominant preferences for perception and judging. They propose four categories of individuals by classifying their preference for each of the four functions from strong to weak . These are: synthesizers, linkages, analyzers and technicians (602-603). The strengths and weaknesses of these categories are describe in Table 3.

TABLE 3

STRENGTHS AND WEAKNESSES OF FUNCTIONAL CATEGORIES

CATEGORY	DESCRIPTION
Synthesizers	Strongly prefer all four functions. Not biased in favor of any method of perceiving or judging.
Linkages	Strongly prefer three functions. Prefer Sensing-thinking and Sensing-Feeling. Not

	as flexible as Synthesizers.
Analyzer/Observers and Data Processors	Strongly prefer two functions. Analyzer can be four types: Sensing-Feeling, Sensing-Thinking, Intuition-Feeling or Intuition-Thinking. Observer strongly prefer two perceiving functions; can not effectively process data but supply data to Analyzers. Data Processors strongly prefer two judging functions; they can not observe data but can process data supplied by others.
Technicians	Strongly prefer one of the four functions. they prefer not to perceive or judge, are inflexible and play only supportive roles.

SOURCE: Compiled from: Academy of Management Review. "On Formulating Strategic Problems," by A Ramaprasad and I. Mitroff (1984).

They conclude that if a manager structures a strategic problem, knowledge of his preference for the four functions will help predict the biases he will introduce in structuring problems. Because of these biases:

> ...the problem cannot be structured by observers, data processors and technicians. They do not have the facility to apply or develop an LMS; to do so requires strong preference for at least one perceiving function and one judging function. (604)

Tversky and Kahneman's study concerning judgment under uncertainty describe three heuristic principles used in evaluating and judging complex situations. Consideration is not given to personality types but only to heuristics used in subjective judgments ranging from complex situations to simple tasks. Biases derived from these heuristic are enumerated.

Managers rely on a number of heuristics principles to help reduce complex situations into less complicated judgmental operations. In many situation, heuristics are valuable decision aides but sometimes lead to severe and systematic errors. Three heuristics described are: Representativeness, Availability, and Adjustment and Anchoring and associated biases encounter when the heuristic is used.

Representativeness heuristic is used in evaluating subjective probabilities in which situation A resembles situation B. Tvershy and Kahneman found this approach to judging probabilities leads to errors because

representativeness is not influenced by several biases negatively affecting sensitivity of these judgments. These biases are: Insensitivity to prior outcomes, insensitivity to sample size, misconception of chance, insensitivity to predictability, illusion of validity, and misconception of regression (1025-1026).

Availability heuristics are situations which managers assess frequencies of classes or events by the ease which instances or occurrences can be brought to mind (1127). The availability heuristic is very useful but is affected by such biases as retrievability of instances, effectiveness of a search set, imaginability, and illusory correlation (1128).

Situations where managers estimate starting points from which adjustments are made to achieve final decisions describe the heuristic 'adjustment' and 'anchoring'. The initial starting point may originate from problem formulations or computations; adjustment from this point usually prove insufficient. Tversky and Kahneman indicate that different starting points yield different estimates biased toward the initial values (1128). Biases associated with adjustment and anchoring include: insufficient adjustment and

evaluation of conjunctive and disjunctive events.

These heuristics are sometimes found to lead to systematic and predictable errors but are highly economical and usually effective (1131).

Barnes' study discusses cognitive biases associated with subjective judgments usually associated with strategic decision process. If such judgements are faulty in strategic decision processes, solutions are likely to be misdirected. Several inferential rules or heuristics used by managers when evaluating uncertainty are described, although valid in some cases, they lead to large and persistent biases with serious implications (129).

Judgmental biases are derived from such heuristics as: availability, hindsight, misunderstanding the sampling process, judgements of correlation and causality and representativeness. Each of these heuristics are described in a strategic situation example and their effects on the decision process are discussed.

Schwenk's research also discusses heuristics used in strategic decision making processes in which strategic decisions are viewed as special kinds of

decisions made under uncertainty. Such decisions involve systematic processes for resolution and within each step of the process, specific simplification processes are sometimes used which result in biased outcomes.

Several models describe strategic decision making processes including models of Hofer and Scheandel, Mintzberg, Glueck and Mazzolini. From these models Schwenk derived his own model where simplification processes are analyzed at each stage of the operation. Schwenk's model consists of three stages: goal formulation, problem identification; strategic alternatives generation; evaluation and selection; and implementation (113).

Schwenk indicates simplification processes may not operate in all strategic decisions and conclude at this stage of research, it is not possible to specify conditions under which processes will or will not operate. The simplification process is most likely to impact organizational decisions when consensus within the decision group is great. If all members of the decision group or highest ranking members enforce consensus, basic assumptions about specific problems

are likely to be challenged. This may induce divergent assumptions leading to critical examination and resulting in correction of the simplification process (125).

Jung's personality theory defines four ways of perceiving and judging information: sensing-thinking, sensing-feeling, intuition-thinking, and intuition-feeling. Variations in ways information is perceived and judged results in biases associated with each psychological function. These biases affect ways information is perceived and judged and ultimately affect solutions through actions taken.

