The joint use of role-playing games and models regarding negotiation processes: characterization of associations

Role-Playing Games (RPG) and computerized models are old and new Information and Communication Technique (ICT) tools aiming at providing support for analysis and support for negotiation processes. As learning tools RPG aim at providing either players or game organizers with better knowledge of a given situation. They thus constitute social learning support tools. Computerized models in negotiation processes aim at simulating either the negotiation itself so as to better handle the process, or the evolution of stakes to broaden the discussion. Each of these tools has already been used on its own but each has its limits. When used jointly, at least one of them constitutes a 'like society' about which scientists and/or stakeholders can think over. This paper focuses on the interactions between both kinds of tools when dealing with negotiation issues, and is based on experiments presented in the thematic session about 'role-playing games, models and negotiation' held at the Ecological Economics conference in Sousse, Tunisia, in March 2002. They are analyzed and compared with a post normal posture on negotiation processes. The post normal version of a model as a scientific tool involves opening an axis [conceptual model, controlled experiment] to include a third pole: observed reality. This is a means of dealing with the complexity and uncertainty of the systems at stake, by involving the various viewpoints concerning the system. RPG are a good tool for introducing this third pole, while computerized models considerably ease their use and design. Thus, each joint use experiment is presented as a path within this triplet. Two main categories of joint use have been identified: mutual support in use and mutual support in design and analysis. In the first category, both tools are used simultaneously with different underlying conceptual models. In the second category, both tools are used one after the other and have the same underlying conceptual model. Practically speaking, the joint use of RPG and computerized models can be considered as a craft. The artisan nature of tools as well as of their methodology of use is coherent with the artisan nature of consensus building processes. Not all joint use experiments allow standardized tools and methodology to be built. However, some guidelines can be formulated for the building of suitable mediating objects for a post normal approach to negotiation process.
Introduction

1.1 Role-playing games and models are increasingly being associated for educational purposes as well as for dealing with negotiation topics. Both aim at reproducing part of the complexity of these issues in order to understand and eventually support them. From analysis to support, models and RPG are involved either jointly or separately in various processes regarding negotiation. As for RPG design, the way in which both kinds of tools are associated and jointly tackle negotiation issues is hard to standardize, except in the case of experimental economics examples. They are primarily based on empirical approaches and deal with the control of behavioral patterns through the specification of roles and rules, as well as with learning about the behavior and viewpoints of players. They aim at simulating complex systems such as those that are at stake in negotiation processes. These simulations are based on the background assumption that it is useful to control part of this complexity in order to (i) better grasp the consequences of the controlled part and (ii) make the other part react to the situation proposed by the controlled part. This article aims at characterizing the joint use of RPG and models in regard to their relation to negotiation processes as well as to their own implementation.

1.2 From a post-normal science standpoint, we have analyzed various experiments, containing the joint use of models and RPG, and their relation to observed reality. This relation is dynamic and can be better described by a path among three poles: observed reality, conceptual model and controlled experiment. To begin with, the area covered by this path is a characterization of these associations in regard to their relation to negotiation processes. This characterization also considers the practical joint use of both tools. For this purpose it is rather an issue of elements common to both tools on the one hand and sequential versus parallel use on the other hand.

1.3 This paper is based on the analysis of various research presented at the conference of the International Society for Ecological Economics, held in Sousse, Tunisia, in 2002, in the special session entitled "Role games, models and negotiations". Some of them are appearing in an extended version in this special issue of JASSS. This sample of experiments is backed by other papers that have recently been published on the same subject. All the papers analyzed deal with the association of RPG and computer based models, that aim at tackling negotiation issues, either to get a better understanding of behavioral patterns within negotiation processes or to propose some support methodology for negotiations. Papers analyzed refer to several experiments that implement the joint use of RPG and models for negotiation issues, as well as to some methodological issues that have been highlighted by these experiments.

1.4 First, this paper introduces the origins of the use of games in this field, their implementation in negotiation topics. It then discusses their various relations to models and negotiation processes. It concludes with a few practical issues.
The use of RPG for the study and support of negotiation processes

RPG as an ICT tool

2.1
In-between games and theater, RPG are group settings that determine the roles or behavioral patterns of players as well as an imaginary context. A RPG is the performance of a roughly defined situation that involves people with given roles (Mucchielli 1983).

2.2
Players genuinely use RPG as a social laboratory. It is a way for them to experiment with a variety of ways of positioning themselves in a group with presumably few consequences in the real world (Innes and Booher 1999). At present, RPG are used alone as training tools and are also becoming scientific tools. As a group setting, they seem to be of relevance for negotiation or collective decision issues. As a training tool, they have already proven to be powerful in stimulating and supporting coherent group change (Tsuchiya 1998).

