Using social simulations to assess and train potential leaders to make effective decisions in turbulent environments

Phillip L. Hunsaker
School of Business Administration, University of San Diego, San Diego, California, USA

Abstract

Purpose – The purpose of this paper is to describe two social simulations created to assess leadership potential and train leaders to make effective decisions in turbulent environments. One is set in the novel environment of a lunar moon colony and the other is a military combat command. The research generated from these simulations for assessing the decision effectiveness of potential leaders with different personality traits and decision styles under varying degrees of information quantity, uncertainty and complexity is summarized. Opportunities and limitations of applying current computer assisted technology to social simulations for assessing and developing leaders’ decision effectiveness in turbulent environments is discussed.

Design/methodology/approach – College undergraduates and officer candidates in university ROTC programs made a series of decisions while being subjected to varying degrees of environmental turbulence in social simulations. The decision effectiveness of subjects with different personality characteristics under varying degrees of environmental turbulence was assessed through researcher observations, self-reports, and peer ratings.

Findings – Social simulations are a cost effective way to assess and train leaders to make effective decisions in turbulent environments. The results of controlled experiments in social simulations have suggested that leaders with high levels of cognitive complexity and incongruity adaptation are more likely to be successful in highly turbulent environments than leaders with lower levels of incongruity adaptation ability and cognitive complexity who are more effective in more stable and structured situations.

Research limitations/implications – The ease of modifying computer games renders them effective as low-cost virtual worlds that have relevance in military leadership experimentation. However, the use of computer simulations alone fails to capture the impact that relationships and emotions have on leader decision making, highlighting the continuing need for social simulations that include these interpersonal aspects of decision making.

Practical implications – By participating in realistic social simulations, leaders can experiment with new decision styles without the risk of making real world mistakes that could jeopardize their own and their organization’s future. The leaders who are most successful in adapting their decision style to the more complex requirements can be identified for promotion or assignment to appropriate settings.

Originality/value – Both military and civilian organizations are in need of cost effective way to assess and train leaders to make effective decisions in turbulent environments. Social simulations provide a unique approach to meeting these needs and can simultaneously provide a venue for research in associated areas.

Keywords Simulation, Decision making, Leadership

Paper type Research paper
Making difficult decisions in turbulent times is a critical ingredient to success for today’s leaders. Because complexity and ambiguity tyrannize decision-making in today’s rapidly changing environment, leaders need appropriate decision styles and tolerance for incongruity in order to make clear accurate judgments under these stressful conditions (Roberto, 2002). Organizational effectiveness in turbulent task environments is dependent on the decisions leaders make under the pressure of information complexity, uncertainty, and change (Cabana, 1996; Wynne and Hunsaker, 1975; Fleishman and Hunt, 1973). Responsiveness under time pressure, ability to handle emergencies under stress, and quick decision-making, for example, are major components for effective military leadership (Roberto, 2002; Hunsaker et al., 1975). Other personal attributes, such as perseverance, communication skills, and positive interpersonal relations are positively related to effective leadership, and under conditions of environmental turbulence they assume critical importance (VanDevender and Barker, 1999; Hunsaker et al., 1974). Unfortunately, leaders’ capabilities to perform effectively under stress are not usually identified until after they have been exposed to turbulent conditions, sometimes resulting in catastrophic results. Consequently, there is a need to assess leaders’ potential for coping effectively with turbulence before they are exposed to situations where ineffective decisions may result in serious damage to the organization (Yusko and Goldstein, 1997).

This paper explains how social simulations can be utilized to assess and train leaders to make effective decisions in turbulent environments. The methodology is based on the finding that “prior exposure to a wide variety of demands in an unfamiliar setting provides a reliable measure of behavior, which generalizes beyond single specific situations and therefore may be expected to generalize to other situations belonging to the same factorial domains” (Helme et al., 1971). Simulations of two complex and turbulent environments (a lunar moon colony and a military combat command) were created to assess and train leaders to make effective decisions under conditions of uncertainty, complexity, and stress. Following the descriptions of these two simulations is a summary of the associated research and resulting implications for developing leaders’ capabilities to make effective decisions in turbulent environments.

Assessing leader decision making with social simulations
Studies of complex information processing, group structure and process, and inter-group interaction have discovered that there is a need for more realistic, complex and novel simulated environments where the uncertainty and complexity of decision inputs can be varied to study differences in information processing, decision making, risk taking, and group structure as functions of personality differences and changes in environmental turbulence (Lauriola and Levin, 2001; Streufert et al., 1965; Guetzkow, 1962; Schroder et al., 1967; Tuckman, 1964). Most research in these areas has been confined to small-scale decision tasks (e.g. gambling or hypothetical choice situations) where subjects were either operating as advisors with no possibility of experiencing positive or negative outcomes as the result of their decisions or where they were unable to win or lose but small amounts of money (Lauriola and Levin, 2001; Streufert and Streufert, 1968). Real-world situations can differ greatly from these simple laboratory environments in terms of the degree of potential loss and gain, the intensity of personal involvement by decision makers, and the complexity of determinants and outcomes (Yusko and Goldstein, 1997; Higbee and Streufert, 1969). Rasa (1969) found that more
complex social simulations offer a satisfactory compromise between control and the complexity of reality. Other research using simulation techniques has verified that simulation participants experience considerable realism and involvement (Yusko and Goldstein, 1997; Driver, 1962; Alger, 1963; Streufert and Streufert, 1968). Social simulations, for example, have provided organizations with a powerful means of selecting and training leaders to effectively handle crisis situations. After defining the critical tasks, knowledge, skills and abilities involved in effectively addressing a crisis, observers are able to measure the crisis handling performance of participants during the crisis simulation. The information obtained from the simulation is then utilized for selecting, coaching and developing crisis leaders (Yusko and Goldstein, 1997).

