DECISION THEORY AND RISK MANAGEMENT IN PUBLIC ORGANIZATIONS: A LITERATURE REVIEW

TEORÍA DE LAS DECISIONES Y GESTIÓN DEL RIESGO EN ORGANIZACIONES PÚBLICAS: UNA REVISIÓN DE LITERATURA

IGNACIO CIENFUEGOS SPIKIN
University of Twente, Holanda
i.j.cienfuegosspikin@utwente.nl

RESUMEN

La disciplina de gestión del riesgo es cada vez más aceptada y promovida por practicantes, académicos y gobernantes en el sector público. Por otra parte, la Teoría de las Decisiones está implícitamente contenida en el proceso de gestión de riesgo, considerando que depende de las normas y preceptos generales de ese enfoque. Al concebir la gestión de la incertidumbre como un ciclo, luego de la fase de evaluación de riesgos, los tomadores de decisiones debiesen adoptar decisiones en cuanto a su tratamiento. Este artículo discute los métodos normativos más comunes sobre toma de decisiones en el contexto de las entidades públicas, instrumentos que apoyan decisiones racionales sobre estrategias de riesgos. Luego de estudiar las dificultades del enfoque neo-clásico sobre toma de decisiones y en particular los métodos de análisis costo-beneficio y análisis multi-criterio, se examinan los enfoques descriptivos utilizados para explicar decisiones reales en el ámbito de la política pública, como son; el enfoque de racionalidad limitada, las reglas de oro, el incrementalismo y la exploración mixta, métodos que podrían entregar elementos adicionales en relación a revelar cómo toman decisiones las organizaciones públicas al formular opciones sobre mitigación de riesgo.

Palabras clave: Gestión del riesgo, Organizaciones públicas, Teoría de las decisiones, Ciclo de gestión del riesgo.

ABSTRACT

Public risk management is becoming accepted and promoted by practitioners, scholars and governments in the public sector. Decision Theory is implicitly contained by the risk management process, since risk management depends on rules derived from general knowledge and precepts of Decision Theory (Vaughan, 1997). Once a risk has been past the assessment phase, a decision must be made regarding what –if anything– should be done, thus different approaches to risk management decisions are possible. This article discuss the most classic norma-

tive methods for decision making in the context of public entities, elements that could be used to support these types of organizations in the assessment of risk strategies. After studying the difficulties of the rational methodology of decision making and in particular the methods of Cost Benefit Analysis and Multi Criteria Analysis, we review the descriptive approaches used to explain decisions in the field of public policy, such as Bounded Rationality, Rules of Thumb, Incrementalism and Mixed Scanning, frameworks which might provide us with further explanations in terms of how local public decision makers formulate choices about risk options.

Keywords: Risk management, Public organizations, Decision theory, Risk management cycle.

INTRODUCTION

Public risk management is becoming accepted and promoted by practitioners, scholars and governments in the public sector (Fone and Young 2000). As discussed by Boorsma (2006), there are enough reasons to apply risk management to public organizations: the economization of financial losses and time, the prevention of human life loss and the accomplishment of strategic objectives, among others. Additionally, risk management decisions are concerned primarily with a specific step in risk management process, which is through selecting the techniques or strategies that will be used for the risks that have been identified and measured. Consequently, we state that Decision Theory is implicitly contained by the risk management process, since risk management depends on rules derived from general knowledge and precepts of Decision Theory (Vaughan 1997).

Modern Decision Theory has developed since the middle of the 20th century, through contributions from several academic disciplines. Although it is now clearly an academic subject on its own right, Decision Theory is typically pursued by researchers who identify themselves as economists, statisticians, psychologists, political and social scientists or philosophers (March and Shapira 1987). A political scientist, for example, would be interested in studying voting rules and other aspects of collective decision-making, a psychologist is likely to study the behaviour of individuals when making decisions, and a philosopher would probably study the requirements for rationality in the decision process. However, as mentioned by Vaughan (1997), there is also a large overlap between these applications of Decision Theory, and the subject has gained from the variety of methods that researchers with different backgrounds have used for the same or similar problems. Especially in recent years, we have seen how quantitative techniques of decision making have grown, although not neglecting the fact that the analysis of a problem of decision making often requires some qualitative considerations (Vaughan 1997).

Under the heading of the discipline, literature offers an account of the ways people actually make decisions and a discussion on the mechanisms underlying this behaviour. This is called a descriptive or positive perspective of Decision Theory. On the other hand, we can also find the approach of Decision Theory that consider rational decisions and prescribe a normative formula for the decision process.

Normative and rationalistic models for decision making are based on the conceptions about how decisions are to be made. In this perspective, a decision maker should first become aware of a problem, then posit a goal, carefully weigh alternative means, and finally choose among them according to his estimates of their respective merit. This rational approach of decision making applied to risk

management, prescribes how to act when there is uncertainty and lack of information. We could find several techniques both for the assessment (identification and evaluation of risks) and to determine the optimal response for a specific risk (e.g. Cost Benefit Analysis). In the public arena, the standard literature of decision making pays more attention to the rational and normative approach rather than the descriptive one. The tendency to prescribe public decision even for complex problems by normative approaches has been influenced by the attention paid to operations research, the statistical decision theory, and systems analysis methods (Lindblom 1959). As argued by Lindblom (1959), the main characteristics of the normative and rational methods for decision making are: clarity of objective, explicitness of evaluation, high degree of comprehensiveness of overview, and, wherever possible, quantification of values for mathematical analysis. Nevertheless, norms of rationality are by no means the only or even the most important approach that we can apply in decision making.