2.3
The next step is then to determine their suitability as group decision or negotiation support tools. Literature on the subject of Group Support Systems focuses more on computer based instruments (Parent and Gallupe 2001). These computer based instruments, primarily based on models, are supposed to support collective decision processes, either through the simulation of a negotiation process or its stakes, or through the building of a shared information system and thus increasing individual and collective information. RPG provide participants with simulation and enactment through their own implication in the game, whereas computer based models provide this through features in their interfaces. Both act as "ICT tools", as old and new ICT tools respectively.

2.4
There are at least two main types of game families that are used for negotiation or dialogue issues, differentiated mainly by the point of view concerning the aim of the process: as a learning tool for the players or as a learning tool for the game organizers. Some multi-objective experiments can also be found: RPG as a learning tool for players and organizers.

RPG as a learning tool

2.5
RPG encountered in science or development processes can be categorized into three types of uses: training, research or policy making (Peters, Vissers et al. 1998; Barreteau, Bousquet et al. 2001). The first one is however predominant. They aim at placing players in real life situations in order to train them to react to specific conditions or to foster interactions among them according to a specific question.

2.6
These types of training tools, often used with professionals in training sessions, are the most common RPG. The Irrigation Management Game (Burton 1989) is one of them in the field of irrigation management: players take on the role of an irrigation department officer or village water manager and have to manage an irrigation scheme. Roles are strictly defined by the teacher's knowledge. Nevertheless, these games allow each player to benefit from his or her own experience and real practice as well: when irrigation system managers play the irrigation management game,
they bring their own experience and work habits to the game. They are also a means to empower trainees, decreasing the black box effect of the training support.

2.7

Another kind of RPG, considered as a learning tool for the player, constitutes thought support: players are put into a situation that is comparable to one they might encounter and from which they learn the consequences of the reactions they might have. They are used, for example, to prepare government establishments for a terrorist attack, or with army leaders to simulate war in war games. Policy exercises are the paradigm of this kind of tool (Toth 1988; Mermet 1993). Players learn more about the context of their real decisions and how negotiations may evolve. In a game environment, communication is made easier since the barriers between players have been partially lowered (Ubbels and Verhallen 2000). Thus, discussion among them concerning real cases is fostered and they can concentrate on the specific aspects that have been chosen by the game designer. Roles are here more loosely defined yet the situation is usually realistic and well documented. Experience of players is far more important than in the other types of RPG. This is a very interesting alternative to hands-on learning, in cases when it is hardly possible from a practical point of view or ethically non-acceptable, e.g. human systems when drastic changes or long term planning is being discussed. It implies learning through simulation provided by the RPG. This type of learning through simulation may also be of interest with computer based tools which in this case may partially overlap with RPG. This last type of RPG is in fact being used more and more as a negotiation support tool for the training of negotiators in simulated cases.

Games as a tool to grasp information: when the learner is on the other side

2.8

The observers and designers are on the other side of the game process, opposite players, and also learn from game sessions for their own needs. Experimental methods for social and human sciences, from economy to psychology, are absolutely in that field. These types of experimental settings are however located at one end of the range of degrees of freedom assigned to players in RPG. Players are rather bound, not only by rules but also by communication means. Yet constraints may also be fairly strict in some games with training as their goal. Another feature of RPG, which is barely found within these experimental settings, is players having fun. But this is not a mandatory feature for RPG. Thus, we can consider these experimental settings as a type of RPG.

2.9

Experimental economics features an environment that is controlled by the scientist conducting the experiment and which places a set of human players within a real economic context, that can be identified and reproduced. It makes real players, most often but not necessarily students, take on strictly controlled roles in order to analyze their individual and collective behavioral patterns in this type of controlled conditions. Objectives might be: test of theories, better knowledge of human behavior, testing of new institutional patterns (Friedman and Sunder 1994). These types of experiments are particularly suitable to issues dealing with the importance of communication or the influence of institutional patterns on the interaction of individuals (Ostrom, Gardner et al. 1994). The controlled aspect of experiments allows for the interactions as well as the viewpoints of players throughout the game to be recorded.

2.10

RPG are specific experiments designed to provide data to study behavioral patterns for interaction. Between theory and observation, they pave the way for a new access to knowledge (Friedman
and Sunder 1994).

2.11

For this use, the interest leading players to enter the game is important: to find players for experiments first, but also to grasp the bias due to the methodology. Therefore players are usually rewarded for their taking part in the game, with various possibilities implementing different relations between results in the game and final reward of the player. These rewards have two main objectives depending on their rationale:

- to encourage the participation and to compensate any direct or indirect cost of this participation. This is usually determined prior to the game and is independent from the behavior of the player during the game;
- to involve players so that their economic behavior is identical to that in real life.

