

On the rationality of Decision Aiding processes

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Abstract

The notion of rationality plays a crucial but so far insufficiently clarified role in Decision Aiding (DA), both as a scientific discipline and as a professional practice. Indeed, a pervasive and possibly constitutive feature of DA is that it constantly faces challenges as to whether it is valid, legitimate, useful, practical, etc. Rationality plays a pivotal role in participating to determine whether DA fulfills such requirements. Here, we take advantage of arguments developed in the philosophical literature, mainly by Habermas, to introduce a framework defining a series of conceptions of rationality. We use this framework to introduce a typology of DA approaches, distinguishing objectivist, conformist, adjustive and reflexive approaches. Whereas the underlying conception of rationality plays a key role in determining the features of DA processes, we argue that tools are largely independent of conceptions of rationality, in the sense that a given tool can be used in all the kinds of DA approaches. As a consequence, even though inventors of DA tools may often have had one specific conception of rationality (perhaps implicitly) in mind when creating their tools or using it, this does not preclude the possibility that these tools might be used in an approach anchored in a completely different conception of rationality. Nor does it preclude the creative use of parts of different tools. Using an extensive series of concrete examples, we highlight the practical usefulness of our theoretical reasoning.

Keywords: Decision processes, Problem structuring, Philosophy of operational research, Legitimacy, Validity.

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1. Introduction

Any practicing decision analyst knows that, in any decision aid that he provides, at some point the issue of the validity or legitimacy of his work will resurface. Other requirements, such as usefulness or practicality, are similarly often emphasized. Such challenges are a pervasive and possibly constitutive feature of decision aiding (DA), both as an academic discipline and as a professional practice. Focussing on the first two requirements, Landry and coauthors ([30] and [31]) famously argued that their precise content evolved as the discipline of operational research and its applications historically unfolded. More generally, one easily understands that, behind their commonsensical relevance, requirements such as legitimacy, validity, practicality and usefulness, are interrelated in complex ways. They implicitly refer to presupposed ideals of scientificity, computability and deontology, and they take different meanings depending on the context, the decision situation in which they are used and the available technology.

In such conditions, one should not expect it to be possible to carve out definitions of these requirements applicable to all sorts of DA activities in all sorts of contexts. A more reasonable endeavour is to identify and characterize general factors liable to play a decisive role in determining if DA fulfills such requirements. In line with this idea, our aim here is to elaborate an account of one of the most important factors underlying all the above requirements: rationality. We do not claim that rationality is all there is to validity or legitimacy or any other similar requirement. What we claim is that rationality is a common determining factor for all of them.

This idea is naturally suggested by the fact that one of the main distinctive features of DA is its aim to introduce “elements of rationality”, such as axioms, mathematical models, and algorithmic procedures, in the way a problem is handled ([58]). Similarly, the very label of the concept of “rational choice” [3], which plays an important role in many DA frameworks, echoes the importance granted to the notion of rationality. References to rationality are hence pervasive in DA, but what exactly is the role played

by rationality in DA? To articulate clearly this pivotal question, it is useful to introduce the following definitions.

We consider situations schematized as the interaction between an Analyst (A) and a Client (C) or a decision-maker (the distinction between the latter two notions, though important in some contexts, will be left aside here). This schematic representation is a profound simplification of real-life DA interactions, but it will prove sufficient for our purposes in this article. These interactions involve a series of entities:

- A first set of entities, which will be collectively termed “tools” in this article, encompasses:
 - Mathematical procedures, which are sequences of elementary mathematical operations transforming a mathematical structure into another one. Typical examples include: inverting a matrix, transitively closing a graph, etc.
 - Algorithms, which are sequences of mathematical procedures with a precise information handling purpose. Typical examples include: the simplex algorithm, the variants of the SAT-algorithm, etc.
 - Protocols, which are sequences of mathematical procedures and/or input/output steps allowing to collect information and to interact with C. Typical examples are the construction of an utility function, indifference swaps in conjoint measurement, etc.
 - Methods, which are sets of algorithms and protocols allowing to analyse information for some decision aiding purpose. Typical examples include: the Branch and Bound method, multiple criteria decision analysis methods, etc.
 - Models, which are structural representations of the elaborated information (see the definition of an “evaluation model” introduced in [8] and [58]).
- As opposed to tools, following [59], one can term “artifacts” the shared representations formed, partly on the basis of the above-defined tools, by

the various individuals involved. These artifacts include: a representation of the problem situation, a problem formulation, an evaluation model, a final recommendation.

- Following Tsoukis [58], a “decision aiding process” then refers to all the work that A does in his endeavour to develop “artifacts” and proceed towards the resolution of the problems he tackles when aiding C.
- Lastly, we will use the term “approach” to refer to the way A conducts a DA process.

These definitions allow to clarify the question that we started to articulate above, concerning the precise role of rationality in DA. Indeed, using this vocabulary, one can now articulate the following more specific questions:

- Q1: Should one consider that rationality characterizes tools or artifacts or processes or approaches or all of them?
- Q2: What does a “rationality” requirement amount to when applied to the above entities?
- Q3: Are there various conceptions of rationality, and in that case is it possible to establish a correspondance between specific types of DA tools, artifacts, processes or approaches and specific conceptions of rationality?

The fact that these questions are currently left unanswered in the literature illustrates that the notion of “rationality” plays a crucial but so far insufficiently clarified role in DA. In order to address this lacuna, in this article we develop a framework distinguishing a series of markedly different *conceptions of rationality*. This typology then allows us to develop a typology of *DA approaches*. We then take advantage of this framework to answer questions Q1-3.

Although there is an obvious philosophical dimension in the concepts that we are addressing, this paper is not confined to philosophy and rather claims to tackle these issues in an “operational” way. Indeed, our framework can be used by Analysts to understand the implicit assumptions underlying

their practices, and by Analysts and Clients working together to understand the implications of these assumptions.

The article is organized as follows. We start by spelling out our framework to define a series of conceptions of rationality relevant from a DA perspective (Section 2). Next, we discuss what we mean by objectivist, conformist, adjustive and reflexive DA approaches (Section 3). We then compare our typology with classical typologies found in the DA literature. This allows us to argue that, as opposed to approaches and processes, DA tools are largely independent of conceptions of rationality (section 4). A concluding section (5) ends the paper.

