

The Main Factors beyond Decision Making

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Abstract

This paper argues that the time has come to focus attention on the search for factors that affect decision making because decision making errors are costly and are growing more costly, decision makers are receptive, and academic insights are sure to follow from research on improvement. In addition to calling for research on improvement strategies, this paper aims to conclude the main factors that affect decision making, and how these factors have a great impact and influence on decision makers. The researcher focuses on literature review to come up with these main factors.

Keywords: Decision making, Decision-making process, Decision specific characteristics

1. Introduction

Managers devote substantial efforts to making appropriate organizational decisions. Many important theorists and practitioners consider decision-making to be the most critical, core managerial function. Today's manager therefore needs to recognize his obligation to study and significantly enhance his knowledge of the decision-making process, including related theory and approaches, methods and techniques, and also develop advanced personal decision skills.

The recent years have witnessed rapid changes in information technology, the New World economic order, the coming of the new regional power and many others (Ossama & Muhittin, 1998). All these changes have presented on the one hand a very dynamic world of increased population, inflation, social consumption, and on the other hand limited scarce resources.

In such a complex and fast changing business environment, managers are faced with a multitude of decisions every day. They have to make decisions even if they are not willing to do so. Pearce II & Robinson (1989) indicated that decision-making is inevitable, because to explicitly avoid making a decision is in itself to make a decision. Toffler (1980) in his book entitled *The Third Wave* indicated that to make too many decisions, too fast, about too many strange and unfamiliar problems introduce a new element into management, forcing executives already nervous in unpredictable environment to make more and more decisions and at a faster and faster pace.

Mark (1997) concluded that for many reasons, the hardest part of managing an organization today is making the appropriate decision. Decision may be programmed or non-programmed (Simon, 1977), generic or unique (Drucker, 1956), routine or non-routine (Mintzberg et al., 1976) and certain or uncertain (Milliken, 1987).

Once a manager chooses an alternative and knows how to implement it, he can allocate the resources necessary to achieve the defined goal; but getting to that point can often be a long, complex, and challenging process. And the difficulty arises when the most preferred alternatives are infeasible (Nutt, 1998).

This study explores decision-making and its process. The choice to focus on decision making is due to its nature and significance. Decisions are long term, highly unstructured, complex, and inherently risky and have great impact on the future of the organization. Strategic decisions are those important decisions that typically require a large amount of organizational resources, and firm's environment consideration. In decisions, top management usually plays a central role, in making the decisions (Hofer & Schendel, 1978). These decisions influence organizational direction, administration, and structure (Christensen et al., 1982).

Since decision not only affects the organization in which they are taken but also the society (Colignon & Cray, 1980), it is not surprising that decision-making process has been heavily researched (Amason, 1996). One stream of these researches has focused on the decision-making process and factors influencing the process. (e.g. Fredrickson, 1985; Miller, 1987; Eisenhardt & Bourgeois, 1988; Fredrickson & Iaquinto, 1989; Hill & Tyler, 1991; Dean & Sharfman, 1993; Priem et al., 1995; Smith & Hayne, 1997; Van Bruggen et al., 1998;

Papadakis et al., 1998).

2. Definition of a Decision

In the Webster dictionary a decision is described as a conclusion arrived at after careful consideration. By a decision we transfer from internal to external action (Lapin, 1994). Decision is defined as a moment in an ongoing process of evaluating alternatives related to a goal, at which the expectation of decision maker with regard to a particular course of action impels him to make a selection (Harrison, 1981). Decision is an event that occurs (Carlisle, 1979), a conscious choice to behave or to think in a particular way in a special situation (Duncan, 1973). On the other hand other researchers' definition is:

A **decision** occurs when a solution to a problem is selected for implementation. Decisions can be made either formally or informally:

Formal decisions are relatively complex, non-routine, and generally non-repetitive. Policies, procedures, criteria, and methods for making such decisions may not always exist since the problem faced may lack precedent. Creativity may play a key role in such decisions.

Informal decisions are more repetitive and routine in nature. Policies, procedures, criteria, and methods often exist to assist managers in making such decisions.

Decision-making is the process of identifying and selecting from among possible solutions to a problem according to the demands of the situation. For example, decision-making in the area of vendor contracting might address how to deliver a service, which bidder gets a contract, how to ensure that a contractor meets its obligations, or whether to pay the contractor in large or small bills.

A **decision** is a conscious choice to behave or to think in a particular way in a given set of circumstances (Duncan, 1973).

Decision-making is often referred to as the heart of the management process (Mann, 1976). "Decision-making is the process of thought and deliberation that leads to a decision" (Qlueck, 1977). It is a dynamic process (Harrison, 1975), which indicates that a problem exists, thus the best courses of action must be selected and implemented (Gass, 1985). Decision-making is a conscious process, involving both individual and social phenomena (Shull et al., 1970). It is the right of choosing a course of action from among a number of alternatives.

Many literature viewed decision-making as the process of choosing among alternative courses of action for the purpose of solving a problem or attaining better situation regarding the opportunities that exist (e.g. Carlisle, 1979; Stoner, 1982; Trewatha & Newport, 1982; Bedeian, 1986; Plunkett & Attner, 1994; Turban, 1995; Harrison, 1999). Results of these definitions and discussions lead to the following conclusions:

Most of the definitions of decision-making are very similar to each other.

The decision-maker has several alternatives for evaluation and selection. Thus, if there is only one choice the manager is not actually involved in decision-making.

Decision-making involves conscious choices and acts.

Decision-making is aimed at some specific goal(s).

Managers must constantly make decisions even if they are not willing to.

Decision making like any other organizational activity does not take place in a vacuum (Kreitner, 1995).

“Decision-making is an integral part of the management of any organization. More than anything else, competence in this activity differentiates the manager from the non-manager and, more importantly, the good manager from the mediocre manager” (Harrison, 1975). Simon (1977) defined decision-making as a process synonymous with the whole management. In reality, managers must make decisions while performing managerial functions; planning, organizing, staffing, leading, and controlling. Therefore to be a good planner, organizer, staffer, leader and controller, a manager must first be a good decision maker (Rue & Bayrs, 1986).

Decision-making is so important that none of the managerial functions can be performed without it (Trewatha & Newport, 1982). They argued that for management purpose, decisions are obviously required in planning, organizing, actuating and controlling. However, some authors believed that, decision-making is only one of the tasks of an executive; it usually takes time but a small fraction of manager's time (Drucker, 1967). Plunkett and Attner (1994) suggested that, decision-making is an important part of managers' job. A manager makes decisions constantly while performing managerial functions. But none of his activities is more important than making wise decision (Newman & Warren, 1977).