2.12

The payment of players in experimental economics is particularly at stake since it is often implicitly assumed that players want to maximize their rewards. Moreover, since the "for the fun" aspect is weakened, the reason players come and play has to be thoroughly analyzed.

2.13

Another important factor affecting the dynamics of such games is the personal history of players which is not neutral: several experiments comparing the results of games with heterogeneous groups of players highlight the diversity of games' results (Cooper, Kagel et al. 1999; Cardenas 2000; Gintis 2000). This diversity is even greater when different cultures are involved: Henrich and collaborators compared classic experiments with players from all over the world and still obtained results that were inconsistent with canonical theory, but that had more variability than experiments with students, they found out that this variability is linked to the collective characteristics of the players' society (Henrich, Boyd et al., 2001).

2.14

The aim of experimentalists using this family of RPG is never to simulate reality, which constitutes the main difference with the first family of games presented above. For them, a game is a way to piece together a controlled complexity on which to work. The emergence of this controlled complexity comes from the multiplication of decision centers within game setting: even though each player's behavior is under strict control by the experimenter through fixed rules and setting, the distribution of decision-making processes among all players generates some complexity (Schelling 1961).

Towards interactive methods and social learning: reconsidering the definition of a game

2.15

Both kinds of learning are far from being exclusive. The distinction above lies mainly in the point of view on the game's use, which may be both for the very same session of the very same game depending on who is looking at it. In "Njoobaari Ilnoowo" (Barreteau, Bousquet et al. 2001), players learn about the interaction of different sets of rules whereas researchers learn about other farmers' behavioral patterns (Daré and Barreteau 2002). This brings us to current trends in social sciences and group decision support which tend towards social learning, with interactive methods, that call for specific support tools and platforms (Röling and Jiggins 1998).

2.16
Several RPG belong to this category of interactive methods: The *Stratagène game*, which deals with property rights on phytogenetic resources, has been designed in close collaboration with scientists and a board of stakeholder representatives (Aubert, Le Page et al. 2002). They actually promote learning through action and dialogue, which aims at being social learning: I learn directly as well as through your learning. This type of social learning is completely intertwined with action and practice (Friedmann 1987; Weblter, Kastenholz et al. 1995; Daniels and Walker 1996), which is to take place through RPG. Even though they are controlled and explicitly "out of real life" experiments, RPG are social places, and playing is in itself a social activity. As such, along the same lines as Goffman, they depend on a framework of interactions involving players, scientists and observers, and restricting each player's action (Ogien 1997).

2.17
These games, now considered as interactive methods, feature group settings from real life situations, only stakes are simulated. For players, learning might then only concern how to interact with each other. The overlapping of game and real life is then even greater: game is no longer out of real life and is clearly useful for real activities. The relation between the world of the game and the world of real life, between RPG and social processes through "social games" actually appears to be a continuum. Real interactions between a society and its environment may be seen as a game in itself (Mermet 1992). Interactions within society, such as for consensus building, share many points with RPG as people act in them as representatives of groups or stakeholders and thus take on specific roles (Innes and Booher 1999).

2.18
Since RPG take place within real life, interactions in the experiment and interactions in real life cannot be fully separated. This leads to the reconsideration of Huizinga's definition of a game (1951): it is an activity bound in time and space, which includes imaginary components and the enforcement of some rules, inducing group reactions, and which is partially embedded in real life rather than beside it. It may not be an absolutely free activity. However, it is an extra-ordinary encounter and must be considered as a specific rendezvous.

2.19
A common assumption is that players behave in the game as they do in reality concerning choices made out of context of any roles, which should be nuanced since players come into the game with their own habits and strategy (Daré and Barreteau 2002). With social learning both game organizers and players are considered to be learning from an interactive pattern such as a RPG session (Hare, Heeb et al. 2002). Game organizers may be both designers and "external" observers commissioned to analyze the processes at stake within the game itself. This type of social learning may be an answer to the question of the players' interest in participating in games, as long as induced constraints are acceptable. While experimenters expect them to play for the rewards, they may play because they are interested in learning through the experiment.