2. Conceptions of rationality and rational decision aiding

What does “rationality” mean? The whole history of western philosophy can be seen as a tale of competing answers to this question ([23]). A comprehensive review of this debate falls beyond the scope of this article (the reader can see [10], [50]). Our point here is rather to argue that different approaches to DA can be distinguished by identifying the conception of rationality in which they are entrenched, among a small series of ideal-typical conceptions. In order to establish this point, we will start by briefly reviewing a couple of keystone references in the conceptualisation of rationality. We then introduce a typology based on the work of Habermas ([23]), which will provide the backbone for our rationale in the remainder of the article. Genard and Pirlot [21] already hinted at the usefulness of Habermas’ philosophy to think through many aspects of the philosophy of operational research. Here we follow this suggestion through an in-depth analysis of the contribution of his understanding of rationality.

2.1. First steps towards conceptualizing rationality

Let us start with a commonsensical exploration of the concept of rationality. Standard dictionary definitions refer to ideas such as having good sense and sound judgement (hence such phrasing as “his rationality was impaired by anger”). The idea of acting based on reasoning is also often associated with rationality. The notion of coherence is also typically mentioned: one

establishes a principle and acts “rationally” if one remains coherent with this principle. This coherence can refer to a reasoning principle (e.g., a principle defining how to establish if a sentence is true), an objective to achieve, a procedure to follow, etc.

Beyond these commonsensical but barely informative everyday notions, the contemporary understanding of rationality in the social sciences literature is essentially associated with Weber ([65]). This literature singles out a form of rationality termed “substantive”, which is defined in terms of goal attainment: an agent is rational in that sense if he cogently chooses the means to achieve his objectives. As opposed to this form of rationality, “procedural rationality” refers to the adherence to a rule: when facing a problem, an agent is procedurally rational if he uses the appropriate procedure.

Simon ([52]) famously pointed out that models of rationality such as Weber’s presuppose that agents have perfect knowledge of the objectives to attain and/or of the rules to abide by and of the resources they need for that purpose. All these assumptions are demonstrably unrealistic in real-world decision processes. Simon ([51], [53]) accordingly observed that real decision-makers within real organizations do not obey these rationality models. To overcome them, Simon introduced the concept of “bounded rationality”. In this approach, decision processes are guided by a principle of “satisficing” (a Scottish term that Simon revived for the purpose of exposing his views), according to which agents facing decision problems typically content themselves with solutions that they subjectively and locally deem “satisficing”. The bounded availability of information and resources, as well as the bounded capacity of the agent to process the information s/he has, result in a behaviour that is subjectively rational but falls far short of the standards set by visions of rationality like Weber’s.

2.2. Habermas’ typology of models of action as a template for a typology of conceptions of rationality

Both Weber’s and Simon’s understandings of rationality refer to the behaviour of a single agent who, facing a problem situation, aims to be “rational”, presumably to make sure or to convince her/himself that what s/he is

planning to do is the best possible option, or one among the best or at least a satisfactory one (here we purportedly use the general and commonsensical notion of “satisfactory” rather than Simon’s technical term “satisficing”, because our argument aims at being more general than a strict application of Simon’s reasoning). These visions of rationality ignore the social dimension of decision processes. They ignore, for example, that the agent can be more concerned to convince other people (involved in the decision process, or affected by it) that what is happening (or happened or is going to happen) is the best possible option or at least a good option. In fact, the agent is rarely alone when deciding, and the problem situation for which the agent “makes a decision” often involves other people, some of which might have important stakes in the agent’s decision. Partly as a response to such concerns, Habermas ([23]) developed the concept of “communicative action”.

For that purpose, Habermas ([23]) first introduced a typology of “models of action”, stemming from his reading of the history of sociology and philosophy. He showed that the philosophical and sociological literature, including the above-mentioned classical contributions, has been mainly devoted to develop three templates used to represent and explain agent’s actions and decisions. These templates are what he calls “models of action”. The three models embody different claims about assumptions that one should make in order to correctly represent and explain the way people act and decide:

- The strategic model claims that people first and foremost determine what they do by analysing objective facts. According to this model, when they act or make decisions, agents mainly use the available factual and theoretical knowledge to identify what to do to bring about their objectives.
- The norm-regulated model claims that people first and foremost determine what they do by striving to identify what they take to be justified or legitimate norms or expectations. In other words, they determine what they do by identifying what they are supposed or expected to do in a given situation.
- The dramaturgic model claims that people first and foremost determine

what they do by trying to portray themselves and their inner consciousness before a public.

The strategic model does not deny that people can take some expectations to be valid or that people have feelings and live experiences. But it claims that these are epiphenomena that are useless to represent and explain people's actions. Symmetrically, the norm-regulated and the dramaturgic model take objective facts and, respectively, inner consciousness and valid expectations, as epiphenomena.

Habermas then noticed that these three models share a key feature. All three models of action are typically presented in the literature as third person accounts of observed behaviors. But all three can be used by the actors themselves to respond to criticisms addressed to them. If an agent is criticized on the grounds that he did not took the relevant facts into account, he can (implicitly or explicitly) take advantage of the strategic model and strive to counter such criticisms by uttering and defending "validity claims" concerning the "objective truth" underlying his choices. Similarly, if he is criticized on the grounds that he misidentified what he had to do or what he was supposed to do in a given situation, he can (implicitly or explicitly) take advantage of the norm-regulated model and strive to counter the criticisms by defending validity claims about the "normative rightness" of his deeds. Lastly, if he is criticized on the grounds that his expressions were not sincere, he can (implicitly or explicitly) take advantage of the dramaturgic model and strive to entrench his "expressive or subjective truthfulness".

A given agent can hence, not only account for his own actions and decisions in terms of one of the three models above, but also change his own behaviour in the light of his account, in the light of the criticisms that he faces, and in the light of the way he manages to withstand or fails to withstand criticisms. To account for the dynamics of this process and the importance of interpersonal interactions in this dynamics, Habermas then introduced his notion of *communicative action*. This fourth model of action is a reflexive integration of the three other models of action. This means that, in this fourth model, the other models are conceived as frameworks

that actors themselves can alternatively use in various situations to defend their actions and decisions. In this fourth model, “normative rightness”, “objective truth” and “expressive or subjective truthfulness” are three incommensurable dimensions of validity. Depending on their situation and the decisions they make, agents raise validity claims with respect to one or several of these validity dimensions, and they face criticisms articulated by others by defending their validity claims.

