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MEANING AND VALIDITY OF INTERACTIVE PROCEDURES
AS TOOLS FOR DECISION MAKING (*)

SENS ET VALIDITE DES PROCEDURES INTERACTIVES EN TANT
QU'OUTILS EN MATIERE D'AIDE A LA DECISION (*)

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- (*) Ce texte étant particulièrement court, on trouvera dans ce cahier, après une version anglaise, la version originale française. Ce texte a fait l'objet d'une communication au Congrès EURO VII, Bologne, juin 1985.

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ABSTRACT

This paper examines procedures based on answers to questions than an entity Q asks an actor D in accordance with a protocol P . The aim is either to select an alternative a^* , considered by D to be the optimal choice among a set of alternatives A , or to formulate a utility function U , considered relevant by D for comparing alternatives in A .

What gives meaning to the final result of this type of interactive procedure? On which criteria can its validity be assessed? In analysing three questions of a parlor game, we can produce evidence that the answers to such questions do not depend on P alone, but that the way in which D produces his answers plays just a central role. Three different hypotheses concerning this point led us to a new approach to this type of question, an approach which points out the illusive nature of certain types of answers.

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RESUME

On s'intéresse ici aux procédures qui suscitent des réponses de la part d'un acteur D à des questions que pose une entité Q selon un protocole P . L'objet peut être soit de sélectionner une action a^* jugée par D optimale dans un ensemble A , soit d'explicitier une fonction d'utilité U jugée pertinente par D pour comparer les actions de A .

Qu'est-ce qui confère un sens au produit final d'une interaction de ce genre ? Selon quels critères en apprécier la validité ? Prenant appui sur trois versions d'un jeu de société, nous montrons que la réponse à de telles questions ne peut être trouvée en ne raisonnant que sur P : la manière dont D fabrique ses réponses joue un rôle aussi central. Trois hypothèses faites à ce sujet nous conduisent à envisager les questions ci-dessus sous un jour nouveau, lequel met en évidence le caractère illusoire de certaines formes de réponses.

1. INTRODUCTION

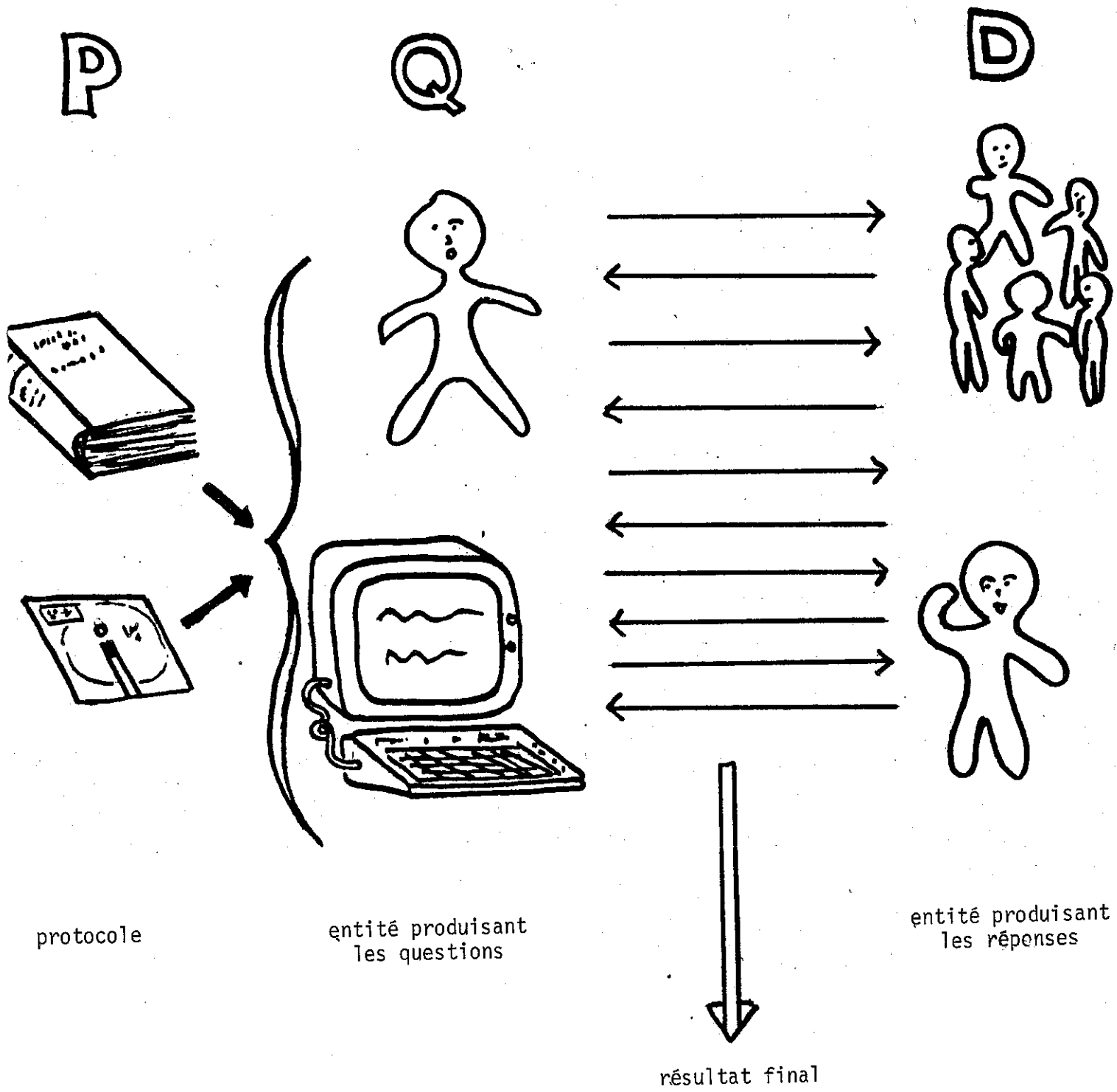
The following observations are concerned with the most classic type of interactive procedures encountered in decision aid. More precisely, the procedures involved are those which aim to help an individual D (see figure 1) (a decision-maker, a researcher, a participant in a decision-making process) :