2.20
However, this type of social learning touches on another purpose of the use of games: negotiation or discussion support, which may already be the objective of some policy exercises. Several experiments have proven that RPG are always a very powerful tool to make people discuss topics (Tsuchiya 1998; Barreteau, Bousquet et al. 2001; Forssén and Haho 2001) and several papers in ISEE's session also discuss these features of RPG (Aubert, Le Page et al. 2002; D'aquino, Le Page et al. 2002; Duijn and Immers 2003). They have already been successfully used on their own for these specific purposes within the realm of territory management issues (Piveteau 1995).
2.21

All of these approaches use the ability of RPG to create some complexity (Schelling 1961). Even if roles cast a rough yet essential representation of individual behavior, these approaches still adhere to the view that the economy is an interactive system (Kirman 1997). It builds an artificial system by specifying and controlling some of the interactions among players using quite simple individual behavioral patterns. It then assumes that this designed system, notably thanks to the presence of human players, will feature other interaction patterns, which are to be observed. Both controlled and observed interactions together make it a complex system. These systems are of course far simpler than real ones, but they feature and simulate some complexity, which is partly controlled and thus can be studied. They are the "like societies" upon which scientists and stakeholders may reflect and discuss (Kohler 1999). A RPG constitutes a kind of small-scale model of a society in interaction with its environment. Diversity among these approaches comes from the implementation of these "like societies" and their use: discussion and allocation of roles, groups of players and of observers, individual and/or collective debriefing.

The relationship to negotiation processes

3.1

Above and beyond RPG, negotiation or dialogue situations still constitute themselves specific interactive settings, even if less controlled. The formalism underlying a negotiation process does however lead to some control and assigns roles to participants, at least implicitly.

An evolving context

3.2

Most authors now agree that a collective decision and negotiation processes are constantly evolving for that which concerns their content as well as their objective and underlying values (Shakun 1996; Arthur, Durlauf et al. 1997). They have endogenous dynamics and, as open systems, evolve in relation to their context. The population of stakeholders participating in such a process also evolves with newcomers, departing people and interested passive actors. Consensus building is considered as a "game without frontiers" (Innes and Booher 1999), neither concerning solutions nor time: consensus building constantly re-frames issues rather than finds solutions and is a non-ending process; it is self adapting in regard to new events (Innes and Booher 1999).

3.3

When tools involving stakeholders are used, even with a supposed minimum impact such as field observations, they generate other interactions and modify the dynamics of the process.

3.4

This evolving characteristic, in regard to interaction with tools, has two consequences:

- tools must be also adaptable or be considered in a whole modeling process such as the companion modeling approach (Bousquet, Barreteau et al. 1999);
- the influence of tools on process dynamics must be well understood.

A post-normal position

3.5

As for evolving and complex systems that deal with uncertainty, it is useless to strive for a good
collective decision or negotiation outcomes by means of powerful support tools. The legitimacy of these decisions is more important and depends more on the process which leads to it at a given moment than on the quality of the decisions themselves (Funtowicz, Martinez-Alier et al. 1999). This is post normal science and the involvement of the scientist in the process he or she studies or works on has to be taken into account.

3.6

It leads us to focus not only on tools, RPG and models, but also on the methodology of using these tools in relation with the actual world in which processes that implement these methodologies take place. Such parallel focus on tools and their methodology of use make their assessment tricky.

Models and negotiation

3.7

Models, and more specifically computerized models, are often used as support or investigation tools for these negotiation processes. Negotiation models are the most numerous, whether they are intended to foster dialogue through negotiation organization features (Burkardt, Lamb et al. 1998) or to learn from the process itself, such as with theoretical game models or conflict resolution algorithms (Grosz 2000; Faratin, Klein et al. 2001). These negotiation models, such as Pandora of Roberto Pedone or Neg-o-Net of David Hales (Edmonds 2003), try to reconstruct the bargaining process itself. They consider the specific formal stage of the negotiation process in which discussion among stakeholders takes place. A diversity of negotiation models used with a negotiation support goal exist, depending on its social context of use as well as the aim of the organizers of the process.

3.8

Another standpoint is to consider the whole negotiation process, and another way to support negotiation using models is to broaden the field of information available to the participants (Benbasat and Lim 2000): providing stakeholders with the potential consequences of various choices involved in an on-going group decision process reportedly mobilizes them more actively in the process (Driessen, Glasbergen et al. 2001). Here the objective of the model is to represent the stakes at the center of negotiations so as to lead stakeholders to better formulate the problems or to give them a tool to share viewpoints. The objective of using the model and/or simulations is to further at least part of the negotiation process, including stakes and context.

RPG and computerized models

4.1

Computerized models on their own are reported to make communication around projects and plans difficult: these tools are to be considered in interaction with their users (Gardiner and Ritchie 1999). Moreover when dealing with society or complex systems, models need integration of disciplines as well as of organizational levels. Society has a role to play in the integration of various sub-models or of various viewpoints: it may be a better place for integration than the model itself (Robinson 1991). This is a first point of view on sharing competencies between computerized models and RPG. A representation framework to describe these relations is first proposed, which serves then to describe a typology of relations between RPG and models dealing with negotiations.