Most organizations have methods of evaluating quality of important decisions. These decisions are evaluated either directly or indirectly by superiors, auditors, subordinates, dissident interest groups, ambitious subordinates who "second guess" decisions and those adversely affected by decisions. Professional reputations of the decision makers are largely determined by their last few decisions. The effect of previous 'quality' decisions rapidly disintegrates so reputations of decision makers are based on most recent decisions.

> A decision is a judgment. It is a choice between alternatives. It is rarely a choice between right and wrong. It is at best a choice between "almost right" and "probably wrong" --but much more often a choice between two courses of action neither of which is probably more nearly right than the other. (Drucker 143)

The most common method for judging competence of a manger is by evaluating quality of decision outcomes. Decisions made or avoided, whether major, minor, tactical or strategic, may not by themselves impact organization goals but collectively over a period of time, when combined, can change the course of an enterprise. All managerial skills, growth potential, long hours, and intense work effort can not over come a series of incompetent decisions adversely affecting the organization.

There exist in literature vast amounts of research on almost every aspect of decision making. Decision processes are dissected into minute segments and evaluated in detail. Little research has been accomplished to evaluate quality of resulting decisions outcomes.

Science attempts to measure or quantify immeasurable terms through mathematics and modeling.

For example, attempting to quantify 'quality' is, for now, beyond existing mathematical capabilities. Even the definition of 'quality' varies depending on situation and usage. Successful decisions depend on a myriad of factors influencing decision processes as well as decision makers. These influences are usually beyond control of the decision makers but present themselves as constraints of time, environment, information and cognitive abilities . Even if decision makers are knowledgeable of all environmental constraints, have perfect information, enough time to thoroughly evaluate all factors and formulate perfect decisions; decisions will be viewed as a 'poor' if improperly or incompletely implemented.

Decision quality is viewed for the purpose of this paper to encompass the broadest connotations including: timeliness, accuracy, reliability, cost effectiveness, attainment of goals, and acceptance by those affected by the decision. Decision quality is determined by influences of existing constraints on: operating environment, optimum decision time, information availability and the decision makers cognitive influences (Trull 273-274).

Most decisions are made within well defined boundaries existing within organizations. They consist of: past decision history, standard operating procedures, organizational structure and company policies.

Decisions generally have optimum times and information dimensions at which point maximum probability for success occurs. This point is just prior to the time where decisions must be made and occurs at theoretically maximum available information. Ideal time and information availability must be moderated by limitations of the decision makers ability to process, absorb, and evaluate these constraints and influences in order to formulate the decision.

Other external influences affecting decision quality include: stress, risk factors, degrees of understanding, certainty and uncertainty.

Summary and Statement of Hypothesis

Carl Jung proposed two pairs of psychological functions, feeling-thinking and sensation-intuition to describe how mangers perceive and judge information in decision situations. Characteristics of these

functions describe each manager's unique problem solving technique or style and is defined by dominant psychological preferences in both decision making and perceptual orientations.

Managers rely on a number of heuristic principles to reduce complexity of information leading to systemic errors and persistent biases, particularly in unstructured decision situations. These biases influence evaluation and judgement of information and may ultimately affect decision outcome.

Decision quality is determined by constraints on the decision maker including: time, information availability, environmental decision makers cognitive influences. If time, information availability, and environmental constraints are treated as constants in a decision situation, biases influencing evaluation and judgment of information may affect resulting decision outcomes.

Therefore, it is hypotheiszed that specific biases and heuristics associated with each of Jung's four psychological functions affect resulting decision quality.

Chapter III

SELECTIVE REVIEW AND EVALUATION OF RESEARCH

Until 1980, most research considering relationships between decision style and problem solving has largely been expository and based on propositions without scientific proof. Even today much of existing research is based on the propositional studies of others.

The theoretical and empirical basis for the majority of research regarding decision style and its relationship to problem solving is Jung's four personality functions. These functions are operationalized by the Myers-Biggs Type Indicator and are used extensively to identify decision styles in today's empirical research.

Henderson and Nutt studied the decision maker's perception of risk through their inclination to adopt capital expansion projects in structured decision scenarios.

Simulated decisions situations were represented by capital expansion projects scenarios that potentially increased production capacity by 25%, assuring decisions were viewed as having strategic importance.

Project scenarios were constructed of both objective and subjective information consisting of: risk stemming from return on investment estimates, processes used to make ROI estimates and characteristics of the decision environment. Each project summary was tailored to be either compatible or incompatible with each participant's decision style.

Risk, information source and environment were controlled in project summaries presented to each participating decision maker. Environment was defined in terms of organizational and informational factors which were either consistent or inconsistent with the decision maker's style.

The participants were drawn from fifty organizations and each held upper management or Chief Executive Officer positions. Each participating decision maker's cognitive style was measured by the Myers-Biggs indicator. Eight project senecios were presented to each executive in random order. All participants were asked to evaluate perceived risk and rank their likelihood of adopting each project using modified Likert-type scales. Risk was defined traditionally by the range of expected return of each

project. Low risk projects ranged for 8 percent to 12 percent return while high risk ranged from 0 percent to 20 percent.