- either (1) choose the optimal alternative a^* from a set of alternatives, A , whose performance rates are known, with selection based on criteria deemed relevant by D , namely, $g_1, \dots, g_n$ (cf., for example, BENAYOUN (1971), GEOFFRION (1972), GOICOECHEA (1982), ZIONTS (1983) ;
- or (2) elicit a utility function, $U, (x_1, \dots, x_n)$ in the light of one or more x_j attributes which D considers relevant to a comparison of alternatives in a set A (see, for example, KEENEY, RAIFFA (1976), JACQUET-LAGREZE (1984), SISKOS, YANNACOPOULOS (1985).

In each of these procedures, questions are directed to D , whose answers, in turn, serve to elicit and shape subsequent questions. The question-producing entity (either a computer or an interviewer) will be designated as Q . The interaction, that is to say the sequence of questions and answers, can be interrupted :

- (1) by D , either when he believes he has obtained the responses he was looking for (a^* or U), or when he is weary of and no longer wishes to pursue the process.
- (2) by Q , either when he claims to have produced the desired responses (a^* or U), or when a stalemate has been reached and he can no longer generate new questions.

FIGURE 1



We shall call the outcome (a^* or U) of the interactive process the final result. What gives meaning to this final result ? On what bases do we determine that the alternative a^* should be regarded as optimal in A with respect to D 's preferences ? Or that the function U is a faithful reflection of D 's preferences ?

It is clear that an important role in finding answers to these questions will be played by P , a protocol which will determine the nature of Q 's questions and govern the way in which Q interprets and reacts to D 's responses and which will, consequently, structure the interactive process. The answers to the preceding questions, however, do not depend upon P alone. D 's behaviour in the interactive process and, more precisely, the way in which he develops his responses, play an equally important role. In order to highlight this aspect of the problem, we shall study the inner workings of a parlor game (cf. section 2), an analysis which will allow us (cf. section 3) to see the above mentioned questions from a fresh perspective, thus underlining the illusory character of certain types of answers we might be inclined to provide for such questions. In this way we hope to contribute to a clearer definition of the extent to which such interactive procedures are valid and to a greater understanding of what we can realistically expect from them.

