

Research Concept on “Improving Individual and Organizational Decision Making” (PD Dr. Siebert, November 2015)

This research concept is focusing on research in the framework of a habilitation in the fields of operations research and decision theory.¹ In addition, research efforts in operations management, production, supply chain management, and managerial accounting will be summarized at the end of this research concept.

Operations Research (OR) deals with the development and application of advanced analytical methods helping to make better decisions. Sometimes the terms “management science” or “decision science” are used synonymously. OR encompasses a wide range of problem-solving techniques and methods applied in the pursuit of improved decision-making and efficiency, such as simulation, mathematical optimization, queueing theory and other stochastic-process models, Markov decision processes, econometric methods, data envelopment analysis, neural networks, expert systems, decision analysis, and the analytic hierarchy process.

In the last decades, the methods in OR became more and more sophisticated. Researchers developed “fancy” or “high-tech” methods, which can be used to “solve problems” earlier generations dreamt about. Highly ranking journals such as Management Science, Operations Research, or European Journal of Operational Research regularly publish papers on improved or new methods. However, OR methods can reveal their true potential if and only if the problem is defined appropriately. There is a famous quote from Albert Einstein “If I were given one hour to save the planet, I would spend 55 minutes defining the problem and five minutes resolving it.” Therefore, analysing and structuring of problems and **Soft OR** are of utmost importance. Furthermore, it is increasingly acknowledged that the behaviour of the individuals who apply the quantitative models, decision makers and decision analysts, play an important role. Against this background, the stream of **Behavioural OR** becomes more and more popular in theory and practice.

Decision Theory has intersections with OR but is seen as an independent discipline. It is concerned with identifying the values, uncertainties and other issues relevant in a given decision process and

¹ The Habilitation is the highest academic qualification a scholar can achieve by his or her own pursuit in Germany. Earned usually after obtaining a research doctorate, such as a PhD, the habilitation requires that the candidate write a professorial thesis (or habilitation thesis) based on independent scholarship, reviewed by and defended before an academic committee in a process similar to that of the doctoral dissertation.

the rationality of the resulting optimal decision. One distinguishes normative, prescriptive, and descriptive decision theory.

Normative decision theory is based on the Rational-Choice Theory and on axioms such as rationality which should be considered in decision situations (“How should a rational individual decide?”). **Prescriptive** decision theory helps individuals to improve their decision making, here the values of decision-makers play a crucial role (Keeney 2004). **Descriptive** decision theory is concerned with describing observed behaviors under the assumption that the decision makers are behaving under some consistent rules (“How do individuals decide?”).

The **fundamental objective of the research** is to contribute to better informed decision-making and thereby to making better decisions, for individuals as well as for organizations. This research objective is pursued by three pillars: empirical studies, developing methods, and applications as illustrated in Figure 1.

The concept of **Value-focused Thinking** (Keeney 1992) provides the basis for the research efforts. It features a change in paradigm in mastering decision situations. Most individuals and organizations can be characterized as reactive in their decision making. Decision situations are seen as decision problems which are to be solved. Often, with little effort, the most obvious alternatives or alternatives proven in similar decision situations are identified. Most of the effort is spent in evaluating these alternatives. In contrast, Keeney suggests to spend more effort in identifying attractive alternatives since only available alternatives can later be chosen as the best. Individuals or organizations should identify their values, i.e. what they care about, and translate their values into objectives. These objectives should be used for identifying systematically more and better alternatives. Instead of solving decision problems, decisions have to be seen as opportunities which should be proactively developed.

