

THE USE OF SCENARIOS AND GAMING IN CRISIS MANAGEMENT PLANNING AND TRAINING

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KEYWORDS: computer systems, planning, training, gaming, scenarios

ABSTRACT

This paper provides a brief introduction to scenarios and gaming. It clarifies the definitions of each, discusses their possible uses and purposes, and presents some principles of good practice. It then describes how scenarios and gaming can be used together with a computerized crisis management decision support system to provide useful tools for crisis management planning and training.

INTRODUCTION

Crises are rare events. Each crisis is different from other crises. Among the variables that define a crisis are its type (e.g., flood, explosion, war, airplane crash), location, affected population, and relevant support organizations. These variables are practically impossible to predict in advance. Also, the crisis and the resources available to deal with it are continuously changing over time. The problem that organizations responsible for national management of major disaster response activities face is how to deal with these "state of the world" uncertainties in preparing to handle crises. Quade (1989) defines state of the world uncertainties as those that are beyond the practical ability of analysts to predict and cannot be reduced to risks. Two ways of dealing with these uncertainties, which I describe in this paper, are the use of scenarios and gaming. In fact, in my suggested approach for dealing with the above problem, these two ways are interdependent. A scenario becomes the starting point for the game; and the structure and purposes of the game shape the boundaries and content of the scenario. Both of these approaches have been used for similar purposes over the past thirty years. But I propose taking advantage of advances in information systems and telecommunications to make these approaches more useful and effective than they have been in the past.

SCENARIOS

Some Definitions

Scenarios can play an important role in crisis management and contingency planning. The use of the term *scenario* as an analytical tool dates from the early 1960s, when researchers at the RAND Corporation defined states of the world within which alternative weapons systems or military strategies would

have to perform. Since then their use has grown rapidly, and the meanings and uses of scenarios have become increasingly varied. As a consequence, misunderstandings and communication problems about scenarios can arise easily. I therefore, wish to begin by defining what I mean by a scenario in the context of crisis management.

For the purposes of this paper, I propose the following definition of a crisis management scenario, which is based on a more general definition suggested by Quade (1989): *A description of the conditions under which the crisis management system or crisis management policy to be designed, tested, or evaluated is assumed to perform.* The terms context, setting, situation, or environment are often used loosely as equivalents to the term scenario, but I make some distinctions among them.

In particular, I propose to split a crisis management scenario into two parts--the context and the crisis. The *context* may be described as the overall background or environment within which the specific crisis is to be considered. It is the state of the affected area at the time of the crisis. For example, it would define, for a given point in time, the demographics, the geography, the organizational relationships, the availability of data, the telecommunications situation, etc. The context is an environmental framework into which many different crises might be embedded for study.

The *crisis*, on the other hand, is a script for the specific crisis. It includes the chain of (hypothetical) events that lead up to the crisis. If gaming is to be used to examine possible responses (as I propose here), it would also include the exogenous events during the period of the game (the chain of events outside the control of players in the system). For example, the crisis would describe the weather, political events, etc. both before and during the specific crisis. It is the sequence of events to which the crisis management system must respond. For a flood, it would specify the times and places where specific dikes were breached, services were disrupted, persons were swept away, etc.

The context plus the crisis prior to the start of the game would provide the players with the necessary background information about the situation to enable them to specify the initial conditions for their response activities. Also, of course, the purpose of the game would provide several parameters that are vital to the scenario, such as the setting, potential list of actors, and many of the "rules of the game".

The scenario is defined by the values of a set of variables. Some scenario variables are controllable by government agencies, organizations, and individuals (e.g., the numbers and locations of rescue equipment), and some are uncontrollable (e.g., the weather). Some uncontrollable variables may be able to be predicted probabilistically (e.g., weather), and some may be unknowable (e.g., the political situation at the time of the crisis).

Why Use Scenarios?

A scenario describes a hypothetical, but plausible, situation that may be used for a variety of purposes. DeWeerd (1967) lists four purposes of scenarios that are relevant for crisis management:

- To supply the starting point and exogenous events for a game.
- To supply a consistent and plausible situation as a background for the discussion of a proposed [crisis management] system or [crisis management] policies.
- As an environment in which to examine the functioning of various [response] strategies.
- As a background for contingency planning.

