Preference modelling as an activity for 'structuring valid data' during MCDA intervention

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This paper intends to make a contribution to the debate that has been activated by the paper by B.Roy and D.Vanderpooten (1996) regarding the 'European School of MCDA'. I do not intend to go into a 'geographical or linguistic querelle' that does not add any valid research point, especially if one considers the richness and originality of stimula, cultural exchanges and results (in a large sense, from both a 'scientifical/technical' and 'human' point of view) that the EURO Working Group on MCDA has been able to increasingly produce and diffuse over more than 20 years. My contribution intends, rather, to introduce a different view from the 'traditional' one, concerning the problem of preference modelling during 'real' (as opposed to 'laboratory') MCDA interventions.

The studies on Multicriteria Decision Aid in 'real' or Organisational Contexts (*MCDA-OC*) have been widely stimulated over the last fifteen-year period. Such an 'impulse' originated from a long standing tradition of empirical research into OR/DA processes within OC interventions, conducted by various groups since the beginning of the '70s (cf among many important others: Bertier and de Montgolfier, 1978; Hirsch *et al*., 1978; Moscarola 1980, 1981; Bowen, 1981; Heurgon, 1981; Ostanello, 1981; Norese and Ostanello, 1984; Tomlinson and Kiss, 1984; AFCET (ed), 1987). Many of these studies have, in particular, been devoted to 'complex' problem structuring (cf Rosenhead, 1989), and, more generally, to decision processes in multiactorial contexts. Most of this research has been conducted with different perspectives and approaches, even, from various other different fields such as: Cognitive Psychology and Cognitive Science, Management Science, Process Analysis (or longitudinal field studies), Organization Science, Information Systems, Decision Support Systems, and Operational Research, especially 'Soft Systems Thinking' of - what I will call here- the 'English School'. Such a wide scenario of studies characterizes this subject matter as a multidiscinary research domain, that has already permitted a development of several fruitful integrations and results. A general agreement exists in literature on the following facts: *1)* any meaningful conception or representation of a 'complex' problem structuring in organisational contexts has to be related to a multiplicity of different actors (to be intended in a systemic sense); *2)* the presence of such actors induces a variety of 'uncertainty' problems of a cognitive, technical and socio-organizational kind; *3)* most of the decision processes developing within such contexts/processes are based on multiple criteria and refer to problematics that are much more complex than those defined by traditional OR/DA literature.

Such a complexity underlines the importance of considering an integrated framework to support the *DAOC* processes, and of assuming, in particular, an 'understanding perspective' with validation purposes of the process and of its results (cf Ostanello, 1995). Some of these frameworks have been developed within 'Soft Systems Thinking' studies (cf Rosenhead, 1989; Flood and Jackson, 1991). These, however, do not pay sufficient attention, at least explicitly, to some assumptions of a *MCDA* paradigm (cf Roy, 1990). More methodological studies along such a line of research therefore seem necessary (cf Daellenbach, 1994). In particular, a multi-process and a 'bipolar' (or a 'multipolar') conception of the *DAOC* process should be made clear (cf Ostanello, 1994). This permits one to distinguish the different process activities that may be conducted with reference to either the Client's or the Analyst's problem situation, and to separate, for validation purposes, the problem issues that

refer to *Analyst's Problem Situation (APS)* from those that concern the *Client/decision-maker's Problem Situation (CPS)*.