Results indicated sensing-thinking executives were found least likely to adopt projects, viewing them more risky than other decision styles. Possibly, they may see a higher level of uncertainty in the decision because only summary information was used in the project scenarios.

Differences between style and risk were found significant for project adoption ($p < 0.0001$) and for perceived risk ($p < 0.0008$). Sensing-feeling executives were inclined to adopt projects while Sensing-thinking types were inclined to reject the same projects.

Sensing-thinking individuals seem risk adverse while Sensing-feeling types appear risk tolerant. These perceptions may lead a Sensing-thinking executive to reject projects that a Sensing-feeling executive would endorse (381-382).

Data was analyzed using analysis of variance to determine how decision style, information source, risk, and environment influenced the likelihood of adoption and perception of risk of each project. Decision style

was found to be a significant factor in explaining perception of risk ($p<.006$) and decision behavior ($p<.006$) (381). Sensing-thinking executives generally viewed problems as high risk and were least likely to adopt projects. Sensing-feeling executives saw least risk and were most likely to adopt the same projects.

Results supported Henderson and Nutt's hypothesis that different decision styles react differently to the same decision and influenced choices made by executives. Adoption of projects and perceptions of risk were also found to be related to psychological makeup.

Limitations of this study include relatively small sample size of sixty-two participants, unproportional number of personality types participating, and lack of decision complexity and detail in each project summary. This lack of detail in the scenario potentially increases the level of uncertainty by sensing-thinking individuals. Their demand for detail may lead to more conservative posture.

Henderson and Nutt's conclusion supports research by Hellegriel and Slocum who also used Jung's personality functions as a basis for their study. They

proposed a model differentiating problem solving styles of managers, based psychological types and defined characteristics of composite psychological functions.

They concluded that different styles influence actions and reactions to certain problem types (e.g. strategic, operational, etc.). They also found that no single style is inherently better than another but suggest certain organizational roles may be more natural to some styles than others.

Cowan's study compared descriptions of decision makers problem formulation processes to decision styles, decision functions and executive experience. Four types of organizational problems were included: strategic, operating, human relations and technical.

Participants were sixty middle and upper level executives, enrolled in an Executive Masters of Business Administration program at a midwestern university. Average age was 38.6 years, ranging from 28 to 55; six of the participants were female. Experience in each of the four problem types was measured using a Likert-type scale ranging for 'very much' to 'very little'.

A modified Myers-Biggs Type Indicator was used to

measure decision style. The modification uncoupled questionnaire items that measured two functions simultaneously and included Likert-type scales in place of mutually exclusive choices made between two decision functions. Reliability tests were conducted to verify accuracy of the Myers-Biggs modification resulting in alpha-coefficient values comparable to those reported in reviews of the Myers-Biggs Indicator.

Participants were read definitions of the four problem types and then asked to describe problem situations in each category which they actively participated. They were asked to respond to questions or statements concerning each problem type, keeping in mind the specific problem situations previously described. Instructions were repeated for strategic, operation, human relations, and technical problem types. Means and standard deviations were calculated based on responses from each of the four problem types.

Canonical analysis was used to determine whether decision styles were better predictors than problem type experience in the variance found between strategic or human relation problems. Canonical analysis was similarly used to determine if problem

type experience was a better predictor than decision style for the variance between technical and operating problem types. Comparisons were made of the sensitivity between descriptions of criteria associated with each problem type, decision style and decision function.

Data resulting from the study did not support all hypothesis proposed but confirmed strategic and human relation problems relate more strongly to decision styles than problem type experience. The sensing function most strongly related to both strategic and human relation problems while thinking functions were related to technical and operating problems. Contrary to the proposed hypothesis, a stronger relationship was found between decision style than problem type experience in descriptions of technical and operating problems. Results also indicated that thinking about problems, regardless of personality type, was related more to decision function than problem type experience.

Results of this study were based on a relatively small sample size and may not be indicative of the entire population of executives, being biased to characteristics of this group. Much of the data

establishing baseline criteria for problem type experience analysis is based on executives memory and perception of events. This information may lack necessary detail or contain narrow understandings of the decision situation. Cowan's modification of Myers-Biggs Type Indicator proved comparable for the small sample size in this study but has not been proven in larger populations.

A study conducted by Haley and Stumpf explored links between personality type and input and output biases. They propose different personality types habitually use certain 'cognitive trails' or heuristics thereby succumbing to inherent biases found in those trails.

A large scale behavioral simulation revolving around a hypothetical commercial bank with assets of 1.5 billion dollars was used. Participants selected managerial roles in the hypothetical bank; representing twelve senior management positions across hierarchial levels. Each participant received information concerning the financial service industry, the bank, each participant's role and internal policy issues. Critical information was supplied to specific roles to

help diagnose and resolve proposed issues and each participant managed the bank as they saw fit.

Forty-one mangers from four corporations participated, including senior managers from a large national bank and senior managers from a mid-size mid-Atlantic community bank. Myers-Biggs Type Indicator was administered to each participant to determine personality preference and the scores approximated those found nationally among mangers.