Descriptive approaches of Decision Theory assume that the information that decision makers have about the consequences of their choices is, at best, fractional. Therefore, they have neither the assets nor the time to collect the information required for a rational choice. As a result, alternative methods of Decision Theory state that individuals in the attempt of following the view of a rationalistic model will become frustrated, exhausting his resources without reaching a clear decision, remaining at the end without an effective decision-making model to guide them (Simon 1957). Therefore, according to this line of research, individuals are said to be persistently irrational in their decision.

Descriptive approaches that focus on evidence by experiments in economic psychology and behavioural economics, have advanced dramatically in public profile and academic publications over the past two decades, this being developed to a large extent by economist Herbert Simon (1959, 1978, 1987) and more recently, by psychologist Gerd Gigerenzer (2001, 2007; see also Gigerenzer and Todd 1999), Economist Vernon Smith (2003) and previously, psychologists Daniel Kahneman and Amos Tversky (1979).

Therefore the goal of this article is a theoretical one, since we plan to draw explanations about the risk management decision process in public entities, constructing a theoretical framework that could serve us for a further empirical research. Thus, from the existing literature of decision theory, we should be able to build a multidisciplinary approach that takes an account standard and nonerational decision methods. As a consequence, the standard economic tools, which are most commonly used for public decisions, will be first analyzed to explain risk management choices in public organizations. However, because of the apparent limitations in the literature concerning neo-classical theories, the potential deviations from such rational methods by public decision makers, might be better

explain using elements of the descriptive approach[1]. Consequently an eclectic approach , using different and competing concepts of Decision Theory literature, will be considered to give a complete explanation in terms of risk management decision by public organizations.

NORMATIVE PERSPECTIVE OF DECISION THEORY

Cost Benefit Analysis, a standard representation for rational decisions

One of the most well-known methods for rational decision making is Cost Benefit Analysis (CBA). According to Williams and Giardina (1993), every rational decision maker faces the problem of seeking solutions which could enable him to maximize his net benefit. For this purpose, in order to determine whether or not it is advantageous to adopt a particular choice, a decision maker would try to define and quantify its possible effects. We can trace the origins of CBA in Economic theory, particularly in the theory of social welfare and resource allocation, ideas that could assist a decision maker in the objectives of finding the best solution through adding up values of all of the good and bad consequences of a decision. As commented by Fischhoff, Lichtensstein, Slovic Derby and Keeney (1981), these values are defined as individual preferences (or subjective valuations). Therefore, concepts of rational neoclassical economic theory are used in this method to assess preferences, particularly as they are revealed in market behaviour. Thus, CBA seeks to value the expected impacts of an option in monetary terms. Consequently, the valuations should consider the willingness to pay of potential gainers for the benefits they will receive as a result of the option, and the willingness of potential losers to accept compensation for the losses they will incur. The latter implies that rational (optimal) decisions, require to select a set of strategies in such a way that, given the constrains imposed by their decisions possibility set (e.g. municipal institutional context), it would be impossible to make any member of the organization (e.g. community) better off without making another worse off (Pareto criterion). Therefore in terms of this criterion, a policy is desirable if the benefits exceed the losses, appropriately discounted over time.

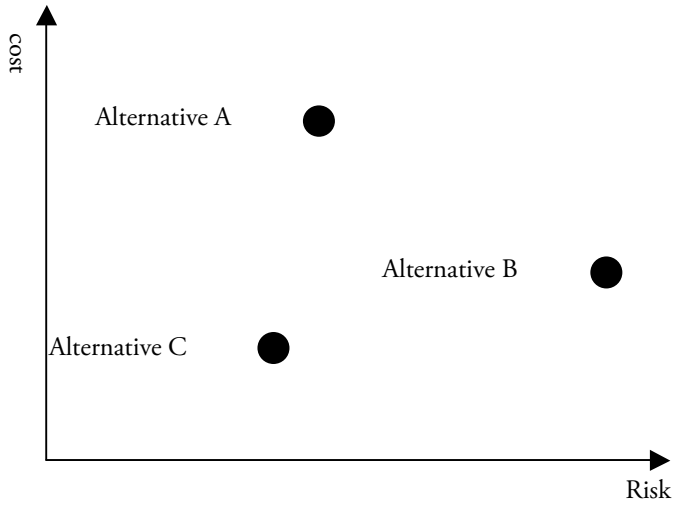
CBA applied to the discipline of risk management, seeks to measure the contribution that a risk technique or response makes to the risk management process by determining whether, and by how much, the technique benefits exceed the cost to implement it. The greater the benefits for a given cost, or the lower the cost

[1] The term eclectic denotes the use of some theoretical elements and concepts of Decision Theory. Eclecticism is a conceptual approach that does not hold rigidly to a single paradigm or set of assumptions, but instead draws upon multiple theories, styles, or ideas to gain complementary insights into a subject, or applies different theories in particular cases An eclectic thinker according to Mautner (2000) is one who selectively adopts ideas from different sources and combines them in order to explain a phenomena.

for a given level of benefits, the more cost effective the particular technique and response is thought to be (Vaughan 1997). Consequently, risk managers might weigh several factors that include cost and risk. For example, as showed in figure 2.1, the analysis of three different alternatives could be presented. Alternative C might be the best choice, because the levels of risk and cost are less than those of alternatives A and B. Nevertheless, if the only alternatives would be A and B, the decision might be more difficult. Alternative A has a higher cost and lower risk than alternative B, alternative B has higher risk but lower cost than alternative A. Consequently, a local public manager would have to weigh the importance of risk and cost and the availability of resources to respond when applying CBA for decision making and would also make use of the information on risk-based developed in the previous stage of the risk management process, where risks where identified and analyzed in respect of their likelihood (frequency) and impact.