Furthermore, in complex simulated environments, decision outcomes can be determined by many interacting factors making it possible to examine which factors were used and how they were integrated (VanDevender and Barker, 1999, Schroder et al., 1967; Higbee and Streufert, 1969). This capability is especially relevant when social learning is critical for collective decision-making to implement changes in social practices, roles and responsibilities to achieve both technical and relational outcomes. In these “participatory agent” based social simulations the actors learn from their own behavior how to improve communication processes, decision-making and strategic planning (Pahl-Wostl and Hare, 2004).

The Luna I Moon Colony

NASA’s interest space travel and the possibility of establishing a permanent manned lunar colony in the late 2000’s generated funding to create an assessment and training simulation designed to provide a complex and novel environment where the uncertainty and complexity of decision inputs could be varied to study information processing, decision making, risk taking, and group structure. Based on these research needs, Driver and Hunsaker (1972) created a programmed social simulation for the analysis of individual and group decision-making under varying conditions of environmental complexity called the Luna I Moon Colony.

The Luna I Moon Colony simulation controls environmental inputs (e.g. information frequency and content, degree of success and failure, and level of uncertainty) to allow for a valid measurement of experimental variables such as cognitive complexity, incongruity adaptation capability, and decision style. Multiple goals and a wide range of complex decision strategies facilitate the measurement of information processing levels. The novelty of the simulated lunar environment discourages standard role behavior and allows for subject experimentation in both behavioral and cognitive strategies. The effectiveness of the simulation in accomplishing these objectives has been demonstrated by Hunsaker (1971) and Driver (1972). With additional or modified data-gathering devices, or minor modifications in the simulation scenario, a wide array of behavioral phenomena can be studied. One adapted format, for example, adds an enhanced information processing and calculation methodology for providing immediate and flexible feedback to promote the study of inter-group competition (Hunsaker and Hunsaker, 1974). The rest of this section will describe the Luna I simulation environment, procedures for conducting the simulation, and methods of data collection and analysis. Information about space requirements, subject preparation and instruction, and operations required from the administrator can be found in Driver and Hunsaker (1972).
The simulated environment

Capitalizing on the interest in space exploration and the need to generate participant interest and involvement, we chose the projected environment of the US's first permanent lunar colony, AD 2050, as the simulated environment. Other situations (e.g. war, economic or business environments) could also have been designed to provide this type of complex and ambiguous setting, but their familiarity might elicit convoluted responses more directly associated with past experiences than the current independent variables being studied, such as novelty and incongruence. The simulation’s unusual setting eliminates the intrusion of role-playing or socially stereotyped behavior that can occur in more familiar settings. An illustration of socially dictated role-playing can be found in many business games where goal setting is dominated by pervasive social norms, such as, everyone ought to maximize profit. In the Luna I Simulation, on the other hand, three (or more) goals are provided about which, few, if any, preconceptions exist (e.g. health, scientific productivity, NASA approval). Consequently, the subjects' goal selection behavior is largely related to personality and experimental variables (Driver and Hunsaker, 1972).

Realism is incorporated into the simulation through the complexity of strategy-goal-consequence relationships. Subjects can be provided with any feedback desired by a specific experimental design while any impression of “rigging” or phoniness is minimized. In the novel, complex and turbulent Luna I Simulation environment it is possible for almost any feedback to seem reasonable. This allows for the maintenance of the high motivation and perception of reality while still providing experimental control over variables such as success/failure, amount of information provided, and level of risk.

Scenario and procedure

The simulation consists of one-hour playing periods representing condensed months on the moon. After each decision period refreshments are provided during a 15-minute recess. To avoid distractions and changes in motivation that might occur in anticipation of leaving the experimental setting, participants are not informed about the number of periods they will participate in.

Each decision period is divided into three parts. During the first 15 minutes, individuals complete rating forms concerning goal relevance, interrelatedness of goals, degree of project contribution to desired tasks and perceived risk. Feedback is provided concerning the previous period's results and a new set of “available” projects is distributed. Project sets contain detailed descriptions and are rated according to riskiness, ease of accomplishment, and goal relatedness. Project sequences can be controlled to experimentally manipulate these variables.