Researchers operationalized four input biases: anchoring, perseverance, availability, and vividness. Trained observers tracked participants' discussions of key issues, documented information gathering methods, and made judgments about their input biases. Observers examined participants' policy recommendations for information on output biases. Because of the small number participating and the proportionally large number of sensing-thinking and intuition-thinking types in the group, the study was limited to functional-fixedness and positivity output biases.

Percentages described the number of personality types exhibiting each input and output bias. Chi-square tests were performed by combining two

personality groups into two separate categories because of insufficient numbers existed within the separate categories. Test results supported the proposed hypothesis that Sensing-thinking executives surrender to anchoring bias and Intuition-thinking to perseverance input bias more than other personality types. T-test results also supported the hypothesis that Sensing-thinking individuals made more functional-fixedness recommendations and Intuition-thinking styles made more positivity recommendations. One way analysis of variance compared relationships between biases but results were limited because of the small sample group.

Of the 41 participants, 38 exhibited one or two input biases. Eighty percent of Sensing-feeling participants showed availability bias, as opposed to 11.8 percent for sensing-thinking, 8.3 percent of Intuition-thinking and 14.3 percent of the Intuition-feeling. Similarity, 57.1 percent of the Intuition-feeling types exhibited more vividness bias, Sensing-thinking made more functional fixedness bias and Intuition-thinking more positivity recommendations (491).

A major limitation in this study is the small

sample of participants causing the number of personality types within the study to be extremely small, e.g. sensing-feeling, 5 participants. Data collected during observations is also dependent on observers interpretation of events and participants from one industry, banking, may introduce their own systemic biases.

The influence decision styles have on choices made in strategic decision situations were studied by Stumpf and Dunbar. Their research was conducted to determine whether cognitive style was associated with specific bias patterns in choices made in ill-structured decision situations.

Participants in this study consisted of middle and senior level managers attending executive development programs in strategic management, new managerial employees, financial analysts attending an executive MBA program and senior managers of a mid-size regional bank. Participants average age was 40.4 years with 10.6 years work experience representing one hundred and seventeen different corporations.

Personality preference data was determined by Myers-Biggs Indicator administered to each participant.

Twelve individuals were dropped from the test because their MBTI data did not supply a clear index of their preference. Distribution of personality types within the study had higher intuitive preferences than found nationally while other preference distributions were comparable. (e.g. 56 percent for 407 participants; 43 percent for 5500 business people) (1055).

A large scale behavioral simulation, Metrobank, was used to track ways participants expressed their judgments about selected issues. Using post-simulation questionnaires, researchers examined the variety of actions participants recommended. Over one hundred actions were possible in this simulation and results of these questionaires were used as a foundation for operationlizing biases based on the patterns of decisions made.

Group means and percentages were used to compare actions suggestive of four cognitive biases: selective perception, positivity, social desirability, and reasoning by analogy. Standard deviations were used for comparing numbers of actions suggestive of the four cognitive biases to the Myers-Biggs personality types.

Results supported Stumpf and Dunbar's proposed

relationship between personality type preferences and patterns of choices made in strategic decision situations. These patterns reflected participants' predisposition and the biases contained in those predispositions. The percentages reflected in this study do not imply any personality type will exhibit the same bias in all or most situations. Rather, preferences may reflect a way of thinking that carries a greater susceptibility to specific biases.

The mean number of actions taken by the four personality types suggest Sensing-thinking individuals were not observed to take more actions suggestive of selective perception bias than other personality types. Intuition-thinking individuals took more actions suggestive of positivity bias than other types ($p<.001$). Sensing-feeling types took more actions exhibiting social desirability bias ($p<.01$) and Intuition-feeling actions suggest reasoning-by-analogy bias ($p<.001$) (1060-1061).

The calculated means of cognitive biases indicated Intuition-thinking types take two times the number of actions suggestive of Positivity bias compared to non-Intuition-thinking individuals. Intuition-feeling

executives take three times the number of actions suggestive of reason-by-analogy bias compared to non-intuition-feeling individuals. In contrast, differences in number of actions taken suggestive of biases for Sensing personality type preference do not vary substantially from the number of action taken suggestive of biases for individuals with an Intuitive personality-type preference.

These results support Tversky and Kehneman's study, based on secondary data, showing individuals rely on limited numbers of heuristic principles to reduce judgements to simpler operations. These heuristics lead to biases that potentially cause severe and systemic errors (1124).

Blaylock and Rees used merger/acquisition scenarios to test whether different cognitive styles prefer different information and whether information varied as feedback was incorporated into the decision process.

There were two phases to this study. Phase I determined whether information preference varied by cognitive style and phase II determined if importance and usableness of information also varied by cognitive

style.

The Myers-Biggs Type Indicator was administered to fifty (50) M.B.A. candidates of which sixteen (16) were picked for this study; four from each psychological type. A modified Delphi study was used for its feedback nature, where several independent groups attempt to arrive at decisions.

In Phase I, four students were selected with similar psychological types to comprise each Delphi group. Each member was independently given instructions regarding techniques for documenting comments and opinions and then each was given a brief narrative describing a merger/acquisition decision. They were then supplied with a list of fifty (50) information items about the decision scenario. Participants were requested to rank the information items from most useful to least useful and then asked to make written comments about the top twenty items. Information from each group was evaluated and summarized.