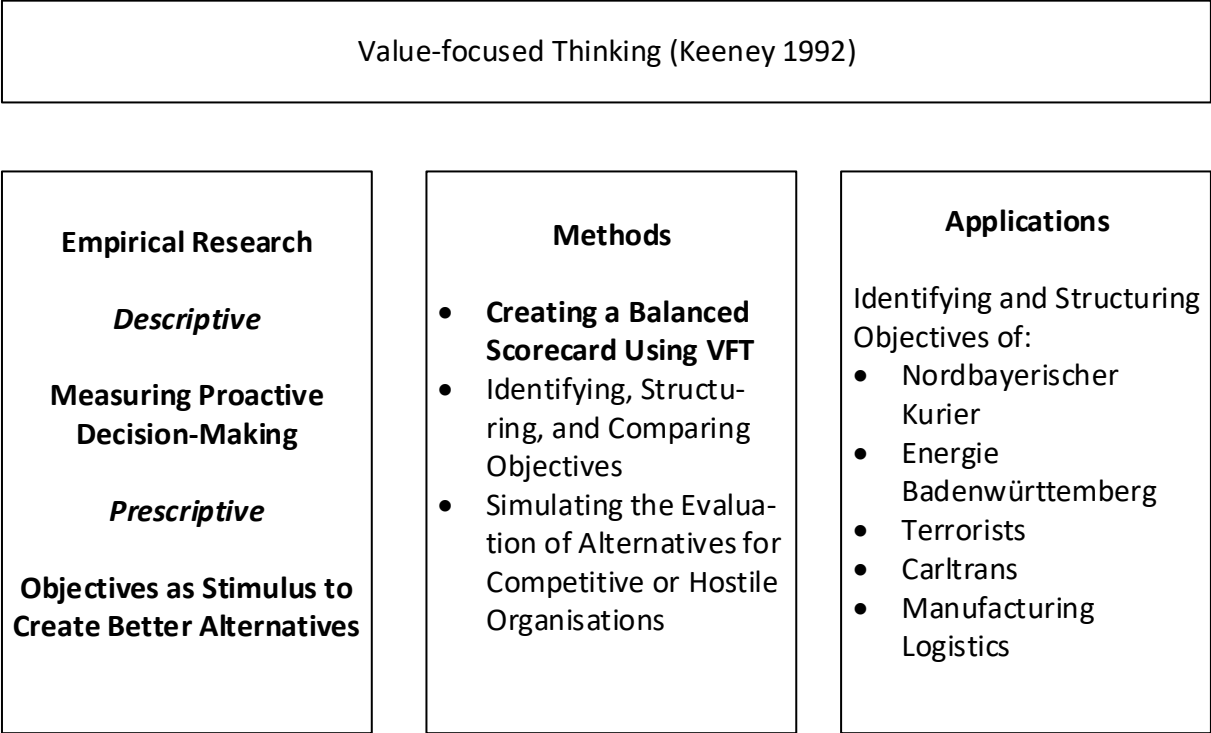


Figure 1: Research Efforts to Explain and Support Individual and Organisational Decision Making and Decision Behaviour; papers emphasized in bold are described in detail in the main text.

In **empirical research**, descriptive as well as prescriptive research questions related to value-focused thinking are analyzed. These research questions are addressed by Soft OR und Behavioural OR methods.

In descriptive research, the analysis focuses on the behavior of individuals in decision situations. The crucial research questions are how individuals can be characterized by their proactivity in decision situations, what the eventual consequences of proactivity in decision situations are and how the degree of proactivity affects the satisfaction with one’s decisions. The scale on Proactive Decision Making (PDM) that has been theoretically developed from literature and empirically validated in cooperation with Prof. Reinhard Kunz (University of Bayreuth) allows describing the degree of proactivity of individuals with six dimensions. Two dimensions cover proactive personality traits: “striving for improvement” and “showing initiative”. The four dimensions “systematical identification of objectives”, “systematical identification of information”, “systematical identification of alternatives”, and “using a ‘decision radar’” concern proactive cognitive skills and integrate the ideas and concepts of value-focused thinking and decision quality into the PDM-scale.

This scale provides the basis for analyzing many research questions. For instance, proactive individuals are significantly more satisfied with their decisions and the scale is able to explain up to

50% of the variance of decision satisfaction. In another study, the scale was used a priori and ex post to analyze the impact of an online course on decision making on the participants. In line with the hypotheses derived from literature, the degree of the proactive personality traits remains stable while the degree of the proactive cognitive skills improved significantly through the training. Scholars who teach courses of decision making can use these results to claim relevance and impact of their courses, in particular for business students. Furthermore, the scale was used to analyze the relation between the six dimensions of proactive decision-making and established scales in decision making, for example the Melbourne Decision Making Questionnaire (Mann et al 1997) or decision making styles (Scott and Bruce 1995) and to describe and predict decision making, behavior, and satisfaction in a more detailed way. The dimensions “vigilance” and “procrastination” of the Melbourne Decision Making Questionnaire can be explained in detail by the four proactive cognitive skills and the two proactive personality traits. In addition, the PDM scale should be established in consumer research. In this context, proactive decision making is hypothesized as upstream construct to explain and predict the satisfaction of decisions to be made or that have already been made.

