BRIDGING THE GAP: Transforming Knowledge into Action through Gaming and Simulation

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Design and Layout: Adrian Döge

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ISBN: 3-00-013989-3

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The Depth and Breadth of Games and Simulation

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This presentation begins with my personal introduction to computer controlled business games which began in 1962. My experience with a formal group which had the theme of gaming, simulation and experiential exercises was first gained through membership in a US academic organization (ABSEL). In 1986, I expanded my experiences with my introduction to ISAGA.

This presentation looks at the great breadth of the techniques that are used in many institutions. Gaming has broad applications from the university, secondary and primary schools and has far reaching implications for training and research in many for profit, non-profit and governmental organizations. The presentation explores the techniques used in research, as well as those that solve complex business and societal problems. These techniques are also used to uncover new technologies and broad areas of unique applications.

The presentation then looks at gaming and simulations from the prospective of depth and intensity. Applications can range from very simple to highly complex. These techniques may be used to probe deeply into a research problem, or to help solve a legal, political, social or public health problem, as well as a multitude of business tribulations. The presentation culminates with a look at the program and organization of the ISAGA05 conference; Serous Play. The presentation ends with a conclusion from this exploration of the breadth and depth of gaming and simulation.

1. Introduction

My first ISAGA adventure was at Toulon in 1986. I had the opportunity to join ISAGA as a representative of ABSEL (the Association of Business Simulation and Experiential Exercises), a US based organization of business school faculty interested in classroom business games and business oriented experiential exercises. Since being a member of ISAGA I have attended all but one of the meetings since 1986, so this makes the 18th ISAGA meeting I have attended over the last 19 years. I missed the St. Petersburg meeting only because of a visa timing problem. ISAGA, for me, has been a great learning experience and it has broadened my understanding of simulation and gaming from an international community perspective. I can say that my experiences with ISAGA have caused me to seek out many international teaching and research opportunities that I would have otherwise missed out on.
My introduction to business games

My first experience with “business games” occurred when I was a graduate student instructor at Purdue University in the fall of 1962. I was teaching a senior level “Business Policy” (now called Strategy) course that used the “UCLA business game.” It was that experience that got me hooked. Maybe it was the carrying two boxes of punched EDP cards (4,000) to the computer center and retrieving them the next day (if the computer center was busy, it took 2 days). Then again, it may have been the full day or more wait to see if I had made a keying error.

From the classroom perspective, it was clear to me that using an interactive process in the classroom resulted in student involvement:

1) being more committed to the subject, when compared to lecture style classes
2) exploring more alternatives to making decision, and being less defensive about decisions they had previously made, when compared to teaching with the classical case method
3) completing better and more thorough analysis of information and statistical data analysis than the students did when solving cases
4) not skipping classes
5) giving me higher teaching ratings than I received when I used lectures, with the assignment of homework problems as the primary methodology for transferring knowledge to the students.

After completing my PhD, I continued to be interested in simulations and games. While at the State University of New York at Buffalo (SUNY), I wrote my own version of the UCLA game and started a little training firm called COMET, inc., COMPuterized Executive Training. That firm held 2-day seminars for area executives in Buffalo. I left SUNY for Georgia Tech in 1971, and assumed the duties of the Associate Dean’s office in 1972. At that time my gaming activities came to a temporary halt. I went back to faculty status in 1981 and my gaming activity resumed. I began using the MARKETING IN ACTION game by Ralph Day and Tom Ness (1964) which had been updated and computerized.

I also received a grant to work with two new magnet high schools in Atlanta, one was a technology magnet school and the other was a finance oriented magnet school. I again rewrote an old existing mainframe game, and rewrote the manuals to appropriately fit a high school environment. The students named the game SZAM for Simulation for Zealous and Aspiring Managers.

My introduction to ABSEL and ISAGA

After spending 10 years as an administrator I felt that I had become rusty with my research skills and needed to get involved with some professional
organizations. One of the organizations I selected was ABSEL. My experiences with ABSEL helped me gain additional depth in this particular form of computerized business gaming, especially in the area of algorithm development. At the 1986 ABSEL meeting, Cathy Greenblat, then editor of S&G, attended and asked if anyone would be interested in attending the ISAGA conference in Toulon, France, as a representative of ABSEL. Can you believe that I was the only volunteer?