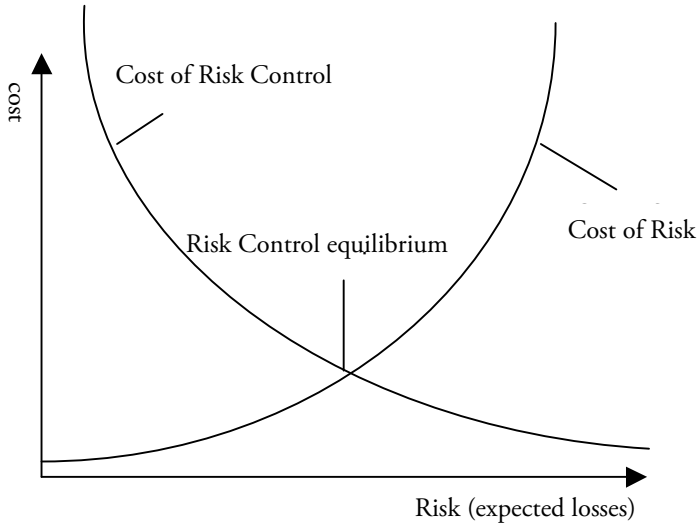
Moreover, as discussed by Ayyub (2003), economic efficiency could be pertinent to determine the most effective means of expending resources taking into account that at some point, the costs for risks reduction (controls) might not provide adequate benefits. Thus, CBA applied to risk management compares the costs and risks to determine where the optimal risks value is on a cost basis. Following this approach then, the optimal value occurs when costs to control risks are equal to the risk cost due to the consequences (loss) (see figure 2.2). Therefore, investing resources to reduce risks below this equilibrium point would not provide additional financial benefits.

Figure 1: Risk Benefits for three alternatives



Source: Ayyub (2003).

Figure 2: Comparisons of risks and control costs



Source: Ayyub (2003).

With the objective of trying to express the principles described above in a more formal perspective, one simple and standard method to develop a benefit/cost ratio (B/C) would be the following:

$$B/C = \frac{A\,(P/A, i, n)}{Ic}$$

Where A = ARB – Ac

ARB = Annualized Risk Benefit
Ac = Annualized Cost
Ic = Initial Cost
P/A = Present value Factor
i = Interest Rate
n = Time Frame, Years

Despite of the contribution of CBA to the discipline of Decision Theory, some disapproval could be found in literature following political, philosophical and even practical grounds. The most popular criticism has to do with the information needed to construct the analysis that this method requires. Often in real life, some authors claim, organizations might not have access to relevant data to conduct a CBA or it could be too expensive to collect the required information

(Olson 1995, Vaughan 1997, Habegger 2008, Bazerman and Watkins 2004, Nye 1994, Williams and Giardina 1993). In addition, a more political and philosophical aspect frequently reported as a difficulty of CBA, has to do with the number of impacts which cannot in reality be quantified against a scale of monetary values (Olson 1995), such us establishing the monetary value of life or human health (Fischhoff, Lichtensstein, Slovic, Derby and Keeney 1981, Ayyub 2003).

Another problem of applying CBA found in literature, has to do with the many intangible consequences of the decision making process. Specifically in the case of risk management decisions, this might represent financial or reputational losses that are frequently relevant for any organization. These certainly intangible consequences are difficult to measure ahead and are often hidden from the eyes of the decision maker, but might affect the future performance of the organization and the trust of the public opinion, citizens or clients. As mentioned by Drennan and McConnell (2007), particularly in the case of public organizations compliance with the legislation, regulations as well as with the expectation of stakeholders and society in general, are risks drivers that are often neglected.

Another view is the one presented by Habegger (2008), who states that the tragedy of applying risk management in public organizations might be that the costs for tackling identified risks occur in the present, while benefits will only be reaped in the future (Bazerman and Watkins 2004, Meier and Slembeck 1998). Therefore, in order to implement a risk management policy or strategy, scarce resources must be used now "to prevent an ambiguous potential harm from occurring in the future" (Bazerman and Watkins 2004). In addition, for further emphasis, the benefits of risk treatment or responses would in most cases only be virtual or hypothetical, because of the difficulty to prove that adverse outcomes were to result from risk management inaction. As Nye (1994) expressed it in response to the nature of risk management, "successes often remain hidden, while failures become public". An extreme example of this might be the risk strategies and responses to the catastrophic exposition to terrorism of the United States, materialized by the large-scale attack of 11 September 2001. Neither citizens nor (the vast majority of) decision makers would have recognized a tangible return from their investments in intelligence as a risk management strategy to deal with such risk that materialized. It is not surprising then, that political decision makers are rarely committed to pushing for adequate risk programs and responses, in view of the difficulty to communicate the optimal respective strategy. They are reluctant to allocate resources to issues that may never happen or whose benefits will only be seen when they are out of office (Cleary and Malleret 2007).

Although CBA is a good normative and rational technique for risk management decision making –as mentioned by Vaughan (1997)– the nature of risk situations creates limitations to its use. Whereas costs are generally measurable,

benefits may not necessarily be. Therefore, in terms of rational or normative decision making, there might be alternative instruments in Decision Theory where not only monetary consequences but also unpriced impacts of policy decisions may be taken into account (Williams and Giardina 1993).

Multi Criteria Analysis, a rational approach with non-monetary elements

Multi Criteria Analysis (MCA) is a popular approach for decision making in risk management, to measure and evaluate strategies to be used through the incorporation of non-monetary elements into the risk decision process. MCA applications often involve combinations of some criteria which are valued in monetary terms, and others for which monetary valuations do not exist.

MCA establishes preferences between options by reference to an explicit set of objectives that the decision maker has identified, and for which it has established measurable criteria. The process of identifying objectives and criteria may on its own provide enough information for decision makers. Therefore, where a level of detail to CBA is required, MCA offers a number of ways of aggregating the data on individual criteria to provide indicators of the overall performance of options. MCA has had an important growth in Decision Theory literature in the last decades. Therefore we can identify several techniques. For the purpose of this research, we will only focus on some applications of this method.