Models, RPG and the real world
4.2

It is assumed here that each type of use of RPG and models draws a relationship between the three poles {conceptual model, controlled experiment, observed reality}: this constitutes a proposed representation framework of related and analyzed experiments, upon which this paper is based. This means that each one can be defined by a single sentence with the three elements of this triplet. For the two families of use already described, we propose the following sentences:

**Experimental economics** implements a **conceptual model** in a **controlled experiment** in order to understand features of an **observed reality**.

**Policy exercises** use background **conceptual models** in a **controlled experiment** with stakeholders of an **observed reality**.

4.3

Each use of an association of RPG and computerized model is linked to the three poles by means of a linking sentence as above. This sentence represents the path of the process of each joint use within the triangle, stressing their evolving characteristics. Figure 1 features these paths for experimental economics and policy exercises according to the example proposed above. This representation highlights that experimental economics is based on the two pillars of theoretical model and controlled experiment, while policy exercises are anchored more in observed reality and less in the controlled experiment, for there is less control and resorting to the model. Our path proposal assumes that the policy exercise paradigm is a purely interactive workshop, in which no conceptual model has been included. RPG with training goals are closer to the controlled experiment pole because they are usually more focused on the training goal itself rather than on the reality in which training takes place. The game provides a reality, upon which action may take place (Watson and Sharrock 1990).

![Figure 1. Paths of policy exercises and experimental economics in triangle {Observed reality, controlled experiment, conceptual model}](image-url)
This representation of the association of RPG and models in this kind of triangle fully builds upon Legay's discussion on the relationships between model and experiment: the use of a model as a scientific tool is the extension of Claude Bernard's experimental methods for complex systems (Legay 1997). Opening of the "Controlled experiment - Conceptual model" axis into a triangle is the post-normal extension of a model used as a scientific tool. Models and experiments are thus still important in this point of view concerning science processes, but as far as social processes are concerned by the use of these tools with a post-normal posture, each experiment can be located inside the triangle proposed above. The new axis, going from the "controlled experiment-conceptual model" edge to the "observed reality" pole, deals with task sharing between the real human world and models. This sharing of tasks is dynamic and evolves along the process represented by the path in the triangle: various translations of a conceptual model in artifacts may consequently be required. This choice of task sharing modalities is a way of choosing the objective control rate of complexity in the experiment. It is then a matter of real world actors meeting with this designed system as well as managing the consequences of this meeting.

4.5

Here the third pole in the triangle is the conceptual model rather than a specific artifact of this model. Most models used are usually based on a computer version and refer only implicitly to a conceptual model. However several artifacts of a given conceptual model may exist with a specific purpose (Barreteau and Bousquet 2001). A RPG might be the structure of one of these artifacts, whereas the pole referred to as the "controlled experiment" deals with its fulfillment with players. A conceptual model is considered as a set of roles and rules played either by a set of humans or by a set of codes (Hanneman 1995).

A typology of relationships between RPG and computerized models

4.6

A first source of differences between RPG and computerized models analyzed in this paper comes from their aims and setting: public dealt with, degrees of freedom allocated to players, individual versus collective use of a computerized model, etc. The relationship between RPG and computerized models within a specific association provides another source of differences, which is analyzed in this part. This cross analysis of a rather technical point of the association of the specific making of tools in overall processes including their use, means that the question of the specific implementation of task sharing modalities has to be dealt with.

4.7

All these associations are classified using the two following keys: parts of the shared conceptual model and concomitance of use. The first key covers a range from two different conceptual models underlying a RPG and a computerized model, while the second key deals with the timing of the use of both kinds of tools. The first key constitutes a rather continuous criterion, however these two extreme poles nevertheless emerge from analyzed experiments. Table 1 below shows these various uses according to this classification. Out of the four categories displayed in this table, most experiments can be categorized in two of them:

- RPG and computerized models have specific tasks which are run simultaneously and interact,
- computerized models and RPG are used alternately according to the evolution of the aim of use throughout the process.

4.8
The two other categories are either a blend or rather at the border with one of the above categories:

- when a game and a model are used to compare their results and to choose the best tool, such as to predict the outcome of conflicts (Green 2002). This use is more on the fringe of a joint use;
- when a game entails learning how to use a model (Hämäläinen, Kettunen et al. 2000). This use is actually more on the border of a concomitant use.

