The Impact of Personality Traits and Problem Characteristics on Management Decision-Making Outcomes: Some Experimental Findings and Empirical Conclusions

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Since decision making behavior has been a focus of economic research and practice, both from a scientific and a professional position, there seems to be a dispute whether rational or intuitive decision making behavior leads to better outcomes. By now, scholars agree that effective organizations do not possess the "luxury" to choose between the "application" of intuitive or rational decision making. Instead, they try to understand how different factors like personality traits and problem characteristics influence the decision making process. Reviewing the literature reveals that personality predetermination and the structure of problems (e.g., well-structured problems versus ill-structured problems) have a significant impact on decision making efficiency. Further, the review also shows that there is a lack of application oriented empirical studies in this area of research. Therefore, the aim of this research paper is to propose a framework for an empirical study on how personality traits and problem structure influence the decision making process and outcomes. First hypotheses are derived according to the state of record on how personality predetermination and behavioral patterns in the decision making process lead to higher "socio-economic" efficiency within certain problem categories. Second a causal model and a setup for a laboratory experiment are proposed to allow testing the hypotheses. Finally, the conclusion provides an outlook on how this research might support organizations in their decision making processes.

Numerous research and practical publications in business administration, economics, sociology, psychology, information sciences, etc. have been dealing with the topic of decision making, decision making behavior, outcomes, or with emphasizing various aspects of this research area (i.e., efficiency criteria, individual and collective decision making approaches, human characteristics, degrees of decision making rationality and measuring decision making success) (Gzuk, 1975; Neuert, 2010; Van Riel, Ouwersloot, & Lemmink, 2006; Witte, 1988).

Based on an intensive literature review, an extended theoretical analysis and preliminary empirical evidence, this paper will develop a theoretical framework (Neuert & Hoeckel, 2013); proposing specific cause effect-relations between personality traits as the independent variable and decision making efficiency as the dependent variable, intervened by various structured decision making problems and tasks.

This paper aims to contribute to the advancement of decision making theory by creating a set of basic hypotheses and by testing those hypotheses via an experimental research design. In this context it will add some elements to the scientific state of the art concerning the overall research and whether various normative decision heuristics and observable actual decision making behavior can explain different intended or unintended outcomes of decision making processes in general or in detail within situational contexts.

Theoretical Foundation

The works of Jung (1971) and Westcott (1968) indicated that intuitive or rational human beings shared distinct personality characteristics. Jung divided human behavior into four mental functions and two attitudes, allowing him to describe different types of people. The four mental functions were sensory and intuitive (related to the preference on how people perceived information), along with thinking and feeling (related to the preference on how humans have made judgments). The more "romantic" view (Allinson & Hayes, 1996; Mintzberg, 1994; Sauter, 1999; Sarmany-Schuller, 2010) was that formal business planning relied on the left brain hemisphere's sequential-logical processes, whereas the less formal intuitive and creative aspects of management were accomplished by the right hemisphere and could not be derived from psychological research (Simon, 1997). The main findings in the study of Shiloh, Salton, and Sharabi (2002) supported the evidence that an intuitive or rational approach in decision making could be related to personality traits or cognitive styles. Within their study they showed that participants with a rational thinking style were more apt to normative judgments while participants with a more intuitive thinking style were prone to more heuristic judgments. According to the Cognitive-Experiential Self Theory (Epstein, 2003) human beings operate on two fundamental information processing systems. The experiential system which operates mainly on an unconscious level, relates to experiences which have been built up in the past. The experiential system can be characterized as automatic, rapid, effortless, associative, and holistic. Although the experiential system is a cognitive system, it derives beliefs from emotional experiences (Epstein, 1991). In contrast, the rational system operates predominantly at the conscious level in an analytical, effortful, affect-free, and relatively slow manner while

demanding high cognitive resources (Epstein, 2003). The rational system is more process and logical-reasoning oriented and requires justification via logic and evidence. The rational system seems to be more suitable when analytical approaches are needed or considerations for long term consequences are at stake (Epstein, 1991). Kahneman (2012) assumed that human beings always addressed System 1 first because it was fast, involved less effort, and was less burdensome. Human beings involved or switched to their slower and more effortful rational system, (System 2), when their first attempt with System 1 failed or did not provide the expected results.