This pivotal step in Habermas’ reasoning is introduced through his notion of “thematization”. Habermas uses this term to capture the idea that agents typically behave in standardized or, one might say, “automatic” ways: they do not spend their time conceptualizing what they do, they most of the time simply do it. But they can, in some circumstances, step back from their usual way of behaving, take some aspects of their own behaviour as a theme for examination and questioning, and eventually change their behavior as a result of this scrutiny. This is what “thematization” refers to. Because thematization allows agents to improve their behavior by transforming “automatic” acts and decisions into acts and decisions that the agent himself is better able to defend against criticisms, thematization is, in Habermas’ reasoning, the basis of *rationalization*. This allows to articulate the following definition of “Rationality”.

Definition 1. *“Rationality” refers to the quality of acts and decisions which is increased by agents when they thematize and modify aspects of their acts and decisions so as to improve their ability to counter criticisms.*

2.3. A four-terms typology of conceptions of rationality relevant to DA

Here we want to use this understanding of rationality to elaborate a natural extension of Habermas’ framework, that consists in defining four *conceptions of rationality* based on differential thematizations of the aspects of action captured by Habermas’ models of action. This idea allows us to introduce the following four-terms typology of *conceptions of rationality*:

- An agent acts according to the *strategic conception of rationality* if he thematizes, and therefore is ready to question and abandon, his belief in the

existence of valid expectations that he should respect and in the importance of his inner life and feelings, but does not thematize the assumption that there are objective, external truths independent from his and other's thoughts and speech. In this conception, the essence of rationality is the quest of objective, independent truths.

- An agent acts according to the *norm-regulated conception of rationality* if he thematizes, and therefore is ready to question and abandon, the assumption that there are objective, external truths and his belief in the importance of his inner life and feelings, but does not thematize the assumption that there exists such a thing as valid expectations that he *ought* to respect. In this conception, the essence of rationality is to act according to valid expectations.
- An agent acts according to the *dramaturgic conception of rationality* if he thematizes, and therefore is ready to question and abandon, the assumptions that there are objective, external truths and that there exist valid expectations, but does not thematize the importance of his inner life and feelings. In this conception, the essence of rationality is to listen to one's inner life.
- An agent acts according to the *communicative conception of rationality* if he thematizes all three aspects: the importance of his inner life and feelings, the assumption that there are objective, external truths, and the assumption that there exist valid expectations.

Each of the first three conceptions has what one might call a fixed point: it takes as given and untouchable one of the three classical models of action that Habermas identified in the literature. The strategic conception of rationality takes the strategic model of action to be untouchable. By contrast, it admits that the basic elements structuring the norm-regulated and dramaturgic models are adjustment variables. Similarly, the norm-regulated conception of rationality does not question the norm-regulated model of action, and takes the basic elements of the other two models as adjusting variables; and the dramaturgic conception of rationality admits that the

dramaturgic model of action is the only relevant one. The communicative conception of rationality stands out by refusing to grant to any of the three classical models of action any specific untouchability.

Following the communicative and argumentative move introduced by Habermas through his usage of the concept of validity dimensions, in the above four conceptions, rationality is no longer exclusively defined in terms of how an individual decision-maker understands his/her own action and decisions or exclusively in terms of how an external observer can analyze them. An agent can be *forced* or *incited* or *driven* to thematize various elements of his actions and decisions because he is criticized by others, or because he wants to convince them of something. Thematization hence typically occurs in interpersonal settings. An agent can obviously decide on his own to thematize some aspects of his action, without communicating with anyone in this process. But just like talking to oneself is only possible for someone who has learnt conversation in pluri-individual settings, similarly, solitary thematizations are derived from interpersonally-prompted ones.

This approach appears especially relevant to conceptualize the rationality of how an Analyst provides decision support to a Client looking for some help within a problem situation. Indeed, in such a situation, the question of how an insulated decision-maker would make a decision becomes irrelevant. What happens to C is better conceived as a series of interactions between him/herself and A around issues arising while they work through the problem together. The DA process appears to be an ongoing interaction where communication between A and C, and communication with concerned stakeholders, both plays a pivotal role.

In the next section, we explain how the various conceptions of rationality articulated above come into play as various types of DA processes unfold.

3. Decision-aiding approaches as embodiments of conceptions of rationality

In this section, we use our distinction between strategic, norm-regulated, dramaturgic and communicative conceptions of rationality to make a distinction between objectivist, conformist, adjustive and reflexive DA approaches.

We distinguish the various approaches by identifying the *conception of rationality* in which each approach is embedded. We then outline how the underlying conception of rationality participates in the validity and legitimacy of the DA process.

Because, as explained in the introduction, the notions of validity and legitimacy are controversial and definitive definitions are certainly unreachable, we however do not take a rigid stance concerning their precise definition. For our purpose here, it will suffice to say that both notions refer to the justifiability of the DA process, but that, whereas validity is more concerned with scientific justifiability, legitimacy is more a matter of public justifiability (see [35] for an elaboration of this approach to legitimacy in an applied DA context).

In order to explain clearly and in concrete terms the items of our typology, we also introduce two series of examples. For each element of the typology, we first spell out a fictive, explanatory example. Still for each element of the typology, we then give an example of a real-life DA process. Because a choice had to be made between myriads of possible examples, and because we wanted the exposition to remain homogeneous, we arbitrarily chose a problem of locating stationing medical emergency vehicles in a given area to structure the explanatory examples, and the domain of environmental policies for the real-life examples.

3.1. Objectivist DA approaches

We will refer to a DA approach as being objectivist when it is shaped by the strategic conception of rationality. Because it is anchored in this conception of rationality, this approach admits that there are such things as objective and unquestionable formulations of the problem that C faces, and objective and unquestionable solution(s) (or an objective and unquestionable absence of solution), independent of the idiosyncrasies of C, his/her context of decision and the stakeholders concerned by his/her decisions.

In this approach, these objective formulations and solutions are not to be questioned during the DA process, they are a pre-requisite constraining the whole DA process. They can be defined by a philosophical theory, which

is then taken to be the true one. For example, hedonistic utilitarianism is a philosophical doctrine stating that aggregate happiness, as measured for example by experienced utility, should be maximized [56]. The latter philosophical doctrine can be used to define an objectivist DA approach, through which one assumes that the problem tackled (whatever it is) should be solved in such a way that aggregate happiness is maximized. More prosaically, the formulation of the problem can be dictated by the stated will of an authoritative third party at the beginning of the process, such as someone higher than C in the organization’s hierarchy. In any case, for the purpose of the DA process, the adopted formulation is assumed to be universal (exogenous with respect to C), in that it is not specific to C and the latter is expected to maintain his adherence to it without questioning any aspect of it for all the duration of the DA process.