Data obtained from the Delphi study was integer data and did not readily lend itself to analysis of variance type evaluations. Non-parametric calculations

such as goodness of fit and two way aligned ranks tests were performed on two test factors: psychological types and information items. Calculations were made from the top ten items of each of three scenarios evaluated by participants.

Results from aligned ranks tests indicate psychological types did not differentiate information preferences in round 1 and 2 even at alpha =.10, but psychological type did influence information preference in round 3 at alpha = .025.

In phase II, Blaylock and Rees administered the Larker and Lessig Information Usefulness Questionnaire to participants. This consists of answering six questions, each addressing the usableness or importance of the information block given them. Analysis of variance was calculated for sum of squares for the two data components: cognitive style and information.

Resulting data indicated that importance of information is significant at the .05 level while usableness is insignificant (<.10) (87). Blaylock and Rees conclude that importance of information, as measured by Larker and Lessig's questionnaire, varies with cognitive style.

Trull examined 100 case studies and determined that decision processes were not explicit but, key variables appeared common in the decision reaching process. These variables influenced the success of the decision in a causal fashion. Total decision success was determined by combinations of decision quality and implementation. Both must be present to obtain total decision success; the degree of success dependent upon the proportion of decision quality and implementation present in the decision situation.

Trull defines decision quality as a combination of factors or interacting clusters consisting of 'operating constraints,' 'optimum decision time,' 'optimum information,' and 'decision makers influence.' Implementation consists of elements; 'avoidance of conflicts of interests,' 'reward-risk factors,' and 'degrees of understanding'. These clusters are not mutually exclusive but interacting when integrated into the decision process.

The decision reaching process is uniquely subjective by nature and includes a high degree of uncertainty with interrelated variables of shifting weight. These variables are significantly affected by

the decision makers cognitive style.

This study was developed from analysis of information obtained from 100 successful decision case examples drawn from Industrial, Military, Medical, Political and Commercial areas. Critical stages in each of the decision reaching processes were analyzed to determine major factors comprising decision success. Total decision success was found to be achieved through effective usage of the variables of decision quality and implementation. These two variables are not additive, when decision quality is high, lack of implementation voids its value. Conversely, when decision quality is low, lack of implementation may have a positive effect even though the decision was unsuccessful.

Summary

Results of these studies generally support the hypothesis that each personality type exhibits preferences for certain heuristics or biases manifesting themselves in the decision process. This preference is based on the decision maker's use of conscious and unconscious tendencies or preferences to

use one problem solving style more than another. Problem solving styles or 'patterns of choices' made in decision situations reflect each personality type preference or bias. Different decision styles can be shown to: have specific preferences for different problem types (e.g. Operational, Strategic, etc.,), react differently to the same problem, have different perceptions of risk, be influenced by information preference, have different tendencies to 'surrender' to input biases, and have different choice preferences in strategic decision situations. These differences in decision style may result in differences in decision outcome even though the same information is available in the decision situation and available to all decision styles.

The majority of empirical research regarding relationships between decision style and personality preference are consistent in their use of Jung's personality type functions and the use of the Myers Biggs Type Indicator to determine decision style. This establishes a common basis for defining decision style in terms of personality and quantifying these terms for statistical manipulation.

Chapter IV

RESULTS

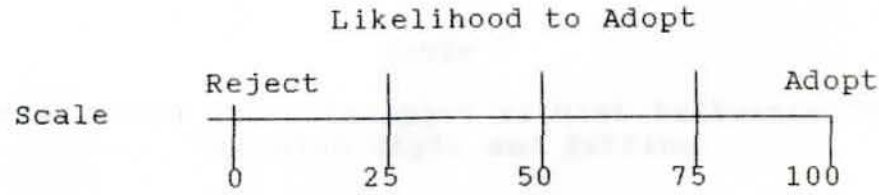
Decision style was found to influence each decision makers behavior when his/her perspective of risk and likelihood of adopting strategic projects was measured by Henderson and Nutt. Sensing-feeling executives were found to perceive less risk and were more willing to adopt projects while sensing-intuition style executives were found least likely to adopt, viewing projects more risky.

Table 4

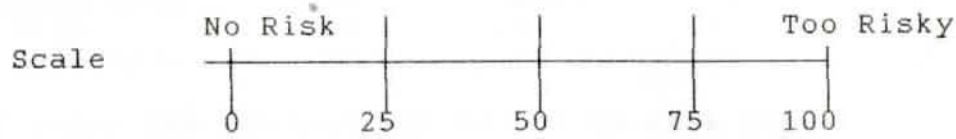
Influence of Style and Project Adoption

Decision Style	Likelihood of Adoption	Perceived Risk
Sensing-thinking	0.58	0.50
Sensing-feeling	0.70	0.40
Intuition-thinking	0.67	0.47
Intuition-feeling	0.63	0.50

SOURCE: Management Science. Exhibit from "Influence of Decision Style on Decision Making Behavior," by J. Henderson and P. Nutt (1980).