The second part of each period lasts for 30 minutes. It consists of group decision-making regarding goal emphasis, project selection, personnel allocation, and equipment distribution. During this time, the subjects rate goals, select three of nine projects for implementation, and assign personnel and equipment for projects. Subjects are provided with biographical data files for all personnel and inventories of equipment and supplies that are available for distribution each period. After the group decisions are completed, they are entered on the appropriate forms and returned to the administrator for evaluation. Results are presented as feedback on each goal at the beginning of the following period.
In the final 15 minutes of each period, participants complete forms concerning their perceptions of member contributions (e.g. task, social, and leadership roles) and the group process (e.g. communication process, decision procedures, role allocation, conflict resolution, etc.).

The simulation scenario can be adapted according to the variables and research design of interest to the investigator. In past experiments, for example, the incongruity of feedback and the specific elements of environmental complexity have been controlled and varied over playing periods. The three elements of environmental complexity, i.e. information load (amount, interrelatedness, and certainty of information), noxity (degree of negative information, such as, mission failure) and eucity (degree of positive information, such as, mission success) can be independently varied while holding the other two constant to determine each element’s causal impact (Schroder et al., 1967). Low environmental complexity has been found to contribute to riskier decisions than high complexity environments that generate more pressure and stress resulting in decisions aimed at producing more certainty and stability (Hunsaker, 1975). A positive correlation has been found between attitude toward ambiguity and attitude toward risk, especially when the risky choice was to avoid a loss (noxity) rather than to achieve a gain (eucity) (Lauriola and Levin, 2001).

The first period of the simulation is very different from those that follow because of its novelty, lack of group history, and lack of previous feedback. Comparative analyses of the data generated in this period should be interpreted with care. In order to study long-term effects with any validity, at least three periods of play should be programmed. Materials for six periods of play have been devised for the simulation in its current form.

Comparability between sessions is maintained by using a uniform program with a predetermined sequence of inputs in the areas of goal attainment, project risk, and information load (e.g. number of projects, forms, messages). To promote perceptions that their decisions are the determinants of specific feedback, administrators respond to group decisions on an individual basis. For example, if a failure is programmed to create noxity in a period, the administrator could send a message to the subject group concerning the failure of a particular project they had selected.

Past experiments have endeavored to maintain comparability of groups and avoid the order effect by programming the magnitude of environmental inputs in a non-linear manner. For example, failure might be moderate in period one, strong in period two, weak in period three and moderate in period four in order to disconnect order from treatment. In order to eliminate any effect due to particular project content, the sequence of success/failure has been formatted into two different series of project inputs.

**Data collection and analysis**

This section summarizes options for data collection on selected variables. It also provides ideas for using other measures and comparisons to other simulated settings.

**Risk perception.** In the simple environments usually utilized in studies of risk preference, objective and subjective risk conditions are defined and the same for each subject (Lauriola and Levin, 2001). Streufert and Streufert (1970) have demonstrated that no such similarity should be expected in more complex environments where objective risk conditions are dependent on interactions between several different
variables. In the Luna I Simulation, perceived risk is measured by the perceived certainty of a given event occurring (e.g. project incompletion) and the perceived magnitude of negative consequences involved if the event did occur. The completion of Likert scales obtains comparative measures of these perceptions. The results are entered into a perceived-risk matrix by assigning a numeric value to each scale and multiplying them to obtain a weighted perceived-risk index (Cunningham, 1967).

A graphic representation of the influence of environmental incongruity on risk preference is generated by plotting game periods on the horizontal axis and the perceived-risk values on the vertical axis. Points representing degrees of perceived risk each period may then be connected to provide a visual demonstration of the changes occurring over varying periods of environmental incongruity. A similar procedure is utilized to analyze perceived-risk differences between individuals and groups, and groups with different personality compositions.

Risk taking. The degree of risk taking each period is ascertained by assigning probabilities of successful completion to each of the three project alternatives teams must choose between to implement the colony’s goals. High-risk alternatives have larger payoffs but lower probabilities of success, and vice versa. This procedure provides results comparable to the standard risk taking tasks utilized in past experiments with simple environments based on objective risk conditions. Lauriola and Levin (2001), for example, used an expanded risky choice task to assess attitude toward risk. They found a positive correlation between attitude toward ambiguity and attitude toward risk, as did Hunsaker (1975) using the Luna I simulation. The analysis of risk taking under varying conditions of environmental incongruity may be facilitated via the graphical procedures plotting risk taking against decision period conditions.

Integrative complexity in decision-making. Integrative complexity refers to a person’s information processing style. People high on this characteristic are called “complex” information processors because they consider all relevant information, many alternatives and multiple criteria before making a decision. People low on this characteristic are called “simple” information processors because they only consider the minimum amount of information, one or few alternatives, and a single criteria before making a decision (Schroder et al., 1967).

Data about integrative complexity of the simulation decisions is gathered through self-reports and administrator observations. Self-report measures consist of rating forms on which subjects indicate the importance of goals and degrees of interrelatedness of colony goals and projects, and open-ended questions asking subjects to list factors influencing these ratings and to describe their contingency plans. Data collected in this manner is analyzed by comparing: the number of dimensions considered; the degree and variety of discrimination; and the amount of integration occurring (Schroder et al., 1967).

