THE IMPACT OF INTUITIVE AND DISCURSIVE BEHAVIORAL PATTERNS ON DECISION MAKING OUTCOMES: SOME CONJECTURES AND EXPERIMENTAL FINDINGS

Josef Neuert, UAS Kufstein Tyrol, Austria, Andreas-Hofer-Str. 7, A-6330 Kufstein, 0043-5372-71819-223, josef.neuert@fh-kufstein.ac.at; in affiliation with The Health and Life Sciences University UMIT Hall/Tyrol

Mariya Lebedeva, UAS Kufstein Tyrol, Austria, Andreas-Hofer-Str. 7, A-6330 Kufstein, 0043-5372-71819-201, mariya.lebedeva@fh-kufstein.ac.at

ABSTRACT

Decision making behavior, decision making processes and decision making outcomes have been in the focus of business management and economic analysis both from a scientific and a professional angle ever since. Decision making research has particularly emphasized the role of individual and collective conduct in decision making processes related to their outcomes. The paper analyzes the impact of intuitive and discursive behavioral patterns in decision making, and in particular the potential impact of "diverse" personal predisposition on decision making results. The authors test hypotheses which suggest a cause-effect-relation between decision making behavior and decision making efficiency via lab experiments conducted 1980s and 2009. Both investigations show that obviously a "mixture" between intuitive and discursive decision making approaches tend to improve decision making efficiency.

Keywords: decision making, intuition, discursion, efficiency.

INTRODUCTION: RESEARCH INTO BUSINESS DECISIONS AND DECISION MAKING BEHAVIOR – SUMMARIZING SYNOPSIS

A myriad of academic and professional publications has dealt with the phenomenon of "human decision making", particularly emphasizing individual and/or collective behavior in decision making processes for decades. Already Immanuel Kant refers to the way human decisions should be conducted, by pointing out behavioral instructions in his categorical imperative, demanding to "act along the guideline, based on which (one) wish(es) that it should become a general law" [31].

Whereas the categorical imperative stresses the underlying norms, human behavior should be based on, decision making and decision making processes as a research topic have been looked at in a multi-fold manner, especially focusing on analytical, theoretical, explanatory, exploratory and empirical aspects, intensively and extensively [11] [9] [7] [15] [25] [4]. The list of relevant publications could be continued nearly endlessly, however, the major areas of decision research are comprised of the following: People, situations and contexts, goals, quantitative and qualitative aspects, heuristics, efficiency and outcomes, timing and processes [35].

Either implicitly or explicitly, the issue of rational vs. irrational conduct can always be observed in the forefront of decision making research. Fehr and Ockenfels, for example, have recently demonstrated that in reality human beings are neither as efficient nor as rational as classical and neo-classical economists suggest in their various models [16] [8]. Thaler and Sunstein deal with the problem how to improve decisions in various areas of the society and the economy, and come to the conclusion that "nudges" indeed increase the efficiency of decisions, also in a socially preferred manner [51].

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Kagel and Roth examined degrees of rationality and empirical anomalies in individual decision making, particularly focusing on judgment issues and choices, and uncertainty. They, too, demonstrate that the "classical" notion of the "rational man" (homo oeconomicus) in decision making processes can no longer be maintained [30].
Generally, decision making research can be divided into three major areas: Normative or prescriptive decision theory, descriptive or explanatory decision theory, and empirical decision theory as the field, where prescriptive and descriptive theory either clash or comply [37] [27].
Prescriptive and normative decision theory have developed rules, tools, models and heuristics for decision making behavior (i.e. rules for decision optimization, decision support models, decision tree, decision matrices, etc.).
Descriptive decision theory has discovered behavioral patterns in problem solving processes, like fairness and reciprocity, special effects like endowment, asymmetric information, loss aversion and specific biases [28].
Empirical decision theory, especially experimental economics, have dealt with various hypotheses of rational conduct in decision making processes and have disclosed numbers of ambiguous behavioral patterns in decision making processes (which is especially pointed out in Kahneman's and Tversky's prospect theory, 1979).
In sum, decision making theory is still one of the most preeminent fields of business and economic research, both in a theoretical and empirical context. In particular, the issue of rationality is still being investigated from various angles, with a strong focus on the potential dependence between decision making rationality and decision making efficiency. Pars pro toto, Neuert (1987) has come to the empirically proven conclusion that in the context of business decision making tasks, the utilization of decision heuristics tends to improve the outcomes of semi-structured problem solving processes on the one hand. But also on the other hand, it was found out that human behavior in decision making processes never shows a pattern of "full" rationality, but moreover a limited frame of rationality [43], in particular combining "intuitive" and "discursive" elements of decision making behavior, can also lead to sufficient decision making results.

INTUITION VS. "DISCURSION" IN DECISION MAKING PROCESSES – THEORETICAL BACKGROUND AND BASIC THEOREM OF CONDUCT

In a basic research study into managerial planning and decision making behavior and its impact on decision making efficiency, Neuert investigates potential cause-effect relations between human conduct in decision making processes, measured by degrees of rationality, and respective decision making outcomes [35]. In addition, a specific research question was formulated, trying to find out whether "intuition" and "discursion" as pre-dispositions of individual personality and behavior do have an impact on the degree of rationality in decision making processes and thus also on decision making efficiency. This research question is, with a time gap of 20 years, again in the focus of the paper.
Classical and neo-classical models of human behavior in business transactions are characterized by the image of individuals as the "homo oeconomicus", the rational man [46] [50]. The rational man possesses "a complete and consistent system of preferences which allows him to choose (advantageously) among alternatives available; he always knows completely what the alternatives are; there are no limits for the complexity of his rationale in order to find out which alternative is the optimal one; probability calculations are neither scary nor puzzling to his mind" [44, pp. 24 et sqq.].
In the meantime, additional research has convincingly proven that such an illusion of human behavior does not exist at all. In a number of publications it has been demonstrated that limited rationality and even sometimes obvious irrational behavior can be observed in decision making processes and business transactions. Effects like fairness, reciprocity, endowment, biases like loss dominating aversion,

emotions etc. do play a preeminent role in decision making and business transactions [4] [23] [3]. On the other hand, there have been tendencies in social science trying to reduce human reasoning and behavior solely to being based on affective impulses [5] [6].

More recently, questions have been raised whether human beings are at all capable to act goal-oriented, rationally reasoning and pro-active, or whether our entire behavioral patterns are based on "depth psychology", which triggers human reaction by environmental stimuli. It is claimed that, in this sense, unconsciousness and sub-consciousness determine all our decisions and actions [49, p. W4]. In particular, latest research efforts in the area of "neuroeconomics" intensively deal with the issue, to which extent neurological pre-disposition is responsible for decision making behavior and our actions and transactions [40, pp. 33 et sqq.]. It seems that the entire scientific discussion about the dominating forces for human decision making can be placed into a continuum with the two extremes, the "homo oeconomicus" on the one hand, and the "homo irrationalis" on the other hand. Reducing human decision making solely to the one or the other end has been called an "act of schizophrenia of social science" by Herbert Simon [44, p. 29].

The state of the art of decision making research represents the notion that neither the entirely rationally acting homo oeconomicus nor the homo irrationalis, solely "inspired" by unconscious stimuli and emotions, do exist in "pure" form. However, it seems to appear plausible to work under the assumption that there are different "layers" of decision making behavior, varying in between the extremes of a 100% degree of rationality and a 100% degree of subconsciously driven conduct [35, pp. 67 et sqq.]. This presumption means that human behavior (in decision making processes) will never occur in form of a constantly complete rational design in the sense of "optimal conduct", nor totally irrational in a sense of affect-driven actions.

To specify this notion, we have to determine more precisely the intension and the extension of the meaning of rationality. Simon says that the degree of rationality of an action depends "on the process which leads to it" [42, pp. 2 et sqq.].

In addition, following Max Weber, we understand "rational behavior" as an action based on consciousness, future orientation, critical reasoning, structuring of the problem and consistency of underlying norms of action [53].

In this context, still the question remains which role "intuition" and, on the other extreme, "discursion" actually play in decision making processes. "Discursion"-based behavior can be characterized as "passing from one topic to another" and - interestingly (!) – "proceeding to a conclusion through reason rather than intuition" [57].

Whereas the term "discursion" comes close to what we understand from "rational conduct", the term "intuition" appears much more vague and undetermined. Indeed, intuition has been dealt within social sciences under a myriad of different and often contradictory perspectives, leading to Fiedler's conclusion that "there are nearly as many definitions and (implicit) meanings of intuition as there are researchers involved" [17]. Moreover, Fiedler points out that intuition is supposed to imply meanings like unconscious, emotional and affective, spontaneous, without any external stimulus, and instinctive [17]. Also, in recent times, frequently the idea of the "gut feeling" has been cited in order to describe and explain intuitive human behavior in decision making processes.