When I arrived at ISAGA86, I found that the area of simulation and gaming encompassed far more than I had ever envisioned. I found only a few fellow business faculty, but numerous academics in multiple fields, a variety of consultants and several practitioners who used simulation and games. During ISAGA86, I played a real-time diplomatic game, on desk-top computers with participants at far distant locations, playing simultaneously using the same simulation. (We played the role of national diplomats from varying countries, trying to solve a terrorist threat of setting off a stolen Atomic bomb. It’s amazing how little terrorist problems have changed over this nearly 20-year period of time.) I also played an early version of a new game by Dennis Meadows called FISH BANKS. We played Cathy Greenblat’s (1987) game CAPJEFOS, and realized why numerous aid projects to help village life in Africa were never fully implemented. Even after the sessions were over, many of us played games into the wee hours of the morning. It was either that or drink French wine at the outside student pub for 8 FF per liter (water was 10FF per liter and coca cola was 10FF per can.). These experiences awakened me to the concept that simulations and games were not only used to teach business theory and to develop business skills, but this methodology was applicable in very diverse fields; from the study of Aberrancy (straying from the correct or normal way) to Zymurgy (a science dealing with fermentation) and all the disciplines in between.

2. The theoretical base – Game Theory

Game theoretic notions go back thousands of years evidenced in the Talmud and Sun Tzu’s writings. In more recent times, Cournot (1838) developed a scenario called Cournot’s Duopoly Model (a social trap). In this model, if both parties act in a “rational” fashion, the outcome is worse for both than it would have been if they both acted differently. Technically, this was not developed as a game, because games require the concept of strategy. But this paper introduced a situation where the “best” solution to a problem could not be found by an analytic process. This early work set the stage for the differentiation of individual and collective rationality (Rapoport, 1995).

Game theory came on to the scene when Von Neumann and Morgenstern (1944) wrote their Game Theory and Economic Behavior which was followed by later revisions. In the early 1950s, John Nash (1950a, 1950b, 1951) generalized these results and provided the basis of the modern field of game theory.
This provided the needed theoretical background for games and the behavioral aspects of decision making.

The two person game, PRISONER’S DILEMMA first was experimented with by in 1952 and reported by M. M. Flood (1952). Morton Deutsch (1958) completed and reported on experiments with PRISONER’S DILEMMA in a game format. And Anatol Rapoport and A. Chammah (1965) published research on this game as well. These 1965 experiments caused a lot of excitement at Purdue University, where I was a PhD student at the time.

3. Business Games and Simulations

Computerized business games had their launch in 1955. That is the year Rand Corporation completed development on MONOPLOGS, a logistics simulation to train US Air Force personal (Jackson, 1959). This game focused on the consequences of a wrong decision. The first truly computerized civilian business game was launched by the American Management Association in 1956. It was called, TOP MANAGEMENT DECISION SIMULATION and was used in numerous AMA management seminars attended by business managers and academicians alike (Meier, Newell & Pazer, 1969). In 1957 THE BUSINESS MANAGEMENT GAME was developed by McKinsey and Co for use in its management seminars (Andlinger, 1958). The University of Washington was the first university to use a computerized business game in a classroom environment in 1957 (Watson, 1981).

In a survey of 107 AACSB member universities/colleges found two responding universities that were using computerized business games (Dale & Klassen, 1962). Since I was using a computerized business game in the two classes I taught that year, Purdue must have been one of the two schools. UCLA, the developer of the game I was using, must have been the other one.

In 1961, Bill Dill wrote two articles on business games, the first was The Educational Effects of Management Games and the second, Experiences with a Complex Management Game was coauthored by Hoffman, Leavitt and O’Mara (1961). These were the first of many many articles trying to assess the learning that takes place in playing a computerized management game.

Business games quickly developed international themes. Hans Thorelli et al. (1964) created the business game INTOP that represented international businesses. This game has survived in several versions and is the oldest business game, by far, that is still being played.

4. Non-Business oriented Games and Simulations

For me, this was the most important contribution to my thought processes. Here was a vast array of processes, games, experiential exercises and simulations that taught by doing and I could learn from many disciplines. This exposure made me think about problems and their solutions in dramatically...
different ways. For me this was a cross-cultural experience with great diversity. Although the disciplines differed from mine, we had a common link – simulations and games.