The suggestions and proposals for possible new lines of MCDA research deriving from such studies have been rich and stimulating. These have not, however, relevantly influenced MCDA literature, which has been principally focused on 'the decision stage' of an isolated individual, until very recently (cf Bouyssou *et al.*, 1993). *MCDA-OC* had, therefore, in our opinion, a 'slower' progression than other fields of research on such subject matter, with the exception of a few groups which have tackled various 'non traditional' problem aspects of decision aiding from a more integrated 'technical' and 'social' perspective. The delay in focusing some important aspects of research, and especially those related to *human interactions* more than only to '*user-tool interactivity*', is due to a few factors, the first of which refers to a *control* that 'mathematicians' have applied to the 'official' streams of this research sector. These researchers have often imposed their own 'validity' criteria even on the research subject matter; the opposition, for instance, made by some 'theoreticians' to a proposal to consider a *rejection problematic* ('problématique du rejet relatif') (cf Bana e Costa, 1986) for 'further research studies', is a known case among the researchers of the EURO-WG; such a position was taken in spite of any evidence of the importance and frequence of such a problem statement in real decision cases (cf, for instance: Tversky, 1971; Humphrey *et al.*, 1983). *OR/DA*-mathematicians are, generally, anchored to a 'closed system' of research paradigms, and have focused their studies on the *preference modelling* of a 'hypothetical' decision-maker 'freed' from any context or process contraints (cf Walsham, 1990). Such limiting assumptions have to be taken in order to 'rationalise the decision process' and to allow that the '*internal*' *logical validity* (i.e. from a mathematical point of view) of the modelling process and of its results be under a researcher's control. These assumptions are rather 'paradoxical' for *Multiple Criteria Aid* for *Decisions,* and are hereafter called *Convenience Hypotheses*.

The various kinds of problems met by the interacting actors, during a *DAOC* intervention, are important issues, if validation of the process results is the 'real' concern of the involved actors. These also have to be research issues, which have to be related to an integrated framework in which a multiplicity of interwoven processes are considered (cf Hirsch and Ostanello, 1986). The usefulness of such a framework has already been proven in various complex situations. Moreover, an *understanding perspective (UP)* (cf Ostanello, 1995) becomes particularly meaningful and rich of operational implications if it is associated to such an integrated paradigm. *UP* is compatible with the *condition of participation and commitment* of the two main actors involved in the *DA* process (i.e. the Client, *C*, and the Analyst, *A*), and also includes a '*constructivist' attitude*, besides some other characterising features, as synthesized in the papers of (Roy, 1990; Roy and Vanderpooten, 1996). An *understanding perspective* is intended as an *OR/DA*-worker's (Oral and Kettani, 1993) point of view that considers certain 'soft' activities of the process as *alternative and not surrogate* of some (decision) support functions that 'hard thinking' researchers include in a category of 'interactive approaches' or 'user-tool' (or user-machine) interactions. An *UP* is *not oriented* to identify and develop formal models or frameworks to be included within a future 'automation' of some human activity, as a *'neo-mechanistic' conception of work in organizations* considers; rather, it tends to enhance 'new forms' of work based on 'trinomial' *man-man-machine interactions* (cf Orlikowski, 1992). It is, therefore, significant to also redefine the analyst's role within such a perspective.

The centrality of *data validity* is underlined in a bipolar framework (cf Ostanello, 1994) and in the literature models that are related to it (cf Landry *et al.*, 1983; Oral and Kettani, 1993). Within an integrated framework of *DAOC*, this concept takes on a meaning related to the process evolution and is therefore more complex than the 'technical' meaning that is usually assumed in literature works. Data validity is not an *apriori* input property that is exogenous to the ongoing *DAOC* process; on the contrary, it is a problematic issue that is constantly present during the intervention. 'Valid data' are partial results that are subsequently searched for and developed during a 'structuring/validation process', *SVP*, by means of different 'local' processes of the participating actors. When these elements are supplied to the analysts by other actors or have been elaborated by the analyst himself with some 'social' purpose, they usually own some kind of operational validity that is often of an 'external' nature and might not be sufficient to guarantee the adequacy of these 'data' to be input for a subsequent tool