Perceived Risk



Using the rating scale to interpret results in Table 4, Sensing-feeling types tend to adopt all projects (0.70) and saw some risk (0.40) in the projects. Sensing-thinking executives viewed project adoption with uncertainty (0.58) and with normal perceived risk (0.50).

The participants in the study were executives from hospitals and firms. Decision setting was measured in relation to decision style in these two business areas. Executives from both hospitals and firms were equally likely to adopt comparable projects and perceived the projects having similar risk. But, decision setting interacted with decision style for adoption ($P<.04$) and perception of risk ($P< .002$). The influence of decision style and decision setting on adoption rates and perception of risk are describe in Table 5.

Table 5

Adoption Rates and Perception of Risk Influenced by Decision Style and Setting

Adoptability	ST	SF	NT	NF
Firms	.57*	.68	.71	.64
Hospitals	.60	.69	.62	.62

Perceived Risk	ST	SF	NT	NF
Firms	.48	.44	.42	.48
Hospitals	.52	.39	.53	.51

* 0.0 means the project was viewed as risk free

SOURCE: Management Science. Exhibit from "Influence of Decision Style on Decision Making behavior," by J. Henderson and P. Nutt (1980).

Intuition-thinking executives were more likely to adopt projects if decision setting was a firm as compared to hospitals. Perceived risk was also influenced by decision setting with Intuition-thinking types seeing less risk in firms than in hospitals. Other differences appear too small for discussion.

In Phase II of Blaylock and Rees' study of relationships between cognitive style and information usefulness, the Larker and Lessig Information Questionnaire was administered to each participant to measure importance and usefulness of information preference.

Participants, grouped by psychological type, were asked to respond to each of four information sets. Each information set was evaluated to determine if information preference was due to importance, usableness or some other concept not measured.

Analysis of variance of the two components; importance and usefulness is shown in Table 6.

Table 6

Analysis of Variance for Information Importance

Source	Sum of Squares	Degree of Freedom	Tail Probabilities
Between:			
Cognitive Style(A)	.75	3	
Error	56.46	12	
Within:			
Information Set(B)	13.31	1	
(A) X (B)	29.96	3	< .05
Error	33.51	12	

SOURCE: Decision Sciences. Data taken from exhibit in "Cognitive Style and The Usefulness of Information." by B. Blaylock and L Rees (1984).

Table 7

Analysis of Variance for Information Usableness

Source	Sum of Square	Degree of Freedom	Tail Probabilities
Between:			
Cognitive Style(A)	15.3	3	
Error	60.49	12	
Within:			
Information Set(B)	1.39	1	
(A) X (B)	33.22	3	< .10
Error	42.06	12	

SOURCE: Decision Sciences. Data taken from exhibit in "Cognitive Style and the Usefulness of Information," by B. blaylock and L. Rees (1984).

The most important factor demonstrated in Table 6 and 7 is information importance is significant at the .05 level while usableness is insignificant. This indicates importance of information varies by cognitive style when measured by Larker and Lessig.

Haley and Stumpf found that different personality

types display the cognitive 'trails' they most frequently use by involving certain heuristics affecting decision making. When heuristics are used in the initial stages of the decision process, these cognitive trails may result in systematic biases affecting intended and realized strategies.

Different personality types are seen following distinct information screening and behavioral preferences. Haley and Stumpf found that different personality types prefer to use specific heuristics to gather data and identify problems. These heuristics influence the decision process by affecting managerial choices and evaluations within the decision process.

Of the 41 participants in the behavioral simulation exploring links between personality type, input bias and output bias, 38 exhibited one or two input biases. Reference Table 8. Eighty percent of Sensing-feeling individuals exhibited availability bias compared to 10% for Sensing-thinking, 14.3% for Intuition-feeling, and 8.3% for Intuition-thinking types. Vividness bias was exhibited in 25% of Intuition-thinking types, 57.1% of Intuition-feeling, 35% of Sensing-thinking, and 40% of Sensing-feeling individuals.

Table 8

Personality type Preference and Bias

Bias	SF %	ST %	NF %	NT %
Availability	80	11	14.3	8.3
Vividness	40	35	57.1	25

Table 9 indicates results of Chi-Square Tests linking personality type with perseverance and anchoring biases. Because of the small number of Sensing-feeling and Intuition-feeling participants, these groups were combined into one category. Results confirm Haley and Stumpf's hypothesis that Sensing-thinking individuals succumb to anchoring bias and Intuition-thinking to perseverance bias more than other personality types.

Table 9

Personality Type and Input Bias

Bias	ST%	NT%	SF & NF%
Did not use	n=3	n=7	n=10
Anchoring	17.6	58.3	83.3
Used Anchoring	n=14	n=5	n=2
	82.4	41.7	16.7
Did not use	n=11	n=1	n=10
Perseverance	64.7	8.3	83.3
Used	n=6	n=11	n=2
Perseverance	35.3	91.7	16.7

SOURCE: Journal of Management Studies, Exhibit from "Cognitive trails in Strategic Decision-Making: Linking theories of Personalities and Cognitions," U. Haley and S. Stumpf (1989).

Stumpf and Dunbar extended the work of Haley and Stumpf by proposing that decision makers with different personality type preferences exhibit cognitive styles and take actions associated with specific biases. These biases are contained in the patterns of choices made in decision situations.