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<th><strong>Table 1</strong>: classification of the categories of joint use of a computerized model and a RPG according to the sharing of conceptual model and the relative timing of use</th>
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<td>different underlying conceptual models</td>
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<td><strong>model and game are used one after the other</strong></td>
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4.9

The first major category has a different underlying conceptual model and concomitant use. All the experiments falling in this category consist in a support in use from model to game and/or from game to model. The model may be included in the game such as when an LP model is used in a business game to show the necessity of co-ordination by decision-makers through the simulation of collective decision making [2]. This is usually the case of business games, even though in some of them the model is implicit and limited to a reproduction of reality in controlled conditions and a communication environment (Forssén and Haho 2001). In these cases, computerized models are based on conceptual models that are simpler than RPG and with a limited extension, for example to the dynamic of a resource such as in Fishbanks (Meadows and Meadows 1993). Computerized models may also provide the spatial representation of the consequences of choices made in a game such as with the simulation of the consequences of road planning (Duijn and Immers 2003). It leads up to more general support of game through the use of a more or less complex model. The use of a game as a communication tool between a model and reality also falls into this category, however within a large time scale of joint use: game is the medium used to explain to people what the
content of the computerized model is, so that they may use it knowingly. This may be used to merely open the black box of a model (Barreteau, Bousquet et al. 2001) or make people behave according to a model (Heathcote 1998). In this last case, a RPG may also have underlying conceptual models similar to one another though it is not necessarily useful: a RPG aims at explaining what is in the model and may thus be a simplified version or an enactment of model use.

4.10 The second category deals with non-concomitant use and close underlying conceptual models. The experiments in this category expect mutual support in design and analysis from RPG and computerized models. In these experiments there is only one conceptual model with various artifacts and at least one of them is a RPG. The computerized model is an expression of the conceptual model of the game, which might control modeling capacities with available computational tools, but which leads to better calibration of the game and a better understanding of the model (Duffy 2001).

4.11 As Piveteau pointed out the need for a computer tool with his RPG (Piveteau 1995), a model can first entail the repetition of simulations, speeding them up and thus preventing boring repetitive RPG sessions. Repeating a game session using a model is not only a matter of providing several results of simulated experiments. A computerized model also allows the reproduction of what happened during certain specific game sessions so that they can be analyzed either at length or collectively (Etienne 2003). Along these lines, model simulations on a computer can be used as benchmarks to analyze game sessions. This is a computer version of the coherence analysis conducted by Etienne through a comparison of game sessions with the same patterns and various players. When using a RPG after a model, it may be used to validate a model, leading to a discussion of its content by players who might know the observed reality or by making the dynamics explicit and paving the way for comparison with real dynamics (Barreteau and Bousquet 1999).

4.12 The mutual support from one tool to another is also at stake as early as the design stage. A RPG is used in many experiments to elicit knowledge and formalize assumptions constituting the model (Hare, Heeb et al. 2002). In these experiments, the conceptual models underlying the RPG are not fully formalized and some behavioral patterns not completely specified. Games then tend to improve this formalization. The whole process heads towards making explicit implicit matters, fostering learning and sharing representations. The repetition and comparison of game sessions with various players brings this elicitation closer to generic behavioral patterns, such as the description of a typology of behavioral patterns for the negotiation between herders and foresters with repetitions of the game Sylvopast (Etienne 2003). A model may facilitate the settling of a game, through the simulation of a game prototype enactment, leading to better calibration. Games are also used to facilitate the choice of scenarios, e.g. when stakeholders, by taking on roles in a game, suggest and fully internalize the scenarios to be simulated (Hare, Heeb et al. 2002). A game also supports the design of the model, leading to a discussion of the hypotheses in the model and thus to better social learning of a model. In one experiment this led to the self-design of a conceptual model by stakeholders, as was achieved with a Senegalese rural community (D'aquino, Le Page et al. 2002). It is one of the first possibilities when using games: exploring some patterns of interaction in order to attain relevant theoretical models (Schelling 1961).

4.13 In general, for many experiments, it is more of a co-construction of model and game (Hare, Gilbert
et al. 2002; Etienne 2003). It is a cycle involving game sessions and model simulations, each one allowing analysis and improvement of the other, leading to a permanent evolution of the underlying conceptual model. Throughout these cycles, different tools that express the very same evolving conceptual model, are used with different aims (D'aquino, Barreteau et al. 2002). This refers back to companion modeling, a three-stage cycle which can be repeated as many times as needed (Bousquet, Barreteau et al. 1999; Bousquet, Barreteau et al. 2002):

- field studies and a bibliography, which supply information and hypotheses for modeling and raise questions to be resolved using the model;
- modeling, i.e. converting current knowledge into a formal tool to be used as a simulator;
- simulations, conducted according to an experimental protocol, challenge former understanding of the system and raise new questions for a new batch of field studies...