2. THREE VERSIONS OF A PARLOR GAME

The game we have in mind has two protagonists : one of them, Q , formulates questions ; the other, D , (not necessarily a single individual) answers Q 's questions. The object of the game is to discover or reconstruct a story. Versions 1 and 2 described below are well-known parlor games. The third version is of our own invention. The reasons for inventing the third

version will be clear to the reader when he gets to section 3.

a) Version 1

D thinks of a story that he chooses from among his cultural repertoire or that he makes up himself. To make the game more interesting, the story should include a certain number of different episodes, unexpected developments and unusual turns. To begin the game, D gives Q only the slightest of hints concerning the story. Q then proceeds to reconstruct the entire story on the basis of questions to which D can provide only yes or no answers.

The story chosen by D obviously dictates whether D replies in the affirmative or in the negative to each of Q's questions. As DUPUY ⁽¹⁾ (1982) points out : "The game unfolds as an interactive process - in part unpredictable - between one player's imagination and a story which has existed from the beginning of the game and which is present throughout the game" ⁽²⁾ (and remains unchanged by the dynamics of the game). "Usually the process leads fairly rapidly, through experimentation, trial and error, to the 'discovery' or reconstruction of the story".

b) Version 2

From Q's or any outside observer's standpoint, this version would seem to be identical to Version 1. The only difference is that in Version 2, D has no particular story in mind. Instead he chooses a completely arbitrary means of deciding whether to reply negatively or affirmatively to Q's questions. He might, for example, answer "yes" to all questions ending in a vowel and "no" for all ending in a consonant, although he would ignore this rule if applying it meant contradicting a previous answer.

(1) Who, in another context wholly unrelated to decision aid, analyzes the first two versions of the game.

(2) "Le déroulement du jeu est un processus d'interaction, en partie aléatoire, entre l'imagination du joueur et un certain récit qui, tout au long de la dynamique, aura toujours été déjà là. Normalement, le processus converge plus ou moins rapidement, par tâtonnements, essais et erreurs, vers la découverte de l'histoire".

Again citing DUPUY : "Here the game unfolds as a wholly unpredictable process of interaction between one player's imagination and a series of semantic accidents, limited only by the coherence of meaning which the player confers on the story he thinks he is reconstructing. Sometimes it happens that a well constructed story emerges from this interplay, and when it does, it is obvious that this is nothing other than pure creation. For the inside observer, by which we mean here, in fact, the player who is unaware of the real rules of the game, everything seems to happen exactly as it would in the preceding situation". In version 1, "the range of possible stories is progressively restricted from the beginning until the end of the game and comes closer and closer to an order which has always been present, namely the story to be reconstructed. For the players ⁽¹⁾ who choose the story in Version 1, the surprise aspect of the game diminishes progressively as the game is played out. In the second version of the game, however, these same players encounter one surprise after another. For them, the game becomes increasingly complex even as the player who asks the questions thinks he is getting closer and closer to discovering an immutable, ever present entity".

c) Version 3

As with Version 2, Version 3 would seem identical to Version 1 to the player Q or any outside observer. Here D has neither chosen a story nor set up any sort of arbitrary convention designed to dictate

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- (1) Here D is presumed to designate several individuals.
- (2) "Le déroulement du jeu est ici un processus d'interaction aléatoire entre l'imagination du joueur et le hasard sémantique des réponses, uniquement contraint par la cohérence de sens que le joueur prête au récit qu'il croit découvrir. Il arrive qu'une histoire bien constituée émerge de cette dynamique, et il est clair qu'il s'agit alors d'une pure création. Pour l'observateur intérieur qu'est de fait, ici, le joueur ignorant de la véritable règle du jeu, tout se passe cependant comme si l'on était dans le cas précédent". Dans la Version n° 1, "l'éventail des histoires possibles se resserre entre le commencement du jeu et sa fin, pour se refermer sur un 'ordre' qui a toujours été présent : l'histoire à découvrir. Pour les joueurs qui ont choisi l'histoire, il y a réduction de surprise à mesure que le jeu se déroule. Dans le second cas, les mêmes joueurs vont de surprise en surprise. Il y a véritablement, pour eux, complexification alors même que le joueur qui pose les questions croit se rapprocher d'une forme présente et fixe".

his answers. This time he responds "yes" or "no" according to his mood and how he wants to direct the story which is being created within the framework of the interaction. Just as in Version 2, something is created ; but the creation which takes place in Version 3 is unlike that of Version 2 in that it is given shape and direction by D's personality (although still influenced by Q's personality as in Version 2).