Fiedler tries to elaborate a scientific approach for the phenomenon of intuition as a behavioral pattern. In his explanation, intuition can be characterized as a "kind of a 'hidden' platform of informational knowledge, based on learning processes" [17]. In addition, he points out that the preciseness of intuition-based information activation is correlated with the volume of the "learning sample". In this sense, intuition can be defined as "a small sample" of repeated learning processes. The Figure 1 illustrates Fiedler's approach:

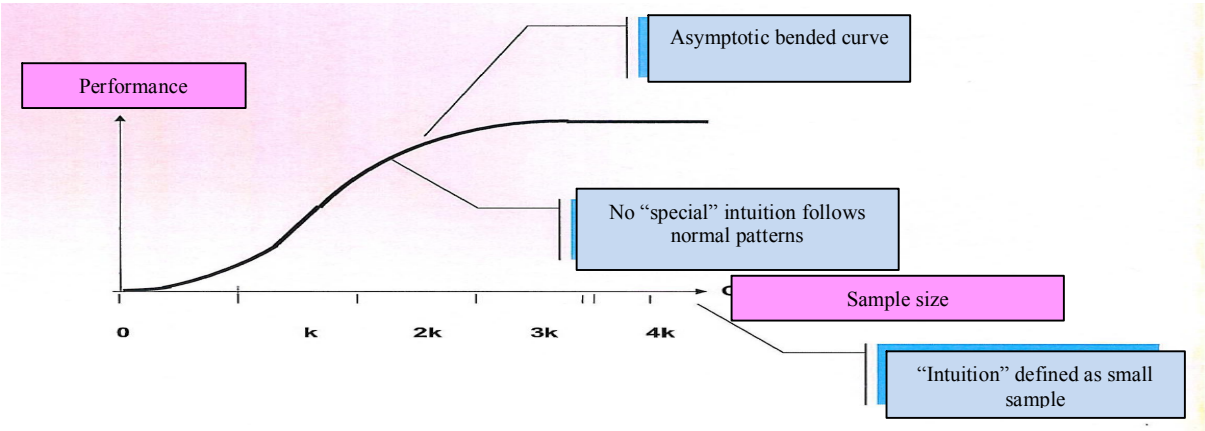


Figure 1. Fiedler´s approach (Fiedler, 2009)

Still, the question needs to be answered, when and why "intuition" occurs in decision making processes and research. In particular – in this context – it needs to be clarified whether individual personality respectively personal pre-disposition contributes to the degree of "intuitive" versus "discursive" behavior in decision making processes.

Kurt Lewin generally characterizes human behavior as an interplay between the person and its environment. These conjectures are summarized in his "psychological field theory": "In psychology, one can primarily distinguish between a person (P) and its environment (E) in a situational context. The extent of one or the other element, which certain behavior depends on, varies tremendously. In principle, however, this psychological phenomenon depends on the predisposition of the person and its environment. So far, we can utilize the formula B (=behavior) = f(S=situation). Behavior (B) can describe any psychological activity as the function B=f(P, E)." [34, p. 34]

Based on this "programmatic equation", we formulate a cause-effect-relation between behavior (as a dependent variable), and personality and its environmental context (as the independent variables). Given this notion, we can investigate whether and to which extent certain observable personal traits and observable environmental situations have an impact on the degree of rational decision making behavior.

Before we work deeper into the depth of this theorem, in the following we try to demonstrate the relevance of the actual discussion, whether intuition and/or discursion as behavioral patterns in decision making processes should be researched into and should be further worked on, in order to improve human decision making and business transaction behavior.

The Centracon Study about strategic IT-decisions tries to find out about the impact of intuition on the actually chosen courses of action. In a sample of 288 organizations with revenues of more than € 100,000.- p.a., decision makers were asked, "how high they estimate on an average the portion of intuitive assessments in their decisions". Nearly 60% answered that more than half or around half of their "final" decisions have been influenced by intuition [56]. In various other publications, intuition is considered as an important or even dominating element as far as the efficiency of decision making is concerned. Wunderlich points out that "intuition doesn't have anything to do with emotional 'fiddling'. Also it isn't in any manner related to para-psychological competences" [55], just the opposite. Modern neurological research has found out that intuition is based on complex processes in the brain, which without "exact" consciousness can contribute to sufficient decisions and pertinent problem solving.

This leads to the conclusion that the "dictation of logic" should be seriously reflected and the "potentials of intuition" should be unlocked and discovered in order to come to sound decision making results [55]. Finally, Wunderlich quotes Albert Einstein: "An intellectual mind is basically not very active on our road of exploration. There is a phenomenon in our consciousness, call it intuition or whatever, and the solution comes to you, and you don't know how and why." [55].

Gerd Gigerenzer, a German business and economic psychologist, has done intensive research into "the intelligence of the unconsciousness and the power of intuition" [21]. He refers to the usual way of decision making in business transactions, where "pros" and "cons" have to be listed and weighed up against each other [21, pp. 49 et sqq.]. This approach, in his view, is logical, but assumes that human intelligence works like a computer [22]. In his opinion, logic is only one of many tools of intelligent problem solving. In many more cases, we rely on our "gut feelings", meaning that we decide intuitively (ibid.). "Gut feelings are the result of simple heuristics. These heuristics often don't come to our consciousness and quite often they are based on only one reason. Nevertheless, intuitive decisions are not only more economical and faster, but often also simply better" [22]. In addition, Gigerenzer clarifies that human decision making needs both, "the head and the tummy". With "tummy", he means intuition and with the "head", he means discursion. Human decisions are based on different tools, which our brain provides. Some are more on the intuitive side, others are more on the discursive side [21].

On the other hand, there are also publications which represent a sustainably skeptical attitude towards the power of intuition in decision making processes. Straub raises the question, whether the belief into the efficiency of intuition can still be maintained at all [48, p. 3]. He also refers to the actual financial and economic crisis, asking whether the enormous dimension of the crisis could have been avoided or reduced, if banks, organizations, managers, rating agencies, etc. would have had much better information platforms available [48]. In sum, Straub develops a plea for "management by mathematics", based on the following rationale: Decision making needs better analytical fundamentals, and decision makers should much more frequently use mathematical methods and models, in order to improve the IQ of their organizations sustainably, ultimately meaning to strengthen their 'empirical basis' [48].

A study of Anderson analyses the question: "Intuition in managers – are intuitive managers more effective?" [2]. This study was comprised of a sample of 200 managers from 8 companies. The concept of intuition measurement in this study was based on Jung's typology.

As a result, Anderson points out that intuition still appears to be related somewhat to organizational effectiveness, meaning that several managers are mostly intuitive decision makers. However, whether intuitive managers are more effective than discursive ones, "remains to be seen" [2].

Sjöberg conducted a study, labeled "Intuitive vs. analytical decision making: Which is preferred?" [45]. His investigation examines the preferences for intuitive against analytical decision making. The findings were related to perceived control, and into the risks and chances of negative and positive outcomes of the decision, respectively. Control was found to be positively related to the preference for an intuitive mode of making decisions. It was also found that the preference for an intuitive mode of decision making was mostly found in private consumer decisions, the outcomes of which were also seen by the decision makers as being most accessible to their own influence. In particular, judgments made by professionals, not directly affected by the outcome of decision were regarded as requiring a more analytical approach [45].

Finally, the latest publication of Dan Ariely with the title "Predictably Irrational" should be mentioned. He discusses "the hidden forces that shape our decisions". Ariely strongly refers to those hidden forces as some of the causes responsible for the current economic crisis. He claims that irrational conduct is still a major driving force for human decisions. Ultimately, he tries to answer the question, how the world can recover from an economic crisis. He suggests being constantly aware of account potentially irrational elements of human conduct and, as a consequence, to introduce regulations, based on empirical research results, to further avoid continuous fallacies of scientific knowledge and actual behavior [3].

Last, but not least, Gaeth and Shanteau suggest to strengthen experts' knowledge by reducing the influence of irrelevant information on experienced decision makers, by improving scientists' judgments of risks and by improving expert judgment capabilities, in order to come to better decisions as far individual and societal utility and wealth are concerned [18].

Summarizing all the conjectures, hypotheses and research results mentioned above, we again refer to the primary research question of this paper: to investigate the impact of intuitive and discursive behavioral patterns on decision making outcomes.

In our sense, discursive decision making is characterized by logical and analytical conduct, moving step by step towards a problem solution, "where the steps are taken explicitly" [38]. Based on this, discursion is a purely fact-based and not at all psychologically or socio-psychologically influenced way of decision making, utilizing a high degree of information and proven knowledge for the problem solving process [35]. This notion, of course, is an ideal image, which to this extent, in all likelihood, never occurs in reality.

Intuitive decision making, on the opposite, "does not move ahead in clearly defined steps, but is much more based on an implicit recognition and insight into the entire problem." [38, p. 42].

Westcot characterizes intuition as the "ability to come to pertinent and helpful conclusions, even on the basis of lower explicit information which would be usually necessary to come to this conclusion" [54, p. 98].

In analogy to our characterization of discursive decision making behavior, we can emphasize the following elements of intuitive decision making: Relatively low and small information basis for the problem solving procedure; relatively low transparency and comprehensiveness of the problem solving procedure; relatively short time for coming to a problem solution [35].

It is self-understanding that those typologies of discursive and intuitive decision making simply depict the "polar" ends of problem solving behavioral patterns, referring to a continuum of decision making attitudes in between, neither representing "complete discursion" nor "complete intuition" in decision making processes.

Based on this, we can formulate the following general hypotheses of cause-effect-relations between the degree of discursion/intuition and the degree of "rational" decision making behavior, itself again determining decision making efficiency.

The main research question, underlying this study, is a two-fold one: First, it tries to answer the question about the impact of intuitive vs. discursive (analytical) decision making behavior on the degree of rationality in decision making processes. Second, it is assumed that – based on the outcomes of an experimental study conducted by the main author in the 1980s – a higher degree of decision making rationality results in a higher degree of decision making efficiency.

The following complex of hypotheses sketches the presumed elements of influence on human decision making behavior. In accordance with Lewin, we suppose that decision making behavior is influenced by personality and situation (of the environment). From this statement we deduce the following basic sentence:

- Decision making behavior depends on the personality of the decision maker and the situational context of the decision making process.