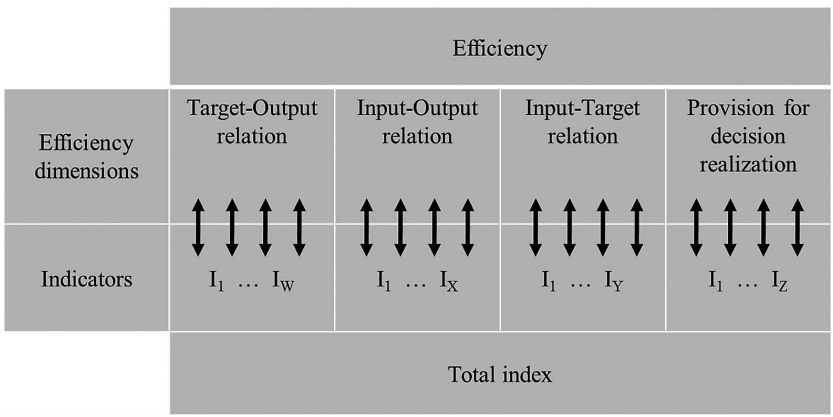
Dijksterhuis et al. (2006) found in their studies that participants facing simple decision making situations performed well when taking a conscious, deliberate effort, whereas participants facing a complex decision making situation performed better when using unconscious, intuitive thoughts. The study also showed that post-choice satisfaction was greater in simple decision making situations when decision makers had taken a deliberate, rational approach. However, for complex decisions, the decision makers experienced greater post-choice satisfaction when they had taken unconscious approaches. For Shapiro and Spence (1997) the approach of the decision making process (intuitive versus rational) depended on the nature of the task (e.g. structured or unstructured). For them, tasks that had a more structured nature like accounts receivable or order entering and inventory control were conducive to analytical reasoning because they typically had well-accepted decision rules. Other tasks with less structured problems like mergers and acquisitions, new product planning and corporate strategy formulation were typical for the "use" of intuition. Van Riel et al. (2006) supported this view that the decision tasks varied with the structure of the decision. They also concluded that well-structured problems called for a rather rational approach, as decision makers can more easily make rational calculations. In turn, ill-structured problems were not for rational decision making as they were characterized by a high degree of uncertainty about the actual and desired situation and therefore, did not have a base for rational calculations.

Another major condition for the nature of the task could be seen in the complexity of the decision making context. Problem complexity can overstrain the physical constitution of a person's brain and therefore, rational decision making may not be as easily achievable when dealing with complex problems. Conscious thoughts in this case suffer from low capacity, making it less suitable for very complex problems (Dijksterhuis et al., 2006; Van Riel et al, 2006; Witte, 1988). Dane and Pratt (2007) saw problem characteristics as one of two factors which influenced intuitive effectiveness. They postulated that the more increasingly unstructured the problems were, the more effective intuitive judgment was compared with rational analysis. For Dane and Pratt (2007) ill-structured problems were conducive to the intuitive decision making process because of the absence of well-accepted decision making rules. The model of Sinclair and Ashkanasy (2002) assumed that behavior in decision making processes was affected by various factors (e.g., cognitive style, problem structure, managerial experience, professional expertise, time pressure, decision importance, etc.). But according to the literature (Allinson & Hayes, 1996; Dane & Pratt, 2007; Feger, 1975; Fields, 2001; Hauschildt et al., 1983; Pretz & Totz, 2007), the individual personality and the ambiguity of the problem task seemed to be two of the bigger contributors to the

degree of decision making efficiency. This is why this paper focuses on the relationship between personality traits and decision making efficiency, but by no means denying that the variables like the ones mentioned above have an impact on decision making efficiency.

Within the scientific community, various opinions exist whether the overall performance accomplished by the decision makers in the course of a decision making process should be labeled either in terms of effectiveness, achievement, quality, etc. The term efficiency will be used as the overall measure of decision making results, because it seems to be the most comprehensive concept of accomplishment evaluation from the point of a scientific observer examining and assessing the conduct and outcomes of decision making processes (Gzuk, 1975; Neuert, 1987; Simon, 1997). Outcomes or the results of decision making in business management can be characterized by different dimensions of efficiency. For Gzuk (1975), to achieve efficiency in the decision making process, there were two conditions which needed to be fulfilled. Firstly, a decision had to create the most efficient ratio between output and input. Secondly, a decision needed to create results which ensured that the intended objectives would be achieved. To determine and to measure efficiency in the decision making process for Gzuk (1975), it was therefore necessary to split the total construct of efficiency into single dimensions. He advocated for three components which described the dimensions of efficiency best: 1) the target of the process, 2) the input, or the resources allocated to the process, and 3) the output, or the result of a process.

Figure 1: *Multi-dimensional Indicator Model for Efficiency Measurement*



Using this multi-dimensional model (Figure 1) allowed for the measurement of various single efficiency dimensions and then, by combining them, to determine the total efficiency of the decision making process outcomes. Neuert (1987) supported this view by describing the material efficiency as one dimensional, where the measurement was a realistic input and the output comparison in commercial activities could be measured by objective criteria like earnings, profitability, growth, and financial independence. Bronner (1973) referred to this part of efficiency as the economic efficiency. In contrast, for Neuert (1987), in addition to the material efficiency, the personal satisfaction of the decision maker reflected a rather subjective outcome of the

decision making processes. As subjectively assessed results, the literature understood outcomes like identification with the team work, self-reflection on the group behavior, and the decision making contributor's individual role within the group. In sum, he characterized this personal efficiency as the individual evaluation of the decision maker, concerning his results of the decision making process and his self-reflection on their behavior during the decision making process. For Bronner (1973), it was not possible to measure the personal efficiency on an objective basis. He advocated measuring it via the personal activity of the decision maker within a decision making process. As a third dimension, Neuert (1987) saw the formal efficiency, which characterized the comparison of the aimed target or the desired outcomes with the achieved outcome. In this sense, a larger coincidence between the targeted and the current state/situation indicated a higher efficiency and in turn, a smaller coincidence between the targeted and current situation indicated lower efficiency.