In an objectivist DA approach, the task of C and A is to compute the problem according to the adopted formulation and to identify the corresponding solutions (if any). Deviations from the standards set by these formulations and solutions reflect mistakes or shortcomings of C’s, who should be aided in learning to decide in a “correct” way.

As opposed to the assumed objective truths defining what is here taken to be “correct”, the two other aspects of action pinpointed by Habermas, valid expectations and inner consciousness, are admitted to be liable to be questioned by objectivist DA processes. For example, if C thinks that he is expected to behave in a certain way or has a duty to behave in a certain way, but this expectation is at odds with the recommendations produced by the objectivist DA approach, then in this approach one assumes that the above expectations should be discarded. Similarly, if the inner feelings or consciousness of C lead him to question the identified solution(s), C is expected to hold them back.

Concerning the legitimacy of the DA process, objectivist DA approaches assume that, because the formulations and solutions they adopt are unquestionable, they must be publicly accepted, which implies that the process will appear legitimate. Validity is similarly entrenched in the fact that the formulations and solutions are considered unquestionable.

Example (explanatory) 1. *C asks help from A to find the minimum number of locations for stationing medical emergency vehicles such that every village in a region can be reached by an ambulance within a pre-specified number of minutes. This problem statement, including the objective to minimize and the maximum number of minutes to accept, is taken as an unquestionable standard by both A and C. A develops an optimization model to follow such standard using a standard OR set covering model. The role of C, after formulating the request, is to provide the necessary data (average speed of the ambulances, eligible routes, etc.).*

Example (real-life) 1. *In the Ile-et-Vilaine department, in France, the local administration owns various areas considered to be of environmental value, and regularly asks, through public procurements, for decision help to consulting firms in order to elaborate management schemes for plant species and natural habitats. For these public procurements, the department uses very specific contractual requirements that were elaborated by an authoritative third party, the Botanical Conservatory. The contractual requirements in particular specify the entities that the consulting firm will have to study, the methods that they will have to use, and how they should value and prioritize the various entities found during the DA work in the field. All these elements are untouchable fixed points that both A and C are expected to take as absolute references. For more details see [34].*

3.2. Conformist DA approaches

We will refer to a DA approach as being conformist when it is shaped by the norm-regulated conception of rationality. In concrete terms, this means that we are talking here about approaches that aim at aiding C to make a decision that he and the other people involved or concerned by his decision will consider conform to what C is expected to do or has a duty to do, or conform to what appears satisfactory (as above, we purportedly use here the general and commonsensical notion of “satisfactory” rather than Simon’s technical term “satisficing”). In this approach, the main threat that C is concerned to avoid is that his decision will create problems because other people consider that “that’s not what has to be done”. The task of A is to identify relevant observational insights to understand the kinds of decisions and the features of decisions that render them “satisfactory” in the specific context of the DA process.

For the purpose of identifying such “satisfactory” decisions, this approach can draw on a vast literature empirically addressing human judgment and behaviour ([2, 25, 27, 28, 39, 45, 55, 60, 61, 64]). This literature often refers to “biases”, and this very choice of vocabulary betrays the fact that it was originally intended to overcome the weaknesses of economic models of behavior and judgment that set standards that are too exacting for real human beings to live up to. But the reason why such studies provide the most important material for conformist approaches is independent of this academic dispute: the reason is simply that this literature produces descriptive accounts of the way people behave, and accordingly about the way they expect other people to behave.

In addition to the above models derived from psychology, the empirical material available for this approach may encompass organization theories, the past experience of C’s organization and other organizations, and other empirical knowledge about what works well or does not work well. Such accounts often involve rules of thumb, shared practices, “ways of doing things” which altogether delineate what a decision maker and the various other people that have a stake in his action will consider to be a satisfactory solution to his problem or a satisfactory decision.

In this approach, the core assumption is that there are such things as justified expectations, things that “have to be done”. As opposed to these assumed valid expectations, the two other aspects of action pinpointed by Habermas, theoretical truth and inner consciousness, are admitted to be liable to be questioned. If the inner feelings or consciousness of C are at odds with the recommendations produced, then they must be discarded; similarly, if it appears that objective facts contradict the recommendations, it must be that these alleged facts are misconceptions or illusions.

In this approach, legitimacy is based on the fact that C and the people that interact with him or observe him will consider that his decisions correspond to what ought to be done. Validity is judged by how well the process reflects the best practice in light of existing empirical knowledge that describes the situation and the actors involved (e.g., past experiences in an organization, track record of a method, organization theories, psychological

literature).

Example (explanatory) 2. *C asks help from A to find where to locate stationing medical emergency vehicles in his area. Instead of starting from the assumption that every village in the region should be reached by an ambulance within a pre-specified number of minutes, A investigates how similar problems have been tackled in different regions, and gathers informations about the settings that proved most acceptable to Clients and to the general population. Based on extensive questionnaire surveys and statistical analyses, he proposes a setting that he expect will not arouse any outcry.*

Example (real-life) 2. *Natura 2000 is a European-wide network of natural sites and agricultural lands which benefit from environmental regulation and partial protection due to the fact that they shelter or are exploited by some species of wild fauna and flora or some natural habitats considered of “community interest” according to the European legislation. In France, this environmental regulation is materialized by the fact that, on each and every Natura 2000 site, a dedicated action plan must be carved out and implemented so as to ensure the conservation of the species and habitats concerned. However, as a matter of legal requirement, the whole action plan should be entirely “voluntary”, in the sense that it cannot involve any mandatory action and should be entirely based on the goodwill of the stakeholders involved. In order to elaborate such voluntary action plans, local governments often ask decision help to consultants, whose job is then to implement consultation processes and fine-tuned studies of the economic and social processes at play in the area, so as to identify a series of actions that will appear acceptable and will be endorsed by the stakeholders involved. A detailed account of such a process can be found for example in [37].*

3.3. Adjustive DA approaches

We will refer to a DA approach as being adjustive, or say a DA process is conducted in a adjustive way, when the process embodies the dramaturgic conception of rationality by tracking the idiosyncrasies of the decision maker. In a word, an adjustive DA process is purportedly only suitable for the contingent DM in a particular context. Such DA processes aim to identify C’s needs, preferences and values as well as possible, namely with minimum interference and maximal accuracy.