We can, therefore, conclude that the primary duty of managers is decision-making. These decisions may be related to planning, organizing, staffing, leading or controlling can be straight forward or complex (Main & Lambert, 1998), short-range or long-range (Pearce & Robinson, 1985), flexible or inflexible (Sharfman & Dean, 1997) and even crisis decisions (Mintzberg et al., 1976). In other words, managers must make decisions even if they are not willing to do so. Pearce II & Robinson (1989) indicated that decision-making is inevitable, because to explicitly avoid making a decision is in itself to make a decision. Thus making decisions is the most important job of any manager or executive (Hammond et al., 1998). To be effective in the highly competitive environment of today, managers in any organization need to devote a significant amount of skill, knowledge and attention to managerial decision-making.

The preceding discussion illustrates three important themes in managing an organization: (1) the link that exists between the success of an organization and the quality of its managerial functions, (2) the link that exists between success of the managerial functions and managerial decision-making outcomes, and (3) the third theme is related to the first two, attempts to link managerial decisions outcomes to knowledge and ability of managers in making a decision.

Many managerial researches in the past several decades, especially in the early 80's, have investigated and written about managerial decision-making from a variety of dimensions and

perspectives (e.g. Argyris, 1976; Cohen et al., 1972; Hickson et al., 1986; Mintzberg et al., 1976; Simon, 1957; Werhrich & Koontz, 1993; Kim & Mauborgne, 1998). In spite of this ongoing attention, the subject of decision-making is still in a contradictory and controversial phase with theoretical dilemmas. Harrison (1999) believed that part of the problem is derived from the multidisciplinary nature of the decision-making (e.g. psychology, economics, politics, sociology and mathematics which all contribute their own perspectives). The problem can be more complicated by differentiating decision maker into individual, group, multi-group or organizational (Kriger & Barnes, 1992).

3. The Decision-making Process

Decisions are means of achieving predetermined goal or goals (ends). Every decision is an outcome of a dynamic process. Harrison (1999) suggested that decision-making is a dynamic function rather than a static action. It is a sequential process. However, managers in making a decision may apply different processes. Several varieties of these processes have been recognized and suggested by many researchers (e.g. Bross, 1953; Druker, 1956; Simon, 1965; Newman, 1971; Mintzberg et al., 1976; Archer, 1980; Reitz & Jewell, 1985).

Since Simon (1976) questioned the validity of the rational model of decision-making, many theorists and researchers have been trying to define, and develop feasible decision-making processes that can be applied in real life. There are numerous approaches to the decision-making process and which is best, depends on the nature of the problem, the availability of resources, the cost, decision-maker characteristics, time pressure and others factors (Donnelly et al., 1998). Decision-making process has emerged as one of the most active areas of current management researches. In recent years, researchers concerned with decision-making process have investigated a range of process antecedents, characteristics, and have tested a profusion of research hypotheses on aspects of the decision process and factors that may affect this process (Rajagopalan et al., 1993).

Archer (1980) argued that the following objectives of decision-making that were presented by Barnard in Princeton University in 1936 might be the groundwork for decision-making processes:

- To ascertain the truth,
- To determine a course of action, and
- To persuade.

According to Archer (1980) Barnard's idea was ignored, and likewise little attention was paid to Bross's (1953) decision-making process, which was composed of the following:

1. Responding to conditions in the environment,
2. Determining mutually exclusive courses of actions, and
3. Selecting a course of action to achieve a specific purpose.

McDonald (1955) raised the question that was whether managerial decision-making is an unconscious and intuitive art form, or a scientific, conscious, rational, and systematic process? To answer this question, Drucker (1956) in his article "How to make a business decision" defined, the decision-making process as a rational and systematic process consisting of four steps (Archer, 1980). However decision-making can be considered both an art and a science.

The impact of the two articles by Mc Donald and Drucker was manipulated in such a way that, suddenly many researchers tried to substantiate the existence of a decision-making process. These researches and investigations led to Simon (1965) contribution to decision-making theory. He suggested three distinct but related phases in the decision-making process (Archer, 1980).

1. The intelligence phase,
2. The design phase, and
3. The choice phase.

Newman (1971) suggested a five-step decision-making process consisting of:

- . Recognition of a situation that requires a decision,
- . Identification and development of alternative courses of action,
- . Evaluation of the alternatives,
- . Choice of one of the alternatives, and
- . Implementation of the selected course of action.

For the past few decades, researchers have attempted to model the strategic decision process and identify the major types or categories of strategic decisions. Mintzberg et al. (1976) provided an early attempt at modeling the process and identified three main phases as:

1. The identification phase: opportunities, problem, and crises are recognized and relevant information is collected and problems are more clearly identified,
2. The development phase: alternative solutions to problems are generated and modified, and
3. The selection phase: alternatives are analyzed and scanned, and an alternative is chosen.

Cray et al. (1991) suggested three types of decision-making processes: fluid, constricted, and sporadic. A fluid decision process is one that is steady-paced, formally channeled, and speedy. A constricted process is one that is narrowly channeled and is limited in terms of obtaining information and participation in the decision-making. And finally sporadic decision-making processes tend to take longer than others do and involve relatively more informal interactions along the way and it is spasmodic and protracted.

Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making a decision implies that there are alternative

choices to be considered, and in such a case we want not only to identify as many of these alternatives as possible but to choose the one that best fits with our goals, objectives, desires, values, and so on. (Harris (1980).

According to Baker et al. (2001), decision making should start with the identification of the decision maker(s) and stakeholder(s) in the decision, reducing the possible disagreement about problem definition, requirements, goals and criteria. Then, a general decision making process can be divided into the following steps:

Step 1. Define the Problem

This process must, as a minimum, identify root causes, limiting assumptions, system and organizational boundaries and interfaces, and any stakeholder issues. The goal is to express the issue in a clear, one-sentence *problem statement* that describes both the initial conditions and the desired conditions.. Of course, the one-sentence limit is often exceeded in the practice in case of complex decision problems. The problem statement must however be a concise and unambiguous *written* material agreed by all decision makers and stakeholders. Even if it can be sometimes a long iterative process to come to such an agreement, it is a crucial and necessary point before proceeding to the next step.

Step 2. Determine Requirements

Requirements are conditions that any acceptable solution to the problem *must* meet. Requirements spell out what the solution to the problem *must* do.. In mathematical form, these requirements are the constraints describing the set of the feasible (admissible) solutions of the decision problem. It is very important that even if subjective or judgmental evaluations may occur in the following steps, the requirements must be stated in exact quantitative form, i.e. for any possible solution it has to be decided unambiguously whether it meets the requirements or not. We can prevent the ensuing debates by putting down the requirements and how to check them in a written material.

Step 3. Establish Goals

Goals are broad statements of intent and desirable programmatic values.... Goals go beyond the minimum essential *must have.s* (i.e. requirements) to *wants* and *desires*.. In mathematical form, the goals are objectives contrary to the requirements that are constraints. The goals may be conflicting but this is a natural concomitant of practical decision situations.