Personality predetermination/cognitive styles are mostly measured by psychological self-report instruments. Some of the most well-known and most used measures for the cognitive style or intuitive/rational behavior (Hodgkinson, Langan-Fox, & Sadler-Smith, 2008; Langan-Fox & Shirley, 2003; Pretz & Totz, 2007; Ritchie, Kolodinsky, & Eastwood, 2007; Woolhouse & Bayne, 2000) included the Cognitive Style Index (Allinson & Hayes, 1996), the Agor Intuitive Management Test (Agor, 1986), the Rational-Experiential Inventory (Pacini & Epstein, 1999) and the Myers-Briggs Type Indicator (Briggs Myers et al., 2003). The Cognitive Style Index (CSI) was designed by Allinson and Hayes (1996) to assess individual preferences on information processing. It distinguished between two different cognitive styles: an intuitive style which emphasized feelings, openness and a global perspective and an analytical style which emphasized reasoning, detail, and structure. With a relatively small amount of items (38 items with 3-point ratings), the CSI is convenient for administrating within large scale organizations. To test the use of intuition in management decision making, Agor (1986) tested executives from a wide range of organizations with the Agor Intuitive Management Test (AIM) in 1981. The AIM was a self-report questionnaire including two parts. The first part reflected the ability to use intuition and consisted of 12 questions which were taken from the Myers-Briggs Type Indicator (MBTI®). Depending on the answer of the experimentee, the first part gave an indication on the preferred cognitive style (intuitive or rational). The second part of the AIM test consisted of ten questions and measured the actual use of intuition.

Epstein introduced the Rational-Experiential Inventory (REI), a measurement to assess the preference for rational versus intuitive thinking on the basis of the Cognitive-Experiential Self Theory (CEST) (Pacini & Epstein, 1999). The REI distinguished between two cognitive styles: a rational style which was measured by items being adapted from the Need for Cognition (NFC) scale (Cacioppo & Petty, 1982), and an experiential style which was measured by the Faith in Intuition (FII) scale. Theses scales were again divided into subscales of ability and favorability. The ability subscale reflected the individual's belief in their ability for using rational or experiential thinking and the favorability subscale reflected the preference to engage in this kind of information processing (Pretz & Totz, 2007).

The Myers-Briggs Type Indicator (MBTI®) is one of the most widely used measures of intuitive traits (Langan-Fox & Shirley, 2003). The MBTI® is a self-reported personality construct which is based on Jungian theory (Jung, 1971). The MBTI® identifies basic preferences on four dichotomies. Those basic preferences describe different ways of how people perceive information (Sensing-Intuition dichotomy) and different ways of making judgments (Thinking-Feeling dichotomy) in combination with different attitudes (Extraversion-Introversion and Judging-Perceiving dichotomy). From a theoretical point of view there are two mental functions, the Sensing/Intuition (S-N) scale which measures the holistic nature of intuition, and the Thinking/Feeling (T-F) scale which measures the affective nature of intuition (Pretz & Totz, 2007). The MBTI® identifies 16 different personality types which result from the interactions between the four dichotomies (Briggs Myers et al., 2003).

Taking the theoretical background into account, it seemed that individuals facing simple decision making situations performed well when using more conscious and deliberate thoughts, whereas participants facing complex decision making situations performed better when using unconscious, intuitive thoughts. There seemed to be a clear link between the cognitive style and the structure of the problem. The more increasingly unstructured the problems were, the more effective intuitive judgment became in comparison to rational analysis. Ill-structured problems therefore were conducive to the intuition-based decision making process because of the absence of well-accepted decision making rules and vice versa (Dane & Pratt, 2007; Dijksterhuis et al., 2006). Intuitive behavior, using heuristics to solve problems, could be characterized as automatic, rapid, effortless, associative and holistic. This led to the conclusion that intuitive behavior seemed to be more appropriate and therefore more efficient whenever ill-structured problems had to be solved. In contrast, rational behavior could be characterized as process orientated, logic, and reason-oriented and required justification by using analytic approaches to solve problems. This led to the conclusion that rational behavior seemed to be more appropriate and more efficient whenever well-structured problems had to be solved.