Several rating scales have been developed for use by simulation observers to assess participant information processing characteristics and styles. Observers may be professors, human resource personnel, or trained researchers, depending on the learning, assessment, or research objectives of the simulation operators. One scale, for example, assesses the decision styles of group members by observing individual behaviors on the dimensions of communication quantity, communication style, leadership style, goal preference, involvement, decision making method, ideas versus action, and follower roles. An individual communication style observation form utilizes
the categories of interruption, withdrawal, premature closure, dominance, use of excessive detail, and switching topics.

**Group process and structure.** Observer ratings and self-report forms are used to obtain measures of structural consistency, mode of influence, method of conflict resolution, and member role behavior. Five-point Likert rating scales have been developed for rating:

- trust levels between group members;
- the amount influence individuals have on group decisions and why they have it by rating use of information, competence, emotion, dominance, authority, and charisma; and
- predominant method of conflict resolution – denial, voting, rules, complication, simplification, compromise, or dominance.

Functional task and social role behaviors within each group are assessed on a check list where team member initials are inserted each time they act as a blocker, clarifier, critic, decision maker, dominator, elaborator, encourager evaluator, facilitator, information seeker, information giver, or secretary (Benne and Sheats, 1948).

The Luna I environment provides a setting which is novel enough to free participants from most stereotyped conceptions of appropriate organizational behavior norms. Consequently, the analysis of creative versus traditional structure, fixed versus flexible role behavior, high versus low levels of conflict, and conflict resolution via traditional versus novel methods can all be studied as a function of differences in personality and degrees of environmental incongruity and complexity.

**Creativity.** The Luna I Simulation provided several opportunities to study creativity: the development of an entirely new procedure, the combination of existing procedures to create something new, or the new application of an existing procedure. One way observers can assess creativity is to note the degree of spontaneous and experimenter prodded reorganization of game rules and materials. Prodding can be accomplished by failure feedback or by the introduction of a crisis resulting from previous operations. In a two period version of Luna I, for example, teams received massive failure feedback after period I. Then midway through period II they were given an emergency message concerning public dismay at America’s performance after a Russian Mars launch. Team responses varied from designing new projects to a routine, non-creative pursuit of the set of projects given them by the administrator. For other procedures for ranking degrees of creativity related to different personality, training, and experimental conditions see Driver *et al.* (1971).

**Other measures.** The simulation permits the comparison and measurement of many other variables that may be of interest to investigators. Using the Luna I Simulation, Hunsaker (1975), for example, found that subjects with high incongruity adaptation levels (high expectations, tolerance and preference for incongruent and ambiguous outcomes), perceive less risk and make riskier decisions over periods of varying environmental incongruity than do subjects with low incongruity adaptation levels. It was also found that risk taking is greater in periods of congruent environmental feedback than in periods of incongruent feedback (Hunsaker, 1972). A modified version of the simulation provides measures of group productivity in a complex environment of inter-group competition that has successfully be utilized as a classroom training device in small group decision-making (Hunsaker and Hunsaker, 1974).
Leadership assessment and training simulations

An examination of how well US Army educational systems prepare officers for contemporary military operating environments by the Leader Development and Education Task Force recommended that the Army incorporate simulations into leader development and education (Hirai and Summers, 2005). Bakken and Gilljam (2003) have documented the advantages of applying system dynamics techniques when designing simulations to represent “real world” operational challenges, especially where task complexity is the manipulated variable. Simulations have also been identified as being beneficial in training military commanders to include environmental considerations in their military decision-making process (Vargesko, 2005).

The research generated by the Luna I Moon Colony simulation, coupled with the recognized need for developing military leaders’ decision effectiveness in turbulent environments, resulted in a grant from the Army Research Institute for Behavioral and Social Sciences for the development of a pilot-simulation which could be used by ROTC units for assessing the leadership potential of officer candidates in turbulent military environments. The result was the tactical pacification game that provided a simulated military environment for the assessment of officer candidates’ decision-making, leadership, and team skills (Mudgett et al., 1975). The success of the tactical pacification game paved the way for the creation of two more sophisticated simulations to provide more complex assessments of potential military leaders and train them to make effective decisions in turbulent environments. The leadership assessment and training simulation (Hunsaker, 1974) was developed to provide a method of identifying officer candidates who are able to cope with turbulence and to provide a training vehicle for enhancing this capability. This simulation provides a decision-making situation in which information quantity and complexity can be varied to examine participants’ reactions to information overload and incongruity. Personality and performance measures, administered before, after, and during the simulation, provide data on how different types of people perform under varying degrees of environmental turbulence. The final simulation in this series was the leadership effectiveness development simulation (Hunsaker, 1977). It consists of a complex military situation requiring decisions about interrelated economic, socio-political, and military tactic problems. It is designed to facilitate the development of specific tactical competencies as well as broader leadership, decision-making and interpersonal skills.

Following are descriptions of the simulation scenarios and procedures for conducting them. This is followed by a summary of the research findings they have generated. Finally, future applications, including techniques for data collection, anticipated problem areas, and related research paradigms, are discussed.