4.14

Here, the third stage is conducted using a RPG. It is possible to find experiments supported only by a computerized or a thought model and fully referenced in literature.

4.15

This iterative approach is actually a path in the triangle used to locate all the possible joint uses of RPG and models. However, when dealing with co-construction or companion modeling, the entire triangle is covered and it is hard to identify an emphasis on a specific part of the triangle to represent this approach.

4.16

Figure 2 includes all the examples presented above concerning the association of RPG and models used in relation to negotiation. Extension of each experiment in the triangle is not meaningful: for the sake of clarity, only the center of gravity of the area covered by the path is located in the figure. Their positions relative to the three poles (Observed reality, Controlled experiment and Conceptual model) may be discussed, since many of these uses may more likely appear on a line starting at the bottom edge and going to the Observed Reality vertex. The choice here is to plot them at the minimum level of involvement in observed reality: players’ own experience or already determined co-ordination patterns. A first look at the figure shows that associations based on the same conceptual model for a computerized model and a RPG are more oriented towards tools and less linked to observed reality: stakeholders are involved through the experimental setting constituted by the RPG. Experiments with concomitant use are more often placed at the heart of the action.

4.17

This potential extension in the triangle and the large area already covered highlights the need for an analysis of the implications of various associations of RPG and models for negotiation topics, whether they are implicit or not. This is the agenda for the collective work-in-progress presented in Sousse and continued at the ISEM conference in Lugano by (D’aquino, Barreteau et al. 2002) on the specific case of the joint use of a RPG and the Agent Based Model for renewable resources management, along the lines of (Bousquet, Barreteau et al. 2002).
Implementation of such associations

5.1

This type of joint use of RPG and computerized tools for negotiation related issues is growing steadily. Most experiments are empirically based on field test and developments. This is in harmony with the artisan nature of RPG and paves the way to improving practices. However, all of them agree on the learning power of this joint use, which is becoming more widespread in the realm of artificial societies.

Artisan nature

5.2

The predominance of empirical approaches in the building of associations of games and models comes from the acknowledged artisan nature of games (Mauriras-Bousquet 1984; Toth 1988). There are no formal or strict rules to design games - since they depend on many contextual elements. Feelings and experience are mostly at stake, and guidelines are starting to take shape (D'Aquino, Barreteau et al. 2002). This artisan nature of game design can also be found in scenario writing for future studies (Toth 1988). These scenarios, like RPG, are supposed to place players or participants in a given situation, in which they can discuss reality without being directly implicated in it. The artisan nature of RPG design is not only a matter of designing the environment, the secret touch in the specific association of a specific number of players within a specific frame which triggers the dynamics of the game, but also a matter of the underlying conceptual model and modeling choices which have been made to create the "controlled complexity". Designing a conceptual model, be it in view of designing a RPG or a computerized model, is craftsmanship in itself.

5.3

Both elements in the associations analyzed thus have artisan features. This is in agreement with their focus on negotiation processes which also have some artisan features; most analyzed experiments deal with negotiation processes as some "consensus building" rather than 0-sum negotiations and
Innes and Booher noticed that consensus building has to do with "bricolage" as defined by Levi-Strauss (Innes and Booher 1999). Facilitators have to make do with opinions and viewpoints available in a group and reframe issues in order to build a consensus rather than reach solutions. Any end of the process is temporary and defined intuitively. Both may be considered as craftsmanship, thus joining the question of designing "long-enduring institutions" which is considered as having no ideal solution, but which is rather a trial and error process: a crafting activity (Ostrom 1992).

5.4

Therefore, knowing how to build the relation between the three poles so as to keep players interested, and to obtain interesting results without being exhausted after the first repetition, is very important. The only rule, which may be inferred from these experiments and from the analysis of various analyses (training game design, future studies, resource management, planning and political science), is to keep this relation dynamic. This role of tool and methodology of use of the designers' know-how strengthens the necessity of ex-post analysis and the comparison of experiments already mentioned.

5.5

Each artifact used in these approaches, RPG or computerized models, is an artificial society and provides the means to explore the behavioral characteristics of these artificial societies and to inform parties involved in the dialogue process.

Practical characteristics

5.6

Implementation of these tools and methodologies is thus very pluralistic as shown by the papers in this special issue. We are at a stage of "experimental bubbling". Some practice-related features have already come to the forefront.