Based on those theoretical outlines the following hypotheses can be formulated:

> *Hypothesis 1: Intuitive rational responses and "discursive" behavioral approaches make a difference in decision making outcomes in connection with different decision making problem structures.*

With the sub-hypotheses being,

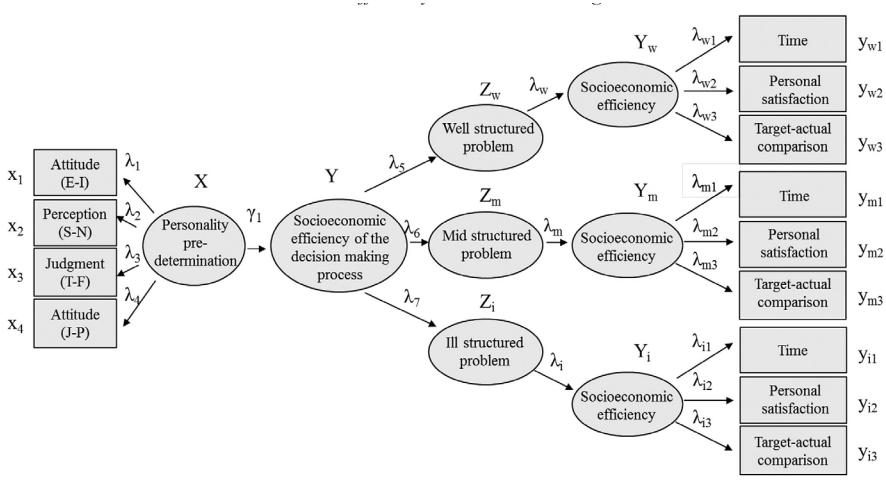
- H_{01}: *Intuitive behavior in the decision making process leads to higher decision making efficiency within ill-structured problems than rational behavior.*
- H_{02}: *Complimentary intuitive and rational behavior in the decision making process leads to a higher decision making efficiency in mid-structured problems than sole intuitive or rational behavior.*
- H_{03}: *Rational behavior in decision making processes leads to higher decision making efficiency in well-structured problems than intuitive behavior.*

H_{04}: *Rational behavior in decision making processes leads to lower decision making efficiency within ill-structured problems than intuitive behavior.*

H_{05}: *Intuitive behavior in decision making processes leads to lower decision making efficiency in well-structured problems than rational behavior.*

Based on the theoretical background and on the set of hypotheses outlined above, a path analysis was used to select the relevant causal factors and to establish the proposed relationship between the independent and dependent variables, allowing for the set up of a causal model (Figure 2). The latent exogenous measurement variables x_1, x_2, x_3 and x_4 provided information about the nature of the latent exogenous independent variable X (personality predetermination). The independent structural variable X influenced the intervening variables $Z_w \ldots Z_i$ and the dependent $Y_w \ldots Y_i$ variables. These dependent variables ($Y_w \ldots Y_i$) again were operationalized and measured by the latent endogenous variables $y_{w1} \ldots y_{i3}$.

Figure 2: *Casual Analytical Model for the Relationship of Personality Traits and Socioeconomic Efficiency in Decision-Making*



Legend of the casual model:

X = Independent structural variable (personality predetermination)

Y = Dependent structural variable (Socioeconomic efficiency of the decision-making process)

$Y_w \ldots Y_i$ = Socioeconomic efficiency of the decision-making process depending on the problem structure (well-structured, mid-structured, ill-structured)

$Z_w \ldots Z_i$ = Intervening structural variable (structure of the problem)

$x_1 \ldots x_4$ = Latent exogenous measurement variables (personality predetermination)

$y_{wl} \ldots y_{i3}$ = Latent endogenous measurement variables (socioeconomic efficiency)

γ_1 = Correlation degree between the latent exogenous and latent endogenous variable

$\lambda_1 \ldots \lambda_{u3}$ = Correlation degree between the structural and measure variable

The cause-effect model (outlined in the form of a structural equation concept) depicted the multiple framework of determinants and variables, dealing with the impact of personality traits, behavioral patterns, and decision task structure on decision-making outcomes and decision-making efficiency.

The various elements of personality pre-determination were themselves influenced by the independent variables attitude, perception, judgment, and respective attitude as outlined above. Those independent variables determined the independent personality set on a range between intuition and rationality, mirroring the variety of personality traits. In the next stage, the former dependent variable personality pre-determination became the independent variable in a cause-effect-relations chain, influencing the socio-economic efficiency as the outcomes of the decision-making processes and the dependent variable were affected by the varying (individual) personality traits.

According to the proposed set of hypotheses, the socio-economic efficiency of decision-making processes varied within the problem structure of the decision-making task in connection with the personality traits, meaning that specific personality traits caused different effects in decision-making outcomes, and were dependent on whether the decision-making task was well-structured, mid-structured, or ill-structured. This led to the explanation that the socio-economic efficiency of decision-making processes not only varies with the different degrees of personality pre-determination, but also with the respective problem structure.