Since Raiffa’s seminal RAND report ([46]) there has been a remarkable development in the DA literature in the direction of “client driven” decision

modelling ([7, 29, 32, 62, 63]), suitable to unfold adjustive approaches, aimed at discovering the DA models that best fit C, unveiling his system of values.

Although C can be in difficulty trying to answer to A's questions and/or can be unable to provide a complete description of the problem situation and his values, an adjustive approach will aim to provide an answer fitting C's information as well as possible. The task for A is to learn about the problem and C's needs and preferences, and then prescribe the best solution given C's needs and preferences. If these needs and preferences appear to contradict alleged theoretical truths or to question supposedly justified norms, this means that the latter are ill-conceived.

In this type of approach, the legitimacy of the DA process is based on the aspiration to match C's needs and preferences as well as possible. The validity of the process is then often judged by the perception that A was competent in diagnosing the situation, eliciting C's values, and prescribing appropriate models.

Example (explanatory) 3. *C asks help from A to find where to locate stationing medical emergency vehicles in his territory. C has preferences on the kind of setting he wants to see implemented, he has priorities concerning the areas within his territory that he deems more important than others, and he has preferences concerning the balance to be reached between providing a service to his constituency and minimizing public expenditures. The task of A is to take all these dimensions of C's preference into account to identify the setting that best matches his preferences.*

Example (real-life) 3. *In 2014, the local government in the French department of Gironde asked help from consultants through a public procurement procedure to evaluate and redefine its water environment policy. The department had conducted a water environment policy since 1999 without formalizing its proper objectives and ambitions. The various agents involved in the definition and implementation of this policy could only formulate a vague vision of their aims, and they wanted to clarify this vision by articulating a series of hierarchized ambitions. The work of As was to help Cs to understand and clarify their own aims and to formalize them. For more details see [36].*

3.4. Reflexive DA approaches

We will refer to a DA approach as being reflexive, or say that a DA process is reflexively conducted, when it is based on the communicative conception of rationality. As opposed to the other three kinds of approaches, reflexive approaches do not start from any fixed, unquestionable reference point: both authoritative conceptions, behavioral expectations and inner preferences can be questioned. In line with, for instance, [4, 44, 54], reflexive approaches take the structuration of C's problem, its formulation, the identification of relevant tools, and the very genesis of preferences and behavior, as integral parts of what the DA process has to construct, through continued interactions between A and C.

Reflexive approaches distinctively emphasize two aspects of DA practice. First, they conceive DA as socio-technical interventions (see [1, 13, 14, 20, 38, 41, 42, 43]), in which C and A both decisively influence the process and its outcome. This echoes the view, most prominently held by proponents of Problem Structuring Methods [47], that the social aspect of the intervention is as important as the technical aspect. Second, reflexive approaches understand DA processes as a learning processes, where the DM increases his knowledge about his situation and his preferences, which may change as a result of what is learnt (e.g., see [15, 22, 26]).

In a reflexive DA approach, the legitimacy of the DA process is partly based on the coherence of the series of successive and exploratory agreements between Client and Analyst. Because DA processes conducted in such a way are anchored in a reflexive understanding of all the different sorts of validity claims identified in Habermas' notion of communicative rationality, reflexive DA processes also owe part of their legitimacy to the importance they grant to communication, which in turn can play a key role in the public justification of the process and its various steps. Concerning the validity of the process, it is judged by how coherent the arguments resulting from the learning process of C and A are.

Example (explanatory) 4. *C asks help from A to find where to locate stationing medical emergency vehicles in his territory. A starts by emphasizing that C should pay attention to the very formulation of the problem he*

faces. Like in an adjustive approach, he leads *C* to express his preferences over various aspects of the problem. But unlike in adjustive approaches, he does not assume that *C*'s preferences are given and untouchable: he rather admits that the very process through which he leads *C* to express his preferences can, and certainly should, lead him to form new preferences. Like in an adjustive approach, *A* pays great attention to how acceptable various solutions can prove to be. But here he uses the corresponding analysis to feed back his understanding of the problem. For example, based on his understanding of the importance that *C* gives to his constituency's willingness to accept this or that solution, he can venture that *C*'s problem might not really be one of stationing medical emergency vehicles, but one of ensuring a feeling of being taken care of by some parts of his constituency. Like in an objectivist approach, he assumes that some well-defined problems can be solved by specific existing tools, but he is cautious not to distort the problem by imposing an ill-adapted tool. In all this process, *A* works together with *C*, and the problem as they eventually manage to articulate and solve it can turn out to be very different from the one initially formulated by *C*.

Example (real-life) 4. In 2016, the local government in the French department of Charente-Maritime asked help from consultants through a public procurement procedure to elaborate its strategy for its so-called "Vulnerable Natural Areas" policy. The department had initially formulated its problem by referring to the elaboration of similar strategies in other French departments. However, As soon understood that, even upstream the definition of a "Vulnerable Natural Areas" strategy, there were important questions that the department had neglected, concerning, in particular, the way it wanted to define the very point of this policy, the relationship that it should have with other environmental policies, the kind of influence this policy could be granted when deciding how to allot the money devoted to various kinds of environmental policies, and so on. As therefore set out to redefine the precise scope of the mission with *C*, to identify with it a shared formulation of the key problems that they should tackle together, and the elaboration of the strategy could in the end be completed on firmer foundations. For the detailed story see [11].

3.5. Inter- and intra-approaches differences

Now that we have introduced the four approaches, in order to explain further the logic of our typology, it is useful to identify a series of important differences within and among approaches.

We may start (first line of Table 1 below) by recalling the model of action in which the corresponding conception of rationality is anchored.

It is also useful to notice that the differences between the four types of approaches translate into important differences in the process through which models are elaborated within the DA process (second line). In objectivist approaches, models are mainly derived from postulated exogenous standards. In conformist approaches, models are mainly derived from empirical observation: they focus on how DMs actually make decisions, and what procedures have produced the best results according to what has been observed in similar contexts. When it comes to adjustive approaches, they will attempt to unveil C's system of values without much interference, and then find a model that fits C as well as possible. Lastly, reflexive approaches do not assume (or deny) that such preferences or values pre-exist, but lead C to construct his system of values as the DA process is conducted. There are several steps in such a process: structuring the problem situation, formulating a problem, establishing an evaluation model, formulating a final recommendation. At each and every step, the main source is the collaborative search for a mutual understanding between A and C.