Step 4. Identify Alternatives

Alternatives offer different approaches for changing the initial condition into the desired condition. Be it an existing one or only constructed in mind, any alternative must meet the requirements. If the number of the possible alternatives is finite, we can check one by one if it meets the requirements. The infeasible ones must be deleted (screened out) from the further consideration, and we obtain the explicit list of the alternatives. If the number of the possible alternatives is infinite, the set of alternatives is considered as the set of the solutions fulfilling the constraints in the mathematical form of the requirements.

Step 5. Define Criteria

Decision criteria, which will discriminate among alternatives, must be based on the goals. It is necessary to define discriminating criteria as objective measures of the goals to measure how well each alternative achieves the goals. Since the goals will be represented in the form of criteria, every goal must generate at least one criterion but complex goals may be represented only by several criteria.

It can be helpful to group together criteria into a series of sets that relate to separate and distinguishable components of the overall objective for the decision. This is particularly helpful if the emerging decision structure contains a relatively large number of criteria. Grouping criteria can help the process of checking whether the set of criteria selected is appropriate to the problem, can ease the process of calculating criteria weights in some methods, and can facilitate the emergence of higher level views of the issues. It is a usual way to arrange the groups of criteria, sub-criteria, and sub-sub-criteria in a tree-structure (UK DTLR (2001)). According to Baker et al. (2001), criteria should be able to discriminate among the alternatives and to support the comparison of the performance of the alternatives, complete to include all goals, operational and meaningful, non-redundant, few in number.

In some methods, see Keeney and Raiffa (1976), non-redundancy is required in the form of independency. We mention that some authors use the word attribute instead of criterion. Attribute is also sometimes used to refer to a measurable criterion.

Step 6. Select A Decision Making Tool

There are several tools for solving a decision problem. Some of them will be briefly described here, and references of further readings will also be proposed. The selection of an appropriate tool is not an easy task and depends on the concrete decision problem, as well as on the objectives of the decision makers. Sometimes, the simpler the method, the better. But complex decision problems may require complex methods, as well.

Step 7. Evaluate Alternatives against Criteria

Every correct method for decision making needs, as input data, the evaluation of the alternatives against the criteria. Depending on the criterion, the assessment may be objective (factual), with respect to some commonly shared and understood scale of measurement (e.g. money) or can be subjective (judgmental), reflecting the subjective assessment of the evaluator. After the evaluations the selected decision making tool can be applied to rank the alternatives or to choose a subset of the most promising alternatives.

Step 8. Validate Solutions against Problem Statement

The alternatives selected by the applied decision making tools have always to be validated against the requirements and goals of the decision problem. It may happen that the decision making tool was misapplied. In complex problems the selected alternatives may also call the attention of the decision makers and stakeholders that further goals or requirements should be added to the decision model.

4. The Decision Maker

There are many dimensions along which decision makers vary; this section focuses on the factors beyond decision making: risk and emotions....etc. Several books and reviews have appeared on risk (Fischhoff et al 1997, Schoemaker 1993, Shapira 1995, Yates 1992) and emotions (Landman 1993, Parducci 1995, Roese&Olson 1995). We begin with the distinction between risk perceptions, how risky we view objects, hazards, or technologies, and risk attitudes, how willing we are to accept risk.

Risk Perceptions

Two approaches have been used to study individual differences in risk perceptions. In the first, risk is a multidimensional construct with dimensions labeled as dread, lack of familiarity, and lack of controllability (Fischhoff et al 1981).

Slovic (1996) argues that those who have less trust in governments, institutions, and authorities perceive risks of hazards or technologies as greater than those with more trust. For example, environmental hazards are perceived as riskier by women than by men. Environmental disasters are perceived as riskier by blacks than by whites. Well-educated, conservative, white men perceive environmental hazards as least risky (Flynn et al 1994, Slovic et al 1993). Finally, experts and non-experts differ in their estimates of environmental disasters, particularly for low-probability risks (Gregory et al 1996, Peters & Slovic

1997). Experts are less willing than the public to generalize from animal studies to human beings about chemical causes of cancer (Kraus et al 1992). Furthermore, experts show large affiliation effects; chemical risks are often perceived as lower by toxicologists in industry than by toxicologists in academia (Kraus et al 1992). How accurate are the perceptions of these groups? Slovic (1996) argues that this question is impossible to answer because there is no single, objective definition of risk. Risk is a social construct invented to cope with the dangers and uncertainties of life. For example, between 1950 and 1970, coal mines became less risky in terms of deaths from accidents per ton of coal, but riskier in terms of accidents per employee (Wilson & Crouch 1982). Was coal mining riskier in 1950 or 1970? There is no right answer. Likewise, there is no single, objective definition of safety. For example, airline safety can be measured on many dimensions, including the percentage of flights ending in accidents relative to total number of flights and the percentage of traveler deaths relative to total number of travelers. But there is no single definition of safety.

The second approach to risk, reviewed by Yates & Stone (1992), examines the perceived riskiness of monetary gambles. Over a decade ago, Coombs & Lehner (1984) found that losses have greater impact than gains, an asymmetry well known in choice behavior (Kahneman & Tversky 1979). Coombs & Lehner described this asymmetry in risk judgments with a bilinear model, similar to subjective expected utility theory with sign-dependent utilities and probabilities.

Luce & Weber (1986) proposed a theory of risk judgments called conjoint expected risk. Risk perceptions were described as a weighted combination of three probabilities (winning, losing, and receiving nothing), expected gains (each gain raised to a power) conditional on winning,

and expected losses (each loss raised to a different power) conditional on losing.

More recently, Weber et al (1992) find that, holding probability constant, the effect of a given outcome on risk judgments decreases as the number of other outcomes in the gamble increases. This averaging effect cannot be explained by the previous models. Weber et al propose a relative weight averaging model with sign-dependent utilities and probabilities. Although each of the models describes risk judgments in some contexts, none of them gives a complete account, because changes in the stimulus context can alter decision strategies used to form risk perceptions (Mellers & Chang 1994). Simply by including certain gambles within the stimulus set, experimenters can get subjects to change their strategies for judging risk. This approach to risk perception has identified some cultural differences. Bontempo et al (1997) asked students in Hong Kong, Taiwan, the Netherlands, and the United States to rate the riskiness of monetary gambles. Responses are well-described by the conjoint expected risk model. Parameters of the model differ for subjects from Western countries and those from Asian countries. Western subjects place greater weight on the probabilities of losses, and Asians place greater emphasis on the magnitudes of losses. For Westerners, perceived risk decreases as some of the outcomes in a gamble improve and become positive. For Asians, perceived risk is less influenced by whether any of the outcomes are positive. Risk is clearly a cultural construct.