Finally, the socio-economic efficiency was measured by the three different dimensions: 1) time used to perform the decision-making tasks, 2) personal satisfaction with the decision-making process, and 3) comparison of the actual results and the intended (target) outcomes of the decision-making process.

The Myers-Briggs Type Indicator was chosen for the determination of the personality/cognitive style even though it was soundly criticized by some literature (Langan-Fox & Shirley, 2003). The MBTI proved to be a valid and reliable instrument as many other published studies demonstrated, especially because the MBTI showed a strong relationship with four out of five scales in the Big Five Model of Personality, measured by the NEO-PI (Furnham, Moutafi, & Crump, 2003; McCrae & Costa, 1989). Further, the MBTI has been one of the most widely used and understood instruments to measure personality traits/cognitive styles within organizations, and therefore allowed direct transfer from research to practice (Hough & Ogilvie, 2005). Appelt et al. (2011) generally recommended using existing and well-known measures without modification where appropriate, as they allowed for a better cross-comparison between different studies. According to Jung's (1971) and Briggs Myers et al. (2003) theory, the four dichotomies were used to assess the personality predetermination. The intervening variable (Z), the problem structure, was operationalized by devoting three different kinds of structures with the well-structured problem (WSP), the mid-structured problem (MSP), and the ill-structured problem (ISP). Based on the theoretical background, the three different structures (WSP, MSP and ISP) were characterized by the following definitions. Ill-structured problems (ISP) could be specified by the following elements: 1) goals were defined vaguely or not at all, 2) the problem description was not clear or well-defined, 3) there was no single objectively correct solution, 4) information to solve the problem was not within the problem statement, 5) the problems were in a special context where

one or more aspects were not specified, 6) in-between domain transfer capabilities were needed, 7) there was no execution program or algorithm available to solve the problem in a routine, and 8) solutions may not have been final, rather a plan was put in place to find out if the solution worked in reality, based on the implementation and evaluation. Problem solving in this case became an iterative process. In contrast, well-structured problems (WSP) could be specified by the following elements: 1) they had a well- defined initial state and goals, 2) they had a single correct answer, 3) all elements which were required for the solution were known, 4) problem solving required using rules and strategies like logical, algorithmic processes which ensured a correct answer, and 5) the current state of the problem could be consistently compared with the goal state. For mid-structured problems (MSP), the following definitions were adopted: 1) they had a defined initial state, 2) goals were known, but only as information, findings and data might be implicitly embedded in the problem and must be formulated and found by the individual, 3) required the use of a limited number of concepts, rules and principles, and 4) knowledge of skills of how to solve well-structured problems was needed (as a sort of "metacognition").

The operationalization of the socio-economic efficiency could be accomplished by various constructs, especially since the choice of the efficiency dimensions is always related to the judgment of the observer. To measure the dependent latent endogenous variables, the socio-economic efficiency will be split into three dimensions: the formal efficiency, the material efficiency, and the personal efficiency (Neuert, 1987, p. 114). By definition, the decision-making process can be understood as a target-oriented process (target-output relationship) where the aim is to reach a future/target state. In this sense, the decision-making procedure with its various sub-processes can be seen as a formal instrument for solving problems by taking choices when selecting alternatives (Gzuk, 1975). The comparison between the initially intended goal fulfillment and the accomplished goal fulfillment can be described as "formal" efficiency. The level of formal efficiency can be determined by comparing the target or the desired outcomes with the actually "performed" outcomes. The material efficiency in decision-making relates to the economic results and can be mainly understood as an input-output relationship which is measured by criteria like profit, growth, rate of return, etc. Management science has created a series of key indicators to display the material efficiency in decision-making, exemplarily measured by the overall-economic indicator of time consumption. For the most part, these are measures which indicate economic activities as input-output relationships with performance indicators like profitability, cost and returns, or cost and benefits. The formal and the material efficiency deal with the hard facts and reflect the economic and more objective side by detectable and reproducible elements of decision-making. The personal (individual) efficiency reflects the socio-psychological and subjective part in decision-making and therefore deals with results which can be considered as soft facts and are related to the emotions, feelings, acceptance and satisfaction of the individual.