By focusing on intuition and discursion as basically dichotomic variables of influence on the degree of rationality in decision making behavior, we develop the following basic hypothesis **A1**:

- If the intuitive personality disposition dominates, then the degree of rationality of decision making is significantly beneath average,

and consequently, basic hypothesis **A2**:

- If the discursive personality predisposition is dominant, then the degree of rationality of decision making is significantly above average.

Hypotheses A1 and A2 refer to the cause-effect relation concerning intuitive vs. discursive personal predisposition and degree of rationality in decision making processes.

In addition, we developed the following derivative hypothesis **B**:

- The higher the degree of rationality of decision making behavior, the higher the decision making

efficiency.

This hypothesis B refers to the elementary cause-effect-relation we developed above, meaning that decision making efficiency ultimately depends on (more or less ´rational´) decision making behavior in general [32, pp. 141 et sqq.] [1, pp. 13 et sqq.] [33, pp. 120 et sqq., pp. 252 et sqq.].

In compliance with the "best tradition" of Popper's "The Logic of Scientific Discovery", we believe that scientific research is not just comprised of the formulation of cause-effect hypotheses, but also of the attempt to empirically substantiate and/or falsify the respective conjectures [39] [10]. This is why in the following we introduce the research design of the empirical study which we conducted, based on an laboratory experiment.

RESEARCH DESIGN FOR THE EXPERIMENTAL INVESTIGATION

In the early 1980s, the author conducted a laboratory experiment, using the business game FINIS as the experimental design. FINIS is a computer-based business simulation which demands periodical business decisions from the participants, competing with each other. At the end of each period, balance sheets, profit and loss accounts, cash statements and profitability indicators were developed to demonstrate the participants' decision making efficiency. Indeed we mean efficiency and not "just" effectiveness (as the degree of fulfillment of goals), because decision making efficiency ultimately, in our definition, pertains to "criteria of accomplishment" (like profitability, satisfaction, sustainability, etc.), occurring as decision outcomes, some of which may have been intended, others not so, explicitly. In addition, participants were asked for the degree of satisfaction they had gained with their own performance and the degree of compliance between their intended performance and the actual performance. As a result, a three-fold set of dependent variables, representing decision making efficiency, was developed.

Participants were observed by trained experimental supervisors in an anonymous manner, registering and documenting the following elements of rational decision making conduct: Goal-orientation, utilization of available information, organization of the decision making process, utilization of decision making heuristics, and continuous reflection and controlling of the respective decision making performance.

As a result, the following "efficiency function", was formulated:

$$\mathbf{DE = f\,(DDR);}\ \text{DE = Decision Making Efficiency} \qquad (1)$$

DDR = Degree of Decision Making Rationality.

More precisely, in mathematical terms it reads [35, p. 309]:

$$\mathbf{b_1y_1 + b_2y_2 + b_3y_3 = a_1x_1 + a_2x2 + a_3x_3 + a_4x_4 + a_5x_5} \qquad (2)$$

[y_1 = formal efficiency, y_2 = material efficiency, y_3 = personal efficiency; x_1 = goal orientation, x_2 = organization of the decision making process, x_3 = utilization of available information, x_4 = utilization of decision making heuristics, x_5 = reflection and controlling].

Formal efficiency represents the degree of actual performance in comparison with the intended performance, the material efficiency represents indicators like profitability, solvency, rankings in comparison with competitors, and personal efficiency represents individual satisfaction of the participants with their performance.

The structural equation depicted above represents a canonical correlation, which was conducted as a statistical analysis of the collected data sets.

All together, 83 participants contributed to the laboratory experiment sample.

65 participants were advanced students of business and management, 18 participants were experienced practitioners.
The participants formed the competing "enterprises", for which they had to make periodical decisions competing on a virtual market against three other "enterprises". In sum, eight periods were conducted, finally leading to the entire data set which was subject to statistical analyses.
The statistical analyses delivered the following results, showing the relation between decision making efficiency as the dependent variable and the "rationality elements" of decision making behavior as the independent variables, achieved via a multiple regression analysis [35, p. 300]:

- Multiple correlation coefficient: 0,82041;
- Multiple coefficient of determination: 0,67307;
- F-value – (in order to find out the level of significance of the correlation coefficient and the coefficient of determination): 30,67558 (with a level of significance of 0,008).

The statistical analysis leads to the conclusion that there is a (statistically) positive relation between decision making efficiency and decision making rationality. However, it can definitely be stated that there is no linear functional dependence being observed, but an (estimated) degressive type of regression function.
The results of the multiple regression analysis were further supported by the procedure of the canonical correlation, showing the following canonical function combination [35, p. 312]:

$$V_1 = 0.12527x_1 - 0.50896x_2 - 0.12082x_3 - 0.38648x_4 - 0.21524x_5 \quad (3)$$

$$W_1 = -0.19679y_1 - 0.91849y_2 - 0.11450y_3 \quad (4)$$

$$r_{vw} = 0.81720;\ r^2_{vw} = 0.66781 \quad (5)$$

All those results allow for the conclusion that there is basically a positive correlation between all the elements of the canonical function V_1 (x_1, x_2,…, x_5) and the variable W_1 with its respective elements.
Again, it has to be pointed out that there is no linear function observable between the degree of decision making rationality and the decision making efficiency, but a "depressively bended" form of dependency.
The main research question of our empirical investigation, however, tries to discover a potential cause-effect-relation between intuitive vs. discursive decision making behavior and decision making efficiency. Since intuition and discursion are extremely hard to observe even in a laboratory experimental environment, we had to develop an "indirect" set of indicators, finally allowing some conjectures about the cause-effect-relation between intuition vs. discursion and decision making efficiency.
Before the beginning of the laboratory experiment, all participants were subject to the "Gray-Wheelwright-Test", which is also called the Jungian Type Survey [26] [24].
The Gray-Wheelwright-Test is based on a questionnaire referring to personality characteristics in order to determine so-called Jung typologies of "bi-polar" attitudes, measured in the categories extraversion/introversion, intuition/recognition, thinking (discursion) /feeling.
The questionnaire consisted of 81 items. As a result, by combining the elements of intuition/discursion with the dichotomic auxiliary elements thinking/feeling and introversion/extraversion, the following scale of discursive vs. intuitive personal predisposition could be developed: Discursion 1st degree, discursion 2nd degree, discursion 3rd degree, discursion 4th degree vs. intuition 1st degree, intuition 2nd degree, intuition 3rd degree and intuition 4th degree.
Those eight basic types of personality traits could be derived from the Gray-Wheelwright-Test scores.
Thus, independent variables could be operationalized and measured on a scale from 1 to 8 (1 meaning "full" degree of intuition, and 8 meaning "full" degree of discursion).
The dependent variable was represented by the degree of rationality gained from the data set of the experimental observation on a scale between 0 and 5 (0 meaning no rational decision making conduct at

all, 5 meaning "total" rational decision making behavior).
Using the dependent and independent variables and their measurement described above, a correlation analysis was conducted to test hypothesis A1, leading to the following result (Table 1):

Table 1. Correlation Analysis [35, p. 281]

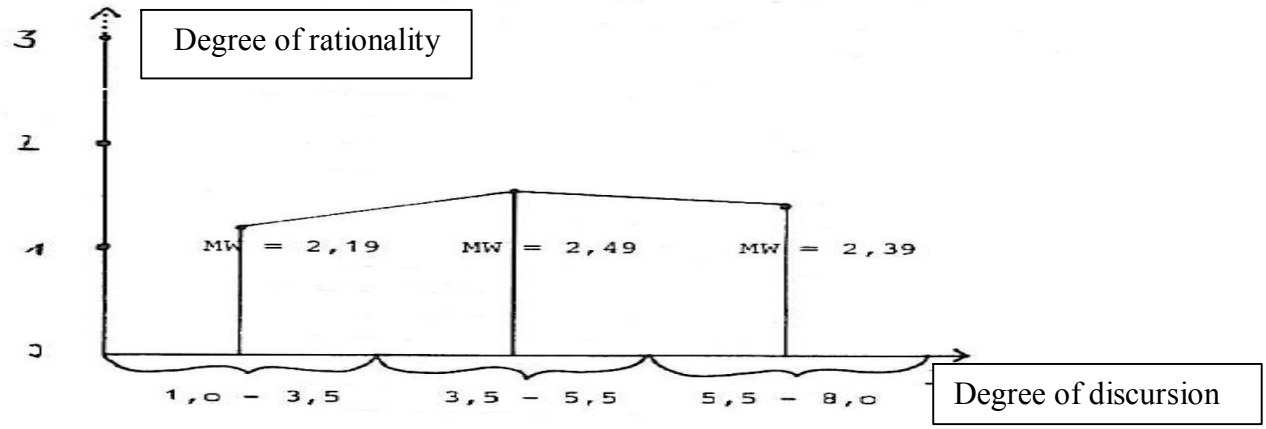
	Degree of rationality	X_1	X_2	X_3	X_4	X_5
Coefficient	0.0055	-0.1266	-0.0700	0.1656	0.0053	-0.0158
Cases	160	160	160	160	160	160
Significance	p=0.472	p=0.055	p=0.190	p=0.018	p=0.474	p=0.421

The statistical analysis clearly shows there is no cause-effect relation between the increase of decision making rationality and the degree of intuition/discursion as a personality predisposition of the decision makers.
Moreover, a closer in-depth analysis shows that those participants (decision makers) demonstrated the highest mean concerning the degree of decision making rationality, who were placed nearly precisely in the middle of the spectrum between "complete intuition" and "complete discursion". Table 2 depicts the respective data-set:

Table 2. Cause-Effect Relations [35, p. 282]