**Diplomacy**

Soon after attending ISAGA86, I was asked to accept a joint appointment in the School of International Affairs at Georgia Tech, thus combining my interest in business with my avocation for international affairs. As mentioned in my introduction to ISAGA, the first game I played as an ISAGA member was a diplomatic game run by David Crookall. The scenario was designed by Bob Noel who was at UC Santa Barbara at the time. This game was used in POLIS, which became Project ICONS detailed in *Crisis, conflict and instability* by M. Breecher and Jonathon Wilkenfeld (1989). I also taught a course for the Georgia Tech’s School of International Affairs in which I used a game called Project IDEALS (Crookall & Landis, 1992). This game had the students negotiating the *Treaty of the Seas* with teams of students from other countries that spans the globe. BAFA BAFA (Shirts 1970) was designed for the US Navy to teach how to observe a culture when it was foreign to the observer and has been used in training diplomats.

**Cross-Cultural Games**

In the early 1960s, Daniel Druckman (1994) used INTER-NATION SIMULATION to test hypotheses on ethnocentrism and Harold Guetzkow (1968) was developing methods of studying international relations using the same simulation. A recent intercultural simulation game is CALDER CONNECTIONS (Fowler, 2003) which uses art in an ice breaker game that leads participants to make connections with people like and unlike themselves. Sandra Fowler has published a 2-volume intercultural source book entitled, “Cross-Cultural Training Methods (1999) edited by Sandra Fowler and Monica G. Mumford, describes many games dealing with cross cultural learning.

**Games About Social Behavior**

Claude Bourles (1989), developed a fantastic game exploring social behavior called ENCOUNTERS, which many of us played at a previous ISAGA meeting. This game makes players aware of possible outcomes of recreation sex and allows the players to see how easy it is to get wrapped up in events without considering the consequences.

**Commons Games**

Commons type games all have a set of teaching objectives (Powers, 1985-1986). These are:

“Produce an understanding of the trapping character of a commons, i.e., that short-term, individual gain tends to dominate long-term collective gain; illustrate the importance of trust when one’s gains are dependent not only
on what one does but also on what others do; and allow students to experience the difficulties and frustrations of attempting to solve the commons dilemma with only a small amount of control over others’ actions.” (p. 5). There have been numerous ecologically oriented games presented at ISAGA over the years. One of the more renowned was FISH BANKS by Dennis Meadows (1989) which first was presented in its early design stages at ISAGA86.

**Medical and health care application of simulation**

“Simulation is an integral part of today’s undergraduate, graduate, post graduate and continuing medical education curricula” (Lane, Slaven & Ziv, 2001, p 297). The health care industry uses a wide range of technologies in their simulation methodologies. Role playing, simulated patients, electronically controlled mannequins as well as screen or computer-based clinical simulations are used. Since a simulated environment can be modified, it may be used in teaching and evaluating profession, teamwork, communication, interpersonal and clinical skills.

**Political Games**

THE POWER POLITICS GAME: Offensive realism in theory and practice (Reilly, 2003) is a good example of a political game. This game allows participants to discover the offensive realism which dominated foreign policy making for centuries. Reading about international politics does not enable the participants to understand the intricacies of the strategies that have evolved from power politics nearly as well as playing this game.

**Using simulations and games to teach and understand changing and developing economies**

This a challenging task. To develop simulations that can, over time, change an economy. At ISAGA03, Kikubo Harada (2003) reported on how simulated experiences can bring real community change. The Japan Network of Virtual Companies (JNVC) is a training network where students manage and operate virtual businesses as a part of their learning program. The concept of JNVC is to promote students’ entrepreneurial spirit and to develop employable skills and business knowledge. These students are expected to become aware of the resources they have and don’t have in their local regions. In this way they learn how they can best provide a better or new way of life using resources they can obtain. The local adults, in turn, learn some innovative ways to solve problems from the youth.

The Amrita Institute of Management in Coimbatore and Professor K. B. Saji has developed a game that simulated the technology transfer negotiations of an International Joint Venture. This game is used to train university students in the art of negotiating for the importation of new technologies.
**Language Games**

**Learning a new language**

Li & Topolewski (2002) reported that, “a review of more than 60 research studies revealed that games and simulations were more effective than traditional classroom instruction and the effectiveness was strongest for language.” The authors’ game ZIIP & TERRY has incorporated automatic speech recognition and was designed by experts in the entertainment industry. The game uses natural language understanding, neurolinguistics, learning methodologies, and vocabulary acquisition.