A third important difference (third line) is that the four approaches are characterized by what might be called different "justification arbitrators". We use here this phrase to refer to the aspects of the final situations which will decide whether the outcome of the DA process will appear to be justified and legitimate (as in sections 3.1 to 3.4, we do not delve here into the complex debates on the precise definitions of these two notions, and rather limit ourselves to ideas that apply to both notions understood in a large sense). Proponents of an objectivist approach admit that the outcome of their work is justified or legitimate because they admit that the standards they postulate are acceptable. If they are asked to entrench the justification or legitimacy of their approach, they will fall back upon the standards and their supposed unquestionability. By contrast, proponents of conformist approaches will consider that the outcome of the process they unfolded is justified or legitimate if it smoothly fits in its context of implementation: the acceptability of the decision by C and the people with whom s/he works

determines whether the process is justified or legitimate. When it comes to the implementation of an adjustive approach, it will be considered justified or legitimate if and only if it appears to have captured the idiosyncrasies of C, so that the latter can see it as a truthful expression of his. Lastly, the justification or legitimacy of reflexive approaches will be decided by whether or not they withstand continued challenges through communication and argumentation and counter-argumentations between C and A.

In addition to these differences between the approaches, within each of them, there can also be non-negligible differences (fourth line). It is important to consider them in order to better understand the logic of the typology. Above, we already hinted at the main two variants that are encompassed within objectivist approaches: some are anchored in standards that are imposed by an authoritative third party, while others are anchored in standards derived from a (more or less implicit, more or less acknowledged) philosophical doctrine accepted or presupposed by A and C (or possibly imposed by one of them). Conformist approaches can be based on the idea that the best way to fulfill expectations is to imitate the others' behavior, while others can strive to identify the norms that happen to be accepted in the situation where the DA process takes place. Still others can claim that a normative, philosophical analysis of the norms that *should* be accepted is a more relevant source than an empirical analysis of the norms that *factually happen to be accepted* (a detailed explanation of this idea falls beyond the scope of the present article; an example of such a reasoning is given in [24]). Prominent variants of the adjustive approach are distinguished by whether the process aims at fitting what one might call Cs' "shallow" preferences, that is, what he spontaneously expresses or reveals when the DA process is launched, or rather the more elaborate things that a dedicated part of the DA process allows him to express, such as his informed preferences (see for example [5]). Lastly, reflexive approaches can put more emphasis on various steps of the DA process in their struggle to reach an agreement: in particular, more emphasis can be put on either the formulation of the problem or in the construction of C's preferences.

Table 1 hence allows to flesh out the meaning of our typology of ap-

Approach	Objectivist	Conformist	Adjustive	Reflexive
Model of action	Strategic	Norm-regulated	Dramaturgic	Communicative
Main source from which models stem	Postulated standards	Perceptions or conceptions of what has to be done	Search for the “best fit”	Search for mutual understanding
Justification arbitrator	Acceptability of the standards	Acceptability of the decision	Idiosyncrasy	Communication- and argumentation-proofness
Noteworthy variantes	Standards set by: - an authoritative third party - a philosophical doctrine	Expectations defined by: - norms that are accepted - norms that should be accepted - imitation	Features to track: - “shallow” preferences - informed preferences	Emphasis put on: - constructing preferences - articulating a shared problem formulation

Table 1: Differences among approaches

proaches. However, we do not conceive of the items of the typology as completely impermeable categories. The categories should rather be seen as ideal-types. Some real-life DA processes can fall neatly within a given category, as illustrated by our real-life examples in sections 3.1 to 3.4. However, most of the time real-life DA processes will involve different approaches at different steps. For example, processes implemented along objectivist lines can integrate conformist findings (see the case of qualitative decision theory [9, 18, 19]). It is therefore to be expected that, most of the time, when trying to decide in which category a given DA process belongs, various interpretations, linking this process to this or that approach, will appear to be plausible. The fact that such conflicts of interpretations might, in some cases, be undecidable, is no critical flaw of our reasoning’s. Quite the contrary, we believe that such discussions, even if they end-up being undecidable, can in any case be useful to improve our understanding of the DA process at issue and, more generally, of DA practice in general.

Remark 1. *Habermas’ communicative model of action can be seen as superior to the other three models of action since it encompasses them. Similarly, one can argue that the communicative conception of rationality as we define it provides a more convincing understanding of the concept of rationality than the other three conceptions because it encompasses them. One can*

therefore surmise that reflexive approaches should be considered superior in some sense to the other three approaches. We do not make any such evaluative judgment here. In some situations, deploying a reflexive approach can prove irrelevant or too cumbersome or exceedingly expansive, whereas another kind of approach would be more commandable. In a given situation, a given approach can certainly be more adapted or relevant than another one. But we do not think that one approach can be considered “superior” to another one in general.

4. Rationality and the object of typologies in the DA literature

4.1. Classical typologies in the DA literature and their ambiguities

The reader will probably identify some familiarities between the typology introduced in the former section and classical typologies found in the DA literature. Among these typologies, possibly the most famous one is based on the descriptive vs. normative dichotomy. Descriptive contributions are concerned with the way people make decisions, as a matter of empirical fact, whereas normative contributions investigate what makes a decision a good one. This distinction has been enriched by Bell, Raiffa and Tverski ([6]), who added a “prescriptive” term to the dichotomy, designed to capture the contributions of “the methodologists, the consultants (...) concerned with the bottom line: how do you improve the quality of decisions in practice?” ([6], p.ix).

Another classical distinction was proposed by Roy in [49], who distinguished three *paths* to give meaning to the knowledge produced in DA: the path of realism (quest for descriptions for discovering), the axiomatic path (quest of norms for prescribing) and the constructivist path (quest for working hypotheses for recommending), where the axiomatic path can be combined with any of the other two paths.

Having in mind these classical typologies, the reader might see similarities between, on the one hand, the concepts of objectivist, conformist and adjustive approaches as we define them, and, on the other hand, the concepts of normative, descriptive and prescriptive contributions. Similarly, it is tempting to identify what we call a reflexive approach with Roy’s notion

of constructive path. Tsoukis' ([59]) typology of normative, descriptive, prescriptive and constructive approaches also can be seen as very close to our own typology.