Risk Attitudes

In economic theories, risk attitudes are measured by revealed preferences. Consider a choice between a gamble and a sure thing equal to the expected value of the gamble. People who choose the sure thing are said to have risk averse preferences, and those who choose the gamble have risk-seeking preferences. Preferences are often risk averse in the domain of gains. Kahneman & Lovallo (1993) point out that risk premiums (differences between the expected value of a gamble and its certainty equivalent) can be substantially reduced if risks are aggregated over time. Thaler et al (1997) provide additional support for this claim. Although preferences are typically risk averse in the gain domain, they are frequently risk seeking in the loss domain, a result known as the reflection effect (Kahneman & Tversky 1979). In earlier research, the effect has been attributed to utility functions that differ for gains and losses. More recently, different weighting functions for gains and losses have been proposed instead of, or in addition to, changes in utilities. March (1996) examines whether preferences for risk can be described from experienced outcomes. Consider a two alternative, forced-choice task with variable reinforcement.

Learning theories assume that choice depends only on the outcomes experienced. March defines a set of simple stochastic models that describe trial-by trial learning and shows what happens when a learner is confronted with options of variable risk over many trials. When experienced outcomes are positive, learners favor less risky alternatives. When experienced outcomes are negative, learners favor riskier alternatives in the short run and risk neutrality in the long run. In short, the tendency for greater risk aversion with gains than with losses is predicted by simple theories of accumulated learning. Do decision makers believe their own risk attitudes change across gain and loss domains? Weber & Milliman (1997) hypothesize

that when risk preferences are defined by the decision maker, not by economic theory, perceived risk attitudes will show greater consistency across domains. Weber & Milliman present subjects with pairs of gambles and measure both preferences for gambles and risk perceptions. The majority of subjects choose gambles perceived as less risky in both domains. Perceptions of risk vary across domains, but perceived-risk attitudes are more stable and consistent than risk attitudes defined by economic theory. Mellers et al (1997b) find similar results.

Emotions

Emotions have powerful effects on decisions. Moreover, the outcomes of decisions have powerful effects on emotions. This section reviews research on both pre decision and post decision affect. Isen (1993) argues that positive emotions increase creative problem solving and facilitate the integration of information. Estrada et al (1994) find that doctors in whom positive affect has been induced integrate information more efficiently than do controls, show less anchoring on earlier diagnoses, and display more creativity in their thinking. Positive feelings can promote variety seeking (Kahn & Isen 1993), overestimation of the likelihood of favorable events, and underestimation of the likelihood of unfavorable events (Nygren et al 1996, Wright&Bower 1992). In contrast, Bodenhausen et al (1994) find that people in positive moods are likely to engage in more stereotyped thinking than people in neutral moods. However, the effect vanishes when people are held accountable for their judgments. Negative affect can produce a narrowing of attention and a failure to search for new alternatives (Fiedler 1988). People in negative moods make more attribute-based comparisons than alternative-based comparisons (Luce et al 1997). In addition, they make faster and less discriminate use of information that can increase choice accuracy in easier tasks and decrease it in harder tasks. Research in this domain often treats emotions as a unidimensional construct, ranging from positive to negative. Lewinsohn&Mano (1993) propose a two dimensional model of affect, based on pleasantness and arousal. People in pleasant moods deliberate longer, use more information, and reexamine more information than others. People in aroused states tend to take more risks. Those who are aroused and in unpleasant moods employ simpler decision strategies and form more polarized judgments (Mano 1992, 1994).

Even a two-dimensional model seems inadequate for describing emotional experiences. Anger, sadness, and disgust are all forms of negative affect, and arousal does not capture all of the differences among them. Furthermore, many emotions, such as parental love, are domain specific. A more detailed approach is required to understand relationships between emotions and decisions.

Most of us know all too well the feeling of regret that can follow a decision. Gilovich & Medvec (1994, 1995) show that in the short term, people feel greater regret about actions than inactions, but in the long term, people feel greater regret about inactions than actions. Gilovich & Medvec suggest that time reduces the sting of regrettable actions and increases the sadness of regrettable inactions. In contrast, Kahneman (1995) believes people regret actions more than inactions throughout their lives. He contends that Gilovich & Medvec are

measuring two distinct emotions, one being an intense, hot feeling that accompanies action and the other being a reflective, wistful feeling that captures the sadness of missed opportunities.

Mellers et al (1997a) devised a paradigm for measuring both choices and affective responses to monetary outcomes of gambles. After a choice, subjects learn the outcome of the chosen gamble and describe their emotional response to it on a scale ranging from very elated to very disappointed. This paradigm allows the estimation of decision utilities from choices and experienced utilities from emotions. Decision utilities differ from hedonic responses in two important respects. First, unlike decision utilities, experienced utilities are influenced by subjective probabilities. Surprising wins are more pleasurable than expected wins, and surprising losses are more disappointing. Second, unlike decision utilities, experienced utilities depend on counterfactual possibilities. Obtained outcomes are evaluated relative to what might have happened under different states of the world and different choices. These comparisons can make larger losses feel less painful than smaller losses and smaller gains feel more pleasurable than larger gains, a result also found by Boles & Messick (1995). Mellers et al provide an account of emotional responses that they call decision affect theory. With some additional assumptions, this theory can predict choices from emotions. Memories of hedonic experiences can be important guides to future choice. Kahneman and his colleagues show that when we make global evaluations of past experiences, we are often insensitive to the duration of the experience (Fredrickson & Kahneman 1993, Varey & Kahneman 1992). In one study, Redelmeier & Kahneman (1996) examined moment-to-moment and retrospective evaluations of the pain experienced by patients undergoing diagnostic colonoscopy. Patients indicated their discomfort every 60 s during the procedure and their overall discomfort at the end. The duration of the procedure, which ranged from 4 min to 69 min, does not predict retrospective evaluations. Instead, a peak-end rule, representing an average of the worst moments and the final moments of the experience, predicts global hedonic responses. In other experiments, Kahneman and his colleagues show that by adding diminishing pain to the end of a painful experience, global evaluations can be made more positive (Kahneman et al 1993a). These results have both humane and Orwellian implications and suggest enormous possibilities for decision engineering.

Beliefs

Decisions are based on beliefs about the likelihood of future events. Those beliefs are expressed as probability judgments, judgments under uncertainty, and confidence judgments.

Values

The endowment effect refers to the observation that people value objects they own more than objects that are not part of their subjective endowment (Kahneman et al 1990). Not only current ownership but history of ownership affects value (M Strahilevitz & GF Loewenstein, manuscript in preparation). For objects in one's possession, value increases with the duration of ownership. For objects that are currently not in one's possession but were at one time, value increases with the duration of past ownership. Loewenstein & Issacharoff (1994) further demonstrate that value is influenced by how the object was obtained. People who

obtain an object due to exemplary performance value that object more highly than people who obtain the same object due either to chance or to poor performance. Their results have implications for public policies, such as housing programs. Policies that give homes away to lower income families may be less effective at improving neighborhoods than policies requiring families to purchase homes, even at extremely low prices. These results converge with those of Arkes et al (1994) who find that windfall gains are spent more readily than other types of assets, presumably because they are valued less. Similarly, unexpected tax rebates, lottery winnings, and inheritances may have less value than earned income.