Degree of intution	**Degree of rationality**
1.33	2.60
2.75	1.79
3.75	2.44; 2.09
4.25	2.06
4.40	3.07
4.67	2.83
4.75	2.28
5.13	2.29
5.25	3.12
5.37	2.28
5.50	2.09
5.67	2.02
6.00	2.86
6.50	2.43
6,87	2.28
7.13	2.15; 2.16
7.25	2.63
7.63	2.37

In addition, a graphical figure also reports the described impression [35, p. 283]:



In sum, we could conclude from our 1980's laboratory experiment that neither "extreme" discursive decision making behavior, nor "extreme" intuitive decision making behavior contributes significantly to decision making rationality and via that to decision making efficiency.
Moreover, a "sane mixture" between intuitive and discursive elements in decision making processes appears to be a sustainably successful prerequisite for efficient decision making [35, pp. 281 et sqq.].
With a time delay of more than 20 years, in 2009, the laboratory experiment on the cause-effect-relations between intuition vs. discursion in decision making processes and the respective decision making efficiency was repeated (based on a somewhat different lab experiment – design see below), trying to either replicate the empirical findings of 1980´s study or to falsify them.
The empirical design of the 2009 experimental investigation was comprised of the following elements:

- Main research question: Is there an impact of intuitive vs. discursive decision making behavior on the decision making outcomes?
- Laboratory experimental sample: 115 graduate students in Master's programs of Business Administration, International Management, Sports-, Cultur- and Eventmanagement, Facility Management at a German University of Applied Sciences and an Austrian University of Applied Sciences.
- As the experimental design, the NASA game was utilized. The NASA game represents a decision making situation in an imaginative urgency (see attachment). The participants had to present their solution for this task, which was in the end "contrasted" with NASA´s optimal solution.
- The participants had to act individually, independently and without any support and/or discussions with other participants. They were not given a time limit, but the actual time they needed to come to a complete solution was recorded.
- After the conclusion of the problem solving process, each participant was asked to fill in a questionnaire, either based on the Gray-Wheelwright-Winer 4-letter Type Indicator Test (based on Jung's typology theory) or the Myers-Briggs-Type-Indicator Test, which similarly deals with personality patterns like the Gray-Wheelwright-Winer-Test, as there are extraversion/introversion, sensing/intuition, thinking/feeling and judging/perceiving.
  The Gray-Wheelwright-Winer 4-letter Type Indicator Test is a modified version of the Gray-Wheelwright-Test, which was used in the 1980s experiment, described above.
  Recently, both test apparatuses were subject to reliability and validity investigations [12] [41]. Those studies came to the following main conclusions:
  1. The study of Schaubhut/Herk (2009): The correlation coefficients as the test/re-test reliability indicator of the MBTI Test were higher than those of the Gray-Wheelwright-Winer Test, ranging from 0.61 to 0.89 with an 8-week time period [41, p. 6].

2. Davis/Mattoon's study: The Gray-Wheelwright-Winer Test is one of the few tests especially designed to measure Jung's concepts of extraversion/intraversion, sensing/intuition, thinking/feeling and judgment/perceiving. It can be regarded as one of the best test instruments available. But the T/H scale has limited reliability and validity [12, p. 238].

- Eventually, a correlation analysis was conducted to find out about a potential dependency between the decision making performances in the NASA game and the operationalized indicator results of the intuition/discursion personality tests. The analysis' results and their accordance or divergence from the 1980's empirical findings are reported in the following chapter.

EMPIRICAL FINDINGS AND MODEL REFINEMENT: THE SEMI-DISCURSIVE RATIONALE - SDR

Once more, the basic hypotheses of the underlying research questions are formulated as follows:

- Intuitive/discursive personality traits do have an impact on decision making behavior and decision making efficiency.
- If decision makers show a significant intuitive/discursive personal predisposition, then the degree of rational decision making behavior is significantly below/above average.
- Since the hypothesis concerning the positive cause-effect-relation between rational decision making behavior and decision making efficiency in the business management context has been substantiated, we now propose that intuitive/discursive personal predisposition ultimately leads to a lower/higher decision making efficiency.

At first, referring to the experimental design (NASA game), we develop the indicator for decision making efficiency as follows (formula 6):

$$Efficiency = \frac{x_i / \bar{x}}{t_i / \bar{t}} \qquad (6)$$

Where:
X_i – the sum of points (got in NASA play) of i-person
$\bar{x}$ - average result (n=115)
t_i - total time needed for decision making by i-person
$\bar{t}$ - average time (n=115)

$$X_i = \sum_{j=1}^{15} [\,|X_j - X_{opt}|\,] \qquad (7)$$

X_{opt} – an optimal solution developed by NASA experts*

* The best result achievable is 0 points (if everything is right, that means NASA´s optimal solution), the next best result is 2 points, the worst result is 112 points. Theoretically there are 15! combinations.

Secondly, we want to find out, whether the laboratory experimental design shows an acceptable level of empirical validity and reliability. To achieve that, we tested the empirical distribution of the variables "decision making results", "time needed for decision making", and "decision making efficiency" against the theoretical normal distribution. The procedure led to the following outcomes (Figures 2-4):

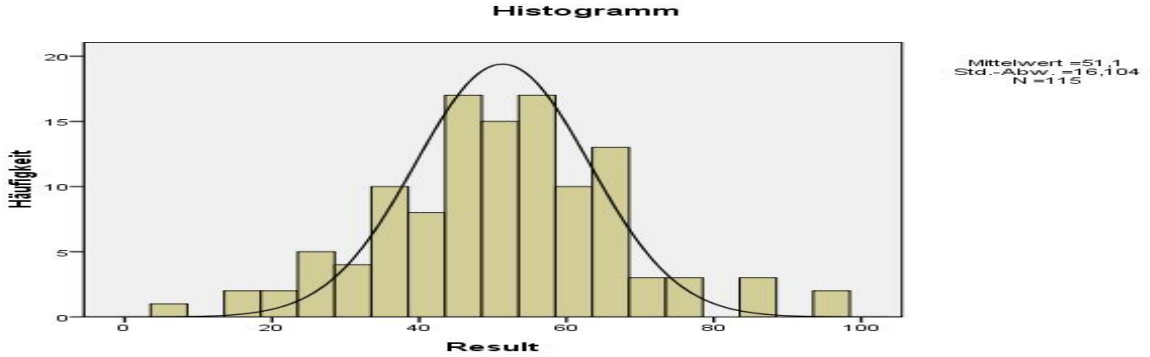


Figure 2. Distribution of variable "Result" (X_i)

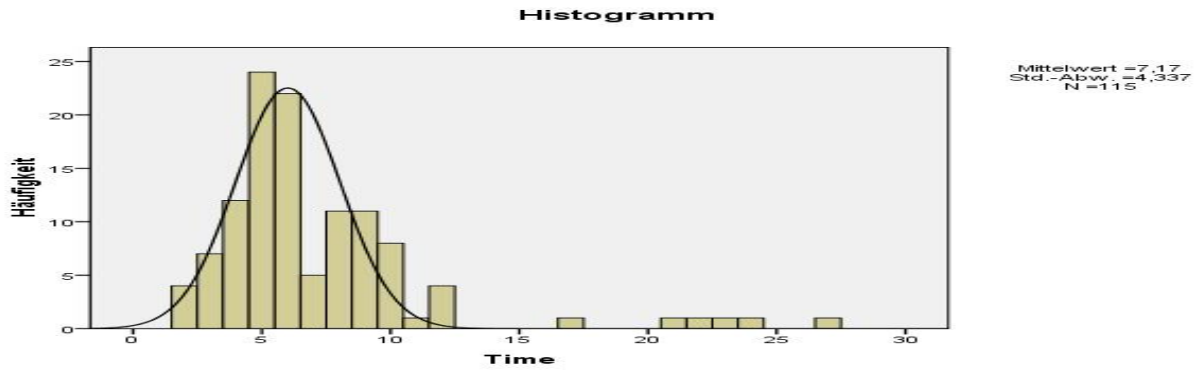


Figure 3. Distribution of variable "Time" (t_i)