Procedures and scenarios. The three military simulations referenced above have common settings, similar scenarios and administration procedures. They differ considerably, however, in their specific objectives, conduct, and outcomes. The leadership assessment and training simulation (LATS) contains all of the common ingredients of these simulations. It is described below, followed by a discussion of the various adaptations and research.

The simulated environment. The LATS environment that is common for all three of these simulations is described in detail by Mudgett et al. (1975). It contains physical, military, economic and social-political factors analogous to those existing during the...
US involvement in the Vietnam and Korean conflicts. High participant involvement is generated through the stress of time demands for solving complex problems and competition between teams. Current developments and feedback about the consequences of previous decisions are provided by the delivery of message cards. Scores for decision effectiveness are determined from the responses of both teams to their mutual problems in order to provide a sense of inter-team competition.

**Conducting the simulation.** Figure 1 contains numbered footnotes documenting the processes involved in conducting the simulation. A simulation session typically contains ten problems that opposing teams are required to solve. The problem format describes a situation and requires the team to decide on the best of three alternatives. A second version presents a problematic situation and requires the team to create its own plan of action to resolve it. A typical problem might be to prepare a defense plan for company headquarters that soon will be attacked by enemy forces.

Teams communicate and submit problem decisions on planning, action, or communication forms. All forms are given to the simulation controller who responds with a message providing answers to a question, new information, or the consequences of past decisions. Consequences for team decisions are based on the “problem consequence schedule” in the instructor’s manual[1].

**Variations in scenario and administration.** By adapting the simulation’s scenario, information inputs, and role assignments, several different learning and/or assessment environments can be created. In one version, each team begins with the same situation and overlapping objectives, i.e. success in tactical decision, negotiations, economic

---

**Figure 1.**
Physical layout and activity scenario

---

1. Controllers give problem cards to teams.
2. Teams return problem solutions to controllers on indicated forms.
3. Controllers provide consequence cards containing problem feedback and scores, plus other evaluation information to teams.
4. – Observers continually watch team members’ behaviour and complete leadership skills diagnoses
   – Team members complete leadership skills diagnoses and give to observers.
5. Observers provide feedback and conduct skill building sessions with teams based on their own leadership skills diagnoses and the summaries provided by the team peer evaluations
change, and intelligence gathering. A sequence of specific messages is provided to the teams in fixed order at predetermined frequencies. The challenge is for the teams to organize themselves, process the continuing flow of new information, and decide how to react. The predetermined flow messages consists of a sequence of crises related to the multiple team goals.

Another variation of the simulation provides optional versions for twenty percent of the previously standard messages. This allows the game controller more flexibility in specifying the interaction between participants and providing unique and more realistic feedback without significantly altering the simulation sequence. Feedback messages can be preset at a constant mix or in a dynamic pattern of negative and positive content. Frequency and quantity variables remain constant across teams to allow for reliable inter-team comparisons.

The simulation performance may also be compared between teams with assigned and unassigned leaders. The first two periods, for example can be conducted with no assigned leader to study the process of leadership emergence: how the team organizes to deal with the problem situations, who emerges as team leader, how the emergent organization and leader relate to personal attributes of the individuals comprising the team and to the different levels of environmental turbulence. In each of the next four periods, a different team member is assigned the leader role and his or her performance is observed and analyzed.

If the simulation is being used primarily for training purposes, feedback addressed to actual responses can be used as reinforcement, but it necessitates that the controller evaluate responses quickly and either selects a prepared message for feedback or creates an appropriate one within a reasonable time. These customized messages are delivered as attachments to the set of information inputs that remain constant for all versions. The debriefing session at the end of the simulation takes on increased importance as a reinforcement device in training version, and observers collect data for learning feedback instead of using the evaluation instruments provided for the research and assessment applications.

Applications and results
These simulations have been used for a wide variety of purposes including leadership assessment, tactical training, and research into individual and team decision-making. This section summarizes some previous applications and research results.

Research
LATS have controlled environments for the study of relationships between independent variables and behavior that are difficult to assess in an uncontrolled field environment. Hunsaker (1975), for example, used the simulation to determine that environmental incongruity and incongruity adaptation levels influence the degree of risk perceived and incorporated in decisions, and, that in turbulent environments, leaders possessing higher than average incongruity adaptation levels make more effective decisions without panicking. An incongruity adaptation level is an individual's utility for risk, novelty, conflict, ambiguity, and dissonance[2]. In assessing leadership competency in turbulent environments, Hunsaker et al. (1975) used the LATS to compare potential leaders’ differences in cognitive complexity and incongruity adaptation levels. They found that individuals higher in both traits cope
more effectively with environmental turbulence than lower scoring people. In general, the more successful leaders had attitudes directed towards inquiry and novelty, were flexible their approaches to problem solving, enjoyed working with high levels of complexity and variety, had possessed high degrees of tolerance of ambiguity and independence.