5. Decision Makers and Decision Making Processes

So far, the literature reviewed has identified the nature of strategic decisions, characteristics of good decision making processes. This section will consider the role of individuals and groups in Decision Making processes. Eisenhardt & Zbaracki (1992) note three paradigms which attempt to describe the nature of strategic decision making: rationality or bounded rationality; politics & power; garbage can. The authors review the empirical support for each theory, concluding that several main contentions have enough empirical support that they can be agreed, namely:

- Decision makers are rational or boundedly rational;
- Decision making is a political process in which the powerful get their way;
- Decision makers play politics; and
- the garbage can model (though limited in its empirical support) offers an important signal - that chance is important.

Eisenhardt and Bourgeois (1988) identify the importance of power and conflict, and propose a critical link between centralization of power and the appearance of politics in an organization. While the authors accepted that all strategic decision processes are ultimately political. (p.737), they defined politics as .the observable, but often covert, actions by which executives enhance their power to influence a decision. (p.737-738). In

organizations which they studied in depth, politics were negatively linked with performance. Using quite different quantitative methods across a larger sample group, Dean and Sharfman (1996) evaluated Strategic Decision Effectiveness in twenty-four firms, looking at sixty-one decisions, and similarly found that political behavior was negatively related to effectiveness. Conflict in team processes is discussed by many authors (for instance, Amason 1996 and Eisenhardt (1997). Amason (1996) notes the importance of team heterogeneity for decision making processes, and suggests that both cognitive characteristics and team processes influence the SDM process, and that types of conflict influence decision quality. He identifies affective conflict (which is dysfunctional and has a negative effect on decision quality) and cognitive conflict (which is functional has a positive effect on decision quality), and notes that well managed team processes are likely to result in better decisions, with less affective conflict. In a similar vein, Eisenhardt, Kahwajy & Bourgeois (1997) equates .substantive, issue oriented and .cognitive. conflict, and describes the importance of conflict in extracting

comprehensive and extensive decision processes. Eisenhardt et al. (1997) conclude that conflict reflects a continuously evolving understanding of the world that is gained through interaction with others around alternative viewpoints. (p.60) Hambrick and Mason's (1984) paper on upper echelons opened up a stream of literature examining the makeup of top management teams. They argued that if decision making is a process, and process is affected by behavioral factors, then the behavior of senior managers is important to understanding the strategic decision making process. And behavior is at least in part derived from the characteristics of the individuals at the top of the organization. In keeping with the view that strategic decisions are made by the firms most senior managers, many authors (for instance, Eisenhardt (1989), Smith, Smith, Olian, Sims, & O.Bannon (1994), Papadakis & Barwise (1995) and Miller Burke & Glick (1998)) explore the actions and composition of top managers and management teams, and the effects of these on strategic decisions.

The influence on decision making of cognitive diversity (Miller et al. 1998), and demographic diversity (Smith, et al. 1994) in the top team have been examined. Conclusions from both studies suggest that diversity of individual characteristics of members of the team may require a process which enables them to integrate effectively. Thus in Smith et al., some aspects of heterogeneity had a negative impact on performance, and it is suggested that team building activities in some circumstances might have substantial pay-offs for the firm. Similarly, Miller et al. identify a negative influence of cognitive diversity over comprehensiveness and extensiveness, and suggest that the management of diversity needs further research.

Papadakis & Barwise (1995) examined both demographic and cognitive characteristics of CEOs and Top Management Teams. They found that decision process was strongly influenced by the team makeup, but not by the individual CEOs. Thus it is the teams themselves that seem to be linked to performance, rather than the individuals.

In the SME field, owner managers and entrepreneurs are frequently cited as having identifiable characteristics (Stokes 1998). All owner managers are not entrepreneurs, however, and entrepreneurs may exist in much larger organizations. Stokes also notes that researchers (for instance Kets de Vries (1985), Chell, Haworth & Brealey (1991)) have tried to identify both single important traits and clusters of characteristics which define the entrepreneur. He also notes that the sheer variety of people who are identified as entrepreneurs indicates a limitation to the demographic approach.

Lawrence (1991) notes that demographic studies have a key shortcoming: they substitute input characteristics for process. They collect demographic information about management and try to establish causal relationships directly with outcomes, thus ignoring the .black box. of the interactions between managers, systems, and the environment. Pettigrew (1992) attributes the conflicting and uncertain findings of these studies to this problem, critiquing in addition the shortcomings of the correlational methodologies employed. He builds on this criticism, noting that the:

Damning indictment of the demography-based top management team research is that no one has ever been anywhere near a top team in an organizational setting either to directly observe

a team in action, or to interview the members about the links between their characteristics and structure, processes of communication and decision making and their impact and performance.. (p.175)

Pettigrew completes his critique by calling for more contextualized approaches to research to be employed in the field. These alternative methodologies would consider the wider range of influences in a more holistic manner. Pettigrew (1992) also notes that even difficulties of access to senior managers can be overcome, citing Eisenhardt (1989) Eisenhardt and Schoonhoven (1990) and Pettigrew and Whipp (1991) as good examples in the field.

Higgs (1997) investigates these matters with a more complex model, using demographic, process, and outcomes characteristics of working teams to try to establish relationships between inputs, process and outcomes. This work builds on the proposed models of McGrath (1964) and Hackman and Morris (1975). The McGrath (1964) model is shown as Exhibit Two. Higgs work takes a more holistic view than those attempting to link demographic characteristics of individuals with performance. It lends support to the view that process is an intervening variable between individual characteristics (inputs) and outcomes. It also looks at teams, rather than individuals. However, it also has limitations, resulting from the correlational analysis, and the necessarily limited number of factors used to enable the model to be analyzed with multivariate statistics. Dean and Sharfman (1996) collected data on 61 decisions, using interviews with senior managers to investigate the effectiveness of Strategic Decision Making process. Their conclusion was that .decision processes influence the strategic choices managers make, which in turn influence the outcomes affecting a firm. (p.389). They also note that .managers who collected information and used analytical techniques made decisions that were more effective than those who did not. Those who engaged in the use of power or pushed hidden agendas were less effective than those who did not. (p.389), they note that their study, despite using quite a different methodology, shows .that some of the findings of Eisenhardt and Bourgeois (1988) and

Bourgeois and Eisenhardt (1988), extend beyond unstable environments to include stable ones as well. (p.389).