Drawing such parallels would be hasty, however, for several reasons:

First, one might question the philosophical robustness of the above-mentioned classical typologies. Indeed, as Bell, Raiffa and Tverski themselves emphasize ([6], p.2), the very structure of their trichotomy can be questioned, because the prescriptive category can be seen as a subcategory of normative. They accordingly see the trichotomy as a convenient tool to classify contributions to decision science on a provisional basis, for exploratory purposes. But they do not give it a more fundamental meaning, and do not see it as anchored in a rigorous philosophical reasoning. Similarly, despite the fact that the terms “constructive” or “constructivism” are often used in the philosophical literature, Roy himself never claimed that his contributions had a philosophical dimension or anchorage. The same goes for Tsoukis' typology. By contrast, our typology of DA approaches is based on a typology of conceptions of rationality, which is in turn derived from a generalization of Habermas' philosophical theory. This typology of approaches therefore claims to enlist categories that are neatly and rigorously distinguished and whose definition is theoretically and philosophically entrenched.

Second, one might claim that it is unclear what the above classical typologies are concerned to classify. Roy ([49]) talks about the meaning of the knowledge produced, which is intuitively easily understandable and compelling, but arguably rather vague: What exactly is the “meaning” of a piece of knowledge? Is it the interpretation that someone has of this piece of knowledge? Is it permissible that several persons diverge in the meaning they give to a given piece of knowledge? Roy leaves these questions and similar ones largely unanswered because his typology does not claim to have a philosophical dimension. But this implies that his typology can be variously interpreted and applied to different sets of objects, which can create ambiguities. Bell, Raiffa and Tverski's formulations are similarly ambiguous. The subtitle of their famous book ([6]) talks about “descriptive, normative,

and prescriptive *interactions*". However, it is difficult to understand how an *interactions* can be descriptive only: in the ordinary sense of the terms "description" and "interaction", if one interacts with something, one induces changes in this thing, and one can then no longer be said to have only "described" it. Unless one introduces technical definitions of the terms "description" and "interaction", differing from their ordinary sense (which the authors do not), a "descriptive interaction" is a contradiction in terms. A similar comment applies to Tsoukis' usage of the term "descriptive" to talk about DA processes: A DA process is a series of actions that eventually aim at providing advices. In that sense a DA process can never be confined to a description of what *is* the case (a descriptive task), it unavoidably involves envisioning and striving to materialize what *should be* the case (a normative task). In line with this logic, Bell, Raiffa and Tverski's own application of their trichotomy appears to correspond mainly to disciplinary differences: statistics, mathematics and economics are "normative", psychology and behavioral sciences are "descriptive" and operations research and management science are "prescriptive". This suggests that the proper objects that their trichotomy is convenient to classify are what we termed "tools" in the introduction above. The authors however do not consistently use their typology in this way, and rather at times use the term "prescriptive" to refer to an *attitude* that consists in striving to apply theories and models to concrete situations, as opposed to the attitude of researchers concerned to answer more general or theoretical questions.

Though we do not question the cogency, usefulness and relevance of these three classical typology, we therefore claim that they are ambiguous in important respects. This ambiguity is partly due to questionable choices of vocabulary, and partly to the fact that various typologies use the same terms in different senses. It is also a consequence of the fact that these typologies had no philosophical pretensions. But most importantly, these ambiguities are due to the fact that these typologies did not clarify the precise nature of the objects they could be expected to be able to classify. As a consequence, they are rather indiscriminately used to classify tools, processes, approaches, and even disciplines, which arguably is liable to create

more confusion than clarification. By contrast, thanks to its anchorage in our reading of Habermas’ philosophy, our typology was elaborated in such a way that it has a clearly defined object: DA *approaches* (ways to conduct the DA process).

This contrast between our proposed typology and the more classical ones found in the literature suggests that, at this stage, it is important to clarify if our typology, introduced as it was at the level of *approaches*, can also be applied at the level of *tools*.

4.2. *The interpretative link between DA tools and conceptions of rationality*

The number of decision support tools available today in the literature and more or less applied is incredibly high (see [8]). They range from optimisation techniques to cognitive approaches, from artificial intelligence tools to multiple criteria decision analysis methods, from extremely sophisticated tools to more “soft”, natural language oriented and user friendly ones. It is no part of our project to present a catalog of these tools.

Each of these tools has been created with a more or less precise (certainly often unconscious) “philosophical” background (see [21]) and with a more or less precise conception of rationality (implicitly) in mind. This inspiration is sometimes reported as an historical fact by the inventors of the tools. Most of the time, however, the link between a given tool and a conception of rationality only becomes visible *ex post* and is to a large extent interpretative.

For instance, it is tempting to claim that traditional Operational Research techniques such as linear programming or combinatorial optimisation, as well as expected utility theory and game theory (see the discussion in [40]), reflect the strategic conception of rationality underlying what we term objectivist DA approaches. Similarly, one can interpret several decision heuristics as well as some early artificial intelligence knowledge representation techniques as reflecting the norm-regulated conception of rationality underlying conformist DA approaches: they capture the way by which DMs and/or experts make judgements and generalize it. Much cognitive analysis can be associated to such an effort. Similarly, several multiple criteria

decision support methods can be seen as anchored in the dramaturgic conception of rationality. Several artificial intelligence tools also make implicitly reference to this model of rationality. Note for instance the common argumentation concerning intransitive preferences in decision analysis and non monotonic reasoning in logic [17, 57].

Finally, several “soft” OR methods and several MCDA methods at least implicitly refer to a concept of communicative rationality close to the one we used to define reflexive DA approaches. Indeed, although he cautiously eschewed philosophical references, Roy’s ([48]) understanding of the notion of “constructivism” is arguably close to the communicative conception of rationality as we defined it above. By clearly focussing on the DA process and the structuring issue, Soft Systems Methodology ([13]) endorses en very similar approach.

In these various cases, the various tools used in DA historically emerged, as a matter of fact, from processes that were (more or less explicitly, and more or less consciously) inspired by various conceptions of rationality. And even when no such historical inspiration is acknowledged by the inventors of tools, it is always possible *ex post* to argue that, at an interpretative level, this or that tool captures what might be called “the spirit” of a given conception of rationality. But beyond historical contingencies and (always disputable) interpretative claims, are the various DA tools really anchored in specific conceptions of rationality, in the sense that they would be undetachable from them? In the following subsection we use a series of example to argue that this is not the case.

4.3. *Examples of how the same tools can be used under different approaches*

Let us now illustrate how the same DA tools might be used in DA processes according to different approaches, as characterized in Section 3. For this illustration, we chose three DA tools that can be interpreted as being associated with different conceptions of rationality:

- Cost-Benefit Analysis ([33]) (CBA), whose philosophical background might seem to anchor it in the strategic conception of rationality.