application for a formal modelling. The analyst has, therefore, to carry out new 'internal' validation tests on such input. The types of such tests depend on the kind of data and the application that must to be conducted (cf Landry *et al.*, 1983). The obtaining of valid data (*VD*) is, therefore, one of the main issues of the analyst's problem situation (*APS*), from the operational and cognitive perspectives. These issues intervene in the construction and definition of a conceptual model, i.e. a stage in which, for instance, the 'existence or accessibility' of *VD* may be the main issue that has to be answered; *VDs* of a different kind intervene in any 'action' development and are also produced by many modelling or 'solving' activies conducted during the process. The produced 'valid data' are sometimes used to facililitate communication in contexts linked to the client's problem situation (*CPS*), and are essential in negotiations that might have to be conducted in the organisational context to favourise an 'action' implementation. *Valid data* are therefore both *input and produced output of SVP*.

The understanding/learning processes of the participating actors are largely based on the process of data validation. This, in particular, implies a wide range of 'objects' that must be learned or understood. These 'objects' go much further than the 'focus-object' of mathematical *MCDA/M* works, i.e. the 'preferences' that an individual decision-maker may have on a 'given' set of potential 'actions', independently of any context/process constraints.This remark can, in particular, be applied to *preference modelling* and especially to works that deal with 'preference learning' using interactive procedures. *MCDA/M* literature, however, almost totally ignores the process of 'data validation' as a research theme.

Within the proposed framework, *preference modelling* is a recurring *issue* that *concerns 'data validation'* at different stages of a *MCDA* process. This implies that many *MCDA/M* research works on such an issue have to be *related to 'elementary' problem statements or 'local' decisions, at the operational level*, more than to a client/decision-maker's 'global' decision situation (cf AFCET (ed), 1987). A multiplicity of 'local decision processes' are induced by an ongoing development of 'complex' operational problematics, by which the OR/DA-worker tries to meet the client's understanding and 'answer' requirements. A solution to such a 'local' problem implies a tool selection to elaborate data that may have been structured during other process stages. It is therefore important to underline that such 'decision-making' situations concern the Analyst's Problem Situation (*APS*), as is pointed out in Landry *et al.*'s model (1983) which considers a unique reference 'problem situation' for a 'modelling-validation process'. Such an interpretation of a decision-making situation may be also applied to a 'decision-aiding' situation in which the analyst and the client activities are not distinguishable (cf Roy, 1985). In such situations, a conception of 'learning' by 'man-machine' interactions may be meaningful within *DAOC*, as long as a reference with the context/process remains clear to the OR/DA-worker who can therefore relativise the importance of such a kind of interaction process. The decision-situations concerning the *APS* should not be confused with both 'local' and 'global' decisions that refer to the client's problem situation (*CPS*). Most of the analyst's issues - as for instance those that concern some 'preference input' or 'subjective data' required by a formal tool application - might be of no interest to or be too 'hard' to understand by the involved actors, with relation to the *real decision 'object'*. This may, therefore, determine a 'tool refusal' or even an 'analyst rejection' (cf Tomlinson, 1984), as the Author's long experience with 'real' decision aiding processes can verify.

The *MCDA/M* researchers are therefore confronted with a 'bifurcation' (Roy, 1990): either to continue, within a '*closed cultural system*', to develop some highly specialised research issues that can be 'ignored' by real decision-makers (cf Moscarola, 1980, 1981; Tomlinson, 1984), and then be satisfied with some '*real applications' of MCDA tools*, or to 'open' their cultural framework, within a 'trinomial' interaction perspective and therefore change their traditional axiomatical bases and work approach and practice. The accepting of a new paradigm implies, in particular, the recognition of *preference modelling* as being *an 'unstructured process*' during *MCDA-OC,* even for an individual decision-maker. This process supports 'implementation' of many process activities, at individual and collective levels, and contributes to introduce new elements of a different nature into the 'Action Space' (cf Ostanello, 1995), to select or re-select some elements or factors of such a space, to define the 'directionality' of the *SVP* (cf Montgomery, 1983) or some 'constraints' that have to be considered in

order to develop some other process activities, and to structure 'valid data' for the *MCDA* models and the possible solution procedures.

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