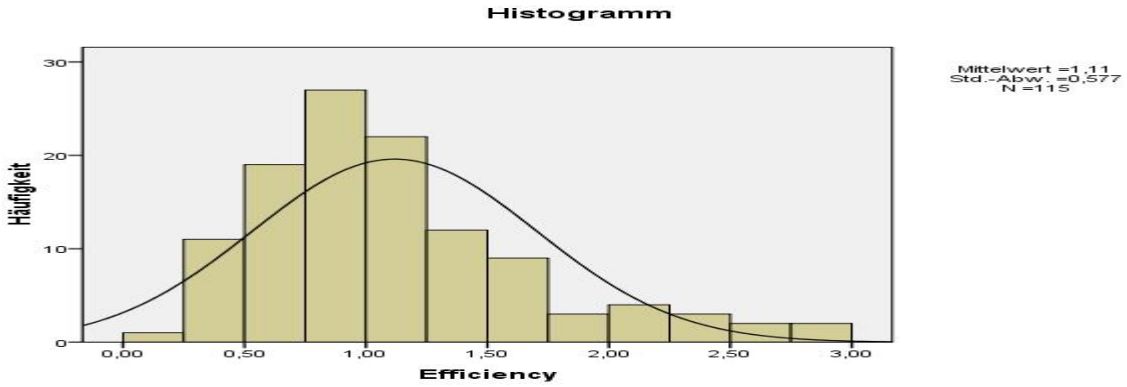


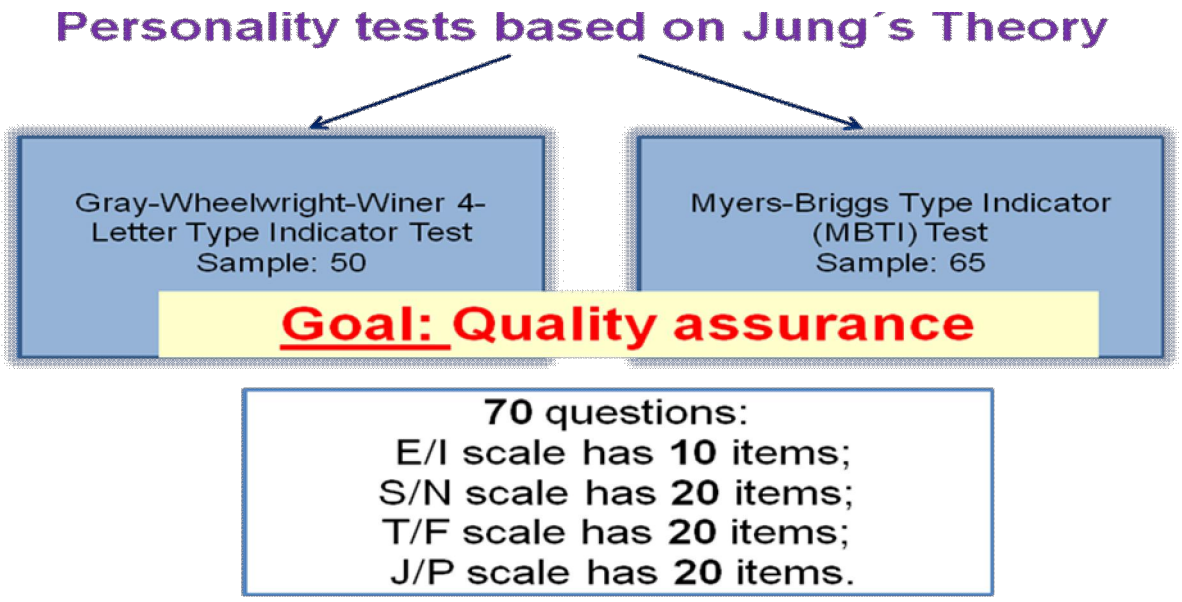
Figure 4. Distribution of "Efficiency"
German "Haeufigkeit" = engl. frequency

The empirical normal distribution against the theoretical normal distribution for the variables "decision making results" and "time needed for decision making" was tested for both questionnaire batteries, the Gray-Wheelwright-Winer-Test and the MBTI-Test (via Kolmogorov-Smirnov Test). As a result, it can be stated that the variables "decision making results" (p=0,921) and "decision making efficiency" (p=0,065) demonstrate a sufficient pattern of a normal distribution (whereas this statement cannot be substantiated for the variable "time" – p=0,000).

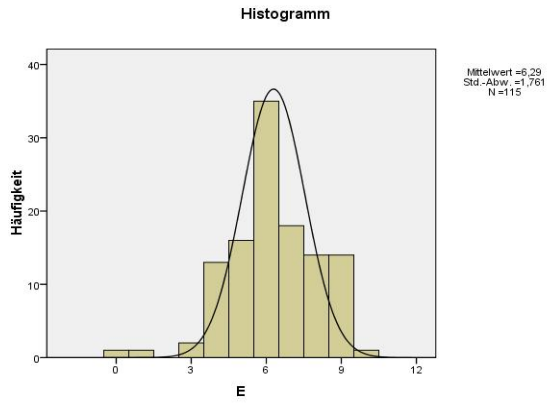
An identical procedure was conducted for the categories of the Gray-Wheelwright Test and the MBTI-Test, which are designed to identify the following personality characteristics referring to the determination of significantly strong intuitive or discursive individual predisposition:

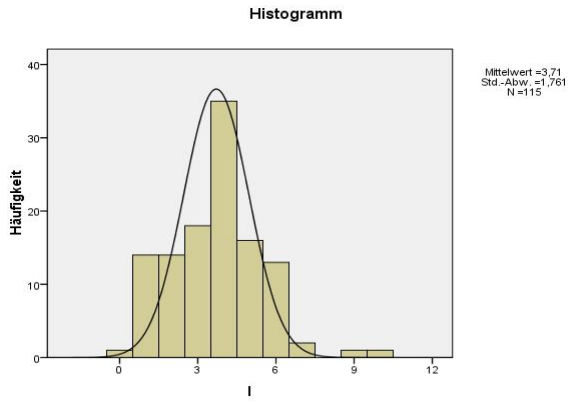
- Extraversion (E) vs. Introversion (I),
- Sensing (S) and Intuition (N),
- Thinking (T) and Feeling (F),
- and Judgment (J) and Perception (P).

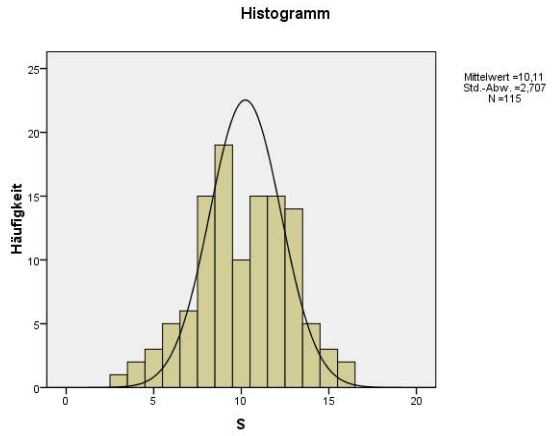
The Gray-Wheelwright-Winer Test and the Myers-Briggs-Type-Indicator are both based on Jung's personality theory. The underlying questionnaire battery can be characterized as follows:

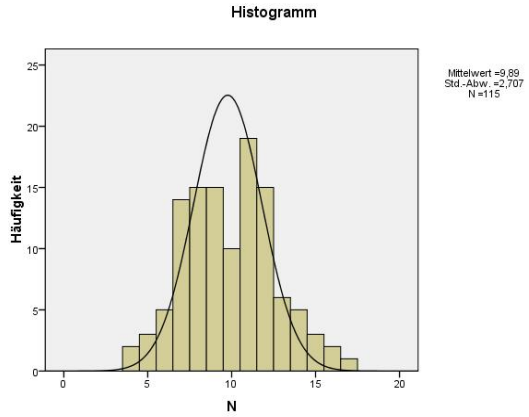


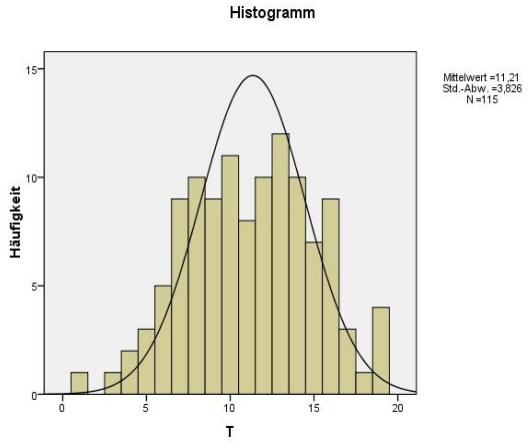
The test procedure of the empirical distributions against the theoretical normal distribution showed the following results:

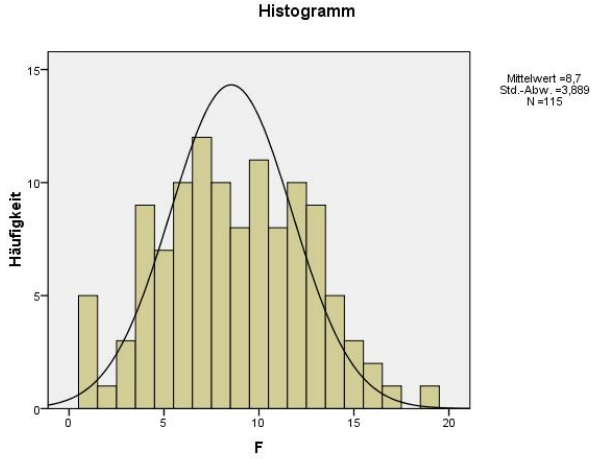


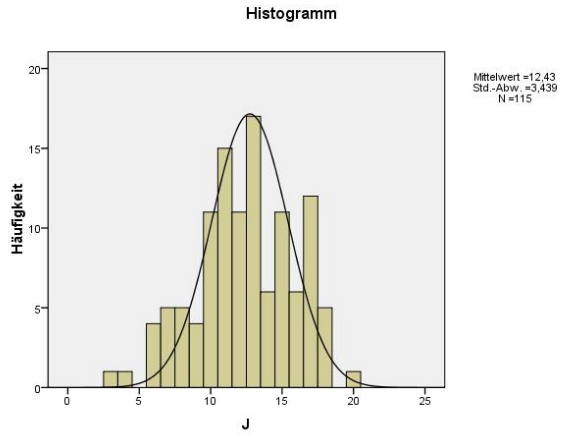


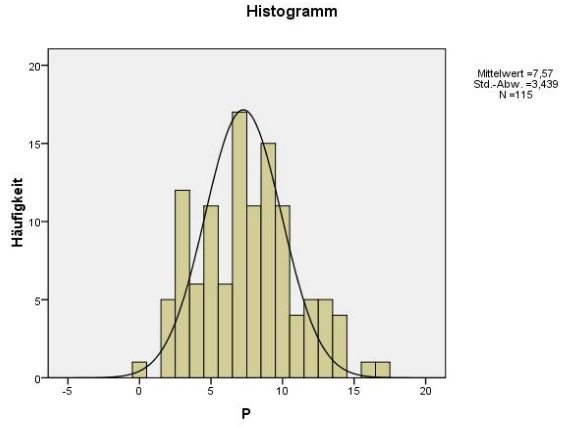








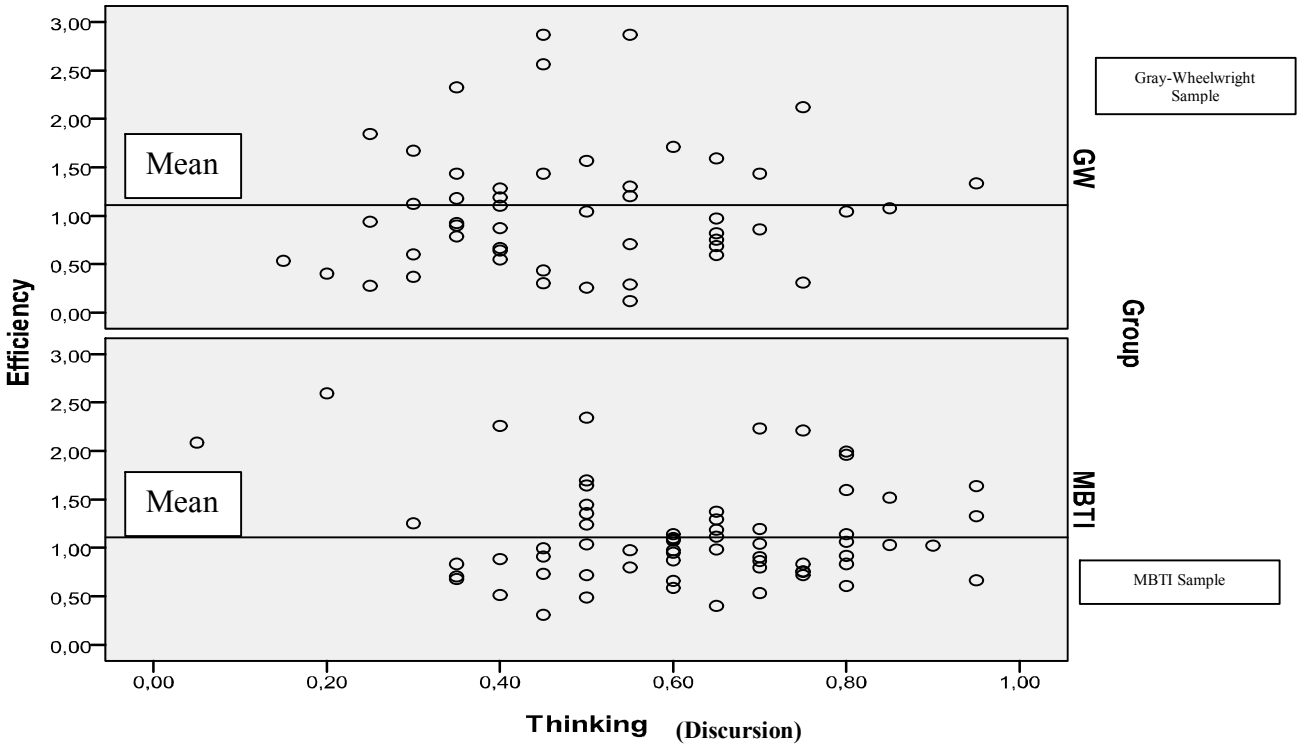




All of the categories tested via the Gray-Wheelwright-Winer Test and the MBTI (extraversion/introversion, sensing/intuition, thinking/feeling, judgment/perception) show a sufficient pattern of a normal distribution. It can be concluded that this result provides no reason to reject the basic notion of validity and reliability of both test procedures as far as the "discovery" of personality traits in the laboratory sample is concerned.

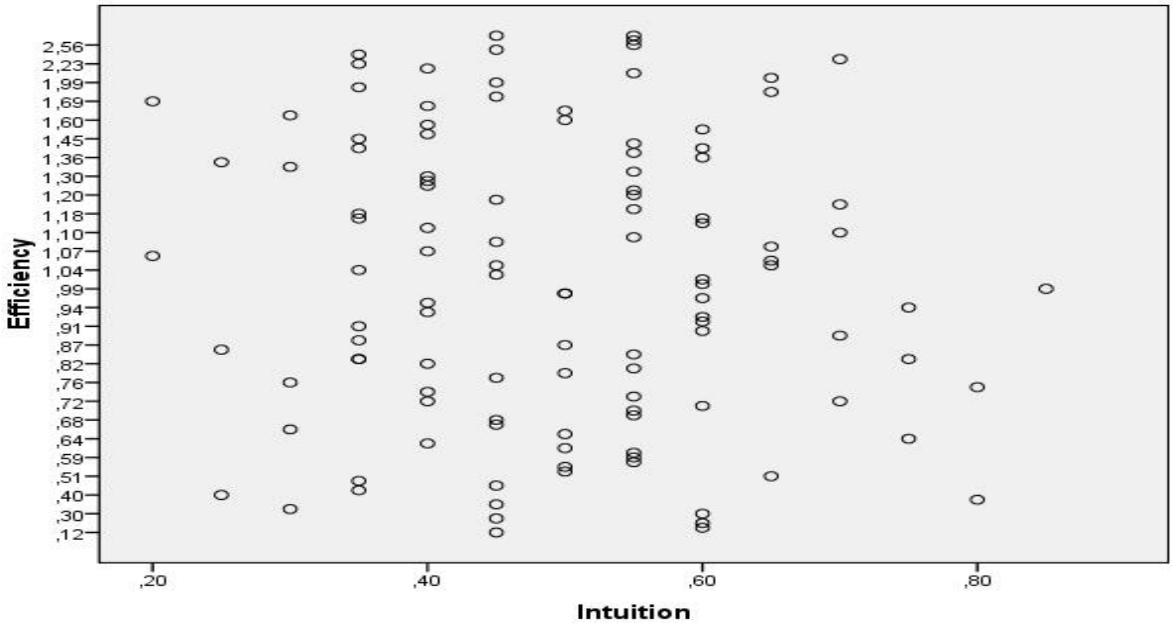
Finally, the "decisive" statistical analysis was based on a correlation analysis in order to find out whether there is a significant statistical relation between personality traits and decision making

efficiency. First, the correlation analysis includes the independent variable "thinking" (as an indicator for discursive predisposition) in relation with "decision making efficiency" as the dependent one. The results are the following (depicted in a scatter diagram below):



The correlation analysis shows no statistical relation at all between "thinking" (discursion) and "decision making efficiency" (correlation coefficient is not significant: r=0.008; determination coefficient r^2 = 0.000064).

In addition, the correlation analysis was conducted for "intuition" as the independent variable and "decision making efficiency" as the dependent variable (depicted in a scatter graph below):



Again, there is no statistical correlation between intuition (feeling) and decision making efficiency (r=-

0.067; r^2=0.0045).
This analysis substantiates our hypothesis that neither an intuition biased personality complex nor a discursion biased personality complex achieve the highest scores of decision making efficiency. Moreover, best efficiency scores are somewhat concentrated in the middle between intuition and discursion. Thus, the findings of the 1980s experimental study can be corroborated and considered as replicated.
Finally, a correlation matrix was developed in order to find out each single correlation coefficient between the personality trait categories as independent variables among the categories themselves. The results are as follows:

	E	I	S	N	T	F	J	P
E Correlation (Pearson)	1	-1.000**	.063	-.063	.186*	-.154	.156	-.156
Significance		.000	.503	.503	.046	.100	.095	.095
I Correlation (Pearson)	-1.000**	1	-.063	.063	-.186*	.154	-.156	.156
Significance	.000		.503	.503	.046	.100	.095	.095
S Correlation (Pearson)	.063	-.063	1	-1.000**	.359**	-.336**	.450**	-.450**
Significance	.503	.503		.000	.000	.000	.000	.000
N Correlation (Pearson)	-.063	.063	-1.000**	1	-.359**	.336**	-.450**	.450**
Significance	.503	.503	.000		.000	.000	.000	.000
T Correlation (Pearson)	.186*	-.186*	.359**	-.359**	1	-.971**	.295**	-.295**
Significance	.046	.046	.000	.000		,000	.001	.001
F Correlation (Pearson)	-.154	.154	-.336**	.336**	-.971**	1	-.275**	.275**
Significance	.100	.100	.000	.000	.000		.003	.003
J Correlation (Pearson)	.156	-.156	.450**	-.450**	.295**	-.275**	1	-1.000**
Significance	.095	.095	.000	.000	.001	.003		.000
P Correlation (Pearson)	-.156	.156	-.450**	.450**	-.295**	.275**	-1.000**	1
Significance	.095	.095	.000	.000	.001	.003	.000	

**. Level of significance is 0.01

*. Level of significance is 0.05

Interesting enough, there is a significant positive correlation between the categories sensing (S) and thinking (T), confirming that sensing is a sufficient indicator for discursive decision making behavior. Also, there is a significant negative correlation between "intuition" (F) and "thinking" (T), indicating that there is an obvious distinction between intuitive and discursive personal traits.
Those results allow confirming the plausibility of the correlation analysis results mentioned above.
Since the result of the 2009 laboratory experiment is in line with the outcomes of the 1980s experimental investigation, we can now try to develop a more reality-based scenario for efficient decision making in business transaction processes.
In the following, we outline a new model approach, labeled **"Semi-Discursive Rationale"** for the conduct of decision making processes.
This **SDR-**model is particularly designed for strategic and cost/benefit-oriented business decisions, i.e. personnel decisions, marketing decisions, investment decisions, financial decisions, logistical decisions, etc.
Given the empirical results that, in all likelihood, a pertinent "mixture" between discursive resp.

analytical elements and intuitive attitudes contribute to a high degree of decision making rationality, and thus to a high degree of decision making efficiency, the SDR-model is comprised of the following elements:

- Neuert's 1980s laboratory experiment has revealed that the utilization of (simple) decision making heuristics actually leads to a higher degree of decision making efficiency. [35, pp. 299 et sqq.]