Four cognitive biases were hypothesized by the research and include: Selective Perception, Positivity, Social Desirability, and Reasoning by Analogy. The relationship between cognitive styles and biases were found through the number of actions reflecting biases taken by participants in a simulated decision scenario. Results of actions by cognitive bias exhibited in this study are listed in Table 10.

Table 10

Mean Number of Actions Taken Suggestive of Each Cognitive Bias

Cognitive Bias	Personality Type Preference			
	ST	NT	SF	NF
Selective Perception	6.2	5.8	6.0	5.7
Positivity	2.2	3.5	1.7	1.9
Social Desirability	4.9	5.0	6.4	4.6
reasoning-by-Analogy	1.0	1.1	1.3	3.4

SOURCE: Decision Sciences. Exhibit from "The Effects of Personality Type on Choices Made in Strategic Decision Situations," by S. Stumpf and R. Dunbar (1991).

Sensing-thinking individuals did not take actions indicating selective perception bias significantly more

often than other personality types. Intuition-thinking types took significantly more action suggestive of positivity bias than other personality types. Sensing-feeling individuals took more actions suggesting social-desirability bias and Intuition-feeling managers took more actions suggestive of social-desirability bias than other personality types.

Twice as many actions suggestive of positivity bias were taken by Intuition-thinking individuals than all other types combined. Intuition-feeling types took three times the number of action taken representative of reasoning-by analogy bias than non-intuition-feeling types. But in contrast, the total number of action taken by Sensing personality types do not vary significantly from the total number of actions taken by Intuition type personalities.

Personality type preferences in relation to patterns of actions taken are also reflective of each cognitive bias. Results are listed in Table 11.

Table 11

Mean Percentage of Patterns of Actions Taken Suggestive of Each Cognitive Bias

Cognitive Bias	Personality Type			
	ST	NT	SF	NF
Selective Perception	21.6	18.7	18.3	19.9
Positivity	6.9	12.6	5.1	5.8
Social Desirability	16.6	16.2	19.9	15.3

Reasoning-by-Analogy	4.2	4.6	3.9	12.4

SOURCE: Decision Science. Exhibit from "The Effects of Personality Type on Choices Made in Strategic Decision Situations." by S. Stumpf and R. Dunbar (1991).

Sensing-thinking individuals took more actions suggestive of selective perception than other personality types, Intuition-thinking, positivity bias; Sensing-feeling, social desirability bias; and Intuition-feeling, reasoning-by-analogy. Results of patterns shown in Table 8 parallels the results actions shown on Table 7.

Summary

Cognitive style (Decision style) has considerable influence on the decision making process, exhibited by individuals with different personality types diagnosing issues and taking actions differently to the same decision scenario. Different preferences for diagnosing issues and actions taken contain characteristics of specific biases related to each cognitive style. These finding are related to Jung's conviction that individuals'decision processes are dominated either by their judgmental or perceptual dimensions of their cognitive style and personality.

Chapter V

DISCUSSION

The general nature of decision situations, especially those faced in upper management have certain identifiable characteristics. Decision situations are unique, complex, involve uncertainty and require a period of time for study even in crisis situations. From these characteristics, all managers must choose courses of action based on available and sometimes conflicting information, knowing that professional reputation is determined largely by the quality of their last decision. The decision makers mental ability to judge correctly, by comparing facts and ideas, is vital to the process of making quality decisions. The decision makers perception and use of these facts and ideas and ultimately the decision makers judgement are influenced by heuristics and biases inherent in each decision maker's problem solving style.

Jung's four personality functions suggest individuals exhibit preferences for ways of becoming aware of situations, people, and concepts and how they judge and perceive these factors in decision situations. Each personality function exhibits

characteristics of these preferences and is unique to each function. For example, sensing-feeling types tend to perceive less risk and adopt projects more often than sensing-intuition types given identical decision situations.

In the initial stages of decision processes, systematic biases can occur when cognitive abilities of individuals are limited by their decision capacities, generally resulting in inferior decisions. If errors in judgment occur, they may result in developing erroneous and inferior conclusions from data or from inaccurate inference processes.

Errors may also result from decision heuristics which can be categorized into input, output or operational biases. These three biases parallel prescriptive decision theories with regard to information collection, alternative generation and alternative evaluation.

Input biases are data biases occurring because of availability, accessibility or importance of some information and are activated within the decision maker, resulting in inappropriate procedures or strategies dealing with information. For example, they may form within the decision maker when one class of information is given more weight than another.

Haley and Stumpf tracked preferences of Jung's

four personality types by methods of information screening and found distinct behavioral and screening preferences. For example, Sensing-feeling executives were found to use availability bias considerably more than other personality types. This bias arises when executives focus heavily on value-latent or emotional information even when other more objective information is presented.

Vividness bias, exhibited in Intuition-feeling types prevailed when executives focused too heavily on idiosyncratic or memorable information. Vividness is influenced by availability factors causing individuals to favor some information over others. Experiments also show decision makers may ignore statistical information in favor of more imagery information.