Finally, we should point out that in this third version, Q through his choice of questions and the conclusions he draws from D's responses to previous questions, has a certain influence on D's behavior. Q chooses selectively from among his own tastes and motivations, focusing his attention on one aspect rather than another of the emerging story. In so doing, Q helps shape the very entity which, in D's mind, is the basis of Q's responses. There is nothing similar to this phenomenon in Version 1 or 2 of the game, where the preselected story or arbitrary convention is a fixed, ever present feature which the dynamics of interaction can in no way alter.

3. THE FINAL RESULT OF INTERACTION : MEANING AND VALIDITY

We would now like to come back to those interactive procedures used as tools for decision aid mentioned in section 1 (see table 1). In what direction do they lead D ? What meaning can we impute to their final result ? How can we judge the merits of a given procedure within a specific context ? The game described above suggests to us that these questions should be examined in the light of three hypotheses. These hypotheses are linked to factors conditioning D's behavior in producing responses throughout the process. We would like to emphasize that these hypotheses are introduced here because they are, in our opinion, useful tools for analyzing meaning and validity.

a) Hypothesis 1

This hypothesis corresponds to Version 1 of our parlor game. D has 'something' which plays the same role as the story does in the game. Like the story, this 'something' constitutes an ever present and fixed entity which cannot be modified by the dynamics of the interaction and which predetermines any reply D might give to Q's questions. Finally, this entity, because of its nature and structure, behaves like a utility function. Most researchers¹ who have worked on developing protocols have assumed that this hypothesis corresponded to reality.

As soon as we accept this hypothesis, both the meaning and direction of a procedure are clear. To be meaningful, the hypothesis must lead us to discover something real, an entity which was present before the interaction began. For our purpose (cf. section 1), this entity is none other than the optimum from set A or the utility function itself. Any evaluation of a protocol's validity within a given context

1) This is especially true of all those cited in the bibliography, with the exception of BOUYSSOU, JACQUET-LAGREZE and VINCKE, who, under the influence of our work, have been willing to envisage other hypotheses.

TABLE 1

The interactive procedure

as a game	as a tool for decision-aid
Version 1 : A story preselected before the beginning of the game.	Hypothesis 1 : a^* or U exists before the beginning of the interaction.
Version 2 : No story but an arbitrary convention preselected before the beginning of the game.	Hypothesis 2 : Nothing similar to a^* or U in D's mind and no special motivation preventing arbitrary answers.
Version 3 : No story, no arbitrary convention, but pragmatic and motivated answers directed towards the construction of an interesting story.	Hypothesis 3 : Nothing similar to a^* or U in D's mind but a strong motivation to progress towards a useful final result.

can, therefore, be expressed in terms of the conditions which this context must meet for the dynamics created by P to converge on what is to be discovered or, failing that, to lead to a very similar final result.

These conditions involve :

- 1. D's personality, since D must be able to interpret correctly any questions asked ;
- 2. The nature of the utility function, U, which should, for example, be concave or quasi-concave.

b) Hypothesis 2

Here, as in the preceding hypothesis, we agree that there is an immutable and ever present entity in D's mind which predetermines any answer D might give in response to Q's questions. We suppose, however, that because of its very nature, structure and form this entity does not behave in the same way as a utility function would : D is driven by another system of logic, by reasons which escape us (which, for example, lead us to interpret the questions asked differently from Q). The entity in question thus behaves like the arbitrary convention in Version 2 of our parlor game.

Although this hypothesis is not entirely divorced from reality, researchers interested in establishing a protocol (P) will not willingly consider it as a working hypothesis. Indeed, if we assume that D's behavior can be fully explained by this hypothesis, then the dynamics of the interactive process will appear equally arbitrary and its final result devoid of any value for decision aid.

c) Hypothesis 3

With this final hypothesis, just as in Version 3 of the parlor game, there is no ever present, unchanging entity which would govern all of D's responses to Q's questions regardless of what had taken place from

the beginning of the game up to the moment a question was asked. Rather it is assumed that D's reactions are a function of his own temperament and system of values and that these constitute the basis of the convictions which structure D's preferences. This is not to say that D's preferences are seen as a perfectly consistent whole. In and among the areas of firm conviction lie hazy zones of uncertainty, half-held belief or, indeed, conflict and contradiction. We admit, therefore, that the interactive dynamics regulated by P may contribute, in one way or another, to eliminating questioning, solving conflicts, transforming contradictions and, indeed, to destabilizing certain convictions. With this hypothesis, the final result (a^* or U) would appear to be somewhat conditioned or informed by P, with the nature of the questions asked, as well as their internal logic, to a greater or lesser degree influencing D's responses.