All MCA approaches define options according to the different criteria and all require the exercise of judgment (Williams and Giardina 1993). They differ however, in how they combine the data. Formal MCA techniques usually provide an explicit relative weighting system for the different criteria. MCA techniques can be used to identify a single most preferred risk response, to rank options, to short-list a limited number of strategies for subsequent detailed appraisal, or simply to distinguish acceptable from unacceptable possibilities (Yoon and Hwang 1995).

A standard technique of MCA reported in Decision Theory literature is the performance matrix, in which each row describes an option and each column defines the performance of the options against each criterion. The individual performance assessments are often numerical, but may also be expressed as bullet point scores (Williams and Giardina 1993). Table 1 shows a straightforward example of performance matrix applied to risk management decisions, where various standard options to deal with risk are presented and assessed by the means of a performance matrix. In a basic form of MCA, this performance matrix might be the final product of the analysis. The decision makers are then left with the task of assessing the extent to which their objectives are met by the entries in the matrix (Yoon and Hwang 1995).

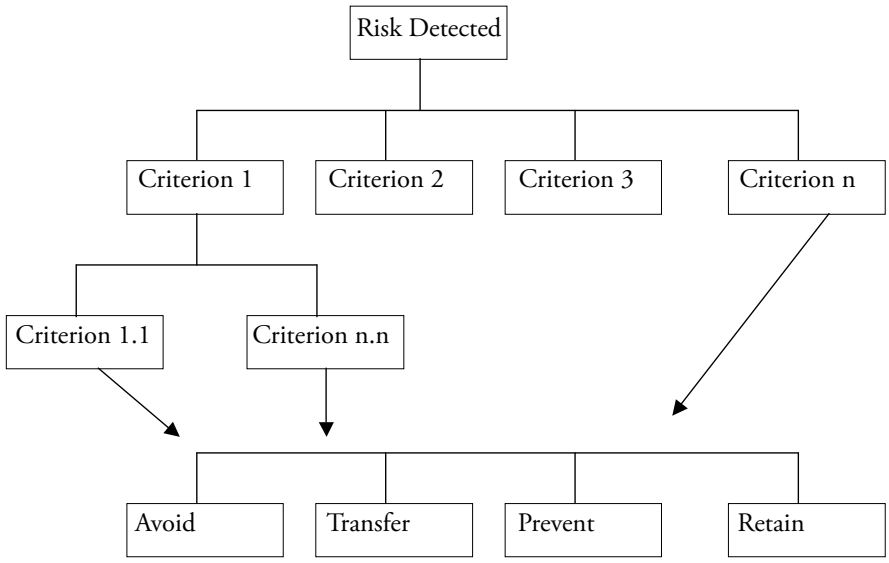
Table 1: A hypothetical performance matrix to weight different risk strategies

Options	Resources expenditure Ease of implementation	Internal capacity requirements	
Transfer	£18000		√
Retain	£0	√	√
Prevent	£22000		√
Reduce	£24000		√
Avoid	£0	√	

Source: Own elaboration.

An additional common method for MCA is the analytic hierarchy process (AHP), which uses procedures for deriving the weighs and the scores achieved by alternatives which are based, respectively, on pair comparisons between criteria and between options (Yoon and Hwang 1995). Thus, in assessing weighs, the decision maker is asked a series of questions, each of which asks how important one particular criterion is in relation to another for the decision being addressed, process which is usually also performed within a group or a team in an organization. Therefore, according to Watson and Buede (1987), for example, to obtain the weighs of attributes at one level in the hierarchy, a decision maker is asked questions such as: "Consider a pair of attributes, are they of equal importance, or is one more than others? If one is more important, which one and to what extent? Is it: weakly more important, strongly, very strongly more important?". In this perspective, the decision maker is allowed to a number of different possible responses and has to choose one of those. Following this method, the verbal responses are then interpreted numerically (Watson and Buede 1987) In Figure 3 we have considered a simple interpretation of the AHP applied to risk management decisions, where by defining and latter assessing several criterion in the way we have described before, we might finally come out with a number of options to confront a specific risk detected within the organization.

Figure 3: Illustration of the analytical hierarchy process



Source: Own elaboration.

The weaknesses of the AHP have been the subject of substantial debate among specialists in literature (Olson 1995, Williams and Giardina 1993, Yoon, 1995), where serious doubts have been raised about the theoretical foundations of the AHP and about some of its properties. According to its critics, there is a possibility that simply by adding another option to the list of options being evaluated, the ranking of two other options - not related in any way to the new one - could be reversed (Yoon and Hwang 1995). This is seen by some scholars as inconsistent with rational evaluation of options and thus, raises questions to the theoretical normative basis of the method (Williams and Giardina 1993, Yoon and Hwang 1995). Another limitation found in literature is that this rational method cannot show that an action adds more to welfare than another. Unlike CBA, there is no explicit rationale or necessity for a Pareto improvement rule that benefits should exceed costs. Thus in MCA, the best option can be inconsistent with improving welfare, so doing nothing might in principle be preferable (Department for Communities and Local Government UK 2009).

Consequently, the view taken by normative approaches in general is that reliable support for decision making is usually best achieved using numerical weighs and scores on a cardinal scale. Nonetheless, it might be the case that decision makers –especially in the context of a public entity– could be frequently faced with circumstances where the information in the performance matrix or regarding any other instrument for decision analysis would need to consider subjective judgments. Therefore, descriptive methods used to explain social and public

management decisions, which can also be found in Decision Theory literature, could be pertinent when considering the subjectivities that public decision makers confront in reality, offering an alternative approach for the assessment of risk management options in public organizations.