The statistical analysis using multiple regression shows the following "weights of importance" of the rationality elements on decision making efficiency:

- Organization of the decision making process: 0.27281 (mean)
- Goal orientation: 0.2045 (mean),
- Utilization of available information: 0.0920 (mean),
- Utilization of decision making heuristics: 0.2720 (mean),
- Continuous reflection and controlling of the respective decision making performance: 0.1534 (mean).

The figures above show the "weights of impact" of the different elements of decision making rationality (leading to a higher degree of decision making efficiency) on a scale between 0.0 (no impact) and 1.0 (100% impact). The results say that the element "utilization of decision heuristics" ("Entscheiungskognitionsgrad") shows an average weight of 0.2720 which is, together with the "degree of process organization" the most powerful element of rational decision making behavior, contributing to a high degree of decision making efficiency.

- Based on this, we propose to use the tool of the "decision matrix" as basic decision heuristics (Figure 5):

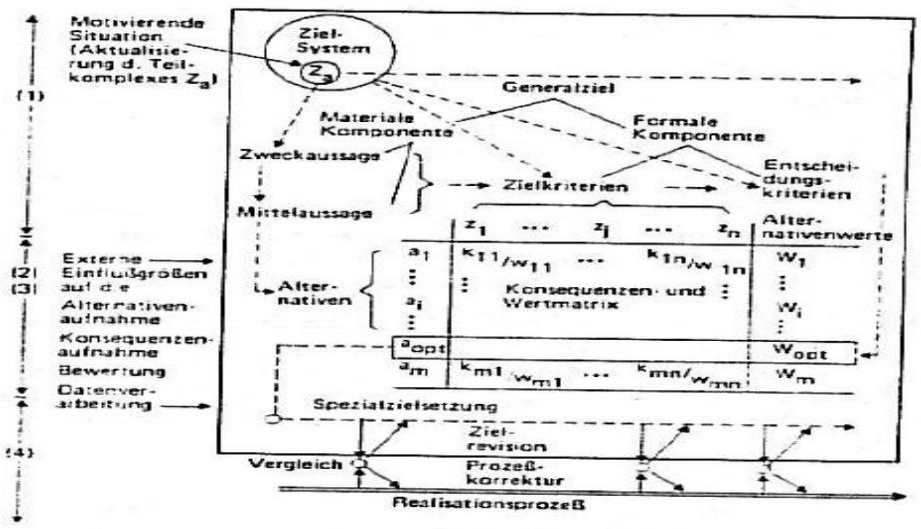


Figure 5. Formal structure of decision making process [13, p. 105]

The decision matrix is comprised of the following elements of "discursive" decision making:

- Set of alternatives,
- set of decision criteria,
- consequences (measures) of all alternatives in combination with the decision criteria,
- algorithm for the calculation of the optimal alternative.

The measurement of the consequences should be based on a decimal scoring system, either utilizing "subjectively" assigned scores between 0.0 and 1.0 or alternatively 0 to 10, or 0 to 100, etc. Thus, an

"overarching" measurement can be achieved for alternatives with different consequences measures.

- In addition, as the second "discursive" element in the SDR model, the following criteria of rational decision making should be worked down on a checklist:
  - Organization of the decision making process,
  - goal orientation,
  - deliberate search for sufficient information,
  - utilization of decision heuristics and
  - continuous reflection and controlling of the decision making results.

Finally, a linear programming procedure, conducted by Neuert in the course of his 1980s laboratory experiment on the relationship between decision making behavior and decision making efficiency, led to the following results, emphasizing the "relevance" of each of the "rationality elements" of decision making, mentioned above [36, pp. 25 et sqq.] (The linear optimization model algorithm was conducted based on the following assumptions:

- Minimization of the decision making input (measured in time needed to come to a decision);
- degree of decision making behavior has to appear significantly above average;
- the given time frame for the decision making process should be standardized to 100 time units;
- since the elements "organization of the decision making process" and "utilization of decision heuristics" show an accumulated relevance weight of about 55%, the time units needed for the organization of the process and the utilization of the decision heuristics has to add up to 55% of the reserved time units).

The linear optimization goal function shows the following form [36, p. 26]:

$$\mathbf{Z = -6{,}25x_1 + 17{,}42x_2 + 22{,}97x_3 - 33{,}24x_4 + 50{,}83x_5 + 76{,}71}$$

[Z = time set for decision making; x1 = goal orientation; x2 = organization, x3 = information, x4 = utilization of heuristics, x5 = reflection and controlling]

- The simplex procedure shows the following standardized results for the relevance of the various elements:
  - goal orientation 0.3536
  - organization of the decision making procedure 0.3768
  - information basis 0.8127
  - utilization of decision heuristics 0.6414
  - reflection and controlling 0.2280

Applied to the assigned decision time frame of 100 time units, this simplex algorithm results would suggest the following "time portions" being reserved to conduct the following procedures:

- Development and determination of a system of goal criteria: 15 time units
- Organization of the decision making process: 15 time units
- Creation of the information basis for the decision making process: 34 time units
- Utilization of decision heuristics: 27 time units
- Reflection and controlling: 9 time units

The computation of time portions represents the relative "weights" of each element.

The procedure described above represents the "discursive approach" in our SDR-model. The next question we will have to answer concerns the utilization of the "intuitive approach", in order to come to an "optimal" solution (based on the experimental findings). Wunderlich points out that the "potentials" of intuition in decision making processes have be unlocked and utilized [55]. In other words, how can intuition or intuitive behavioral elements significantly contribute to the improvement of decision making

efficiency?
In this context, we again refer to Fiedler's scientific approach of intuitive decisions [17]. As a consequence of his conjecture that "rational" intuition is based on learning processes including small samples of learning procedures, he points out that "intuition is not contradictory to analytical decision making…, but intuition can be regarded as a useful benefit coming out of the empirical environment" [17].
Based on Fiedler's works, we suggest the "utilization of intuition" via the following simple framework:

- Each element of the "discursive procedures" described above has to be concluded with the question to oneself based on a semantic differential:
  How certain are you having done the procedure in a satisfactory manner?
  very uncertain *absolutely certain*
  1 2 3 4 5
- After having achieved a "first" optimal alternative, conducting the decision making process described above, the final question to oneself should be added:
  How certain are you that you have come to the right decision?
  very uncertain *absolutely certain*
  1 2 3 4 5

As long as the answer to this semantic differential question does not reach either 4 or 5, the procedure should be repeated within a given time frame. The time frame should have been set at the beginning of the decision making procedure, again based on the intuitive question to oneself:

- How long will I need to come to a satisfactory decision and
- how long am I supposed to need to come to a satisfactory decision.

This **Semi-Discursive Rationale-Model** for decision making may not fulfill satisfactorily the scientific measures one wishes to make a decision subject to. Indeed, the SDR-model is just the first draft of an applied decision making concept, using empirically proven scientific approaches to improve decision making efficiency. Undoubtedly, much more research will have to be conducted in order to elaborately outline the substance of the SDR.
However, as Gigerenzer points out in his monograph "Reckoning with risk – learning to live with uncertainty" [19], "learning to live with uncertainty" may be a first step to at least somewhat enhance the readiness to accept our limited ability to produce "optimal" decisions and actions, individually and collectively.

TENTATIVE CONCLUSIONS

As a summary, we can draw the following tentative conclusions from our analytical and empirical findings:

1. Decision making processes and decision making behavior are still one of the most preeminent research topics in business management, economics and social sciences.
2. The neo-classical notion of the rational man – the homo oeconomicus – as the generally infallible decision maker does not comply with reality.
3. The degree of decision making rationality is limited and subject to individual and/or collective constraints, like insufficient cognitive competences, psychological predispositions, feelings and emotions, etc.
4. However, the degree of decision making rationality, in the context of business decisions, does have an impact on decision making efficiency. A "total" extent of decision making rationality, however, can never be achieved in reality.
5. The degree of decision making rationality, and, indirectly, of decision making efficiency, also

depends on individual personality traits like introversion/extraversion, thinking/feeling, sensing/intuition and judgment/perception.

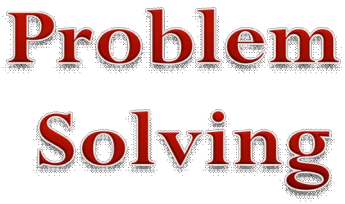
6. Intuition/discursion (as a synonym for analytical decision making) can be measured as individual personality traits. However, intuition/discursion does not determine solely a lower/higher degree of decision making efficiency.
   Moreover, a "sane mixture" between intuitive and discursive behavioral patterns tends to "produce" higher decision making efficiency.
7. Based on the experimental findings, the **Semi-Discursive Rationale-Model** has been developed as a set of heuristics in order to improve business decision making outcomes.
8. Further research needs to be conducted, following the so far unanswered question: "Why do economic transactions take place at all and what determines the terms of those transactions?" [47, p. 3].