- Siebert, Johannes; Kunz, Reinhard. “Developing and Validating the Multidimensional Proactive Decision-Making Scale”. Special Issue „Behavioral Operations Research“ in *European Journal of Operational Research*, 249(3) 2016, 864-877. <http://dx.doi.org/10.1016/j.ejor.2015.06.066>

In prescriptive research, the analysis focuses on the research question how individuals and organizations can systematically create more and better alternatives to improve the outcome of their decision making. The main idea is to use objectives as stimulus in alternatives` creation (Keeney 1992). In cooperation with Ralph Keeney (Duke University, USA), a series of five experiments was carried out. The participants created alternatives for important decisions they were highly involved with. In summary, these experiments provided comprehensive evidence that using objectives for creating alternatives has a significant positive impact on the number and quality of alternatives created. The results were used to derive a guideline for the creation of alternatives in important decision situations.

The empirical verification that objectives are an effective stimulus in principle initiated many interesting and more detailed questions in alternatives` creation. For example, in a follow-up paper, the impact of experience with decision situations on the ability to create alternatives was analysed. The empirical results show that experienced decision makers create on average better alternatives

than inexperienced decision makers. The results further indicate that objectives as stimulus enhance the quality of identified alternatives not only for inexperienced but for experienced decision makers, too. Since gathering experience in decision situations is not possible in a short time it is interesting to analyse the relative positive impact of this stimulus on experienced and inexperienced decision makers. The key finding is that inexperienced decision makers upon stimulation with objectives created on average alternatives that were even slightly better than those of medium experienced decision makers who were not stimulated with objectives. In the experiment, the use of objectives compensated roughly a difference in experience of four semesters of studying.

- Siebert, Johannes; Keeney, Ralph L. “Creating More and Better Alternatives for Decisions Using Objectives”. *Operations Research*, September/October 2015, 63(5), 1144-1158. <http://dx.doi.org/10.1287/opre.2015.1411>
- Siebert, Johannes. “Can Novices Create Alternatives of the Same Quality as Experts?”, *Decision Analysis* (INFORMS) 2016, 13(4), 278-291, <https://doi.org/10.1287/deca.2016.0339>

In the medium term, it is my intention to become an expert for application-oriented multi-criteria decision-making in Germany and on the long term, it is my intention to become a leading expert for identifying and structuring objectives. Third-party and research projects allow me to publish case studies, to finance my participation at international conferences and research stay abroad, gain experience and inspiration for my teaching, and to apply created methods in practice. In most of my projects, we identified and structured objectives for organizations by using different methods. These are the objectives of a medium-sized media company (with Reinhard Kunz), the strategic objectives of one of the biggest German and top twelve European Energy Supplier (with Ralph Keeney), the strategic objectives for allocating a 12 billion USD budget in maintenance for a governmental agency in the United States (with Ralph Keeney), the objectives of the leaders and followers of the terrorist groups Islamic State in the project “Multi-Method Assessment of ISIL, Objectives and Scenarios for ISIL” for the decision makers in the Pentagon (with Detlof von Winterfeldt), and the objectives of medium-sized companies in production logistics.

This research is characterized by direct contact and cooperation with the decision makers of the corresponding organizations. However, for the study on the objectives of the terrorist group Islamic State we use expert interviews and published speeches of their leader. The direct access to the key decision maker of the organizations is crucial for the acceptance and use of our results by the project partner. The CEO of the huge energy supplier in Germany said after our final presentation in

front of the Board of Directors that he was really impressed, how we had been able in only eight days, to fully understand the whole company, consider all its relevant specifics, identify all important objectives, and structure them clearly in a means-ends network of objectives. In particular, the emphasis on different objectives and relations between objectives in the traditional and new business areas, illustrated by different heartbeats of these business areas, is for him the missing piece of the puzzle in explaining and communicating his vision of the company. The general director of the medium-sized media company said after our final presentation that he is impressed that we had been able to identify all relevant operative and strategic objectives (about 700), to select the most important ones, and illustrate them clearly on one page. The means-ends networks are the brain and the central nervous system of the company with all its interrelations. The developed Balanced Scorecard provides a solid foundation for successfully shaping the future of the company. In cases where the project partner permits making the results accessible to the public, it is the intention to publish the results as case studies. We have this permission in case of the study on the objectives of the terrorist group Islamic State. In the paper, we explained the identified objectives of the leaders and the followers of Islamic State and its reinforcing relation. These results are of utmost importance, since they provide the basis to create suitable counter measurements to protect the civilian population in the Middle East, Europe, and the United States.