THE ALTERNATIVE DESCRIPTIVE APPROACHES FOR PUBLIC DECISION MAKING

Bounded Rationality

The theory of bounded rationality tries to explain why human beings faced with immense complexity and cognitive limitations deal with their decision making tasks by constructing simple models of reality and employing heuristics (trial and error). The assumptions and propositions that underlie this theory of decision making are attributed primarily to Herbert Simon (1957). Simon argues that the capacity of the human mind for formulating and solving complex problems is very small compared to the size of the problems whose solution is required for objectively rational behaviour in the real world. In this statement, Simon presents his fundamental thesis about human decision making by contrasting it with the more classical notion of decision making used in economics, which assumes that decision makers are rational in all situations.

Moreover, Simon (1957) and March and Simon (1958) emphasize the inherent cognitive limitations upon the outcomes of decision-making processes. Therefore, March and Simon (1958) argue that the rational neoclassical approach is limited in practice, since the cognitive shortcomings of decision makers constrain their search for alternatives, obstructing their facility for ranking preferred utilities and restrain their ability to calculate costs and benefits. Therefore, in the opinion of Simon (1957), the rationality of decision makers is bounded, where exploration for solutions is truncated before optimal alternatives can be identified, resulting in satisfying but not optimal decisions (March and Simon 1958).

Simon (1957) introduced bounded rationality and the concept of satisfying as analytical constructs to substitute the unrealistic neoclassical assumptions of unbounded rationality and maximizing. This approach does not assume that individuals are in any way irrational, even though such behaviour is expected to deviate substantively from neoclassical norms (Todd and Gigerenzer 2000). Theories of bounded rationality, then, are theories of decision making which assume that the decision makers wish to attain specific goals, using their mind as far as possible for that purpose. In addition, according to March and Simon (1958), individuals who are boundedly rational satisfy because, given the reality of their cognitive framework and uncertainty and imperfection of information and knowledge, they

fail to examine all available information and make choices based on a stopping (search) rules of thumb, where a particular choice appears satisfactory given the objectives and concerns of the decision maker. Therefore, these authors consider that satisfying gives better (optimal) results than the neoclassical normative choice behaviour would (Todd and Gigerenzer 2000).

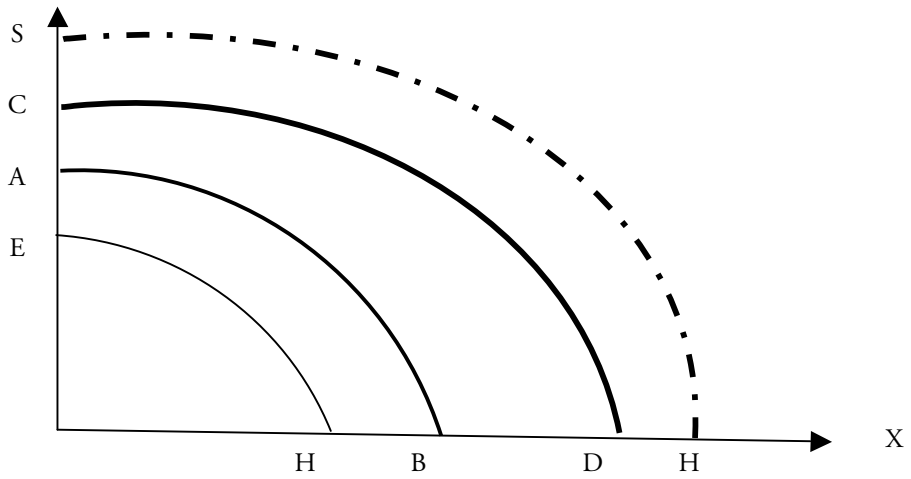
However, according to Altman (2008), bounded rationality is not the same thing as optimizing under additional constraints; it is rather making optimal choices using non-optimizing heuristics, such as satisfying, which yields better results than following neoclassical norms with the imperfect information and limited knowledge environment where choices are made. This approach to rational decision making has been illustrated in Figure 4 where the standard neoclassical rational ideal in terms of the output that the decision generates is represented in the the intersection CD of the figure. Also following Figure 4, we consider the interpretation of bounded rationality from the neoclassical perspective, that is, representing an additional constraint on choices such as increasing the transaction costs of decision making which shift the production possibility frontiers (PPF) inward to AB. As also discussed by Altman (2008), the latter would be analogous to Stigler's (1961) introduction of information costs as a constraint, element which might force search costs upon the economic agent. Thus, any reduction in transaction costs, ceteris paribus, shifts the PPF outwards towards CD. As mentioned by Altman (2008), this representation of bounded rationality captures only a fragment of the bounded rationality narrative.

Therefore, based on the empirical evidence of bounded rationality, Altman (2008) argues that neoclassical type calculating behaviour, given the limited capabilities and (imperfect) information of human beings, would yield a PPF, such as EH, well to the interior of some ideal neoclassical PPF in figure 2.4 (Altman 2008). However, applying what Gigerenzer (2001, 2007, see also Kurz, Milcke and Gigerenzer 2007) refers to as fast and frugal heuristics (non-neoclassical heuristics), would yield a PPF such as SH in Figure 4, where the latter incorporates the satisfying heuristics proposed by Simon (1959 in Altman, 2005). Therefore, in the opinion of Altman (2008), fast and frugal heuristics drawn from the adaptive toolbox (Gigerenzer 2007) would be capable of generating more efficient outcomes than (optimal) neoclassical assumptions.

Figure 4: Bounded rationality and satisfying

EH= Errors and biases
AB= Bounded rationality
CD= Neoclasical ideal

SH= Satisfacing heuristics



Source: Altman (2008).