Empirical Design

The "code of good conduct" for social sciences, economics, and management research demanded not only the development of theories, theorems, and hypotheses but

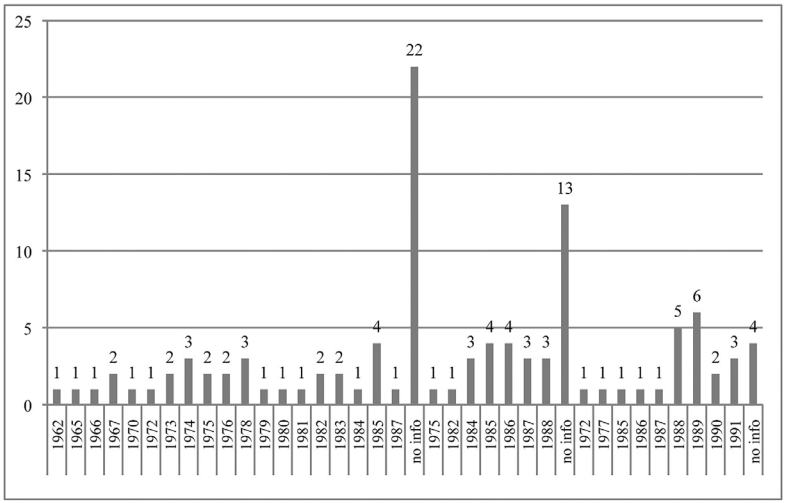
also a profound "scientific" effort to test the validity and robustness of the theoretical construct via empirical procedures and qualitative and/or quantitative analyses (Kirsch, Seidl, &, van Aaken, 2007; Popper, 2005).

In order to test the theoretical outline and the set of hypotheses, it was suggested to design and apply the research method of a laboratory experiment. Laboratory experiments have been widely used for business, management, and economic research dealing with research questions referring to behavioral patterns and their respective explicable outcomes in decision-making processes (Abbink & Tietz, 2008).

Laboratory experiments provide the advantage that the empirical setting allows for the precise control of the formulated cause-effect variables by eliminating potential "interrupting" variables, which might appear in field studies or field experiments. On the other hand, the external validity of lab experimental findings is still an issue in major scientific disputes (Hussy, Schreier, & Echterhoff, 2010).

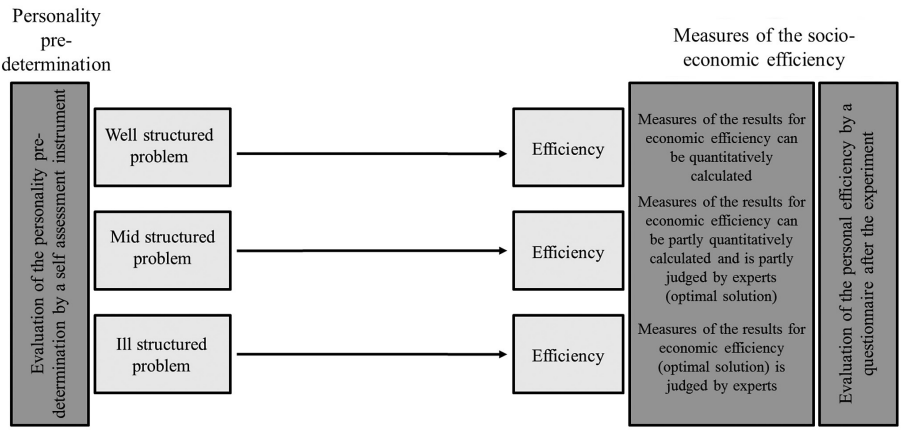
Sample experimentees should consist of graduate students in Master´s and/or doctoral programs with a professional background, and bachelor students with no professional background. Thus, one can make sure that the experimental sample is easily accessible and also includes students with an academic and a professional background as well, which will undoubtedly increase the previously mentioned external validity of the experimental findings (Bardsley et al., 2010). In this current study, 111 students participated in the empirical experiment. 32 of them were full time Master's degree students in the field of International Management (MIM) with little professional background. Fifty-four of them were part-time doctoral students (PhD) in the field of Business Administration with a significant professional background, and 25 were full time Bachelor's students (BIM) with no professional background (Figure 3). Forty-six of the participants were female, 57 were male, and 8 specified no gender information.

Figure 3: *Distribution of Age and Per Studies of the Experiments*



The assessment of the personality predetermination via the MBTI®, which also reflected the behavioral aspects of the hypotheses, was done before the laboratory experiment. This allowed the pre-selection of the participants in accordance with their personality/cognitive style (rational versus intuitive decision-making styles). Within the laboratory experiment, the participants received one out of three tasks with a given problem structure (well-, mid- or ill-structured problem) and were asked to solve the problem according to the description of the problem statement. The well-structured problem task was based on an investment decision-making problem, and gave the option to choose between three different options. This well-structured task could be solved quantitatively by a mathematical algorithm. The indicator for an "optimal" result would be a figure done by a calculation. The ill-structured problem task was about a decision-making situation of an imaginative and urgent (i.e., a crash on the moon) situation. The optimal result was determined by the judgment of experts. The mid-structured task, which could be characterized by having a part within the problem structure and determined by a calculation which might have no objectively correct solution, was addressed by a case study that referred to a decision-making process for a marketing strategy. In this case, the first part referred to a calculation on the financial impact of the marketing strategy. The second part was about ranking the plausibility of the different opinions of various managers regarding the marketing strategy. In this case, the first part of the task was evaluated by correctness of the calculation, and the second part evaluated by a judgment of experts. This allowed testing each one of the three problem structures with participants showing rational and/or intuitive decision-making styles (Figure 4).