Mudgett et al. (1975) have developed mechanisms for generating five complementary types of data from the simulation. Self-report inventories can be completed by each participant in advance to study behavioral differences in the simulation-based variations in personalities or past experiences. The participant behavior form contains 24 Likert-scale items on which each subject is rated with respect: demonstrated leadership, interpersonal effectiveness, and ability to cope with turbulence. All participants are described by each team member on the decision style classification form (Driver and Lintott, 1974) at the conclusion of the simulation to determine their perceived and experienced decision styles. Independent observations by the controller and observers are recorded on the behavioral observation checklist that includes a variety of behavioral categories such as functional and dysfunctional coping behaviors, productive and destructive interpersonal behaviors, and communication patterns. Finally, planning sheets and action orders can be content analyzed to produce data on things like goal setting, conflict resolution, information processing, strategic planning, and operational problem solving.

Assessment
The simulation has been used to assess leadership skills, decision effectiveness, communication styles, risk preference, and ability to cope with turbulence. Although most of this research has been conducted in military settings, it could just as easily be applied to other organizational settings. Some examples of assessment applications are described below.

Military tactics. These simulations were designed for the Army Research Institute for Behavioral and Social Sciences and have face validity for ROTC and Officer Candidate School curriculums. Instructors are able to insert additional situations and provide specific feedback so that they can tailor the simulation to assess relevant in factors in any tactics curriculum. The results provide an economical mechanism for screening ROTC students before commissioning, placement or promotion to advanced training.

Ability to cope with turbulence. The simulation has been utilized for assessing and developing participants’ capabilities to cope with turbulence. This is accomplished by increasing the turbulence of the simulation environment over a series of runs and having participants repeat the experience over a prolonged period of time. Both leadership and decision-making capabilities under increasingly turbulent conditions can be assessed by holding the environmental turbulence constant over teams, i.e. utilizing the same degree of uncertainty and change in the feedback provided to all teams. This provides for comparable situations from which standardized comparisons of individual performances under the same conditions can be obtained. Hunsaker (1973) for example, found that significantly more candidates with low incongruity adaptation levels withdrew from an Officer Candidate School program after being subjected to conditions of high environmental turbulence, while those candidates with higher incongruity adaptation levels thrived.
Decision styles. Computer-based method of analyzing peer perceptions within small groups has been developed to extract sociometric appraisals of team members (Hunsaker and Wynne, 1978; Thilmany, 2005). Participants’ ratings of each other on the decision style classification form described earlier are entered into a computer program that tabulates and analyzes responses in an on-line mode. The results are 360-degree descriptions by each person of each other person with respect to their adaptability, complexity, and dominant decision style. Team members scoring higher in cognitive complexity, for example, were perceived by teammates to be more effective decision makers in high turbulent environments (Wynne et al., 1974a, b).

Decision styles differ in two fundamental ways: how much information is used and how options are created. When it comes to information use, “maximizers” want to mull over reams of data before they make any decision. “Satisfiers” just want the key facts and are ready to act as soon as they have enough information to satisfy their requirements. When creating options, “single focus” decision makers strongly believe in taking one course of action, while their “multi-focused” counterparts generate several possible options. Using these two dimensions of information use and focus, a matrix can be created that identifies four styles of decision making:

1. Decisive (little information, one course of action).
2. Flexible (little information, many options).
3. Hierarchic (lots of data, one course of action).
4. Integrative (lots of data, many options) (Driver et al., 1993).

The interaction between cognitive style and career success has long been recognized (Hayes and Allinson, 1994). It has also been determined that decision styles are extremely relevant in understanding why some leaders are more effective than others in complex turbulent field environments. Streufert and Nogami (1989), for example, found that differences in training, intelligence, and experience did not offer an adequate explanation for why some leaders make effective decisions in turbulent environments while others, who had been successful in more certain situations, failed when promoted to more complex environments. Their explanation was that cognitive style, the basis of decision styles, was the primary variable responsible for these differences. Brousseau et al. (2006) confirmed this hypothesis via their findings that leaders with more complex integrative decision styles are more effective in CEO positions than their low complexity decisive counterparts who thrive in lower supervisory positions.

In research comparing leadership style to differences in incongruity adaptation levels and decision styles, Hunsaker and Landkamer (1995) found that although no overall relationship existed between leadership style (relationship or task-oriented) and decision styles, leaders with Decisive and Flexible decision styles used less information, made quicker decisions, and had higher incongruity adaptation levels, than those with Hierarchic or Integrative decision styles. Integrative leaders experienced indecision in the face of deadlines unlike the Flexibles who had no difficulty accommodating deadlines although they did make significantly more errors. Because of their thoroughness, hierarchic leaders had the lowest expectation for experiencing incongruity and made the most high quality decisions.

Leadership effectiveness. At the conclusion of the LATS, each team member and the observer complete the leadership description scale. Team members rate themselves
and each teammate on 12 leadership dimensions of actual behavior observed during the simulation. The observers appraise each team member on the same leadership dimensions and also provide assessments of decision-making and team-building competencies. This 360-degree feedback provides participants with valuable information about their leadership strengths and areas needing improvement. It also provides instructors with three different data points for assessing leader candidates potential and areas where additional training is necessary (Hunsaker, 1978).