Approaching the field from a different perspective, McFadzean and Money (1994) evaluated the literature on Strategic Problem solving, and noted that inputs into decision making can be addressed in many ways, as appropriated: .decision makers may need to use problem solving tools such as conceptual maps, creative problem solving techniques and/or decision analysis tools. The type(s) or tools needed will depend on the complexity and severity of the problem.. (p.18)

In keeping with Pettigrew (1992), Dean and Sharfman (1996) suggest that future research might include .more complex conceptualizations of decision making, implementation, and environmental effects. Formulating these would probably require conducting case study research, so as to disentangle the complex strands of influence on decision effectiveness in any setting.. (p.391).

The literature suggests, therefore, that process is important. The literature on top team

demographics which resulted from Hambrick and Mason's (1984) paper has been inconclusive about the influence of demographics on decision making. Pettigrew's (1992) scathing criticism of the demographic approach for substituting inputs for process is a compelling argument against the approach. Dean and Sharfman (1996) follow Pettigrew (1992) and Eisenhardt & Zbaracki (1992) in calling for contextualized research examining Strategic Decision Making processes in situ.

6. Conclusion

'Decision-making', as it is conceptualized by management and organization studies, is based on the logic of a method, model and goal. It assumes the pre-existence of an ideal which can be designed prior to the human engagement with the object of practice.

It was not the purpose of this paper out of others. On the contrary, it aims to highlight the major factor beyond decision making in any organization, and to highlight the Quantitative and Qualitative Factors in Decision Making.

(Table 1 summarizes the differences between quantitative and qualitative factors in Decision Making)

Table 1. Quantitative & Qualitative factors in decision making

Quantitative Factors	Qualitative Factors
Provide a numerical basis for decision making – reduces decisions to looking at a monetary value placed on different choices, such data provides only part of the story.	Qualitative factors look to take account of these other issues that may influence the outcome of a decision.
The effects of decisions on stakeholder groups and their response to such decisions.	Can be wide ranging and especially need to consider the impact on human resources and their response to decisions.
Investment Appraisal	SWOT: A SWOT analysis might be part of this: <ul style="list-style-type: none"> • Strengths • Weaknesses • Opportunities • Threats
Break-Even Analysis	HRM: Human Resources Management in particular the effects on: <ul style="list-style-type: none"> • Motivation • Morale • Recruitment and Retention • May be difficulty to assess and measure • May need to distinguish between short term effects and long term
Market Research	<ul style="list-style-type: none"> • PEST: Might also need to factor in other external issues that might influence the decision making process which can be summarised as: <ul style="list-style-type: none"> • Political • Economic • Social • Technological
Sales Forecasting	Publicity and Public image
Critical Path Analysis	Long term survival/ development issues
Decision Trees	Stakeholder Analysis

Eventual decision may rest on the balance between the perceived effects of quantitative and qualitative. If the long term effect on the workforce for example was to reduce productivity or increase absence because of the impact on motivation and moral the fact that a decision makes financial sense may be shelved.

Qualitative by its nature, therefore is very subjective

Due to its highly theoretical character, this paper represents a good starting point for some further research. Descriptive, exploratory and explanatory studies may be founded on the basis of the present factors beyond decision making.

References

- Bazerman, M. H., & Chugh, D. (2005). Bounded awareness: Focusing failures in negotiation. In L.Thompson (Ed.), *Frontiers of Social Psychology: Negotiation*. Psychological Press.
- Bazerman, M. H., Loewenstein, G. F., & White, S. B. (1992). Reversals of preference in allocation decisions: Judging an alternative versus choosing among alternatives. *Administrative Science Quarterly*, 37(2), 220-240. <http://dx.doi.org/10.2307/2393222>
- Bazerman, M.H., & Moore, D. (2008). *Judgment in Managerial Decision Making* (7th ed.). Hoboken, NJ:John Wiley & Sons, Inc.
- Bazerman, M.H., White, S.B., & Loewenstein, G.F. (1995). Perceptions of Fairness in Interpersonal and Individual Choice Situations. *Current Directions in Psychological Science*, 4, 39-43. <http://dx.doi.org/10.1111/1467-8721.ep10770996>
- Blair, I. V. (2002). The malleability of automatic stereotypes and prejudice. *Personality & Social Psychology Review*, 6(3), 242-261. <http://psr.sagepub.com/content/6/3/242.abstract>.http://dx.doi.org/10.1207/S15327957PSPR0603_8
- Benartzi, S., & Thaler, R. H. (2007). Heuristics and biases in retirement savings behavior. *Journal of Economic Perspectives*, 21(3), 81-104. <http://dx.doi.org/10.1257/jep.21.3.81>
- Cooper, A. C., Woo, C. Y., & Dunkelberg, W. C. (1988). Entrepreneurs' perceived chances for success. *Journal of Business Venturing*, 3(2), 97-109. [http://dx.doi.org/10.1016/0883-9026\(88\)90020-1](http://dx.doi.org/10.1016/0883-9026(88)90020-1)
- Bourgeois, L.J., & Eisenhardt, K.M (1988), Strategic Decision Processes in High Velocity Environments: Four Cases in the Microcomputer Industry, *Management Science*, Vol. 34, No. 7 pp.816-835. <http://dx.doi.org/10.1287/mnsc.34.7.816>
- Dawes, R. M. (1971). A case study of graduate admissions: Application of three principles of human decision making. *American Psychologist*, 26(2), 180-188. <http://dx.doi.org/10.1037/h0030868>
- Fischhoff, B. (1982). Debiasing. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment Under Uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press: 422 – 444.
- Idson, L. C., Chugh, D., Bereby-Meyer, Y., Moran, S., Grosskopf, B., & Bazerman, M. (2004).Overcoming focusing failures in competitive environments. *Journal of Behavioral Decision Making*, 17(3), 159-172. <http://dx.doi.org/10.1002/bdm.467>
- Johnson, Eric J., & Goldstein, D. (2003). *Science*. 302 (5649), 1338 – 1339.