Scenarios are primarily communication devices. Although they do not reduce the uncertainties inherent in describing a future state of the world, they make situations more concrete, so users can treat a proposed response strategy or crisis management system within a self-consistent and plausible set of circumstances. DeWeerd quotes Herman Kahn as saying, scenarios are meant to "stretch the mind and force a planner to envisage the future in concrete terms." And Quade (1985) points out that well-formulated scenarios have proved useful in broadening the number of contingencies taken seriously in military and industrial planning "by forcibly illustrating the advantages or pitfalls of various proposals or of a new capability."

A scenario specifies a possible, but not necessarily probable, context and series of events. Its usefulness for crisis management planning or decisionmaking does not depend on its accuracy or the probability of its occurrence. (This is somewhat different from its usefulness for policy analysis purposes, where the probability of the situation occurring can be an important factor.) In fact, when using scenarios it is crucial to keep in mind that they are not predictions. The treatment of a scenario as a prediction is one of the most common mistakes made by both their creators and their users, and time should not be spent arguing about the relative probabilities of occurrence of alternative scenarios. The scenario creator should not be claiming that the events he is describing are likely, but that they are not completely impossible, and that they are plausible enough to be taken seriously by contingency planners.

There is no general theory that allows us to assess scenario adequacy or quality. There are, however, a number of criteria that are often mentioned in the literature as being important. Schwarz (1988) gives a brief summary of them. The most important of these in the crisis management context are consistency, plausibility, credibility, and relevance.

Consistency simply means that the assumptions made are not self-contradictory. It is not easy to create a future that is internally and externally consistent (novelists and filmmakers also find it difficult). But, inconsistency in a scenario will raise questions about its validity and usefulness. One of the early tests of the validity of a scenario was whether a sequence of events could be constructed that would lead from the present state of the world to the scenario's future state. According to Helmer (1966), although the purpose of a scenario is not to predict the future, "it nevertheless sets out to demonstrate the possibility of a certain future state of affairs by exhibiting a reasonable chain of events that might lead to it." As DeWeerd (1967) states, "In a good scenario there should be no great unexplained leaps, no uninvited weapons, no reversal of the laws of gravity, and no inner contradictions."

The term *plausible* is used to distinguish a scenario from a prediction. It is a statement that the posited chain of events *might* happen (not *will* happen). Although the specific events may be highly unlikely to occur at the times indicated or the levels assumed, if a scenario is plausible, then a similar sequence of events might very well occur. Plausibility is a great virtue in a scenario, but, as Kahn and Wiener (1967) point out, the scenario writer should not limit himself to the most plausible possibilities, since "history is likely to write scenarios that most observers would find implausible not only prospectively but sometimes, even, in retrospect." For example, DeWeerd (1973) notes that "a scenario of the Watergate bugging attempt, written before 1972, would have been held up to scorn by 'reasonable' men, as would a scenario written before the Pearl Harbor attack, the Berlin Blockade, the Berlin Wall, or the Cuban Missile Crisis."

Credibility is closely related to plausibility. For a scenario to be credible, each change from the present circumstances or those existing at a previous step in the chain should be explained. It is all right to predict that some unforeseen events will occur. However, in mentioning a particular event, it is important to understand why it occurs. If it does occur by "accident", its role in the scenario should not be too important. Otherwise, the scenario loses its credibility and some potential users might refuse to use it. In some cases, the purpose of the scenario should take precedence over credibility (see the discussion of 'relevance' below). But such departures from reality should be explicitly noted.

To be useful, the form, role, and content of a scenario must have *relevance* to the problem at hand. For contingency planning for crises, for example, it might be worthwhile to posit what is usually regarded as irrational behavior by a perpetrator or a development that may be extremely unlikely but would have important, possibly dangerous, consequences.

The Design of Scenarios

Since scenarios may have many uses, the quality and usefulness of a scenario can only be judged according to the use to which the scenario will be put. That is, the form and content of a scenario has to be determined by the specific task at hand. If being designed as input to a game, the purpose and structure of the game will dictate many of the elements of the scenario. Also, the boundaries of the games (what is endogenous and what is exogenous) will dictate the boundaries for the scenario. This information will provide the setting, the

geography and demography, the list of players, the "rules of the game.", and other parameters that are vital to the scenario.

Although it is impossible to generalize about how to set the boundaries of a scenario or what form they should take, de Leon (1975) suggests four decisions that are important in the design of any gaming scenario:

- **Time setting.** For crisis management games, the time should be the present. What we want to determine is how the current crisis response system is working, and what can be done to improve it.
- **Environmental setting.** The environment should be as little changed from the current world as possible. Aspects to be covered include demographic distributions, geographic descriptions, and as much additional information that the players should know in order to make their decisions.
- **Level of detail.** The conditions for the geographical area where the crisis occurs should be carefully delineated and described. However, the amount of detail should be limited to only what is necessary. Players can only absorb and manipulate a limited amount of information; to overload them with trivia would be self-defeating for the purposes of the game.
- **Knowledge, experience, and sophistication of players.** The fewer skills, background, and knowledge the players bring to the game, the more thorough the scenario must be. In the games I am proposing, the players should be playing roles they would be playing in the real world, so the scenario need not fill in too many details.

GAMING

Some Definitions

Abt (1970) defines a game as "an activity among two or more independent decision-makers seeking to achieve their objectives in some limiting context." War games date at least as far back as 500 B.C., when the oriental general Sun Tzu is reported to have said "the general who wins a battle makes many calculations in his temple ere the battle is fought" (Weiner 1964, p.217). Man-machine simulations and war games (utilizing computers to play one of the sides) began to be used in the early 1960s at the RAND Corporation to study real-world political-military crises. (For discussions of the techniques they used and situations they considered, see Geisler and Ginsberg (1965) and Shubik and Brewer (1972).) Since then, the use of games for a variety of teaching, training, and research purposes has mushroomed. They have helped in developing military strategies, in pretesting government policies before implementation, and in helping to understand operational complexities in many contexts. Schwabe (1994) provides a brief introduction to gaming as an analytical tool. Much of the information in this section is drawn from his paper.

Most games have two or more players, each representing a decisionmaking entity. Each player is assigned a specific role--e.g., leader of a country, president of a firm, chief at the scene of a fire. Play of a game is usually divided into moves, each of which begins with the presentation of information that players are asked to accept as true and to use as a basis for their deliberations and decisions. This information is called the

scenario for the game. In the terminology used above, the game would be preceded with a presentation of the context and the crisis up to the beginning of the game. The playing of the game usually involves another set of persons who administer the game. They are commonly called controllers or referees, and usually include those who designed the game and those who will analyze its results. Games have usually been played with all participants at one site; however, distributed games can be played with remotely located players communicating via computer networks, video conferencing, or other means. (For example, on 4-7 November 1994, a distributed interactive simulation (DIS) exercise was conducted that involved the participation of sites throughout Europe and North America.)

Why Use Gaming?

Gaming can be used for many purposes. Shubik (1971) divides these into six categories. Crisis management games can be designed to achieve four of these:

- **Teaching.** One of the major uses of gaming has been as a motivational aid to learning. Business games are used extensively in business schools for this purpose. Gaming has been found to attract the players' attention and involve them deeply. It is an extremely useful way to learn and organize facts. And, because of a game's logical consistency and completeness, it is a useful device for encouraging students to think in terms of models and abstractions. It is also a useful device for teaching about interpersonal relations, such as the need for cooperation, communication, negotiation, and compromise.
- **Training.** Games can be used to improve the performance of a group of persons in an organization in carrying out their normal jobs ("off line", so that mistakes do not affect actual outcomes). More important for crisis management, however, is that games can be used as "dress rehearsals", just as in the theater. In this case, they are aimed at preparing for coordination of the players who may have to cooperate in team action on a temporary basis.
- **Operations.** Operational games are used by military, governmental, and corporate organizations for contingency planning, strategy exploration, and system testing. In this type of use, the game can reveal errors or omissions in a strategy, explore assumptions and uncover those that are implicit, examine the feasibility of an operational concept, identify areas in which required information is lacking, and suggest areas needing further attention.
- **Experimentation.** Human beings are more difficult to experiment with than rats or guinea pigs. In experimental gaming, human decisionmaking behavior is studied by observing the performance of individuals in an experimental setting. Crisis games, for example, might be used to study decisionmaking under stressful, overloaded, conditions.

Schelling (in (Levine, Schelling, and Jones 1991)) is more specific about what he thinks crisis games can accomplish. Because of the relevance of his insights, I quote him at length:

[G]ames are . . . awfully good at . . . demanding careful sequential analysis of plans, decisions, events, and intelligence. Very few plans or situations seem to be subjected to a process of 'walking through,' of dress rehearsal. This is particularly true of plans and contingencies that are political-military, i.e., that involve . . . communications, intelligence activities and interpretation, and the coordination of activities over time as well as among agencies. Crisis games typically subject the players to a continuous process over time in which they are both making decisions and living with prior decisions, in only partial control of their environment, committing themselves to actions that have lead times, reaching decisions on the basis of intelligence that is only partially available when they cannot wait for more. People sensitive to a variety of responsibilities collaborate, applying the criteria that are relevant to their own interests, making estimates that reflect their own kinds of knowledge, and putting themselves in a mood to worry about probabilities rather than just a list of possibilities. They really live through a simulated crisis and not only learn things about their plans and their predictions but learn something about the nature of crisis.

THE USE OF SCENARIOS AND GAMING AS METHODOLOGICAL TOOLS TO IMPROVE CRISIS MANAGEMENT

Advances in computers, networking, and telecommunications open up new possibilities for using gaming as a methodological tool for improving crisis management. It is becoming easier to develop models to support games, to have players at distributed workstations interacting with each other, to have automated controllers supply exogenous events to the players, to enable players to query online data files during the game, and to prepare presentation graphics for use during the game and for post-game debriefings. Videotapes can be used to present scenario updates to players in "newscast" format and to present pre-taped briefings by experts to players. Organizations with responsibility for crisis management (e.g., the Netherlands Ministry of the Interior) are in the process of considering how such new technologies can be used in constructing a crisis management system (CMS) to coordinate response to a crisis, provide decision support during a crisis, and support activities prior to the crisis and after the crisis. (Such a CMS might have elements like those shown in Fig. 1.) If designed correctly, that same CMS could be easily used in a simulation mode to play a crisis management game. (Such a use of the system would also provide personnel with opportunities to rehearse for real crises using the same tools they would have available to them in a real crisis.)

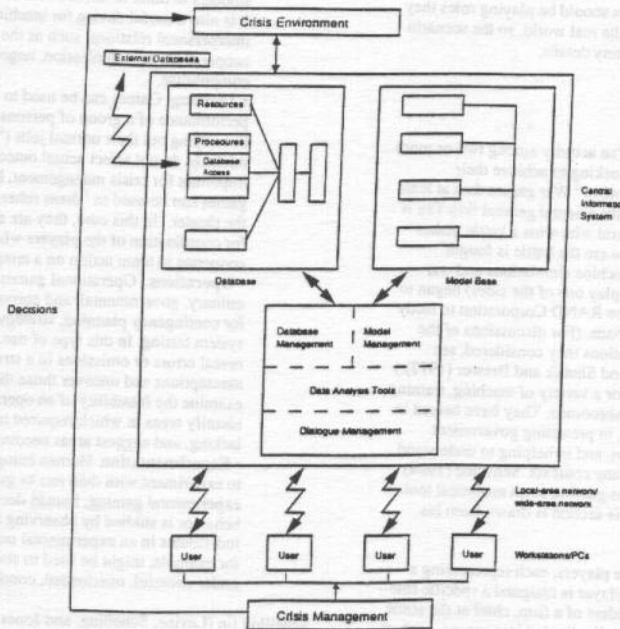


Figure 1 - Elements of a crisis management system

Based on the generic purposes for gaming given in the previous subsection, I can see three specific purposes for using gaming as a tool for improving crisis management:

1. To assist in pre-crisis resource requirements determination and resource allocation decisionmaking;
2. To assist in response planning;
3. To assist in training in crisis management for actual crises

However, gaming is a clumsy and unreliable tool for determining resource requirements and allocation decisions. Resource requirements and resource allocation depend crucially on the specific crisis situation. But scenarios and games are not meant to be predictive, so there is an extremely low probability of any given scenario coming to pass. Gaming is a better tool for response planning, and is best as a training tool. If used for these purposes, the focus can be on lessons learned that (to use the words of Schelling (Levine, Schelling, and Jones 1991)) "are not so particular as to depend on the locale of the crisis, the scenario chosen to initiate the game, the individual participants, or even the character of the crisis."