Figure 4: *Design of the Empirical Experiment*



Source: Authors

According to the causal model (Figure 1), the time consumed to perform the decision-making tasks (as an indirect indicator for costs, assuming that "the longer it takes to come to a solution, the more costly it is") would be the measurement of the variable to track the material efficiency dimension. Thus, the time consumption

to fulfill a certain task would provide information about the material efficiency. The formal efficiency was tracked by comparing the results of the various problem solutions of the participants with the optimal results. As the well-structured tasks, by definition, were tasks that could be solved quantitatively by a mathematical algorithm, the indicator for an optimal result for a well-structured problem task would be a correct figure done by a calculation. For the ill-structured tasks, whereby the problem constellation could not be calculated by a mathematical algorithm and might not provide an objective result, the optimal result was determined by the judgment of academic experts. For the mid-structured problem tasks, which were characterized by having a part within the problem structure and were determined by a calculation that might have no objective solution, the optimal result was a combination of both, a calculation of a figure, and a judgment of experts (Figure 4). The personal (individual) efficiency was tracked with a questionnaire after the participants finished their problem solving task. The questionnaire was chosen as a data gathering method for personal (individual) efficiency measurement which in this case were personal impressions (like satisfaction, self-reflection, etc.) which can be hard or almost impossible to track by simply observing participants in an experimental environment.

Experimental Findings

Based on the laboratory experiment treatments and the resulting data sets, the following statistical procedures were conducted:

1) Computation of means, means distribution and relative frequencies of the overall efficiencies measures in the various decision task structures (well-, mid- and ill-structured tasks)
2) Correlation analyses between various personality trait measures of the experimentees and the decision making efficiency measures in the various decision-making task structures
3) Chi-square-test procedure in order to examine whether decision-making efficiency was either equally distributed among intuitive and rational decision maker or not

The statistical analysis outcomes could be outlined by the following general experimental finding: when solving well-structured problem tasks, the empirical data supported the fact that Thinking types (Figure 5) achieved higher "material" efficiencies than Feeling types. However, Judging types (Figure 6) achieved a higher "formal" efficiency than Perceiving types.

Thinking and Judging types perceived themselves as working more systematically and were more comfortable when solving well-structured problem tasks than Feeling and Perceiving types. This was also in line with the findings of Briggs Myers et al. (2003). They described Thinking/Judging types as logical decision makers whose goal was to impose a logical organizational structure to problems in order to solve them most efficiently. Since there was a significant relationship between the material efficiency and the rational-oriented Thinking types, Hypothesis 3 and Hypothesis 4 can tentatively be substantiated.

Figure 5: *Chi-square-test of T-F Types and Time 1*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	47,199[a]	32	,041
Likelihood-Ratio	25,160	32	,800
Linear-by-Linear Association	5,009	1	,025
No. of Valid Cases	109		

Figure 6: *Chi-square-test of J-P Types and Task 1*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24,627[a]	10	,006
Likelihood-Ratio	23,020	10	,011
Linear-by-Linear Association	3,374	1	,066
No. of Valid Cases	109		

As for ill-structured problem tasks, the empirical data supported no significant results, and there seemed to be no evidence that intuitive oriented types achieved higher efficiency when solving ill-structured problem tasks than rational orientated types. So in this case, the empirical data did not provide substantive results to support H_{01} and H_{05}.

For solving mid-structured problem tasks, the empirical data from the conducted correlation analysis, the mean distributions, and the chi-square-tests provided no significant difference in efficiency measurement between the rational-oriented types (Sensing/Thinking) and the intuitive-oriented types (Intuition/Feeling). So in this case, the data did not provide substantive results to confirm H_{02} tentatively. Complimentary intuitive and rational personality types, however, (ENTJ, INTP and ESTJ) seemed to achieve significantly higher overall efficiencies (Figure 7) when solving problem tasks.

Generally, it can be stated that there was no sustainable empirical substantiation allowing for the existence of concise "linear" functions between rational/intuitive reasoning and decision-making performance. However, there seemed to be a perceivable relation between intuitive versus rational personality traits and the degree of self-satisfaction with the decision maker's performance in well-, mid- and ill-structured tasks.