- Data Envelopment Analysis ([12]) (DEA), which measures efficiency in terms of a non-parametrical empirical-based efficiency frontier, given theoretical or practical obstacles to the definition of an economic production function, and might therefore seem to be anchored in the norm-regulated conception of rationality.
- Soft Systems Methodology (SSM) ([13]), which might seem inherently linked to the communicative conception of rationality.

Table 2 spells out examples illustrating how these three tools can be used in all four different approaches. This illustrates that the philosophical background that can be interpreted as underlying a given tool does not simply percolates to the process in which the tool is used. Although the construction of some tools might have been associated, as a matter of historical fact, with a given conception of rationality, and although one can always speculate on the interpretative link between a given tool and a given conception of rationality, once the tools are embedded in a DA process they can become independent of conceptions of rationality with which they are historically or interpretatively associated.

4.4. *The proper place of rationality*

We are now in a position to answer questions Q1-3, from which we started in the introduction. Let us consider a given DA process. One can distinguish two levels of the rationality issue concerning it:

- A first level is the one of the rationality of this DA process. Recall that, in the introduction, we defined a DA approach as a way to conduct a DA process, and that our typology in section 3 characterized DA approaches as embodiments of conceptions of rationality. In this framework, the rationality of a given DA process is hence the conception of rationality embodied in the DA approach guiding the DA process, *as it materializes in this specific DA process*.
- A second level concerns the conception of rationality underlying the usage of the tools developed and used at various steps of this DA process.

Some of these tools can be attached to a specific conception of rationality, as a matter of historical fact or at an interpretative level, which may in some situations constraint to some extent the kind of usages that can be made of them in different DA approaches (identifying precisely in which situations and to what extent this can be the case falls beyond the scope of the present article). But once a tool or a method has been assigned a role in the DA process, the rationality of its usage in the context of a given DA process is generated by the interplay between the rationality of the DA process, and the way it is used in this DA process. Artifacts, as defined in the introduction, also take place at this level: their rationality is determined by the rationality of the DA process and the role they play in the process. The rationality of the usage of the tool is then part of the broader rationality of the DA process.

We see here that, in this framework, there is no such thing as the rationality of a tool, because tools are always embedded in larger DA processes using them. Accordingly, the rationality (historically or interpretatively) underlying tools has a rather limited influence, since it is confined to a (putative) participation in determining the kind of usages that can be made of them.

5. Conclusion

In this article, we have argued that conceptualizing the notion of rationality can prove very useful to understand DA practices. We took advantage of important insights of Habermas' to establish a typology of *conceptions of rationality*, and we used this typology to introduce a typology of *DA approaches*, distinguishing objectivist, conformist, adjustive, and reflexive approaches.

Whereas the underlying conception of rationality plays a key role in determining the features of DA processes, we argued that tools are largely independent of conceptions of rationality, in the sense that a given tool can be made use of in all the kinds or DA approaches, provided that the usage that is made of this tools is adapted to the specific features of the

DA process. As a consequence, even though proponents of DA tools may often have had one specific conception of rationality in mind when creating their method, this does not preclude the use of a method in different kinds of DA approaches. Nor does it preclude the creative use of parts of different methods.

The rationale spelled out in this article has important bearings for the issues of the legitimacy and validity of DA processes. We have ventured a few ideas about how the various conceptions of rationality embodied in the different DA approaches can be involved in the legitimacy and validity of DA processes guided by these approaches. However, as repeatedly emphasized, the notions of legitimacy and validity are controversial and their meaning is certainly largely context-dependant and unstable. Accordingly, we do not claim that our reasoning here provides a sufficient picture to elaborate a full-blown theory of validity and legitimacy. Our ambition is more reasonably to have produce a serious account of a factor that plays a key role in determining validity and legitimacy: rationality.

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Method	CBA	DEA	SSM
Context	Choice between alternative policies	Evaluation of hospitals	Improvement of a business strategy in a private firm
Objectivist	C asks for a CBA, since this tool is required by law. A takes the criteria couched in law and technical guidelines as given and not questionable. The process is justified by the assumed validity of the criteria and the technical quality of the analysis	C asks to conduct DEA following an authoritative regulatory manual, indicating the DEA model to use and listing inputs and outputs to include. A follows the manual as closely as he can. The process is justified to the degree that the manual was followed and the analysis was technically well performed	SSM is chosen because the company's president firmly contends that this is the appropriate method. A was hired through a job offer where knowledge of SSM was specifically required. The process is justified by the support of the president to SSM. A's role is to abide by the standard according to the president's requests
Conformist	C asks for a CBA because it is commonly used for similar situations. A applies it based on his knowledge about how the method has been used before, avoiding known pitfalls and emulating successful cases. The process is justified to the degree that best practices were followed	A asks to conduct DEA, because it is a widespread practice. A applies DEA, using inputs and outputs common in renown studies. Past studies lead him to reject constant returns to scale, and hence to use a BCC model. The process is justified to the degree that best practices were followed	SSM is chosen for its track record of successful past interventions, in many organizations. A studies extensively these past applications and uses this knowledge to emulate the best practitioners. The process is justified by the evidence in support of the method's ability to allow groups to move forward in problematic situations
Adjustive	C asks A's help to evaluate options. A assesses that CBA is an appropriate method to reflect C's values in this situation. The process is justified to the degree that A effectively managed to reflect C's judgements and needs	C asks for A's help to evaluate hospitals. A deems that DEA is the most appropriate. He interviews C to find out constraints and preferences. The process is justified to the degree that A was competent to reflect A's judgement and needs	A considers that SSM is the most appropriate tool because it allows the persons involved in the company's strategic choice to express their values and preferences, thanks to soft communication facilitating tricks. The process is justified its effectiveness to do it
Reflexive	A proposes the use of CBA at a given point of the process, to check if it allows to build a strong argument for or against a given course of action. Arbitrary options involved in the modelling are discussed. Alternative models are developed to foster discussions. The process is justified by the usefulness of CBA to enrich the discussion	The problem is initially cast as an MCDA evaluation, but difficulties arise. They lead to conclude that DEA is more adequate to C's conception of hospital evaluation as an efficiency evaluation. The process is justified by the extent to which DEA contributed to enrich A's and C's understanding of the situation	In a group meeting, A initially proposes the use of SSM as an exploratory analysis. After having explored other OR models, the group agrees that, in the case at hand, SSM appears relevant and sufficient. The process is justified by the groups thorough discussion and agreement

Table 2: Similar tools used in the different approaches