Based on their experiences in crisis games, Levine, Schelling, and Jones (1991) conclude that "the main beneficiaries of the game are the participants, and . . . in the case of participants in decision-making positions, the benefits are likely to be high." Thus, the game players should ideally be the same persons who will be in training, the players should be using the same support tools (databases, communications facilities, computers) that they would be using during the real crisis. They would then discover facts, ideas, possibilities, capabilities, and arguments that would be valuable for the real crisis (e.g., resource constraints, data availability, jurisdictional problems, standard operating procedures, relevant telephone numbers, etc.). Of course, their actions might still not be the same as they would be if the crisis were real, since they will not be experiencing the actual tensions and pressures. But having the CMS and operating it in real time should come close to reproducing the real situation.

Weiner (1968) describes what is involved in preparing, playing, and analyzing a game. The preparation phase starts with the definition of the purpose of the game. The purpose drives the specification of scenario required, the players to include, the data to prepare, and the analyses that will be done afterwards. Once the purpose is established, a scenario can be prepared, which must include the context (geography, location of resources, lines of communication, etc.) and the crisis (events before the start of the game, and exogenous events during the game). Having developed the inputs, the next major part of preparation is to develop the rules of the game. These rules include political restrictions, operating procedures, etc., that are the ground rules given to the players. They also include rules that will be used in the CMS (which will play the role of the controller or referee for the game) for estimating the effects that the players' actions will have on the system's performance. The CMS will use these rules to create the dynamic changes in the crisis situation to which the players will have to react over time.

Using the rules for the CMS, a simulation program must be written that will provide the game control. If the gaming use of the CMS has been thought of before the system is built, there

will be built-in mechanisms that will facilitate the programming of the game. (In fact, many of the capabilities needed for the simulation will be required capabilities of the CMS.)

Once all of the preparatory work has been done, it is possible to play the game. As mentioned above, the players should be playing the roles that they would play in the case of a real crisis. The playing conditions should match as closely as possible the conditions that would exist in a real crisis. Play is started by a "briefing" to the players (perhaps via videotape), which describes the context and the events or conditions that led to the crisis. Then, the precipitating event is announced, and play begins. If serious confusion, errors, or arguments occur, the game can be stopped and restarted, but efforts should be made to finish the entire game without interruption.

When play ends, the analysis phase begins. Since the type of analysis that will be done is determined by the objective or purpose for which the game is being played, it is not possible to describe specific analyses without describing specific games. It is possible, however, to describe typical kinds of analyses. One type of analysis is outcome oriented. It examines what took place, and evaluates the performance. Positive and negative actions are noted, as well as actions that might have helped, but were not taken. The outcome-oriented analyses generally span the entire system and focus on *overall* effectiveness. There are also special analyses that focus on a single aspect of game play. For example, an analysis might be made of the actions of one particular agency (with the game replayed several times, to look at various alternative strategies for that agency). Another reason for replicating play might be to look at the effects of changing the resource allocation or information availability. An analysis might also be made of the behavior under stress of the various players.

Note that these analyses do not solve problems; if anything, they define new ones (e.g., holes in the system, missing information, inaccurate data in databases). It is also not necessarily true that if something happens in the game world, it will happen in the real world. As Levine (1991) warns, "the seductiveness of gaming is such that it is all too easy to turn hypotheses into conclusions." He then gives the following advice:

"Game if you will. But in presenting policy results, don't tell anyone that you gamed. Present it in essay, model, or other analytical form without mentioning the game. If it is convincing in this form, then the game has been as good an instrument as any. If it is necessary to fall back on game "evidence," however, then the whole process is of very doubtful validity."

One follow-up to a game might be specifying a field test to reduce uncertainty as to the validity of the game's results.

CONCLUSIONS

The above discussion suggests that scenarios and gaming can play a useful role in crisis management planning and training. In particular, recent developments in information technology and telecommunications afford an opportunity to use these methodological tools in ways that were not previously possible. In the past, games were extremely expensive to stage, and took

a great deal of time to play. Because much of the work had to be performed manually, very few "moves" could be carried out. If an existing CMS were able to be used offline to support the game, many of the game's support requirements would already exist, and most of the work that had to be carried out manually could be automated. Operating in real time, crisis managers can use the computer systems, databases, and communication channels that they would have to use in an actual crisis situation. The marginal costs are likely to be relatively small, and the potential benefits large. The time is ripe to try such a creative, state-of-the-art approach.

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BIOGRAPHY

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