5.7

Technical support introduces many variations: experiments stem anywhere from face to face encounters to computer based RPG through different sets involving cards, dice and other devices. Designers have usually tried to adapt them to their a priori opinion on what agreed upon by the actors who might be involved, the conditions in which it might take place and the reasons for doing such experiments. For example, with the "Njoobari Ilnoowo" game in the Senegal river valley played with farmers using irrigation system, "opportunity cards" were preferred over dice because of a supposed cultural reluctance to this type of control over one's luck or chances (Barreteau, Bousquet et al. 2001). The influence of such choices needs to be further analyzed.

5.8

Two kinds of such design choices are particularly interesting because specific outcomes are expected from them: web based games and games where roles are exchanged.

5.9

One of the experiments analyzed compares face to face and web based games and points out that while face to face games facilitate interaction and provide better control of the game by the facilitator, web based games are less costly and provide a time line that is more representative of that available in decision-making processes. A co-evolution and joint use of both is thus suggested (Hare, Gilbert et al. 2002).
5.10

Exchanging roles (a player takes on a role similar to his real behavior or on the contrary, takes on the role of another stakeholder's behavior) is either advocated or left out in proposed experiments. Swapping players' roles is interesting because it tends to increase the sharing of knowledge, mutual understanding and social learning (Hare, Heeb et al. 2002; Etienne 2003). However, when players keep their role they come with their own history from the real world and use it to play (Duijn and Immers 2003). This allows knowledge to be extracted through the observation of players' behavioral patterns. In another experiment each player's own history benefits from an exchange of roles, which allows them to understand each other's behavioral patterns. However resorting to exchange of roles depend on the willingness of players to do so, and on their ability to drop their own habits.

Towards interacting artificial societies

5.11

Though most are still works in-progress, they already are powerful tools from which to learn something about the systems at stake. The co-evolution of model and game allows both scientists and stakeholders to learn about the systems. RPG and at least some of the computerized models used in these experiments, and notably agent-based models, constitute artificial societies. Thus they provide the means with which to understand fundamental issues that need to be brought back to real systems as for example with an agent-based model of Bali subaks (Lansing 2002).

5.12

But as media of interactions, as "intermediary objects" (Vinck 1999), they also provide the means to foster stakeholders' viewpoints: when used in an interactive setting, they encourage them to learn about other viewpoints and to progress in the knowledge of their own system (Etienne, Le Page et al. 2003). This constitutes the first step in a negotiation process. The second step is then to trigger discussion on these viewpoints among the stakeholders and scientists who are involved in this type of interactive setting. The problem is then the interpretation by stakeholders and their ability to foster their viewpoint on real systems through the recognition of specific elements in these artificial societies which refer back to real societies, either being common to both or by remembrance.

Conclusion

6.1

The polymorphism of RPG, including various possibilities of objective and implementation, make them, in association with computerized models, interesting tools for the understanding and/or support of negotiation processes. Several joint use experiments have been analyzed and classified.

6.2

For complex systems at stake in negotiation processes, the "classical" experimental method using models is not enough to cope with this complexity and uncertainty. It cannot fully take into account the diversity of viewpoints, all of them being legitimate.

6.3

Joint use of RPG and computerized models implies evolving along a path within the triangle: {observed reality, controlled experiment and conceptual model}. The description of an entire scientific or development process using such a path highlights the necessity of an explicit sharing of tasks between controlled interactions and live interactions to represent the complexity of a whole
set of interactions. The evolution along the path allows for the representation of various viewpoints regarding the variety of its sets of controlled interactions.

6.4

This synergy between both categories of tools to enlighten a negotiation process is based on two kinds of mutual support between these tools: mutual support in use and mutual support in design. These two support categories depend on the level of overlapping between the conceptual models underlying RPG and computerized models on the one hand and on the concomitance of using both tools on the other hand. However use of these associations still needs to be analyzed for they are truly in interaction with real decision processes and thus influences them.

6.5

Their joint ability to generate ideas and discussions, to foster the involvement of plurality of viewpoints, to enforce controlled complexity, make them together promising tools. Among their most acknowledged fruitful features is the restoring of complexity, yet controlled complexity on which it is possible to work and build theories. This control of complexity is one key issue in the development of this methodology of joint use, since it constitutes a sharing of task for tackling the complexity of negotiation issues. These tools provide also a shift in focus from short term to long term issues through an upset of time representation and landmarks.

6.6

The association of RPG with models may thus provide an extension of artificial societies (Doran 1999) through new synergic artifacts simulating complex social patterns. This still needs to be specified and founded between experimental sociology and a post-normal discourse on method.

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Notes

1 An on-going work of Morardet and Rio is reviewing and assessing the diversity of these tools, it can be consulted on http://www.ceepa.co.za/docs/Morardet.rtf.

2 as implemented in an unpublished work by Philippe Legrusse and collaborators

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