Tentatively the following findings and conclusions can be summarized:

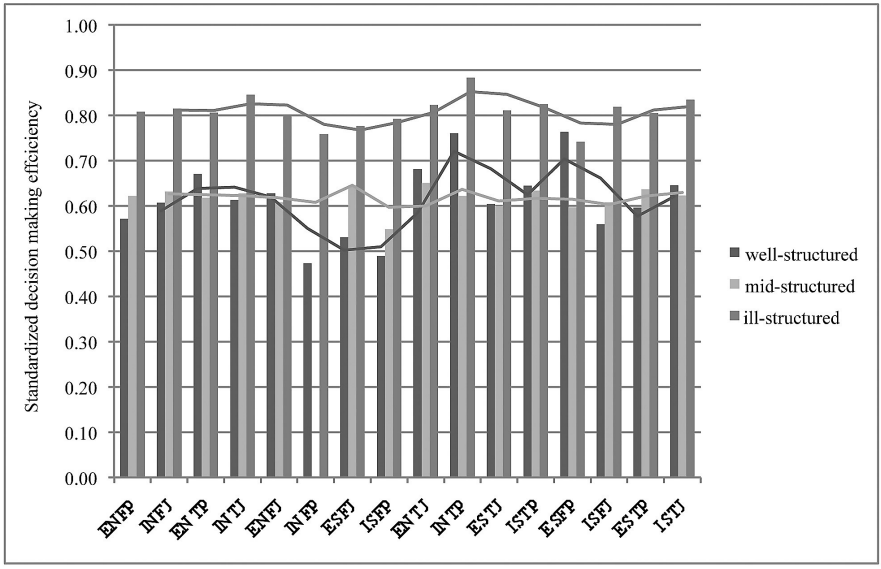
1) The statistical procedures of a correlation analysis (Weiber & Mühlhaus, 2010) and chi-square-test were conducted in order to find out whether there was any relationship between the degree of intuition response rationality (as the independent variable) and the task fulfillment efficiency (as the dependent variable), response, where the expected distribution of task

fulfillment varied between more intuitive decision makers and more rational decision makers.

2) Generally, the were some significant results in the correlation analysis. However, very weak relationships existed between the various degrees of the intuition/rationality indicators and the decision-making efficiency degrees in well-structured, mid-structured and ill-structured decision-making tasks, indicating that overall the hypotheses could be substantiated, although rational types seemed to achieve tangentially higher decision-making efficiency outcomes within well-structured problem tasks than intuitive types.

3) In particular, former research findings (Neuert, 1987) seemed to corroborate that the "highest" degrees of decision-making efficiency could be achieved by a "pertinent blend" (Figure 7) of intuitive and rational personality traits in general, especially when in regards to complex strategic decision-making issues.

Figure 7: *The Arithmetic Means of Decision-Making Efficiency Measures Among the 16 MBTI Types*



From an application orientated point of view, the desire for higher decision-making efficiency could lead organizations to compose decision-making teams with an appropriate mixture of more "intuitive" and more "rational" members. This would then "design" the decision process as a "pertinent blend" of the expertise of both; more intuitive and more rational decision-making.

Finally, more research needs to be conducted on the interdependencies of structural elements in decision-making processes (goals, procedures, sanctions, risks, etc.) and on the individual/personal "design" of the decision makers (personality traits, motivation, psychological predetermination, group dynamics, etc.).

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Appendix

Correlations				
			MBTI types 1-16	R^2
formal efficiency well-structured	Task 1 (0-10)	Korrelationskoeffizient	,093	-
		Sig. (2-seitig)	,336	
		N	109	
material efficiency well-structured	Time 1	Korrelationskoeffizient	,005	-
		Sig. (2-seitig)	,961	
		N	109	
formal efficiency mid-structured	Task 2 (0-10)	Korrelationskoeffizient	-,031	-
		Sig. (2-seitig)	,760	
		N	100	
material efficiency mid-structured	Time 2	Korrelationskoeffizient	-,053	-
		Sig. (2-seitig)	,600	
		N	99	
formal efficiency ill-structured	Task 3 (0-10)	Korrelationskoeffizient	-,044	-
		Sig. (2-seitig)	,652	
		N	106	
material efficiency ill-structured	Time 3	Korrelationskoeffizient	,192*	,037
		Sig. (2-seitig)	,047	
		N	107	
individual efficiency well-structured	PE1	Korrelationskoeffizient	-,186	,035
		Sig. (2-seitig)	,053	
		N	109	
total efficiency well-structured	Total1	Korrelationskoeffizient	,068	-
		Sig. (2-seitig)	,483	
		N	109	
individual efficiency mid-structured	PE2	Korrelationskoeffizient	,015	-
		Sig. (2-seitig)	,887	
		N	98	
total efficiency mid-structured	Total2	Korrelationskoeffizient	,006	-
		Sig. (2-seitig)	,950	
		N	98	
individual efficiency ill-structured	PE3	Korrelationskoeffizient	-,027	-
		Sig. (2-seitig)	,782	
		N	106	
total efficiency ill-structured	Total3	Korrelationskoeffizient	-,025	-
		Sig. (2-seitig)	,798	
		N	106	

*p<0.05. **p<0.01