APPENDIX 1

The main idea of NASA Play (crash on the mood)

15 Pieces of equipment must be positioned (1-the most important, 15 – the less important):

- Matches
- Food concentrate
- 50 foot nylon rope
- Parachute silk
- Portable heating device
- 2 pistols caliber 45
- Powdered milk
- 2-pound-tanks with oxygen
- Mood atlas
- Float for lifesaving
- Magnetic compass
- 5 gallons water
- Signal lamp
- First-aid case with injection needles



APPENDIX 2

REFERENCES

[1] Albert, J. *Besser entscheiden - Gebrauchsanweisung für Unentschlossene*. Frankfurt am Main, Germany: Eichborn AG, 2006

[2] Anderson, J.A. Intuition in managers. Are intuitive managers more effective? *Journal of*

Managerial Psychology, 2000, Vol. 15 No. 1, pp. 46-67,
[3] Ariely, D. *Predictably irrational. The Hidden Forces that shape our decisions*. New York, USA: HarperCollins Publishers, 2008
[4] Arkes, H.R. / Hammond, K.R. *Judgment and decision making: An interdisciplinary reader*. Cambridge, Great Britain: Cambridge University Press, 1992
[5] Asch, S.E. Studies of Independence and Conformity. *Psychological Monographs*, 70. Jg., Pittsburgh, 1956, pp. 1-70
[6] Bales, R.F. *Interaction Process Analysis: A Method for the Study of Small Groups*. Massachusetts, USA: 1950
[7] Bamberg, G. / Coenenberg, F. / Krapp, M. *Betriebswirtschaftliche Entscheidungstheorie.* München, Germany: Vahlen, 2008
[8] Bolton, G.E. / Ockenfels, A. ERC: A Theory of Equity, Reciprocity, and Competition. *The American Economic Review*, March 2000, pp. 166-193
[9] Camerer, F. / Loewenstein, J. / Rabin, P. *Behavioural Economics.* New York, USA: Princeton University Press, 2004
[10] Chmielewicz, K. *Forschungskonzeptionen der Wirtschaftswissenschaft*. Stuttgart, Germany: Poeschel Verlag, 1979
[11] Cyert, R. / March, J. *A Behavioural Theory of the Firm*. Engelwood Cliffs, USA: Prentice Hall, 1963
[12] Davis M.F. / Mattoon M.A. Reliability and Validity of the Gray-Wheelwrights Jungian Type Survey. *European Journal of Psychological Assessment.* Vol. 22(4)., 2006, pp. 233-239
[13] Dorow, W. *Unternehmenskonflikte als Gegenstand unternehmungspolitischer Forschung.* Berlin, Germany: Duncker & Humblot GmbH, 1978
[14] Dürmeier, T. / Egan-Krieger / Peukert, H. (ed.) *Die Scheuklappen der Wirtschaftswissenschaft. Postautistische Ökonomik für eine pluralistische Wirtschaftslehre.* Marburg, Germany: Metropolis-Verlag, 2006
[15] Eisenführ, H. / Weber, F. *Rationales Entscheiden.* Berlin, Germany: Springe, 2003
[16] Fehr, E. / Schmidt, K.M. A Theory of Fairness, Competition and Cooperation. Working Paper No. 4. *The Quartely Journal of Economics*, August 1999, pp. 817-868
[17] Fiedler, K. *Warum sind intuitive Entscheidungen so oft richtig? Eine wissenschaftliche Erklärung braucht mehr als Intuition*. Lecture of the Carl von Linde Foundation. Heidelberg, 2009
[18] Gaeth, G.J. / Shanteau, J. Reducing the influence of irrelevant information on experienced decision makers. *Organizational Behaviour and Human Performance*, 33, 1984, pp. 263-282
[19] Gigerenzer, G. *Reckoning with risk – learning to live with uncertainty*. New York, USA: Penguin Group, 2002
[20] Gigerenzer, G. Der Bauch wird unterschätzt. *Frankfurter Allgemeine Zeitung*, October 18/19, 2008
[21] Gigerenzer, G. *Bauchentscheidungen. Die Intelligenz des Unbewussten und die Macht der Intuition*. München, Germany: Wilhelm Goldmann Verlag, 2008
[22] Gigerenzer, G. *Das Einmaleins der Skepsis: über den richtigen Umgang mit Zahlen und Risiken*. Berlin, Germany: BvT Berliner Taschenbuch Verlags GmbH, 2009
[23] Glimcher, P.W. / Camerer, C.F. / Fehr, E. / Poldrack, R.A. *Neuroeconomics: Decision Making and the Brain*. London, United Kingdom: Elsevier Academic Press, 2009
[24] Gray, H. / Wheelwright, J.W. *Jung´s Psychological Types, including the four functions*. Stanford, USA: 1945
[25] Heinen, E. *Entscheidungsorientierte Betriebswirtschaftslehre.* Wiesbaden, Germany: Mohr, 1972
[26] Jung, C. *Psychological types*. New York, USA: 1923

[27] Jungermann, H. *The two camps on rationality*. in: Scholz, R.W. (ed.) *Decision Making under Uncertainty*. Amsterdam: Elsevier Academic Press, 1983, pp. 63-86
[28] Kahneman D. / Tversky, A. Prospect theory: An analysis of decision under risk. *Econometrica*, Vol. 47, No. 2, 1979, pp. 263-291.
[29] Kahneman, D. / Tversky, A. *On the reality of cognitive illusions.* New York, USA: Econometrica, 1996
[30] Kagel, J.H. / Roth, A.E. *The handbook of experimental economics*. New Jersey, USA: Princeton University Press, 1995
[31] Kant, I. *Kritik der praktischen Vernunft,* 1788
[32] Kast, B. *Wie der Bauch dem Kopf beim Denken hilft. Die Kraft der Intuition*. Frankfurt am Main, Germany: S.Fischer Verlag GmbH, 2009
[33] Lehrer, J. *Wie wir entscheiden: das erfolgreiche Zusammenspiel von Kopf und Bauch*. München, Germany: Piper Verlag GmbH, 2009
[34] Lewin, K. *Feldtheorie in den Sozialwissenschaften. Ausgewählte theoretische Schriften*. Bern/Stuttgart, Switzerland/Germany: 1969
[35] Neuert, J.O. *Planungsgrade: Eine experimentelle Untersuchung zum Zusammenhang zwischen Planungsverhalten und Planungserfolg*. Spardorf, Germany: Verlag René F. Wilfer, 1987
[36] Neuert, J.O. *Zu den praxeologischen und pädagogischen Implikationen einer empirischen Untersuchung zum Zusammenhang zwischen Planungsverhalten und Planungseffizienz auf der Basis von Management Lern-Labors. Band 2, EUROTOP GmbH*, 1994
[37] Neuert, J.O. *The logic of managerial decisions making processes – rational conduct in the context of multiple behavioural patterns: conjectures and refutations tested via an experimental investigation.* http://www.lab.uni-koeln.de/gew2005/public/pdf.php/program.pdf, 2005
[38] Pfohl, H. *Problemorientierte Entscheidungsfindung in Organisationen*. Berlin/New York, Germany/USA: 1977
[39] Popper, Karl *Logik der Forschung*. Berlin, Germany: Akademie Verlag, 2007
[40] Rustichini, A. *Neuroeconomics: Formal Models of Decision Making and Cognitive Neuroscience*. in: Glimcher, P.W./ Camerer, C.F./ Fehr, E./ Poldrack, R.A. (2009): *Neuroeconomics: Decision Making and the Brain*. New York, USA: Elsevier Academic Press, 2009, p. 33-46
[41] Schaubhut N.A./ Herk N.A. *Reliability of the MBTI Form Q Assessment*. CPP, Inc. In: Annual Convention of the American Psychological Association, Toronto, Canada, August 6-9, 2009
[42] Simon, H. On the Concept of Organizational Goal. *Administrative Science Quarterly 9*. New York, 1964, pp. 1-22
[43] Simon, H. *The New Science of Management Decision*. New York, USA: Evatson, 1977
[44] Simon, H. *Entscheidungsverhalten in Organisationen. Eine Untersuchung von Entscheidungsprozessen in Management und Verwaltung*. Landsberg am Lech, Germany: 1981
[45] Sjöberg, L. Intuitive vs. analytical decision making: which is preferred? *Scandinavian Journal of Management 19*, 2003, pp. 17-29
[46] Smith, A. *Wealth of Nations*. London, United Kingdom: 1776
[47] Sowell, T. *Economic Facts and Fallacies*. New York, USA: Basic Books, 2008
[48] Straub, W. (2009): Management by Mathe. *FAS Consulting* September 19, 2009, p.3
[49] Stüvel, H. Die heimliche Macht des Unbewussten. *DIE WELT*, March 21, 2009
[50] Szyperski, N. / Winand, U. *Entscheidungstheorie. Eine Einführung unter besonderer Berücksichtigung spieltheoretischer Aspekte.* Stuttgart, Germany: 1974
[51] Thaler, R.H. / Sunstein, C.R. *Nudge – Improving Decisions About Health, Wealth and Happiness*. New Haven/London, United Kingdom: Yale University Press, 2008
[52] Tversky, A. / Kahneman, D. *Advances in prospect theory: cumulative representation of uncertainty*. in: Kahneman, D. / Tversky, A. (ed.) *Choices, values and frames*, Cambridge, United

Kingdom: Cambridge University Press, 1992, pp. 44-66.
[53] Weber, M. *Wirtschaft und Gesellschaft*. Stuttgart, Germany: 1964
[54] Westcott, M. *Toward a Contemporary Psychology of Intuition. A Historical, Theoretical and Empirical Inquiry*. New York , USA: 1968
[55] Wunderlich, J. *Bauchgefühl: mit Intuition wirksamere Entscheidungen treffen*. http://www.business-wissen.de, [April 09, 2009]
[56] Centracon Study: *Strategische IT-Entscheidungen beruhen zur Hälfte auf Intuition.* http://www.openpr.de/news/160570/Centracon-Studie-Strategische-IT-Entscheidungen [July 29,2009]
[57] http://www.thefreedictionary.com/discursive [September 17, 2009]