- Jolls, C., Sunstein, C. R., & Thaler, R. (1998) A behavioral approach to law and economics. *Stanford Law Review*, 50, 1471-1550. <http://dx.doi.org/10.2307/1229304>
- Kahneman, D., & Lovallo, D. (1993). Timid choices and bold forecasts: A cognitive perspective on risk and risk taking. *Management Science*, 39, 17-31 <http://mansci.journal.informs.org/content/39/1/17?related-urls=yes&legid=mansci;39/1/17>. <http://dx.doi.org/10.1287/mnsc.39.1.17>
- Larrick, R. P. (2004). Debiasing. In D. J. Koehler & N. Harvey (Eds.), *Blackwell Handbook of Judgment and Decision Making*. Oxford, England: Blackwell Publishers. <http://dx.doi.org/10.1002/9780470752937.ch16>
- Lerner, J. S., & Tetlock, P. E. (1999). Accounting for the effects of accountability. *Psychological Bulletin*, 125(2), 255-275. <http://dx.doi.org/10.1037/0033-2909.125.2.255>
- Lowery, B. S., Hardin, C. D., & Sinclair, S. (2001). Social influence effects on automatic racial prejudice. *Journal of Personality and Social Psychology*, 81(5), 842-855. <http://dx.doi.org/10.1037/0022-3514.81.5.842>
- Milkman, K.L., Rogers, T., & Bazerman, M. (2008). Highbrow films gather dust: A study of dynamic inconsistency and online DVD rentals. *HBS Working Paper 07-099*.
- Milkman, K.L., Rogers, T., & Bazerman, M. (in press). Harnessing our inner angels and demons: What we have learned about want/should conflict and how that knowledge can help us reduce short-sighted decision making.
- Moore, D., & Lowenstein, G. (2004). Self-interest, automaticity, and the psychology of conflict of interest. *Social Justice Research*, 17(2), 189-202. <http://dx.doi.org/10.1023/B:SORE.0000027409.88372.b4>
- Moore, D. A., Swift, S. A., Sharek, Z., & Gino, F. (2007). Correspondence bias in performance evaluation: Why grade inflation works. *Tepper Working Paper 2004-E42*.
- Moran, S., Ritov, I., & Bazerman, M.H. (2008).
- Mussweiler, T., Strack, F., & Pfeiffer, T. (2000). Overcoming the inevitable anchoring effect: Considering the opposite compensates for selective accessibility. *Personality and Social Psychology Bulletin*, 26, 1142-1150. <http://dx.doi.org/10.1177/01461672002611010>
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The Implicit Association Test at age 7: A methodological and conceptual review. In J. A. Bargh (Ed.), *Social Psychology and the Unconscious: The Automaticity of Higher Mental Processes*, New York: Psychology Press.
- Ritov, I., & Baron, J. (1992). Status-quo and omission biases. *Journal of Risk & Uncertainty*, 5(1), 49-61. <http://dx.doi.org/10.1007/BF00208786>
- Savitsky, K., Van Boven, L., Epley, N., & Wight, W. (2005). The unpacking effect in responsibility allocations for group tasks. *Journal of Experimental Social Psychology*, 41, 447-457. <http://dx.doi.org/10.1016/j.jesp.2004.08.008>

- Shiv, B., & Fedorikhin, A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, 26(3), 278-292. <http://dx.doi.org/10.1086/209563>
- Slovic, P., & Fischhoff, B. (1977). On the psychology of experimental surprises. *Journal of Experimental Psychology: Human Perception and Performance*, 3, 544-551: 23, 31.
- Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate. *Behavioral & Brain Sciences*, 23, 645-665. <http://dx.doi.org/10.1017/S0140525X00003435>
- Sunstein, C.R. & Thaler, R.H (2003). Libertarian paternalism is not an oxymoron. *University of Chicago Law Review*, 70 (Fall), 1159-99. <http://dx.doi.org/10.2307/1600573>
- Thaler, R. H., & Sunstein, C. R. (2008). *Nudge*. New Haven: Yale University Press.
- Thompson, L., Gentner, D., & Loewenstein, J. (2000). Avoiding missed opportunities in managerial life: Analogical training more powerful than individual case training. *Organizational Behavior & Human Decision Processes*, 82(1), 60-75. <http://dx.doi.org/10.1006/obhd.2000.2887>
- Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185(4157), 1124-1131. <http://dx.doi.org/10.1126/science.185.4157.1124>
- Aczél, J., & Saaty, T.L. (1983) .Procedures for synthesizing ratio judgements. *Journal of Mathematical Psychology*, 27, 93-102. [http://dx.doi.org/10.1016/0022-2496\(83\)90028-7](http://dx.doi.org/10.1016/0022-2496(83)90028-7)
- Baker, D., Bridges, D., Hunter, R., Johnson, G., Krupa, J., Murphy, J., & Sorenson, K. (2002) Guidebook to Decision- Making Methods, WSRC-IM-2002-00002, Department of Energy, USA. http://emi-web.inel.gov/Nissmg/Guidebook_2002.pdf
- Barron, F.H., & Barrett, B.E. (1996) .The efficacy of SMARTER . Simple Multi-Attribute Rating Technique Extended to Ranking., *Acta Psychologica*, 93, 23-36. [http://dx.doi.org/10.1016/0001-6918\(96\)00010-8](http://dx.doi.org/10.1016/0001-6918(96)00010-8)
- Bose, U., Davey, A.M., & Olson, D.L. (1997) .Multi-attribute utility methods in group decision making: Past applications and potential for inclusion in GDSS, *Omega*, 25, 691-706. [http://dx.doi.org/10.1016/S0305-0483\(97\)00040-6](http://dx.doi.org/10.1016/S0305-0483(97)00040-6)
- Brans, J.P., & Vincke, Ph. (1985). A preference ranking organization method, *Management Science*, 31, 647-656 <http://www.mendeley.com/research/notea-preference-ranking-organisation-method-promethee-method-multiple-criteria-decisionmaking/>.
- Brans, J.P., Vincke, Ph., & Marechal, B. (1986). How to select and how to rank projects: The PROMETHEE method, *European Journal of Operational Research*, 24, 228- 238. [http://dx.doi.org/10.1016/0377-2217\(86\)90044-5](http://dx.doi.org/10.1016/0377-2217(86)90044-5)