As soon as we put ourselves within the framework of this final hypothesis, it is no longer possible to base meaning on the idea of convergence or discovery. Indeed, neither that entity which the questions must converge upon nor that which must be discovered exist before the interaction begins but appear as a result of it, as its creation. For meaning we must look to the fact that the procedure provokes and stimulates D in order to have him structure, complete and stabilize his preferences. The procedure allows him to develop a final solution which seems to be :

- 1) satisfying with regard to the preferences he has just put to the test, if it is an a^* solution.
- 2) a model which satisfies the preferences he has just put to the test and to which he has just given form (a model allowing others to reason in the same way, at least provisionally), if it is a U solution.

Thus, we can no longer see the final solution as a process of discovering, but as one of constructing, a process which continues throughout the whole interaction. This is not a process of convergence but of creation. Under these conditions, how can we judge the validity of a protocol, P, within a given context ? In our opinion, we must essentially ask, taking D's personality and temperament into account,

- 1) if P efficiently provokes and stimulates D,
- 2) if P offers sufficient material for testing to be meaningful,
- 3) if P allows enough trials and errors to let D freely shape his zones of questioning, conflict, and contradiction.

4. CONCLUSION

In fact, the truth most probably lies in a combination of the three hypotheses we have just described. Unfortunately, as our analysis of the game so pointedly demonstrates, neither Q nor any outside observer can disentangle the three to evaluate the relative importance of each. Nonetheless, it does not seem too far fetched to say that for the purposes of decision aid, when D consists of actors who are motivated¹ to answer Q's questions, the importance of Hypothesis 2 can be minimalized. On the

1) We limit ourselves here to the case of actors both desirous of participating and endowed with a general cultural background that ensures their understanding of Q's questions. Let us note here that when we depart from decision aid, for example when we perform an experiment, the first of these conditions is not easy to meet and the impact of Hypothesis 2 can no longer be said to be negligible. This is particularly true when we experiment with a given protocol to establish an individual's utility function (e.g., MCCORD and de NEUFVILLE (1984) or COHEN and JAFFRAY (1985). The individual who expects nothing out of knowing this function will not throw himself into answering Q's questions and is likely to give up rather quickly.

other hand, it does not seem reasonable to us, except perhaps in special cases, to assume that the same is true of Hypothesis 3.

The following quotation from J.P. DUPUY (1982), citing ATLAN (1979), seems particularly appropriate to us here : "We should postulate the simultaneity of order and complexity, in the sense previously assigned to these two terms¹. By order we mean the regular features, repetitions and redundancies, that we are capable of perceiving and describing with respect to their meanings. Complexity is anything that denies this order, such as unexpected and inexplicable variations or surprising and apparently contingent diversity. If one of these two ingredients -order and complexity- is lacking, we can no longer speak of natural organization, such as that which a living being represents."²

Focusing only on regularities puts us in the framework that we have characterized elsewhere as descriptive (cf. ROY, BOUYSSOU (1984), ROY (1985, chapter 10) and which, following LANDRY and AUDET (1984), we can call naturalist. Recognizing only those features which contradict regularity and create complexity leads us to adopt a position that we have characterized as constructionist.

1) See the passage cited from DUPUY in section 2,b.

2) "Nous devons postuler la simultanéité d'un ordre et d'une complexité, au sens précédemment donné à ces termes. L'ordre, ce sont les régularités que nous percevons et sommes capables de décrire, avec leurs significations, les répétitions, les redondances. La complexité, c'est ce qui nie cet ordre, comme variations imprévues et inexpliquées, diversités surprenantes et apparemment contingentes. Qu'un de ces deux ingrédients manque au menu, et l'on ne peut parler d'une organisation naturelle, telle que l'être vivant se présente à nous".

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