Leadership training for turbulent field environments
There are several ways that the simulation can facilitate the development of effective leadership behaviors. Participants learn from peer feedback during the decision-making process as they perform the functions of decision makers and leaders. After the simulation experience, participants and instructors share with each other relevant feelings and behavioral responses elicited during the simulation in a task-directed and constructive manner. Concrete examples are provided to document feedback regarding the impact of an individual’s actions on others. Consequently, the participant is provided with 360-degree feedback about his own leadership skills from instructors, peers, and self-reflections. Participants also learn about leadership from observing others and listening to instructor explanations.

The model presented in Figure 2, has been specifically developed for assessing and training leaders for turbulent environments (Hunsaker et al., 1975). The first step is to classify organizational environments according to their contingency-severity, i.e. the degree of complexity and turbulence they possess (Raynolds, 1971). Environments characterized by certainty where specific events occur in well-understood ways and without unexpected side effects present different challenges to leaders than more contingency severe environments characterized by risk (where probabilities of event-sets can be determinable), uncertainty (where outcomes depend in large measure on actions and reactions of other decision makers in the relevant environment), or turbulence (when it is not possible to anticipate the relationships among events with any useful reliability).

Leaders being evaluated for placement in real world turbulent environments, such as military field commanders, can be subjected to conditions of increasing complexity, change, and incongruity in the LATS to determine their level of turbulence readiness. Leader candidates initially enter the evaluation process at different levels based upon their most recent performance on the previously explained measures of their abilities to process information and cope successfully in turbulent situations. Individuals scoring high on these measures can be expected to cope more effectively with turbulence (Hunsaker, 1973) and are introduced into the simulation at a higher level of contingency-severity.

Participants failing to exhibit effective behavior in the risk environment are advised to seek more highly programmed positions, such as administrative positions in accounting with more certainty about decision procedures. Those failing to cope in the uncertainty environment would be assigned to positions supervising only standardized operating procedures, such as inventory control. Success in the turbulent environment would distinguish middle level from top position leaders. Participants progress in a “training sequence” of increasingly incongruent environments until they are unable to process all necessary information to make
Figure 2.
Model for assessing and developing leaders for turbulent environments

Notes: 1. GIAL – General Incongruity Adaptation Level, 2. CCS – Cognitive Complexity Structure, 3. Successful Environmental levels; risk, uncertainty, turbulence, entry due to vertical movement
Source: Adapted from Hunsaker et al. (1975)
effective decisions. Feedback and training can then be given to help these candidates learn how to increase their ability to make effective decisions in turbulent environments if they still desire to apply for more advanced leadership positions in these complex and rapidly changing environments.

Participants screened in this manner have demonstrated that leaders with high incongruity adaptation levels are more satisfied and effective when dealing with unexpected events and consequently cope more successfully with the turbulent field environments (Hunsaker, 1973). They are also more open to risk-taking in complex situations (Hunsaker, 1975). Individuals with higher cognitive complexity, i.e. ability to differentiate and integrate more information, function better in complex and non-programmed types of task environments (Boulgarides, 1973).

The five psychological inventories routinely administered before participation in the simulation provide data for multivariate analyses to relate personality characteristics to risk-taking and effective decision-making under the stressful conditions encountered in the simulations. To summarize the findings relevant to leadership in the initial runs of the LATS:

1. Leaders with high levels of cognitive complexity and incongruity adaptation are more successful in highly turbulent environments.
2. Leaders with lower levels of incongruity adaptation ability and cognitive complexity are more effective in more stable and structured situations.
3. Cognitive complexity is positively related with hierarchic and integrative decision styles.
4. Higher authoritarianism and lower interpersonal effectiveness are positively related with the more rigid decisive and hierarchic decision styles and to less success in turbulent environments.
5. High incongruity adaptation scores are positively associated with flexible, integrative and systemic decision styles as opposed to decisive and hierarchic styles and to more success in turbulent environments (Hunsaker, 1978).

These results are consistent with more recent research that has found that leadership and decision processing in twenty-first-century technical organizations is positively influenced by individual cognitive capacity, information processing acuity and decision-making ability, resulting in promotion to higher levels of responsibility in the United States Army (VanDevender and Barker, 1999). In a study of submarine attack crews during simulated attack operations, operators with equivalent skill levels were found to exchange more task-focused information and perform better if they knew other team members (Espevik et al., 2006). The same has been demonstrated in civilian environments where leaders with more complex integrative decision styles have been found to be more effective in CEO positions than their low complexity decisive counterparts who thrive in more programmed supervisory environments (Brousseau et al., 2006).

Implications for social simulations in future leadership research and training
Advances in more sophisticated computer technology can enhance leader assessment and training in decision-making in turbulent environments, e.g. fighting wars (Reeder,
A recent example is the adaptive thinking and leadership simulation that uses computer game technology to train US Special Forces soldiers in skills like adaptive thinking, negotiation, conflict resolution and leadership. By role-playing in an ever-changing environment, users sharpened their ability to anticipate the consequences of responses to problems that may not have a right answer. The simulation helps players discover their strengths and weaknesses in mental agility, cultural awareness, and communication skills (Thilmany, 2005). A dedicated simulation facility has also been created for the Yugoslav Army to provide military commanders with the capability for two-sided interactive air war gaming (Vranes et al., 1992).