- Brans, J.-P., & Mareschal, B. (1994). The PROMCALC & GAIA decision support system for multicriteria decision aid., *Decision Support Systems*, 12, 297-310. [http://dx.doi.org/10.1016/0167-9236\(94\)90048-5](http://dx.doi.org/10.1016/0167-9236(94)90048-5)
- Csáki, P., Rapcsák, T., Turchányi, P., & Vermes, M. (1995). Research and development for group decision aid in Hungary by WINGDSS, a Microsoft Windows based group decision support system., *Decision Support Systems* 14, 205-21. [http://dx.doi.org/10.1016/0167-9236\(94\)00017-M](http://dx.doi.org/10.1016/0167-9236(94)00017-M)
- Dean, J. & Sharfman, M. (1996). Does Decision Process Matter? A Study of Strategic Decision-Making Effectiveness, *Academy of Management Journal*, Vol. 39, No 2, pp.368-396. <http://dx.doi.org/10.2307/256784>
- Dyer, R.F., & Forman, E.H. (1992). Group decision support with the Analytic Hierarchy Process., *Decision Support Systems*, 8, 99-124. [http://dx.doi.org/10.1016/0167-9236\(92\)90003-8](http://dx.doi.org/10.1016/0167-9236(92)90003-8)
- Edwards, W. (1977). How to use multiattribute utility measurement for social decision making., *IEEE Transactions on Systems, Man, and Cybernetics*, SMC-7, 326-340. <http://dx.doi.org/10.1109/TSMC.1977.4309720>
- Edwards, W., & Barron, F.H. (1994). SMARTS and SMARTER: Improved simple methods for multiattribute utility measurements., *Organizational Behavior and Human Decision Processes*, 60, 306-325. <http://dx.doi.org/10.1006/obhd.1994.1087>
- Ekárt, A., & Németh, S.Z. (2005). Stability analysis of tree structured decision functions., *European Journal of Operational Research*, 160, 676-695. <http://dx.doi.org/10.1016/j.ejor.2003.10.007>
- Figueira, J., Greco, S., & Ehrgott, M. (Eds.). (2004). *Multiple Criteria Decision Analysis: State of the Art Surveys*, Springer, New York.
- Forman, E., & Selly, M.A. (2001). *Decision by Objectives*, World Scientific. <http://dx.doi.org/10.1142/9789812810694>
- Gass, S. I., & Rapcsák, T. (1998). A note on synthesizing group decisions. *Decision Support Systems*, 22, 59-63. [http://dx.doi.org/10.1016/S0167-9236\(96\)00061-9](http://dx.doi.org/10.1016/S0167-9236(96)00061-9)
- Gass, S. I., & Rapcsák, T. (2004). Singular value decomposition in AHP. *European Journal of Operational Research*, 154, 573-584. [http://dx.doi.org/10.1016/S0377-2217\(02\)00755-5](http://dx.doi.org/10.1016/S0377-2217(02)00755-5)
- Harris, R. (1998) *Introduction to Decision Making*, VirtualSalt. <http://www.virtualsalt.com/crebook5.htm>
- Keeney, R.L., & Raiffa, H. (1976). *Decisions with Multiple Objectives: Performances and Value Trade-Offs*, Wiley, New York.
- Keeney, R.L. (1976). A group preference axiomatization with cardinal utility. *Management Science*, 23, 140-145 <http://mansci.journal.informs.org/content/23/2/140>.

- Lai, V.S., Bo K.W., & Cheung, W. (2002). Group decision making in a multiple criteria environment: A case using the AHP in software selection. *European Journal of Operational Research*, 137, 134-144. [http://dx.doi.org/10.1016/S0377-2217\(01\)00084-4](http://dx.doi.org/10.1016/S0377-2217(01)00084-4)
- Leyva-López, J-C., & Fernández-González, E. (2003). A new method for group decision support based on ELECTRE III methodology. *European Journal of Operational Research*, 148, 14-27. [http://dx.doi.org/10.1016/S0377-2217\(02\)00273-4](http://dx.doi.org/10.1016/S0377-2217(02)00273-4)
- Linkov, I., Varghese, A., Jamil, S., Seager, T.P., Kiker, G., & Bridges, T. (2004). Multi-criteria decision analysis: A framework for structuring remedial decisions at the contaminated sites., In: Linkov, I. and Ramadan, A.B. (Eds.) *Comparative Risk Assessment and Environmental Decision Making*, Springer, New York, pp. 15-54 <http://www.springerlink.com/content/j4372u452h6m09j6/>.
- Macharis, C., Brans, J.P., & Mareschal, B. (1998). The GDSS PROMETHEE Procedure. *Journal of Decision Systems*, 7, 283-307.
- Macharis, C., Springael, J., De Brucker, K., & Verbeke, A. (2004). PROMETHEE and AHP: The design of operational synergies in multicriteria analysis.: Strengthening PROMETHEE with ideas of AHP., *European Journal of Operational Research*, 153, 307-317.
- Mareschal, B. (1988). Weight stability intervals in multicriteria decision aid. *European Journal of Operational Research*, 33, 54-64. [http://dx.doi.org/10.1016/0377-2217\(88\)90254-8](http://dx.doi.org/10.1016/0377-2217(88)90254-8)
- Mészáros, Cs., & Rapcsák, T. (1996). On sensitivity analysis for a class of decision systems., *Decision Support Systems*, 16, 231-240 <http://www.sciencedirect.com/science/article/pii/0167923695000127>.
- Mintzberg, H. (1979). *The Structuring of Organisations*, Englewood Cliffs, NJ: Prentice-Hall.
- Munda, G. (1996). Cost-benefit analysis in integrated environmental assessment: some methodological issues. *Ecological Economics*, 19, 157-168. [http://dx.doi.org/10.1016/0921-8009\(96\)00048-1](http://dx.doi.org/10.1016/0921-8009(96)00048-1)
- Nemhauser, G.L., Rinnoy Kan, A.H.G., & Todd, M.J. (1989). *Handbooks in Operations Research and Management Science*, Volume 1 Optimization, North-Holland, Amsterdam.
- Quinn, J.B. (1980). *Strategies for Change: Logical Incrementalism*. Homewood, Illinois: Irwin.
- Rapcsák, T. (2004). Multiattribute Decision Making, Lecture notes, Department of Decisions in Economics, Corvinus University, Budapest. (in Hungarian)
- Roy, B. (1968). Classement et choix en présence de points de vue multiple (la méthode electre). *RAIRO*, 2, 57-75.
- Saaty, T.L. (1980). *The Analytic Hierarchy Process*, McGraw Hill.

Saaty, T.L., & Vargas, L.G. (1984). Comparison of eigenvalue, logarithmic least squares and least squares methods in estimating ratios. *Mathematical Modelling*, 5. [http://dx.doi.org/10.1016/0270-0255\(84\)90008-3](http://dx.doi.org/10.1016/0270-0255(84)90008-3)

Stacey, R.D. (1993). *Strategic Management and Organisational Dynamics*, London: Pitman.

Steuer, R. E. (1986). *Multiple Criteria Optimization: Theory, Computation and Application*, Wiley, New York.

Triantaphyllou, E., & Sanchez, A. (1997). A sensitivity analysis approach for some deterministic multi-criteria decision making methods, *Decision Sciences*, 28, 151-194. <http://dx.doi.org/10.1111/j.1540-5915.1997.tb01306.x>

Triantaphyllou, E. (2000). *Multi-Criteria Decision Making Methods: A Comparative Study*, Kluwer Academic Publishers, Dordrecht.

UK DTLR. (2001). Multi Criteria Analysis: A Manual, Department for Transport, Local Government and the Regions, UK. http://www.odpm.gov.uk/stellent/groups/odpm_about/documents/page/odpm_about_608524.hcsp

US EPA. (2000.) Guidelines for Preparing Economic Analysis, United States. Environmental Protection Agency, EPA 240-R-00-003. <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>

Vincke, P. (1992). *Multi-criteria Decision-Aid*, John Wiley, Chichester.

Wolters, W.T.M., & Mareschal, B. (1995) .Novel types of sensitivity analysis for additive MCDM methods. *European Journal of Operational Research*, 81, 281-290. [http://dx.doi.org/10.1016/0377-2217\(93\)E0343-V](http://dx.doi.org/10.1016/0377-2217(93)E0343-V)