Rules of thumb

According to Vossensteyn (2005), the concept of rules of thumb has been examined thoroughly in psychological and economic literature (Lettau and Uhlig 1999 in Vossensteyn 2005). As discussed by Hutchinson and Gigerenzer (2005), who studied the cognitive mechanisms by which humans make decisions, rules of thumb are what behavioural biologist and psychologist associate to simple heuristics. Rules of thumb can be defined, then, as heuristics that are used to simplify a complex decision situation by comparing similar cases. Following the principles of the descriptive non-rational approach of bounded rationality that we have reviewed, this approach considers that individuals focus on specific aspects of relevant information when making a decision. Therefore, since the preference of many people is imprecise, rules of thumb would allow them to make quicker and more consistent decisions (Loomes 1998). Rules of thumb would indicate what actions should be taken in a given situation and are thus very much based on learning how to handle routine situations (Vossensteyn 2005).

According to Hutchinson and Gigerenzer (2005), this type of method has

its roots in the work of Herbert Simon's (1957) satisfying and bounded rationality, but also in later models of heuristics for preferences, such as the work of Tversky (1972). According to Ellison and Fudenberg (1993), rules of thumb are simple experience, essentially subjective and intuitive guidelines developed from knowledge of the organization and tempered by common sense. In their opinion, it can be used across the whole range of activities, and may be seen typically as the art of locational decision making.

As March and Simon (1958) have mentioned, individuals have a limited capacity to process existing information. In order to reduce this informational complexity, they resort to rules of thumb or empirical rules. As a consequence, the organization depends upon a hierarchy and the capacity of individuals to organize and distribute tasks within the company. Simon (1959) fully assumes that every decision –from mere routine to the most innovative– depends on programmed and therefore potentially reproducible decisions. According to Lazaric (2000), from these hypotheses, Simon and Newell (1958) then searched for the formal decision based of rules of thumb used by organization managers, which must be formalized to anticipate decisions. As a result, Simon (1959) found empirical rules that oppose the rules of profit maximization. The game of chess is a perfect example that these authors often use to illustrate combined reasoning, heuristics and emerging strategies. The formal and simple logic of this game allows the emergence of routines to be seen with increasing informational complexity (Lazaric 2000). This game could demonstrate, according to Lazaric (2000), the routine processes where the player, faced with a multiplicity of possible options, will follow procedures and set up routines.

In the same line, Lettau and Uhlig (1999) explain a rule of thumb to be a set of rules describing a decision procedure with the following characteristics: (a) the variables which are employed in the decision criteria are objectively measurable; (b) the decision criteria are objectively communicable and decisions do not depend on the judgment of individual decision-makers; (c) every logically possible configuration of variables corresponds to a (usually unique) determinate decision; (d) the calculation of the appropriate decision is simple, inexpensive, and well suited for frequent repetition and for spot checking by management.

Lettau and Uhlig (1999) studied the learning process behind rules of thumb and analysed its behaviour. These authors discuss how decision makers in organizations and agents in the market make decisions by using rules of thumb and learn about their quality. Following their ideas, we could establish, for example, a rule of thumb that might say "when the organization detected a risk type s1, use response a1; when the risk is S3, use response a2". These scholars suggest, then, a list of these rules of thumb and strengths which they called a classifier system. They assume that the set of rules in the classifier system will be constant throug-

hout the life of the decision maker. They consider that the learning process takes place via updating the strengths. As a consequence, rules of thumb that performed well in the past will have a high strength, while rules that performed poorly will have a low strength.

The characteristics of the mapping form of the rules of thumb described in the previous paragraph, facilitate an association with the practices of risk management, considering risk responses or strategies followed by decision makers. Therefore, by taking Knight's (1921) standard frequency-severity principle[2], in the discipline of risk management we could identify rules of thumb which suggest particular risk strategies according to the consequences (impacts) and likelihood (probability) of the risks detected. For instance, an accepted rule of thumb that practitioners use in order to establish the best response towards a risk considered to have high probability and low impact, is risk prevention. However, as considered in risk management literature, the measurement of risk often involves formal risk management techniques that use both quantitative and qualitative methods, especially the calculation of the likelihood, which should be determined by previous historical records of events and, if not found, by the expert opinion. Consequently, even though we could say that the decision to implement a risk prevention strategy within an organization could be a decision based on a rule of thumb, the methods to develop the information (risk analysis) also incorporated in the decision process, might often be rational and normative.

Incrementalism

As stated by Lindblom (1959), although in theory (ideally), rational comprehensive analysis leaves out nothing important, in practice, it is impossible to take everything important into consideration unless important is so narrowly defined that analysis is in fact quite limited. He establishes that in reality, therefore, no one can practice the rational method for complex problems, and every decision maker faced with a sufficiently complex problem must find drastic ways to simplify. Additionally, according to Kingdon (1984), if policy makers were operating according to a rational, comprehensive model, they would first define their goals rather clearly and set the levels of achievements of those goals that would satisfy them (setting risk objectives), then they would compare the alternatives systematically, establishing their cost and benefits (risk assessment), and then they would choose (risk decision) the alternatives (risk responses) that would allow them to achieve their goals at the least cost. However, as discussed by several authors (March and Simon 1958, Lindblom 1959, Wildavsky 1979, Etzioni 1967), such rational models do not very accurately describe reality.

[2] The standard frequency-severity principle found in risk management literature follows, in practice, the contributions of Knight (1921), who considered that, in practical terms, after the identification of risk has been accomplished the organization should assess the probability, after which the possible loss is the probability, times the possible loss.

As we have mentioned earlier in this article, descriptive studies about decision making mainly use a cognitive perspective, trying to prove that humans in general and decision makers in particular, are unable to assess many alternatives, keeping them simultaneously in their heads, and compare them systematically (Kingdon 1984). In response to the rational and normative approach for public decisions, Lindblom (1959) and others[3] developed a description of an incremental approach that has had an enormous contribution especially for Public Decision Making. This approach stands more in the limitations and constrains of the political context than in the cognitive difficulties of decision makers, even though it recognizes the rational limits of human beings. However, Incrementalism does not state that the decision process in public organizations will therefore be irrational or a-rational (Dubnick and Bardes 1983); on the contrary, there would be instances where decisions are developed in a process as rational as possible, given the involved socio-political limitations of the situation and the public policy maker.