The third-party and research projects reveal the need of the **development of new methods** to support decision makers and decision analysts. An example is the identification of the objectives of a hostile organization whose decision makers may not be interested in cooperation or contact to them might even be dangerous. In such a case the methods to identify objectives in ones` own or cooperative organizations cannot be applied. We developed a method to identify objectives of a hostile organization using expert interviews and published speeches of their leaders. The method can also be applied in more moderate cases and could find widespread application, for example to identify the objectives of a competitor. Furthermore, we developed a method to compare the objectives hierarchies of two or more organizations or of one organization over time. The identification of such differences is important if they have a substantial impact. For example, to ensure the protection of the civilian population in the Middle East, Europe, and the United States with regard to attacks by the terrorist group Islamic State it is necessary to identify similarities and differences of the objectives of Al Qaeda and Islamic State. The results can be used to analyze which measures

that had been successful and effective against Al Qaeda could be transferred against Islamic State and which not.

- Siebert, Johannes; von Winterfeldt, Detlof; John, Richard. “Identifying and Structuring the Objectives of the “Islamic State of Iraq and the Levant” (ISIL) and its Followers.” *Decision Analysis* (INFORMS), 13(1), 26-50, <http://dx.doi.org/10.1287/deca.2015.0324>
- Siebert, Johannes; Keeney, Gregory. “Identifying, Structuring, and Comparing Objectives of Terrorists”. In “Improving Homeland Security Decisions”, Eds. Abbas, Ali, Tambe, Milind, von Winterfeldt, Detlof: *Forthcoming*

The Balanced Scorecard (Kaplan and Norton 1992) is one of the five management tools used most often and has been implemented by nearly 40 percent of companies (Rigby and Bilodeau 2013). Yet, there is no theoretically sound approach for developing a balanced scorecard. Value-focused thinking is a decision-making philosophy that fits perfectly to Balanced Scorecard creation. It provides methods and techniques for the identification and structuring of objectives that are suitable to systematically derive a scorecard from a means-ends network. However, such a means-ends network is often too complex for enduring use in strategic management. By adapting the network’s structure to the Balanced Scorecard’s layout, the profound and clear set of derived objectives and their measures provide a reasonable basis for applying methods of multi-criteria decision-making in an organization. In a case study, we develop a media-specific Balanced Scorecard to provide media decision-makers with a model that takes characteristics of media management into account and that helps to manage their company successfully. Using a scientifically sound approach that is based on value-focused thinking (Keeney, 1992), we interview the publisher, the CEO, nine management representatives, and ten key employees of a German medium-sized local newspaper company. Overall, 698 distinct objectives and 1,009 relationships are identified. By concentrating on the most important objectives, we derive a Balanced Scorecard with 33 objectives and 65 relationships, which are organized in seven perspectives. Because of its innovativeness, this project was runner-up in the final of the Practice Awards of the Decision Analysis Society (INFORMS).

- Kunz, Reinhard; Siebert, Johannes; Mütterlein. “Combining Value-Focused Thinking and Balanced Scorecard to Improve Decision-Making in Strategic Management”, *in press, Journal of Multi-Criteria Decision Making*, [DOI: 10.1002/mcda.1572](https://doi.org/10.1002/mcda.1572)
- Kunz, Reinhard; Siebert, Johannes; Mütterlein, Joschka. „A Media-Specific Balanced Scorecard Based on Value-Focused Thinking“, *accepted, Journal of Media Business Studies*. <http://www.tandfonline.com/doi/full/10.1080/16522354.2016.1220114>

- Siebert, Johannes; Kunz, Reinhard „Entwicklung einer Balanced Scorecard mit Value-focused Thinking am Beispiel eines mittelgroßen Medienunternehmens“. *Controlling: Zeitschrift für erfolgsorientierte Unternehmenssteuerung*, March 2016, 210-215. DOI: [10.15358/0935-0381-2016-3-209](https://doi.org/10.15358/0935-0381-2016-3-209)

The papers on the development of these methods are either submitted or will be submitted shortly. The clients of the projects in which we have developed the methods were highly satisfied with the results and the comments on international conferences were positive throughout. Therefore, I am highly optimistic that the papers will be accepted for publication in well-known journals such as *Decision Analysis* or the *Journal of Multi-Criteria Decision Making*.

The method development focuses on qualitative methods in the areas of problem structuring and behavioral operations research. However, I also work on quantitative methods. Some high class journals such as *Operations Research* and the *European Journal of Operational Research* prefer quantitative methods and appear to deprecate Soft OR. On the one hand, in cooperation with Detlof von Winterfeldt and Richard John a method for simulating the utilities of hostile organizations has been developed which could be used to identify the most attractive attack targets of terrorists. On the other hand, in cooperation with Roman Slovinski and Salvatore Greco we advanced the robust ordinal regression to the UTA^{GSS}- method, which is able to model bipolar interactions.

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