Using drama as a method for language acquisition has a long history (Bacon, Baolin & Goldfield, 1993) and with the introduction of powerful interactive computers, a new kind of drama blending into a participatory process. However some caution in design is called for. If the learner interacts by merely clicking a line, it does not work well. Either text or oral response is needed. The simulation, BUILDING BRIDGES (Coleman, 1995) closely resembles a real life paradigm. Oxford (1990) reported that simulation-based approaches to teaching foreign languages train learners how to become meta-cognitively competent.

**Learning how to communicate**

Garcia-Carbonell, Watts and Montero-Flets (2002) reported that effective communication requires multiple skills. “Language itself does not provide effective communication. Delivery, content and organization are as important as the quality of the language used, to achieve a successful presentation” (p 190). These authors have used a simulation called KNOW-IT-ALL LINGUISTS provides participants a way to improve their oral communicative competence by playing the roles of professional linguists.

In the “learning how to communicate” arena, REDUNDANICA (D, H. Saphiere, 1995) is an interesting game. It allows the participants to become aware of the changes in their behavior and their reactions to the behavior of others when communicating in a foreign language. Its participants learn how language ability influences perceptions of overall intelligence and competence. They also are to discover methods of enhancing the accuracy of communication in a non-native language and to comprehend how emotions may modify, interfere with and / or assist in the process of communication in a foreign language (Stoy, 2003). I sure wish I could have played this game before I went to France for my first extended stay.

**Primary and secondary educational simulation and games**

An early game to teach school children fundamental economics was TOY STORE (Leonard, 1969), it was created but never published. Another unpublished but used game was called HIGH SCHOOL (Coleman & Seidner, 1972). This game illustrated the impact of the social environment on student behavior and self perceptions (Seidner, 1995).
Donald Thatcher et al. (1980) developed simulations to assist with the education of children with learning disabilities. His ME – THE SLOW LEARNER, was an attempt to present to others through game play, the world in which the children with learning disabilities operate. At this conference, Joan Teach (2004) is presenting a game which is designed to teach social skills and social studies to children with learning disabilities.

**Entertainment**

There is much to be learned from entertainment games. People, especially youths, spend hours and hours with a game boy or game box and get deeply engrossed. If we, the developers and users of educational and training simulation and games, could get that much devotion and concentration, what could we accomplish? I think it behooves us to consider how the attention getting powers of entertainment games can be co-opted for use in our games and simulations.

**Edutainment**

If there is such a word, I can't decide if this is a good word or a bad word.

5. **The relationship between Simulation and Gaming and distance education**

Distance education is broadly defined as a mode of instruction that results in infrequent face to face meetings with faculty (Baugher et al., 2004) (but excludes students who rarely come to a regular scheduled class.) As a result, distance and on-line courses require different behavioral cues. There is a particularly strong link in business education. Distance administered business games have grown dramatically. Wolfe, Flores & Richie (2002) reported in that year, that the game CAPSTONE had increased its adoptions by 33% from 2000 to 2001 (from 300 to 400) and MARKETPLACE had doubled its adoptions each year for 4 years running (no specific number given). In 1997, I designed an internet game called COMPRISE, for distance education (Teach, 1997). This game required each team member to be at a geographically different location. All communications between team members was to be conducted in an electronic and auditable format.

6. **Game and Simulation delivery**

**Programming Languages**

When I started in gaming, I wrote my code in FORTRANII, and then graduated to FORTRAN IV, now almost no one even recognized the name of this once powerful computer language. ASP, Perl, CGI (Common Gateway Interface), JavaScript and a variety of regular programming languages such as C, C++, visual basic and so forth are currently used (Pillutla, 2003).
Agent based programming

Traditional, computers in business games have been used to generate aggregated data that the participants need to analyze. From these analyses the participants then develop new strategies and determine a new set of decisions for the next round. Agent based models have the capability to learn and can develop strategies after exposure to a large number of plays (Kobayashi & Terano, 2003). Their approach was to mix human players with programmed agents. This has great possibilities. Many business games have scenarios that involve many workers, buyers, machines and managers. Currently these games make failure-proof assumptions. After decisions have been rendered, the game processes the data and produces the results. But workers are individuals with many different characteristics. Factory machines also have unique character. Products, at least in the consumer goods industries, are purchased by customers, one at a time. We all know how fickle consumers are. With mixed games, one could program a work force, a production line, and buyers with unique characteristics. Then participants could interrogate the simulation and determine many problems that are “overlooked” in the current games. Marketing research could be collected and one could determine which brand a particular consumer selected and which did not, by brand purchase. Thus, games designed with agents could provide a much richer environment than is currently possible. This leads to a game, under design (Teach, 2004) in which there are 100,000 households, each with many unique characteristics.