Therefore, instead of developing considerations of each program –or in our case– each risk strategy, decision makers take what they are currently doing as given, and make small, incremental, marginal adjustments in that current (risk) policy (Kingdon 1984). Following that principle, public decision makers in public entities do not need to spend enormous time defining and communicating their goals (risk management objectives), they could just compare among the current state of affairs (risk profile of an organization, for instance) and develop small adjustments that are completely manageable. Then, according to Kingdon (1984), the result is that the (risk) policy changes very gradually, in small steps. In Table 2, we have used the framework developed by (Lindblom 1959), in order to present the main characteristics of the incrementalist approach in contrast with a rational model.

The incrementalism method –or also called by Lindblom (1959) successive limited comparisons– simplification is systematically achieved. The latter process is completed through limitation of policy comparisons to those policies that differ in relatively small degree from policies presently in effect. As a consequence, this type of approach immediately reduces the number of alternatives to be investigated and also drastically simplifies the character of the investigation of each one. Therefore, it is not necessary to assume fundamental inquiry into an alternative and its consequences; as a result, it is only necessary to study those respects where the proposed alternative and its consequences differ from the status quo (Lindblom 1959).

[3] See also Wildavsky (1979) and Etzioni (1967).

Table 2: Characteristics of the rational and incremental method

Rational-Comprehensive	Successive Limited Comparisons
√ Clarification of values or objectives are distinct from and usually prerequisite to empirical analysis of alternative policies.	√ Selection of value goals and empirical analysis of the needed action are not distinct from one another but are closely intertwined.
√ Policy-formulation is therefore approached through means-end analysis: First the ends are isolated, then the means to achieve them are sought.	√ Since means and ends are not distinct, means-end analysis is often inappropriate or limited.
√ The test of a good policy is that it can be shown to be the most appropriate means to desired ends.	√ The test of a good policy is typically that various analysts find themselves directly agreeing on a policy (without them agreeing that it is the most appropriate means to an agreed objective).
√ Analysis is comprehensive; every important relevant factor is taken into account	√ Analysis is drastically limited: i) Important possible outcomes are neglected. ii) Important alternative potential policies are neglected. iii) Important affected values are neglected.
√ Theory is often heavily relied upon	√ A succession of comparisons greatly reduces or eliminates reliance on theory.

Source: Lindblom (1959).

According to Lindblom (1957), past sequences of policy steps have given the decision maker the knowledge about the probable consequences of further similar steps. Consequently, they do not need to attempt big jumps towards their goals which might require predictions beyond their knowledge, because they never expect their policy to be a final resolution of a problem. When applying this principle to risk management, we could say that the public decision maker would choose a risk management response which might deal with the most important risks that the organization faces. Therefore, their decision would only be one step, one step that, for the purpose of this article, could be responses connected to evident and catastrophic pure risks (e.g. fire), where the only technique or incremental solution could be to insure. Thus, if that solution proves to be successful in reality, it could be then followed by another strategy such us prevention.

Several criticisms can be found regarding the incrementalism approach for decision making. One of the difficulties reported in literature is that it tends to neglect basic societal and organizational innovations when focusing on the short run and seeking no more than limited variations from past policies and decisions. While an accumulation of small steps could lead to a significant change, there is

nothing in this approach to guide the accumulation of knowledge (registration of risk events or losses in our case); therefore, the steps may be circular, leading back to where they started, or dispersed, leading to the same negative consequences of previous decisions (Dubnick and Bardes 1983).

In spite of the fact that in reality many organizations and public decision makers follow this approach, it is hard to consider that this is the best option for making decisions in the public arena, especially in the field of risk management. As found by Boorsma and Haisma (2005), in the case of the implementation of the Dutch resilience paragraph for municipalities in the Netherlands[4], most of these entities implemented risk management strategies taking into account mainly historical or previous decisions. Consequently, as stated by these authors the fact that municipalities in the Netherlands might not identify risks in a systematic and formal way, making no distinction between events, policy fields and risk exposed objects might partially be explained in terms of the incremental perspective that they are using considering risk management decisions.

Mixed Scanning

The theory of mixed scanning, often referred as a third approach to decision making, was developed by Etzioni (1967). This approach was developed as response to incrementalism. Therefore, Etzioni (1967), founds his contribution on the difficulties of both rational and incremental approaches of decision making, arguing that the rationalist approach appeared to be utopian because decision makers cannot command the resources and capabilities required by rationalist decision making and also remarking that incrementalism was shown to overlook opportunities for significant innovations and to ignore the empirical fact that incremental decisions are often –in reality– made within the context of fundamental decisions (Etzioni, 1967).

The term scanning is used to denote search, collection, processing and evaluation of information as well as the drawing of conclusions, all elements in the service of decision making (Goldberg 1975). Mixed scanning contains rules both for allocation of resources among the levels of decision making and for evaluation,

[4] In the early nineties, the Netherlands prescribed a Bylaw for municipalities and provinces to include a so-called Risk Paragraph in the annual budget and annual report, as an appendix. In the past years, this prescription has been changed into a wider approach, the Paragraph on Financial Resilience. This is basically a sort of financial provision that every municipality in the Netherlands has to calculate, by identifying its financial capacity needed (FCN) vs. the financial capacity available (FCA) in its budget. Although this is a very innovative public policy that has brought risk management awareness to the Dutch local government scene, there is still a lot of room for improvement, especially in the way that this approach is currently implemented by municipalities (Boorsma and Haisma 2005).

leading to changes in the proportion of higher versus lower levels of scanning based on changes in the situation. Mixed scanning has often been presented in literature as a prescriptive theory, not merely a descriptive one (Etzioni 1986).