The close relationship between decision function and problem description and formulation was anticipated in strategic and human relation problems because of their ill-structured nature. This relationship was also evident but not anticipated in technical and operating problems which are more structured. As stated previously, results appear to indicate processes of thinking about problem types are more closely related to decision functions than to problem type experience. But, the process of thinking about specific problems, rather than problem types, is

related more to problem experience .

For example, executives discussing problem types experienced by their organization within the past year are guided by their decision style more than their experience. When executives discuss a specific problem occurring the past year, they may be evoking more specific knowledge of past experience in that problem type.

For both ill-structured problem types, strategic and human relation, the strongest link between problem description and decision function exists in the Sensing perceptual functions. "Since the sensing function is conscious perception ....is given a Priori, and unlike thinking and feeling, is not subject to rational laws" (Jung 463).

Managers who are more sensing tend to think information search is not part of the diagnostic process of problem solving. Well structured problem types were found strongly associated with thinking and judgmental functions.

This function discriminates differences in thought about formulation of well structured problems. Hellegreil and Slocum defined thinking types as: "This manager has a tendency to fit problems and their solutions into standardized formulas" (32).

Individuals with different personality types tend

to have patterns of actions reflecting specific biases, such as selective perception, positivity, social desirability and reasoning by analogy. Individuals with specific personality types were found to exhibit preferences for biases associated with that personality. These biases stem from cognitive trails etched in the minds of individuals and combined with years of thinking and being affected by one's personality.

Personality type preferences appear to reflect ways of thinking that carry a greater susceptibility to specific biases. Individuals are not likely to exhibit the same bias all the time but are likely to exhibit a particular bias a moderate percentage of the time. Some differences were observed depending on the specific situation and the way information was presented. For example, sensing-thinking type managers exhibited tendencies to take action more often suggestive of selective perception bias, intuitive-thinking types take more actions often suggestive of positivity bias, sensing-feeling types take actions suggestive of social desirability bias and intuitive-feeling action suggestive of reasoning by analogy.

Decision outcome is dependent upon the decision makers cognitive abilities to interpret and evaluate

information and his ability to absorb information flows. Different preferences for data gathering, information screening, perceived risk, decision setting, etc., as well as tendencies to succumb to specific input or output biases are associated with each individual's decision process. This unique decision process is either dominated by the decision makers judgmental or perceptual preferences (contained in their cognitive style and personality) and depending on the degree of cognitive influence can directly affect the quality of the decision.

Summary

Each cognitive style exhibits unique preferences toward characteristics influencing decision processes. Emotions, biases, attitudes, predispositions, etc., distort the judgmental and perceptual processes by unknowingly blocking important information, failing to absorb important data, or perceiving higher risk than actual thereby adversely affecting decision outcomes.

These unique preferences or predispositions can take the form of input or output biases, such as anchoring or positivity bias or even simple heuristics. These biases may adversely affect judgement or perception by distorting usefulness of information (Blaylock and Rees), perception of risk (Henderson and

Nutt), perception of importance of information (Haley and Stumpf), or preference for specific biases (Stumpf and Dunbar).

These predispositions or biases can influence the amount of information used and the degree of focus i.e., one or multiple solutions in the decision. If these biases affect the decision process, the result is exhibited in variations of the decision maker's values goals, communication, planning and control of the decision situation, consequently affecting the quality of the decision outcome.

The result of this study shows the effects different decision styles may have on the quality of the decision outcome; where no one decision style is determined to be superior than others in all decision situations.

Decisions based on intuition are usually considered impulsive and lacking analysis. They are considered more inclined to be subject to emotions, biases, attitudes and predispositions influencing the decision process than rational decisions based on thinking processes.

Intuitive decisions are not inevitably inferior to rational decisions on the basis on their non-rationality. Rational decisions are easier to explain and defended even though they may actually be no better

than intuitive decisions. The intuitive decision process is unknown or unknowable and may account for the lack of trust in these decisions.

Limitations

All secondary research used for this study of decision style characteristics were consistent in the use of Myers and Biggs Type Indicator to determine personality type. Using samples taken from different personality types, specific data were collected to support or oppose the researchers hypothesis. Many of the sample sizes used as the basis for determining acceptance or rejection of the research subject are relatively small. In one or more cases, two personality types had to be grouped together for statistical purposes making support of the hypothesis weak.

This paper is concerned with the influence, predispositions and heuristics contained in different personality types and introduced into problem solving situation as biases. During the formulation process of each empirical study or project, personality biases may be unknowingly introduced into project scenarios, particularly when establishing decision scenarios similar to those used in this study.

"It is humanly impossible to eliminate all

> bias and commitment from science...[we cannot] pin our hopes for the existence of any objective science on the existence of passionless unbiased individuals" (Mitroff 248).

The subject of personality type influence into research projects are may be a future topic for research.

Suggestions for Future Research

Future research in the area of decision style, in addition to focusing on one's preference for sensing or intuitive functions, may also attempt to determine under what conditions their associated biases manifest themselves.

Other areas of possible future interest in research may be the determination of characteristics of informational attributes preferred by each cognitive style. Larker and Lessig's usefulness of information construct may be beneficial for this study.

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