Systems dynamics

Many games have been developed using system dynamics which use feedback loops. Systems dynamics and simulation gaming have many similarities. Both model dynamic situations. Both appear to be simulation exercises. Both use computers to evaluate decisions functions and attempt to enhance the understanding of actual situations depicted in scenarios. Therefore, it is to be expected that, combining these two techniques would bring about superior simulations and games. If one examines much of the literature from simulations and gaming and the proceedings of ISAGA and the System Dynamics conferences, one would find that this is true. This is a powerful and extremely useful technique.

Internet Gaming

Internet games and simulations are coming on strong. Many business simulations are now run over the internet. Simulations & gaming recently devoted a special issue to Internet-mediated simulations and games (March, 2003). While entertainment games, both single-player and multi-player versions have exploded on-line, education, business and policy games have dominated this new means of game delivery in the non-entertainment areas. Many of these games make use of the electronic telecommunications tools of E-mail, video conferencing and chat rooms (Asakawa & Gilbert, 2003).
But this form of games introduces many new problems. The internet crosses language and cultural boarders. The National University of Singapore has developed a game called MASGNUS (1998) that incorporates a display of two languages. This form of gaming has an almost unlimited future. Starkey & Blake (2001) state that it would “add previously unavailable dimensions to the simulation process” (p541).

The World Wide Web environment should provide developers of internet games with the capabilities to create:

- a facility to design and / or choose a problem domain.
- a support for data input/model specification
- a support for visual simulation
- a support for simulation statistics and results
- a substantial student and facilitator support and assistance (Kuljis and Paul 2003)

7. Research conducted using Games and Simulations as a data source

In reading simulations & games, the proceedings of both ISAGA and ABSEL and many academic journals, there are many articles that reflect the research that is being conducted where the data collected is generated by simulations.

Solving complex business and social problems

A long time ISAGA member Dr. Dorien DeTomba has work in this field for years. She developed her theories while studying for her PhD under Jan Klabbers at Utrecht University. Much of her methodology uses gaming and simulation fundamentals.

Developing new technologies

Serious Play, (Schrage 1999) details how simulations allow firms to “play with” new technologies and find ways to enhance existing technologies and / or develop new technologies as a result of the serious pay. This is a new area for games and simulation. I have a PhD student, Tim Quey, who is writing his dissertation in this area.

8. What conclusions follow from this rambling Monologue?

One of my purposes in presenting the depth and breadth of simulation and games was to introduce the number and variety (but not all) of the tracks that will be provided during ISAGA05. At this conference opportunities will be provided for paper presentations as well as facilities for playing a wide
array of simulations and games during the ISAGA05 conference in Atlanta. During ISAGA05, we expect to offer authors a wide variety of time formats that can be used to present papers or to play new or existing games and simulations which will be brought to this meeting in the USA. Authors of papers will be given their choice of 30, 45 or 60 minute presentations (this time includes the discussion period with the audiences). Game demonstrators and players will be given their choice of time slots ranging from one to three hours. Thus, time should not be a constraint to presenting a game or exercise.

We also expect to provide one day of special workshops for school teachers to help them establish an understanding of how some of these techniques may be used in primary and secondary education. In addition, we expect to have a day for university level business faculty to be deeply involved in several business oriented games and simulations and to train them before they order a new game for classroom use. On a third day, we expect to have an all-day workshop for corporate trainers which will expose them to the tools of their trade and the developers that produce them.

To Quote Serious Play, (Schrage, 1999) in a manner that I think explains the importance of simulation and gaming activities, “I used to think that creative people used simulations and games as tools of their trade, but I have come to the conclusion that I had it backwards. It is the utilization of simulations and games that makes people creative. This process gives us insight that we could not get any other.

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