Therefore, as discussed by Etzioni (1986), mixed-scanning provides both a realistic description of the strategy used by actors in a large variety of fields and the strategy for effective actors to follow. He demonstrates this approach in a simple situation: he assumes the setting up of a worldwide weather observation system using weather satellites. In that context, the rationalistic approach would seek an exhaustive scan of weather conditions by using cameras capable of detailed observations and by scheduling reviews of the entire sky as much as possible. In the view of Etzioni (1967), this would yield an avalanche of information and details, costly to analyze and likely to overwhelm the action capacities of a decision maker. On the other hand, using an incrementalism approach, by focusing on those areas where similar patterns developed in the recent past and, perhaps, on a few nearby regions, the decision maker would ignore all formations which might deserve attention if they arose in unexpected areas. Nevertheless, a mixed scanning strategy would include elements of both approaches by employing two cameras: a broad angle camera that would cover all parts of the sky but not in great detail and a second one which would zero in on those areas revealed by the first camera to require a more in depth examination. While mixed scanning might miss areas in which only a detailed camera could reveal trouble, it is less likely than incrementalism to miss obvious trouble spots in unfamiliar areas (Etzioni 1967).

The description of the mixed scanning approach mentioned above, could be similar to the actual procedures that organizations follow when they try to identify a risk and find pertinent responses to confront it, not being able in reality to consider all the risks and risk areas that the organization is exposed to, for example, due to limitations of resources and time. In addition, this decision making description is very similar to what the standards and best practices of risk management prescribe (e.g. COSO 2004, Australian Standard 2004a, 2004b, ISO 2009, and AIRMIC, ALARM, IRM 2002). Accordingly, risk management best practices recommend the selection of entity level and activity level objectives when implementing a risk management program. Therefore, even though the integrated or comprehensive standards of risk management (Enterprise or Organizational Risk Management) establish that all the major risks– regardless their nature or consequences –should be systematically managed in a coordinated policy, the best practices tend to recognize a prioritization system such as the one described by the mixed scanning, allowing decision makers to focus on specific areas of interest of the organization, which when selected should be treated in a comprehensive manner, identifying and evaluating all risks present.

As discussed by Etzioni (1986), the decision on how the investment of assets, efforts and time should be allocated among other levels of scanning is, in fact, part of the strategy of this approach. Therefore, in a risk management perspective, an effective decision making through mixed scanning would require that investment in high-coverage scanning will be increased to move beyond the analysis and decision about obvious threats and traditional risk responses to an integrated approach that could consider wider analysis of risk and strategies available.

As a consequence, the perspective of continuous evaluations considered in the mixed scanning approach could be coherent with the principles of modern risk management. The systematic review and evaluation that the organizations and decision makers in a municipality should make in theory, also provides a good application of Etzioni's method. Thus, a modification in the risk responses to expositions detected earlier, is adequate when the decision maker realizes that the environment has radically changed or when he sees that previous risk decisions taken from past experiences bring no improvement to the risk profile of the organization. If, at this point, the decision maker decides to avoid or eliminate the activity that generates those particular risks, the effectiveness of his decision making could improve, given that through some high coverage scanning, he may discover that another risk response such us a risk transfer could lead to a better solution.

CONCLUSIONS

We have described in this article the principal approaches of Decision Theory, in order to explore theoretical explanations about the risk management decision making in the context of public organizations. As we mentioned, the standard economic tool such as Cost Benefit Analysis (CBA), aims to contribute to good policy-making through systematic analysis of the costs and the effects of various policy approaches. Ideally, effects are measured in terms of benefits, so that costs and benefits can be compared and net benefits calculated. Clearly, the presence of uncertainty poses difficulties for quantifying the benefits of risk management strategies, as it makes the impact of those strategies on probabilities extremely hard to determine (Williams and Giardina, 1993). In addition the lack of data related to risk issues, especially in public organizations, establishes a difficulty for the pertinence of CBA as a method to explain and measure risk management decisions. On the other hand and been an alternative approach for CBA, Multi Criteria Analysis (MCA) could attempt to give additional explanations in terms of risk management choices, through measures based on numerical scales or by including qualitative descriptions. Nonetheless, considering as well the own limitations of the MCA approach, in special the intuitive processing of data and the use of unjustified assumptions (Yoon and Hwang 1995), descriptive methods such as Bounded Rationality, Rules of Thumb, Incrementalism and Mixed Scanning, could be relevant in the task of shaping a further explanation of risk management decisions by public entities.

Additionally as discussed by Altman (2008), despite the proliferation of literature regarding Decision Theory, no agreed and integrated theory of decision making exists. Many of the theoretical stand points –both of the descriptive and normative approaches– mainly remain mutually exclusive. Therefore, one either examines (a) the process of decision making itself, (b) the outcomes which are the culmination of such processes, (c) the bounded rationality of individuals in processing information, or (d) the institutionalized rules of thumb by which those procedures are enacted. Thus, we believe that a complete attempt to study risk management decisions in public entities should consider both the rational and descriptive models. Our contribution for this theoretical article, then, does not lie in producing a new brand of Decision Theory, but in developing a more complete and interdisciplinary explanation framework of decision making considering risk management choices. We do not neglect that elements such as the dynamic of the public agenda setting, the legitimacy of public servants under the pressure to quickly deliver concrete results, short-term thinking at the cost of ignoring strategically important long-term issues, all concepts that are in the line of Public Policy literature, could give additional explanations to decisions made by public organization. However, we believe that those theoretical considerations are beyond the scope of this article.

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