The ease of modifying computer games renders them effective as low-cost virtual worlds that have found relevance in military experimentation. The Singapore Armed Forces Centre for Military Experimentation conducted a gaming workshop in 2004 to explore how soldiers could make use of information to alleviate the challenges in an urban warfare scenario. The workshop generated many insights into the issues surrounding information requirement and usage, sense making, and command and control. This initiative represents the commitment to explore and harness computer games in engaging the next generation of soldiers in the development of war-fighting concepts of the future (Fong, 2006).

However, the use of computer simulations alone fails to capture the impact that relationships and emotions have on military decision making, highlighting the continuing need for social simulations that include these interpersonal aspects of team decision making (Gratch and Marsella, 2003). Interpersonal knowledge about team members, for example, has been found to have positive effects on performance and team processes, including an increase in the amount and types of information exchanged, physiological arousal, and shared mental models (Espevik et al., 2006). There is also evidence that US Army officers progress to more complex decision-making strategies when growth is recognized and rewarded (VanDevender and Barker, 1999).

There are a number of opportunities to utilize social simulations to assess and develop leaders’ decision effectiveness in turbulent environments utilizing recent applications of Michael Driver’s constructs of decision style and environmental complexity. Brousseau et al. (2006), for example, have determined that to advance in complex organizations, leaders need to learn and apply more advanced decision styles for using information and evaluating options. The information-maximizing and participative, integrative, decision style of successful CEO’s was found to be the opposite of successful first-line supervisor’s information-minimizing, decisive, decision style. For leaders to succeed as they progress up the organization hierarchy, it was found that their decision styles must evolve to include more complex information processing that is capable of accommodating the challenges of the increased turbulence inherent in the new terrain. The question now is how to train advancing leaders to drop old information processing habits that were successful in the past and adopt new decision styles necessary for success in the more complex and turbulent environments encountered in more senior positions. One approach is through civilian adaptation of the social simulations described above that had successfully assessed and trained military leaders for similar succession paths. By participating in realistic social simulations, advancing leaders can experiment with new decision styles without the
risk of making real world mistakes that could jeopardize their own and their organization’s future. By applying the model for assessing and developing leaders for turbulent environments presented in Figure 2, the leaders who are most successful in adapting their decision style to the more complex requirements can be identified for promotion.

Notes


2. The general incongruity adaptation level (GIAL) self description test for assessing this characteristic is available through Decision Dynamics Corporation, 2131 La Granada Drive, Thousand Oaks, CA 91362.

References


Bakken, B. and Gilljam, M. (2003), "Dynamic intuition in military command and control: why it is important and how it should be developed", Cognition, Technology and Work, Vol. 5 No. 3, pp. 197-205.


Cunningham, S.M. (1967), “The major determinants of perceived risk”, in Cox, D.F. (Ed), Risk Taking and Information Handling in Consumer Behavior, Division of Research, Graduate School of Business Administration, Harvard University, Boston, MA, pp. 82-108.


Driver, M.J. (1972), “Decision style, decision quality and decision speed”, unpublished manuscript, University of Southern California, Los Angeles, CA.


effectiveness: effects on performance and team processes in submarine attack teams”,

Illinois University Press, Carbondale, IL.

Vol. 37 No. 4, pp. 452-65.


Differential Officer Battery, Behavior and Systems Research Laboratory, Arlington, VA.

Vol. 17, pp. 105-6.


Hunsaker, P.L. (1973), “The effects of differences in incongruity adaptation levels and
environmental turbulence on successful completion and leadership effectiveness in officer
candidate school”, Proceedings of the 81st Annual Convention of the American

in individual and group decision making”, unpublished doctoral dissertation, University of
Southern California, Los Angeles, CA.

adaptation level on risk perception and risk preference”, paper presented at the
80th Annual Convention of the American Psychological Association.

and research applications”, JAS Catalog of Selected Documents in Psychology, Vol. 4, p. 151.

ROTC evaluation and training”, paper presented at the 85th Annual Convention of the
American Psychological Association.

decision making environments”, Organizational Behavior and Human Performance,

Reports, Vol. 43, pp. 115-25.

leadership style”, Psychological Reports, Vol. 75, pp. 1-3.

small groups”, Proceedings of the Seventh Annual Western Conference, American Institute


Rasa, J. (1969), Simulation and Society, Allyn & Bacon, Boston, MA.


Further reading


About the author
Phillip L. Hunsaker is a professor of management in the School of Business Administration at the University of San Diego. He is a consultant, seminar leader, speaker, author, teacher and researcher in the areas of personal, interpersonal, team, and organizational effectiveness. Dr Hunsaker has authored over one hundred articles on management and organization topics in academic and professional journals. He has also written eleven textbooks on management, leadership and teams. He has consulted and provided training for a variety of business and government organizations throughout the world. Dr Hunsaker is noted in the 21st edition of Who’s Who in the World, the 57th edition of Who’s Who in America and the 2006 edition of Who’s Who in Business Education. Phillip L. Hunsaker can be contacted at: philmail@sandiego.edu

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints