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BACK TO THE FUTURE OF GAMING

Preface I

In this year, 2014, ISAGA – The International Simulation and Gaming Association – celebrates its 45th anniversary. ISAGA was founded by Richard D. Duke, whose well reputed "Gaming: The Future's Language" has become a classic standard work on Gaming. In 2014 forty years will have passed since the original publication of this book.

My own professional development into the field of Gaming started in 1994 as a research assistant to Dennis Meadows (who also is a past president of ISAGA). Attending my first Gaming conference in Italy, I met Paola Rizzi and Dmitry Kavtaradze and soon many other colleagues who have contributed to this book. Whenever I asked someone for good literature on Gaming to start my journey into this field, they all gave the same recommendation: "Gaming: The Future's Language". So I read it in 1994 for the first time, 20 years after it had been published. As a psychologist I was interested in communication and had written my own master thesis on systems theory, gestalt theory and the construction and change of mental models and communication patterns. Therefore I was immediately captured by Duke´s thoughts on Multilouge and gestalt communication. With Paola Rizzi I developed the concept of an ISAGA summer school in gaming design; we co-founded the annual summer school (2004). Thirty years after the original publication of Duke´s classic we were honored that he came to Munich as one of the teachers, along with Jan Klabbers, Elyssebeth Leigh and Mieko Nakamura. I am happy that these colleagues are all part of this book now.

Published by Sage in 1974, the research for "Gaming: The Future's Language" work had been developed at The Netherlands Institute for Advanced Studies (1973). "Gaming: The Future's Language" was translated into Japanese by Mieko Nakamura and Arata Ichikawa (2001). The book was also translated into Italian by Paola Rizzi (2007). The book continues to be widely cited. For the 45th ISAGA conference in 2014 (in Dornbirn, Austria) I have developed a 40th anniversary celebration of the book with a reprint (second revised printing) of the original. In addition, we have published this second book "Back to The Future of Gaming". This is to be based on Dick Duke´s classic and would explore the past, present and especially the future of gaming in relation to the main ideas of Duke´s book. I am very thankful and honored that he agreed to this plan. (Prof. Duke served as guest editor of the book.)

Willy Christian Kriz, 2014, Dornbirn, Austria

Preface II

We then invited several professionals who worked closely with Dick Duke over the past decades to speculate on the future of gaming. Some of them have been colleagues from the 1960's and 1970's at the University and within the ISAGA community, or have co-authored with him (e.g. Geurts and Duke: Policy Games for Strategic Management – Pathways Into the Unknown, 2004) We also invited a few of Duke´s students from his University of Michigan Certificate Program in Gaming Simulation (1980's and 1990's). In addition to these "veterans" we also especially invited some younger colleagues – "The Next Generation".

Six of the central points of Duke's book were given as a starting point for each author's reflection:

1 Many existing complexities do not readily yield to scientific study.

Science excels in a world where data and theory govern progress. In the early 70's computing power was very limited and data banks were more a hope than a reality. Policy was formed in environments where a small group struggled to exchange ideas based on limited data, wisdom as available, and intuition. "Future's Language" predicted that Gaming would emerge as a valuable approach in such policy deliberations.

» Has this happened?
» What role do you think policy games will play over the next twenty-five years?

2 Increasing complexity is expected in the future (e.g. beyond 1970).

"Future's Language" made the observation that as early as the 1970's many critical problems were evident; this situation was anticipated to become increasingly acute. These problems were characterized by a crisis demanding action, a long-range horizon (10-15 years), a large number of substantive variables in play (often over 100), and a small group dynamic (12-18 stakeholders) being required for a successful resolution.

» Do we face such complex and critical problems today?
» How do you expect this to play out in the coming decades?

3 Existing communication modes are proving inadequate to the task.

A central thesis of "Future's Language" was that language had failed to evolve quickly enough to address complex problems: "The sequential languages of the past fail to convey gestalt and so complexity cannot be readily communicated" to a group of policy makers. A decision is a gestalt event, not a logically determinable process; as a consequence, the decision maker must first comprehend the entirety of the system.

The book argued that a new future-oriented language was needed; further, the evolving technique of gaming simulation proves likely to serve that purpose.

» Has this proven to be the case?
» What techniques and/or technologies do you anticipate for conveying complexity?

4 Policy gaming is an emerging discipline.

The "Future's Language" makes the claim that by early 1970, the emergence of gaming professionalism was increasingly apparent. The book predicted that the discipline seemed to be at "a very early point on a growth curve that will not begin to level out for at least a quarter century". The new professional organizations (e.g. ISAGA and NASAGA) were cited as evidence.

» Has the gaming profession grown rapidly? How has policy gaming evolved?
» How do you see the huge high-tech 'Serious Game' industry impacting the low-tech policy gaming field?

5 Gaming is a Future's Language.

The "Future's Language" makes the case that "Gaming is a hybrid form of communication" still in its infancy. The book argues that there is convincing evidence that as the discipline emerges it will prove to be a useful communication tool for policy makers. A disciplined policy game permits a group to approach complex problems from varying perspectives. It permits research in a context that is coherent and logical and in an environment that permits safe exploration of ideas.

» Is it productive to define a policy game as a "language" used by a group to explore the future?
» Will the concept of a policy game as a communication tool successfully evolve in the coming decades?

6 Game Design Process.

Much of the "Future's Language" was devoted to the process of game design. Seven primary design steps were described for the reader. Game design was presented as a sequential process proceeding logically from point to point. However, it was noted that in practice the designer was expected to move from step to step in a flexible manner.

» Has the design process presented in the Future's Language (now a more refined 21-step process) proven to be of value to the designer of a policy game?
» Will an effective design "checklist" be forthcoming in the years ahead?

These questions were designed to give all authors an equal base from which to begin. However, the contributors were expected to follow their own muse. The invited authors represent a diverse group of experts with various backgrounds and cultures (and English is, for most of them, a second language); we consider this a strength. Therefore we also find a wide spectrum of different perspectives and reflections – from very personal memories and wishes for ISAGA and Dick Duke to deeply elaborated contributions related to theory, empirical studies, innovative ideas and practical examples. We have clustered the contributions into five perspectives: 1) gaming as language for dealing with complex systems in general, 2) gaming for policy, urban planning, community and organizational development, 3) gaming design challenges and developments, 4) gaming for education and learning transfer, and 5) personal stories and memories, anecdotes, speculations on the future of gaming.

This new book serves the participants of ISAGA 2014 both as a retrospective and as a thoughtful speculation about the future of gaming. All conference participants will receive a copy of this "Back to the Future of Gaming" as well as a copy of the second revised printing of the classic "Gaming: The Future's Language". Both books will be useful for coming generations of gaming colleagues. The two books will preserve some history, wisdom and the 'state of the art' of our field while creating a source of inspiration for the present and future development of our gaming discipline.

We thank the authors for their valuable contributions. We thank Bettina Schedler for her support in editing and Yléne Dona and Sabine Sowieja for reproducing figures and for the design and layout of this book.

Richard D. Duke, 2014, Ann Arbor, Michigan, USA
Willy Christian Kriz, 2014, Dornbirn, Vorarlberg, Austria

1

GAMING AS LANGUAGE FOR DEALING WITH COMPLEX SYSTEMS IN GENERAL

SOCIAL PROBLEM SOLVING: BEYOND METHOD

Jan H.G. Klabbers

Abstract

Professional gaming gathered momentum during the 1950s, particularly through the launch of functionally integrated business games. Factors influencing the development of these general management games were: experience with war gaming; mathematical theory of games; General Systems Theory; and advances in electronic computing machinery. During the 1960s and 1970s, attention was increasingly paid to the growing complexity of societal issues, and their impact on policy- and decision-making in areas such as, economic development, health care, urban planning, international relations, eco-systems (pollution), and regional development. They have in common a growing interest in social problem solving. New approaches were needed to scientifically cope with those complexities and related uncertainties and to transmit knowledge about social systems. Those involved in game science (gaming & simulation) were searching for a common language that would enhance handling the complexity of social and environmental issues. A key question of that time was: could games provide such a common language and system's perspective without falling back to scientific reductionism? Those were the circumstances that inspired Duke to write "Gaming: The future's language" (Duke, 1974). His main thesis was that gaming is most suitable to express and communicate a complex reality, which is interactive and dynamic. Although gaming is a powerful Gestalt communication mode, it offers a necessary but insufficient condition for making knowledge usable for handling complex systems. Human action is broader and richer than merely information processing about explicit knowledge. Social problem solving links three interrelated faces of knowledge: the social organization, the substantive corpus of assertions, and the range of media of representation (Barth, 2002). These faces of knowledge provide the context for problem framing, linking two heterogeneous elements together: normative elements, and situations or conditions. On the basis of these understandings a typology of policy problems is presented that enables distinguishing two types of games: type-I, low-context, rule-driven games, and type-II, high-context, free play.

Revisiting “Gaming: The future’s language’ from the perspective of today, we gather that a game is not a neutral communication medium. The primary function of gaming is not information transfer, but influencing thought and action. Advancing game science, we need to be aware that it is our joint responsibility to protect gaming becoming a box of tricks. The philosophy of game science is still thin air, and generally speaking, evaluation studies on games still produce only anecdotic evidence.

Keywords
complex systems; games; Gestalt communication; knowledge creation, dissemination & utilization; large-scale simulation models; problem framing; rhetoric; social problem solving; type-I & type-II games

1 A brief history of professional gaming

For practical purposes I will start with sketching the history of professional gaming since the introduction of war gaming, more particularly with “Das neues Kriegspiel” (The New War Game), introduced in 1798 to train the Prussian army and to perform warfare simulations. Cohen and Rhenman (1961) pointed out that it was the first game in which actual maps were used to replace the older kinds of game board such as, CHESS. They argued that since 1798 war games were extensively developed and used. They have become highly appreciated tools both for instruction and as a technique of analysis. War games introduced a new educational technology with the focus on the learner, who is put in the ‘driving seat’.

In 1956 the American Management Association (AMA) introduced the first functionally integrated business game. Those integrated management games interconnected functional management areas such as, finance, production, sales, purchase, R&D, and personnel management. Due to the enthusiastic reception by business executives and educators, the notion of management gaming became fairly widespread. The AMA Top Management Decision Simulation was the start of a whole series of general management games, developed in the 1950s and 1960s in the USA, such as, the UCLA Game, the Harvard Business School Game, the Carnegie Tech Management Game, The New York University Game, INTOP (International Operations Simulation), and The Executive Game. In Japan the Top-Management-Decision-Game, model 625-B, was developed.

In the 1960s over a hundred different business games were already in use. Factors influencing the development of these general management games were:

» Experience with war gaming – they were direct ancestors of management gaming;
» Mathematical theory of games (Von Neumann & Morgenstern, 1944);
» General Systems Theory;
» Advances in electronic computing machinery;

These first generation computer-supported games ran on main-frame computers, only processing data on punch cards. This AMA initiative launched as well the offshoot of a series of non-computer games, also called in-basket simulations, behavior simulations, and functional management games.

Without any doubt one can say that - on a conceptual, theoretical level - General Systems Theory, and the theory of games, widened the scientific horizon in dealing with complex systems at different levels of aggregation. Advances in electronic computing improved the instrumental potential of games. Gaming and simulation became a way of thinking and a methodology about social problem solving.

2 Emerging questions

2.1 Factors, influencing the development of game science

During the 1960s and 1970s, attention was increasingly paid to the growing complexity of social issues, and their impact on policy- and decision-making in areas such as, economic development, health care, urban planning, international relations, ecosystems (pollution), and regional development. Common opinion was that new approaches were needed to scientifically cope with those complexities and related uncertainties and to transmit knowledge about social systems through new approaches such as, simulation and gaming. Under the auspices of the Club of Rome computer simulation studies were conducted with the explicit purpose to enhance political and socioeconomic policy development. Large-scale simulation models enabled expressing the behavior of complex dynamic systems in tangible ways, and they allowed for performing experiments without interfering with the "real life" referent systems. In addition, linking human players (policy- and decision-makers) to such models could be used for transmitting available knowledge and for policy makers to discover new ways of understanding the characteristics of the behavior of the systems involved. During the 1970s knowledge and experience gained within separate, however adjacent fields of enquiry began to converge. Game science offered an integrating framework for various branches of science and technology. It brought forward this new science of the artificial (Simon, 1969), characterized by a growing scientific awareness about:
» Integrated steering of complex social systems (for example, companies, cities, health care organizations);
» Information feedback on actions, both tangible and intangible;

- Policy & action decisions;
- Strategy development;
- Organized complexity & emergence;
- Evolution cycles in far from equilibrium systems shaping order & chaos;
- Complex connections, which show unfamiliar, unplanned and unexpected sequences, neither visible, nor immediately comprehensible, although, in retrospect, they may not be incomprehensible. They include:
  - Multiple branching paths of events and processes;
  - Multiple feedback loops;
  - Jumps from one (non)linear sequence to another;
  - Visible interaction because of proximity;
  - Invisible interaction because of remoteness in space and time;
  - The 'environment' impinging on multiple components of the system.

Linking these separate fields of enquiry and practice into a trans-disciplinary game science was neither simple, nor straightforward. Although gaining momentum through the global spread of computer-directed games, game science is still in its infancy.

Gaming and simulation were considered new ways of dealing with complex issues as well as transmitting that knowledge to the general public. The idea was that developing simulations in connection to games could serve two purposes: first, learning to understand how systems function, and second, learning to transmit that knowledge to practitioners. Would it be possible to build games that would link the rigor of computer simulation with the flexibility and creativity of play? Gaming was also considered a catalyst in transmitting information and knowledge through enhancing interaction between people in a certain situation, to engage them in a way, which was more productive than those used by other scientific methods.

3 Knowledge creation, dissemination & utilization

3.1 Search for a common language and common knowledge

During the 1970s those involved in gaming & simulation were searching for a common language that would enhance handling the complexity of social and environmental issues. *World Dynamics* (Forrester, 1971), *Dynamics of growth in a finite world* (Meadows et al. 1974), *Mankind at the turning point* (Mesarovic & Pestel, 1974), and related Club of Rome studies exemplified those beliefs.

Those studies focused on the dissemination, assimilation, and utilization of scientific knowledge to enhance policy development. The idea was that engaging policy-makers in the running of large-scale simulation models could enhance the development and implementation of adequate policies.

Linking dispersed information and knowledge into one common framework enhances the development and sharing of a comprehensive view on the whole system. Could games provide such a common language and system's perspective without falling back to scientific reductionism? That was one of the key questions during the 1970s.

3.2 Gaming: Gestalt communication & rhetoric

Communication is a two-way process aimed at reaching mutual understanding, in which the participants not only exchange information, news, ideas, feelings and desires but also create and share meaning. In general, communication is a means of connecting people or places. A social system cannot operate without communication between the social actors. Language is one vehicle of communication. While playing games, body language and expressing feelings such as joy and frustration, play a vital part in that embodied experience. They give meaning to concepts and the way they interrelate.

In the context of this paper, viewing language as a system of communication to share ideas, feelings, and desires by means of sounds and written symbols is too limited to understand the communicative role of games. To present a working definition of language In order to be able to include the communicative role of gaming I propose the following: ***A language is a system of communication which consists of a set of media of representation (words, sounds, images such as, charts, maps, diagrams and so on) with the purpose to engage people in a process of communicating ideas, feelings, and desires.*** More precisely, games should enable people to communicate the idea of complex systems, and from an insider's position enhance both the conceptual understanding about their structure and behavior, and their meaning for the participants in order to learn navigating through the system.

Games embed implicitly or explicitly a message, a perspective, and a value judgment, or an opinion about the processes and outcomes, generated through playing the game. It is the designer who puts that message into the form of play. The rhetoric used through a game aims at persuading people to adopt the meaning of that message and to adjust their opinions and actions accordingly. Bogost (2007) pointed out that during the Middle Ages and modern times the classical concept of rhetoric was expanded beyond oratory and direct persuasion, including new modes of inscription such as, literary and artistic modes of expression.

Contemporary rhetoric favors the effective arrangement of a work, for example a game, to create a possibility space for interpretation, broadening the status of persuasion through verbal and written rhetoric with visual and procedural rhetoric. Although he focused on video games, Bogost's line of reasoning applies to games in general.

Visual rhetoric:

Bogost pointed out that rhetorics of all types assume a particular approach to effective expression. He referred to Sonja Foss, Karen Foss, and Robert Trapp who defined rhetoric "*broadly as the uniquely human ability to use symbols to communicate with one another"* (Bogost, 2007, p. 20). He referred as well to Kenneth Burke, who argued that rhetoric facilitates human action in general, expanding the domain to include non-verbal domains of expression: symbolic production in the abstract. Multiple forms of cultural expression such as, photographic and cinematic expression represent media forms of visual communication – visual rhetoric – used to influence people's attitudes, opinions, and beliefs.

As visual rhetoric is often used in (video)games, a medium that applies both still and moving images, it falls short when trying to address the rhetorical function of procedural representation, which is basic to playing games. Bogost noted: *"Image is subordinate to process"*. (Bogost, 2007, p. 25), and one would add: the game process drives the rhetoric. Email, websites, blogs, and wikis are examples of digital rhetoric, which focus on text and image content of a machine (a computer) and the communities of practice in which that content is created and used. Bogost, while referring to Gurak and Warnick, argued: *"In short, digital rhetoric tends to focus on the presentation of traditional materials – especially text and images – without accounting for the computational underpinning of that presentation"* (Bogost, 2007, p.28).

Procedural rhetoric:

By combining the concepts of procedurality and rhetoric Bogost then presented the following definition: *"Procedural rhetoric is the practice of using processes persuasively, just as verbal rhetoric is the practice of using oratory persuasively and visual rhetoric is the practice of using images persuasively. Procedural rhetoric is a general name for the practice of authoring arguments through processes. Following the classical model, procedural rhetoric entails persuasion – to change opinion or action. Following the contemporary model, procedural rhetoric is a subdomain of procedural authorship; its arguments are made not through the construction of words or images, but through the authorship of rules of behavior, the construction of dynamic models"* (Bogost, 2007, 28-29).

Thus the game designer is in charge of shaping the conditions for procedural rhetoric to emerge during play, and to include suitable visual rhetoric. Defining the rules of the game, and choosing the appropriate media of representation provide suitable conditions for visual and procedural rhetoric to occur.

With these notions on language and rhetoric in mind, let us take a closer look at Duke's inspiring view on gaming as the future language, more particularly on communication and persuasion through gaming.

4 Duke's view on gaming

Duke (1974) argued why gaming is most suitable to express and communicate a complex reality, which is interactive and dynamic. He defined gaming as a gestalt communication mode, representing a three-dimensional space, which combines a game-specific language, and an appropriate communication technology (communication channel), with the multilogue interaction pattern. Multilogue represents a multiple, simultaneous dialogue among members of a group (collective network), a dialogue that is triggered via a 'pulse' that is, a problem, an issue, or an event.

The dialogue is the basic component of the multilogue. According to Duke, a game itself could act as a Gestalt to convey an issue to a well-specified audience, and trigger a simultaneous exchange of messages between players. He defined Gestalt as follows: *A structure or configuration of physical, biological, or psychological phenomena so integrated as to constitute a functional unit with properties not derivable from its parts.* Duke stressed that human communication is much broader and richer than the successive transmission of encoded messages via text and the phone. Playful gaming can tap the full richness of human communication through the simultaneous use of face-to-face communication and various communication channels, enhancing the transmission of a Gestalt – a system's perspective – about a complicated social question. Duke's vision on gaming was new in the 1970s, and very inspiring for a large group of young researchers who engaged in this new field of enquiry and practice.

4.1 Game design – tapping and communicating system's complexity

Duke (op cit.) distinguished three phases in the development of a game: the design, the construction, and use. He started the game design process with the notion that some complex reality is out there to be discovered. The knowledge extracted represents a pre-given world. The act of perceiving – extracting – reality implies conquering various barriers: *"impediments to a clear interpretation of reality; barriers of language, knowledge, prejudice, human limitations, and so on"* (Duke, 1974, p. 203). That perceived reality - the referent system -, forms the basis for developing a conceptual map, an abstraction which is *"an explicit, thorough, unambiguous, understandable, presentation of the system or gestalt... Only upon the completion of an express statement of the conceptual map (text and graphics) should game design be initiated"* (Duke op cit., p. 76).
The generic structure of games such as, METRO, and HEXAGON, is depicted as a so-called communication network with at each node an actor – a sender and/or receiver of messages (Duke op cit., p. 41), see figure 1. Linkages between the nodes of the network make use of various communication modes and channels.

Duke noted: *"These linkages are discovered during the play of the game, and they should be emphasized during the critique process. The pursuit of the logic relevant to a given issue by a given player leads to confrontation with parallel but separate tracks initiated by other players working from different perspectives. The results of this interaction lead in serendipitous fashion to increased understanding of the total reality by each players"* (Duke op cit., p. 54).

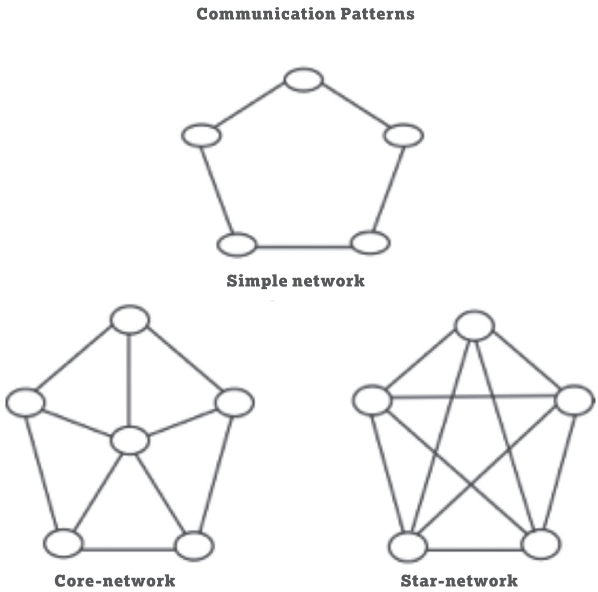

Figure 1 Illustration of communication patterns in games

Gaming has the capacity to deal with multiple positions and perspectives in a social system, at a level of understanding that is comprehensible for the participants.

Game-based learning enhances the conceptual understanding of complex systems - their structure and behavior – from the perspectives of the designer, the facilitator/ observer, and the participants. Whether that increased awareness and understanding also improves competency in handling the related referent systems, and helps transferring those capabilities to new contexts of use, is a very important question that needs to be addressed by the communities of game professionals.

An interesting question is, whether the visual and procedural rhetoric built into the game not only help building a right Gestalt of the referent system, but also persuade the players to adjust their opinions and actions.

Gaming, viewed as a powerful Gestalt communication mode, offers a necessary but insufficient condition for making knowledge usable for handling complex systems. Human action is broader and richer than merely information processing about explicit knowledge. Knowing-in-action is less easily transferable and less cumulative than expected during the 1970s. We have become aware that gaming, as a particular approach to knowing-in-action and reflection-on-action, offers an approach to social problem solving, much broader than the narrowly instrumental approach to social problem solving so predominant at the time.

5 Social problem solving: the increasing quest for usable knowledge

5.1 Views on knowledge production

All learning aims at developing expertise, broadening our scope, and improving our capabilities. Learning through knowing-in-action is a key quality of playing games. Regarding gaming and simulation different views on knowledge mingle among game scientists. They refer to rationalist, or positivist, and constructionist (constructivist) theories of knowledge.

Rationalist knowledge is explicit, articulated and can be packaged and transmitted with the use of information and communication technology. Social problem solving, based on rationalist knowledge, results from applying this view on knowledge. It is knowledge driven. Accordingly, professional activity consists of instrumental problem solving made rigorous by the application of scientific theories and methods. From a practical point of view during the 1970s and 1980s there was a growing crisis of confidence in this type of professional knowledge and consequently in this type of knowledge transfer. Schön (1983, 1987) argued that professionally designed solutions to public problems have had unanticipated consequences, sometimes worse than the problems they were designed to solve. He observed that newly invented technologies, professionally conceived and evaluated, have turned out to produce unintended side effects unacceptable to large segments of our society.

Social problem solving is the outcome of a collective decision making process among stakeholders (social actors), advancing future opportunities, while dealing with a variety of uncertainties. It is a form of *problem framing:* a process in which we interactively name the elements and attributes to which we will pay attention, and frame the contexts in which we will pay attention to them (Schön, 1983).

Gradually during the 1980s and 1990s we became aware that discussions about uncertainty seemed to rely on the naive notion that inadequate control of risks is due only to inadequate scientific knowledge. Wynne (1992) criticized this idea, and added the concept of *indeterminacy* as a category of uncertainty. Indeterminacy refers to the open-endedness (both social and scientific) of social processes. Indeterminacy acknowledges the fact that many of the intellectual commitments, which constitute our knowledge, are not fully determined by empirical observations. This implies that scientific knowledge depends not only on its degree of fit with nature, but also on its correspondence with various social constructions of reality. The related constructivist approach will invite the game designer to choose a form that enhances and facilitates problem framing.

5.2 Social problem solving

Social problem solving links three interrelated faces of knowledge: the social organization, the substantive corpus of assertions, and the range of media of representation (Barth, 2002). These faces of knowledge provide the context for problem framing, linking two heterogeneous elements together: normative elements (norms, values, beliefs, principles, ideals, goals) shaped by the social organization, and situations or conditions: empirical or experiential elements that express assertions about how people connect objects and actions to explain series of events (Hoppe & Peterse, 1993; Douglas & Wildavsky, 1983). Values, norms, beliefs, and ideas are valuations to objects, products, processes, systems, and relations, attributed by the social organization. Therefore, problems refer to tensions between what is, and what could or should be. They are social constructs. Problems and situations are shaped by the variety of ideas and frameworks, embedded in the social organization. Members of the social organization deal with multiple realities, based on their various positions and interests.

Judgment of facts and judgment on the significance of these facts for the appreciator (policy-maker) imply judgment on underlying values and norms that play a role while dealing with situations and conditions. In pluralist societies it is common practice to distinguish between consensus and dissension about values (and norms). In addition, the perception of existing and the anticipation of future situations are influenced by more or less certainty about the knowledge being or coming available to deal with them. Both viewpoints result in the following framework (see Table 1).

	Knowledge / Values	Certainty about knowledge to be, or to become available	Uncertainty about that knowledge
Type-I Games	Consensus (Competitive goals)	*Manageable knowledge problems*	*(In-) tractable knowledge problems*
Type-II Games	Dissension (Conflicting goals)	*Tricky ethical problems*	*Wicked governance problems*

Table 1 A typology of policy problems (adapted from Klabbers, 2009; Hoppe & Peterse, 1993)

For the following reasons wicked policy problems resist conventional analysis and problem solving techniques (Kalff, 1989).

» They lack a definite expression. The process of framing and reframing will never come to a conclusion.
» Phrasing the issue and framing the options to solve it are inseparable. Rephrasing leads to different options, leading to rephrasing the issue.
» They have no closure. Restructuring the socio-economic system sows the seeds for the next round of restructuring.
» They are dynamic in nature. Each strategic commitment triggers action by stakeholders such as governments, industry, etc., which renders the original problem formulation rapidly obsolete.
» Tricky problems are unique; history provides little guidance.
» Wicked problems are mold by personal and societal characteristics, loyalties and interests. This is one of the reasons why the position and interests of the political and institutional actors involved should be made clear in advance.
» With regard to wicked governance problems the lack of consensus is itself the problem. Arbitration is needed to deal with conflicting interpretations of partial consensus.

On the basis of the scheme of table 1, I propose to use two different types of games for social problem solving: type-I games, for dealing with manageable, and type-II games focusing on tricky ethical and wicked governance problems.

6 Type-I & II games for social problem solving

Table 1 depicts a typology of policy problems based on certainty about knowledge available or potentially to be acquired, and consensus or dissension about norms and values concerning the issue at stake.

Dependent on consensus or dissension about values, and the different underlying processes of policy formation, the scheme of table 1 allows making the distinction between type-I and type-II games. As games are forms of play, both types represent two distinct forms. To typify type-I and type-II games, it is worthwhile to keep in mind the interconnected components of games: *actors* (individual and groups of players, assuming roles), *rules, and resources.*

6.1 Type-I games: low-context games

The organizational structure of type-I games is well defined. The roles, that is, the typical arrangement of lines of authority, and the rules: communication rules, rights and duties are specified. The different actors manage various resources the (referent) system has available. That organizational structure determines how the roles and responsibilities are assigned, controlled, and coordinated, and how information flows between the actors. The configuration of actors, that is, the social organization of the game, is an expression of the objectives of the game, their decision-making power, and control over resources. In a decentralized structure the decision-making power is distributed, and the actors experience different degrees of interdependence.

Type-I games are rule-driven. Information about the state of the system is dispersed over the actors, who may only have distributed access to pieces of information and knowledge. Each of the actors lacks the overall system's perspective, and they need to communicate with each other, and to collaborate in order to grasp that big picture. The main goal of type-I games is to bring together dispersed information and knowledge to enhance the development of a Gestalt of the system involved. It is the major task of the game designer and facilitator to enhance the players pulling together the pieces of information and knowledge with the purpose that they jointly build an overall image about the structure and behavior of the referent system. In this respect type-I games represent the Gestalt communication mode as presented by Duke (1974). Typical type-I games, designed by Duke are METRO and The HEXAGON GAME. METRO is an urban management game. The referent system is a medium-sized U.S. Midwestern city. The game aims to mirror city operations. The actors such as, politicians, planners, land developers, and educators interact with sub-models that map socio-economic characteristics of the urban population and urban ecology, households, firms, and the urban budget (Duke, 1974, figure 20, p. 92-93).

Type-I games generally show the following characteristics:

- The course of the game session is well-defined;
- Rules drive the changing nature of processes and communication;
- Extensive charts, tables, and calculations incorporate the dynamics that model the system's resources;
- Type-I games are based on historic data and information;
- Prescriptive rules cover what the players can do;

» Descriptive rules cover what the immediate outcomes of each action will be (describing the system's behavior). They mirror the causal relationships in the system;
» The structure of the game is not questioned. It is given.

An advantage of type-I game is their internal consistency, the detail of its rule structure, and their computational rigor. The rules of the game do not permit the players to step out of the decision space provided. They can make decisions within a pre-defined range of parameters (bandwith), and are not allowed to "step out of the box". General management games – as sketched earlier – are well-known examples of type-I games. METRO, THE HEXAGON GAME, designed by Duke and colleagues, are other examples.

Social problem solving - based on type-I games - presumes a sharing of goals among the actors involved. The decision problem is to identify a solution that satisfies the shared criteria. Conditions for coordination by persuasion exist when individual goals within the social system may vary and the common goals are taken as fixed. This view on persuasion is based on the belief that at some level of communication, objectives are shared and that disagreement over sub-goals can be mediated by reference to implicit common goals, norms and values. This view is in line with Duke's idea of Gestalt communication. He stressed that gaming is the future language for dealing with complex reality, aimed at arriving at a holistic understanding of complex problems. These views express the characteristics and underlying values of type-I games. However, with respect to social problem solving through type-I games, there are risks involved. Type-I games are so-called closed games. They need to contain all relevant information and cause-effect relationships that cope with the issue. Players are put in the position: This is the problem, how will you solve it? The risk is that the issue at stake is being encapsulated, and alternative visions on and ideas about the issue are excluded. This would imply that the game addresses a so-called closed problem. Moreover, procedural rhetoric of type-I games may enhance that kind of inclusion, of considering only one view on the issue. These risks are particularly real when we are dealing with persuasive digital games.

Low-context games:

Type-I games symbolize so-called low-context games, based on low-context communications. The game structure, (communication) rules, and role descriptions are explicit and well-defined. Most information provided in the game is contained in explicit knowledge, code and rules. Focus is on well-articulated content. The broader context – the environment in which the referent system is operating - is only marginally presented in the game. The target audiences may have a wide variety of backgrounds, and shared experience upon which the communication during the game is built can change drastically from one group of players to another one, and between different contexts of use. This may create communication gaps between the players. Therefore, information and role descriptions need to be precise and detailed. The steps of play and time perceptions presume a clear pacing of interactions and procedures.

6.2 Type-II games: high context games

Type-II games mirror dissension about norms and values, and conflicting goals. They focus on handling tricky ethical and wicked governance problems. They resist conventional knowledge acquisition and assimilation techniques. The course of the process is open for twists, and outcomes are highly uncertain. The structure of type-II games is only partially defined at the start. Type-II games self-organize and evolve over time via the free play of the participants. Because of the underlying conflict about norms and values, this type of games represents and links multiple realities. Greenblat (1981) questioned the notion of a common reality underlying game design and use. Multiple realities stem from variability of (conflicting) goals, salient for different people at any given time.

Depending on one's goals and interests, different aspects of a situation or event will be experienced as relevant. Greenblat argued that any social actor has a history, and, hence, definitions of the situation are partly biographically determined, affected by the unique stock of previous experiences and recollections. Multiple realities often arise among those variously situated in the social structure with respect to the power, threats, dangers, or liabilities they are exposed or vulnerable to, as well as the opportunities and action alternatives open to them.

Type-II games deal with multiple realities. During the game the actors produce and continuously reproduce order. Type-II games are self-organizing. They address processes that:

» are unpredictable in their execution;
» are driven by uncertain and indeterminate events;
» include actions with unforeseen consequences;
» require the ad-hoc inclusion of new actors;
» tap actor's tacit knowledge that cannot be encoded in explicit rules and procedures;
» must enable players to add or adjust rules at any time.

To capture the fluidity of game play, type-II games are so-called free-form games, or free play.

The visual and procedural rhetoric of type-II games are only partially provided at the start of the game. They mainly evolve through the actions of, agreements among, and interventions by the players during the game. More than one Gestalt may emerge from the multilogue during the game. For those reasons, the debriefing of type-II games is usually more intriguing and difficult to handle than the debriefing of type-I games.

High-context games:

Type-II games symbolize so-called high-context games. In high-context games information is internalized in the players. It is embedded in their tacit knowledge, their unspoken language. Focus is on building mutual relationships. Although a scenario may be provided at the beginning of the game session, many things are left unsaid or written down. The shared tacit understanding about the issue makes that many things stay implicit, even the unspoken disagreement about interests, values and norms. Very little is in the coded, explicit part of messages, leaving much room for interpretation. The participants understand the shared silent language, the non-verbal communication to read situations. Words and word-choice are very important, since a few words and images can communicate a complex message very effectively. The participants have a good sense of tradition and history. In high-context games it is more likely that the participants ask questions rather than attempt to work out detailed solutions.

Developing and sustaining (governing) relationships evolves through mutual engagement, which at the same time are the decisive issue. During high-context game sessions multiple things are done simultaneously, and the participants take a fluid approach to time, being less focused on a rigid accounting for steps of play, and performance of tasks.

7 Gaming: the future's language from the perspective of today

Reflecting on games for enhancing social problem solving I have conceptualized the social context in which change may happen, emphasizing that it is both the purpose and outcome of ongoing social problem solving. Taking into account the importance of the human factor in changing systems, game science offers a broad and rich frame-of-reference to deal with the hybrid form of social systems, linking their physical, information, and knowledge infrastructure with webs of significance, interwoven by social arrangements and shaped by social actors. Gaming embeds the player (human actor) into these hybrid forms.

Advances in science and technology since the 1940s were the context that moved Duke to present in 1974 his ideas in "Gaming the future's language". The major challenge of professionals of that time was to develop complex models of large-scale systems, and to communicate their structure and behavior to a large audience of practitioners. Duke presented gaming as a Gestalt communication mode with as it first goal to make the social system visible to itself, by including the major stakeholders into the game architecture. That was and still is an inspiring vision.

Implicit in that view was that a game is not only a language, moreover it conveys a message, built into it by the designer. In that sense a game applies visual and procedural rhetoric to convince the audience to adopt a certain view on the referent system, on its configuration and behavior. So, a game is not a neutral communication medium. The primary function of gaming is not information transfer, but influencing thought and action.

What has stayed implicit in Duke's views is that gaming - a Gestalt communication mode - served a wider goal. METRO, THE HEXAGON GAME, and other games he designed did not aim at developing and testing theories about urban and regional management as a branch of management science. His aims did not fit into that so-called *analytical science* frame: developing and testing theories. Duke aimed at improving urban and regional planning and management practice, and by doing so facilitating change with the objective to improve malfunctioning referent systems. That, in essence, is a *design science* approach. (For a more elaborate discussion on these two distinct areas of research and practice, see Klabbers, 2009).

In the 1970s, analog games such as, board games and role-playing games used manual calculations to support their visual and procedural rhetoric. The computer was mainly used for data processing. Since the 1980s increasingly computers are used for image processing, opening a complete new virtual world to transmit information and knowledge, and to persuade the players to adopt the messages conveyed through this new medium. Those developments had a great impact on the design of digital games, their potential for including powerful visual and procedural rhetoric, and their capabilities as a Gestalt communication mode. The industrial design and widespread use of video games, especially during the last decade, helped to accept that gaming is serious business, as well as a challenging field of scientific enquiry and professional practice for a whole generation of youngsters who have grown up with social media within arm's reach. Considering the current state of game science, and viewing games as viable artifacts for social problem solving, the future that Duke envisioned in 1974 has finally arrived. With the success of gaming we should be alert. It is our joint responsibility to protect gaming becoming a box of tricks.

8 Game science: a prospect

Game science covers three levels of discourse: the philosophy of science level, the science level, and the application or practical level. During the past decades we have focused primarily on the practical level, demonstrating that game design and use have achieved a sold basis. The science level, more particularly the design and analytical sciences approaches to gaming have received less widespread attention, although the analytical branch of game science has brought forward several Nobel Price winners in economics.

For example, the study of methodological issues – related to the assessment and evaluation of games – have not yet generated a coherent framework because analytical and design science methodologies got mixed up. As a consequence, most evaluation studies are still not conclusive and do not produce consistent and reliable results. Also the intricate linkages between play and game need more attention. What sort of games trigger what sorts of playfulness?

The philosophy of science level is still thin air in gaming. The play element of culture and its impact on the development and evolution of the brain; processes of individual and organizational acting and knowing through gaming; post-normal science – indeterminacy – and social problem solving and game play, are just a few examples that game scientists should address to underpin the claims made about the value of gaming.

Type-I and -II games, sketched above, refer to different theories of knowledge, different design theories and methodologies, varying approaches to problem framing, and at the practical level, to different forms of play. They exemplify the sort of characteristics that underlie classes of games and the purposes for which they are designed and used. Both types of games require different frameworks for evaluating them. Comparing the architecture of games that address similar topics could advance game science with respect to the kind of play they evoke, and the relationships between their form and function. Games can be compared via deconstructing their architecture into basic components and the way they are linked to each other.

Generally, evaluation studies on games produce only anecdotic evidence. Common practice such as, assessing this particular game for this particular context of use, is insufficient for underpinning generic statements about games and gaming. A generic evaluation methodology, covering games as typical artifacts, is available, however it is only occasionally put into practice. Comparing different architectures of games that are based on similar design specifications would deepen our understanding of the relationship between form and function, and their impact on the playfulness of games. In addition, thoroughly testing a game for varying target audiences, and contexts of use, with the purpose to advance game theory and game science, should become standard procedure of game laboratories. Addressing these questions would imply conducting high-level game research, based on appropriate funding of game laboratories. These questions go beyond instrumental methods and techniques of game design. The philosophy of science level, and the science level should give backing to practical matters of design and use.

Overwhelmingly attention is being paid to the instrumentality of digital games, making the field primarily computer science and technology driven. Conceptualizing what play and game are all about is much more difficult to grasp. Uneasiness about proper terminology is expressed by hybrid terms such as, entertainment games vs. serious games, gaming simulation, simulation games, and recently serious entertainment games. Sorting out a coherent and consistent terminology is foremost the primary challenge ahead of us, otherwise game science is built upon quicksand. Considering the great success of video games for entertainment, there is no longer a need to propagate gaming as serious business. The real challenge we are facing nowadays is advancing game science to address serious social and societal issues. The building blocks for such an endeavor are available. Since the 1960s, increasingly they have proven their worth.

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KNOWING MORE THAN WE CAN SAY – AND USING SUCH KNOWLEDGE TO BUILD COMMUNITY AND A PROFESSION

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> *[It is] a fundamental assumption of organisational theory and practice: that a certain level of predictability and order exists in the world. This assumption, grounded in the Newtonian science that underlies scientific management, encourages simplifications that are useful in ordered circumstances. (Snowden & Boone 2007)*

Abstract

This chapter considers Duke's work on *'Gaming: the Future's Language'* in relation to the need to develop a professional role for simulation and gaming experts. It touches on reasons for the slow pace of recognition of the validity of such a goal, and notes the extensive body of knowledge – spread across many diverse disciplines – on which such a profession will be built. It uses work from the domain of Knowledge Management (itself an emergent discipline) to show how Duke's conceptualisation of gaming as a language/gestalt provides a powerful way of thinking about how to engage with each other and with the complexities of modern life.

Keywords

simulation as profession; domains of knowledge; complexity and simulation

1 Introduction

In writing "Gaming the Future's Language" Dick Duke (1974) provided a prescient voice from mid-stream in the social, educational, and technology developments of the 1970s.

The preface to this seminal book provides an overview of the context of simulation gaming in the mid-1970s, and a re-reading indicates that much has changed, but some crucial things have stayed the same. Simulation is used far more extensively and for many more purposes than Duke identified in 1974. However recognition of practitioners as members of a profession is still elusive. The greatly increased body of knowledge about simulation and gaming is not yet codified across all the existing disciplines that use it. Expert practitioners usually consider their primary 'professional' affiliation to be the discipline in which they first qualified (e.g. engineering, health, education) and for many the notion of simulation and gaming as a profession in its own right is still a novel idea. This has been a problem for some time, causing many practitioners to limit their perspective to a single domain, thus failing to comprehend the interconnectedness of all their (our) varied knowledges.

This chapter explores reasons for the current condition in which terms like simulation, games, gaming, serious games, scenario, role-play exercise (and on and on) share an essential core of commonality yet are too frequently considered as separate and even unrelated concepts. It uses Duke's framing of simulation and gaming as a gestalt form of communication to consider how a similar approach might be applied to achieving recognition of simulation gaming as a discipline and a profession. The belief underlying this task is that such recognition will assist expert practitioners understand the wider scope of their field of practice, and conversely assist participants and potential users to realise the complexity and professionalism involved in effective application of simulations and games.

The *Cynefin Domains of Knowledge,* developed within the field of Knowledge Management, provides a framework for considering both the complexity of human society and the parallel complexity of simulation and gaming. Further, the concept of Domains of Knowledge (with its emphasis on plurality) allows us to explore the interconnectedness of forms of simulation and gaming because of its focus on the contexts of knowledge and the varied modes of response required.

2 Order and Gestalt

The comment that opens this chapter notes the persistence into the 21st century of assumptions about attainable predictability and order that were first codified hundreds of years ago. However by the 1970s Duke was one of a comparatively small number of researchers focusing on understanding how unpredictability and disorder also shape and affect human behaviour. Through a series of both structured and 'backward analysis' Duke (1974, p. 174) presents the processes that led him to recognise how simulation and gaming are a gestalt means of communication, providing tools that enable development of ways to more accurately replicate the real conditions that humans normally occupy.

At the time Duke was developing his ideas about gaming as a futures language, the concept of 'games theory' was becoming widely used in economics research to explore the vicissitudes of interactive decision-making. According to Avinash Dixit (Public Broadcasting Service, 2014) -

> *Game theory studies interactive decision-making, where the outcome for each participant or "player" depends on the actions of all. If you are a player in such a game, when choosing your course of action or "strategy" you must take into account the choices of others . . . [and] recognize that they are thinking about yours, and in turn trying to take into account your thinking about their thinking, and so on.*

Such a description could apply equally well to the experiences of participants in Duke's own designs for face-to-face experiences of town planning simulations. Yet this proximity of concepts and practices seems to me to illustrate one of the most difficult and complex issues facing the field of simulation and games, then and now.

This issue can perhaps be more clearly delineated as a series of questions

» Why have so many uses of simulation and gaming evolved as apparently separate and unrelated genres?

» What makes it difficult for researchers and educators to consider games and simulation as the same tools just used differently for analysis across all spectrums of human endeavour?

» Is the comparatively esoteric analysis of economic behaviour done by John Nash, who used the 'Prisoner's Dilemma' game in his work on economic theory, so different from the practical application of the same game design which I experienced as a face to face activity focusing on trust and betrayal?

» Why do 'many serious games' practitioners still consider themselves to be in a Domain unrelated to other forms of simulation?

» Why does 'case study' research not mention its place in the simulations and games arena?

» And so many more questions about diversity that separates rather than unifies?

This separation of genres and perspectives has contributed to a large number of parallel developments, such that the range of available roles for gaming and simulation has become both greater and more visible and acceptable, and yet is still not understood as a single discipline with practitioners still inhabiting many guises.

What actions are required to bring proponents of the widely divergent applications of simulations and games close enough to see how they are all *'same, same – but different'?*

(This Phrase refers to thing/s that are functionally or substantially the same as something else, but differs in method of implementation, or in minor details). Finding a way through the morass created by this emphasis on separated orderliness will, I believe, bring us to a gestalt of simulation and gaming as a single discipline, field of study and a profession. A 'reverse parallel' example is the field of medicine whose members – while becoming ever more specialised and diverse – continue to see themselves as members of a single entity called 'medical practice'.

3 Gestalt beyond the Boundaries

My own conclusion about the continuing difficulty of achieving agreement about the nature of simulation is that the felt need for orderliness, as identified by Snowden and Boone (2007), continues to outpace recognition of the impact and consequences of the actual complexities of life. And, further, that this felt need precludes many simulation users from seeing beyond the perimeter of their own practice and discipline. While Duke identified barriers to cooperative activity across the simulation gaming spectrum, it is evident that naming them has not reduced their power, so a further barrier preventing simulation achieving discipline and professional status seems to be that very

> *… lack of gestalt communication modes and therefore the lack of an integrated or holistic perspective* (Duke, 1974, p. 23)

which he considered was impeding the ability of humanity to manage the complexity around us. After a painstaking process of identifying features of products available as games and simulations, Duke concluded that they appeared to share no single characteristic in common. Yet, he also observed that

> *… several thousand professionals did, in fact, understand the phenomenon in practice even though the theory was not coherently expressed, [he] deductively, set about determin[ing] the nature of games* (Duke, 1974, p. XVI)

so that his conclusion that they are all about communication is both obvious and startling! It is obvious once stated, since the similarity is unmistakable once pointed out, and startling because it was pointed out so long ago, and is still not fully accepted. Also startling is the fact that this generic uniformity of their nature appears to still elude many of those currently using games and simulations. Thus engineering has developed a comprehensive taxonomy for 'Modeling and Simulation' (M&S) (Ören, 2011) entirely separate from the efforts of the Society for Simulation in Healthcare (SSH) to develop its own extensive and specific taxonomy for health practitioners. Both taxonomies address the same terms and concepts and differ only at the margins, yet as long as each discipline considers it has unique and specialised applications little attention is paid to collaborating across boundaries.

To a certain extent such specialisms are unique, but the core characteristics of any form of simulation, as identified by Duke, share a commonality that transcends such boundaries. It is unfortunate that this is still only visible once we shift our focus from simulation and gaming as 'tools' to simulation and gaming as 'gestalt communication mode'. And beyond that to simulation and gaming as a professional body of knowledge that is truly cross-disciplinary in nature, whose practitioners share a body of knowledge that is more, and other, than their initial training and professional competencies. So one task ahead for the next generation of simulation gamers is to convincingly demonstrate that simulation has a depth and strength of theory and practice that extends it far beyond the limits of any one profession that uses it. There is also the problem of making discipline/profession boundaries permeable in the sense that 'professionals' will belong to more than one grouping.

While simulation and gaming practitioners – including engineers and health professionals – may comprehend the complexity within particular professional domains, and effectively use simulation to convey that complexity, we are, as yet, seldom able to extend this perspective beyond our own domain. And I do not dissociate myself from this perspective, however much I am seeking to break down the barriers to cross-disciplinary collaboration. Indeed, the more I attempt to find a way through to achieving agreement on the value of developing a discipline and a profession to incorporate all aspects of simulation and gaming (and all the associated terms) the more complex and chaordic (Hock, 2005) the task becomes. (The term 'chaordic' was coined by Dee Hock to mane the blending of 'chaos' and 'order' into a form where both can coexist and neither is reviled or avoided.)

4 Simulations, Games and Communication Theory

In many ways, the problems we face today are far more complex than those faced in the 1970s, and our knowledge and ability to access communication has also grown and expanded. The scope and variety of issues – as well as the depth of knowledge and information available – are all much richer than they were forty years ago, but much that underpins our current grasp of communication complexity, was already in place. Theories of communication had begun emerging by the 1920s alongside rapid expansion of electronic modes of communication. By 1951 Shannon's article on *Prediction and Entropy of Printed English,* was providing a clearly measurable link between cultural practices and individual capacity to recognise meaning.

But the growing ability to model and theorise communication was not necessarily making it easier for individuals to communicate when confronting the realities of communicating in context. Indeed, in most contexts, theory and practice continue to be separate entities.

It is widely acknowledged that one of Duke's (1974) particular contributions to developing our capacity to use simulations and games to manage the complexity within which we reside, lies in recognising the value of the gestalt of simulations and gaming. As he saw it then

> *... society's management of such complexity has consisted of four concurrent dimensions: false dichotomies, professional elitism, increasing dependency on technology, and gigantism (Duke, 1974, p. 23).*

And all of these are dependent on the use of 'either/or' dichotomies and those previously noted assumptions about the primacy of order and certainty as attainable and guiding principles for all situations. Duke's conclusion that combining play with learning could provide a means of working and communicating in new ways brought forward the prospect of using 'both/and' strategies that allow for the natural complexity of life. 'Both/and' strategies seek to meld opposites rather than 'resolving' them. They consider paradox as a working proposition indicating a need for new perspectives, not a cause for closing down one option or the other.

5 Gaming and Knowledge Management

Duke's conceptualisation of gaming as a language/gestalt provided researchers and educators with an entirely new way of thinking about how to engage with each other and with complexity. While existing modes of communication are not totally inadequate, they are still very much in need of development and support. Duke provided a mode that was a 'game changer' by demonstrating how simulations and games take communication beyond 'words' into the domain identified now as Knowledge Management – itself a very new discipline. Snowden (2012) lists seven key principles of Knowledge Management as follows

- Knowledge can only be volunteered it can't be conscripted
- We only know what we know when we need to know it, we are pattern based intelligences not information processors
- In the context of real need few people will refuse to share their knowledge
- Tolerated failure imprints learning better than success
- The way we know is not the way we say we know

» We always know more than we can say and we can say more than we can write down
» Everything is fragmented, humans seek messy coherence

All of these precepts are equally applicable to the theory and practice of simulation. The difference between these disciplines then, is that simulation and gaming take these principles as working propositions and uses them to develop tools and strategies for enacting one or more principles in such a way that participants are more able to manage themselves and their contexts. Knowledge Management is more focused on understanding then conceptualising and theorising their effects and impact. Both are necessary to each other, but as yet the relationships between them are tenuous. Snowden and colleagues developed The Cynefin Domains of Knowledge, (Figure 1) which has become one of the better-known conceptualisations of the complexity of knowledge, and is directed at providing a way of understanding the kind of emergent complexity that Dick Duke was bringing to our attention.

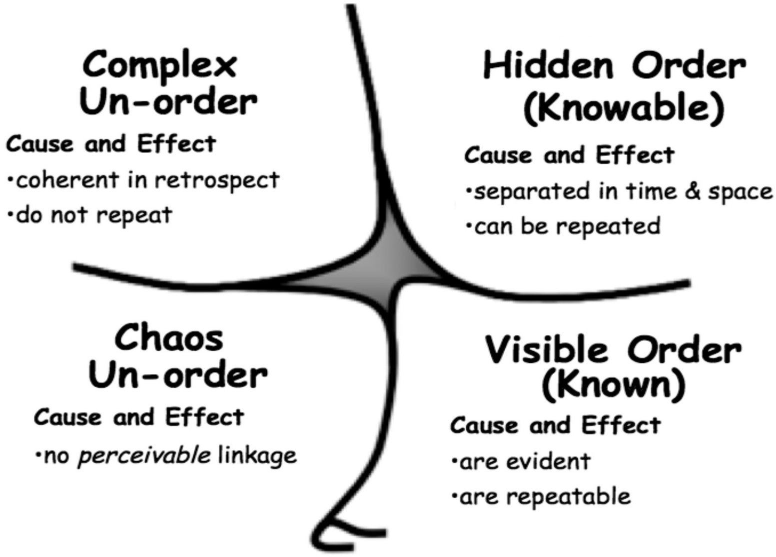

Figure 1 The Cynefin domains. The Ordered Domain is on the right, and the 'Un-ordered Domain' on the left.

The concept proposed in the Cynefin Domains of Knowledge is that we manage diversity by framing knowledge, and problems awaiting solution, as existing within one of four, enlivening and activating domains, and a fifth domain that is enervating or fear-generating and represented by the odd shaped figure at the centre of the image.

While this work was done within the context of Knowledge Management as an emergent discipline and field of practice, it provides a perfect framework for considering the shape and design of simulations of all kinds. Moreover the domains are almost tailor-made for helping users and researchers understand the nature of the choices associated with selecting simulations and simulation strategies for specific contexts and problems. The Visible Order Domain is most suited to activities of the Puzzle type, where answers are pre-set and known in advance. The Hidden Order Domain suits activities requiring subject matter expertise to achieve effective results. The Complex Un-Order Domain requires simulations and gaming designs that are open-ended and have no routinely replicable outcomes. Each enactment brings its own new solutions, and while patterns may emerge overtime, there is no guarantee that any prior solution will ever be repeated. Finally the Chaos Un-Order Domain will engage gamers in the most abstract 'playing with' of ideas since nothing can be known until after the action is over, and even design of such activities will itself be tentative and responsive to moment to moment need. Yet 'play' in this arena is what makes humans most competent to manage crisis and resilient in recovery.

In the article from which the opening quote is taken (Snowden & Boone, 2007), the authors describe their application of gaming to encourage novel thinking as follows:

> *We created a game played on a fictional planet based on the culture of a real organisation. When the executives 'landed', they were asked to address problems and opportunities facing the inhabitants . . issues they encountered were disguised but designed to mirror real situations, many of which were controversial or sensitive.*

They noted that this 'disguise' made it easier for the executives to generate fresh ideas – something that simulation professionals will find unsurprising – and added that

> *Playing a metaphorical game increases managers' willingness to experiment, allows them to resolve issues or problems more easily and creatively, and broadens the range of options in their decision-making processes. The goal of such games is to get as many perspectives as possible to promote unfettered analysis.*

This game was designed to replicate conditions in the 'Complex Un-Order Domain' where knowledge was generated through analysis of possibilities preceding action, and with general understanding that decisions cannot be based on certainties and results are only 'coherent in retrospect'. In effect they were (re)discovering that a game, such as theirs, is a way to create and share *'knowing more than we can say'* in a manner that provides sharing through 'more than words' either spoken or written.

In effect they have arrived at the same point that Duke had found in 1974, namely that the visceral 'meaning' of emotions and the complexity of intra/interpersonal communication cannot be conveyed through words alone. Their learning goals for those executives come to life in that simulation as the participants slip into engaging with the complexity instead of merely observing it.

6 Conclusions

As we celebrate and continue to develop Dick Duke's legacy by creating this new profession of simulation, we also need to extend our own capacities. In my opinion, a most important chapter in his book is the one in which Duke reveals his concept of *'backwards'* as design in action. I believe that the 21st century is becoming more able to cope with the concept of 'emergent' he was forecasting, and we will be less tied to checklists and stepped processes and more open to the state of messy coherence that simulations and games generate on the way to achieving outcomes worthy of deep analysis. While items on checklists remain vital, they will not have the primacy they once had, since we are working in a 'meta-data' age where information is relational and non-sequential and is no longer linear.

This, above all, is the lesson gained from combining the Cynefin domains of knowledge with Duke's 'future's language'. Linearity of lists and step-by-step processes, along with concepts of 'Best Practice', belong in the 'Ordered Domain' and are suitable when the context is familiar and quickly recognisable. Simulations and games can be created for this domain but the most relevant place for simulation is in the 'Unordered Domain' of Complex and Chaos problems where ideas must be [depending on needs] either tested and checked, or enacted quickly and analysed later.

Duke's (1974) legacy is that he knew, before any of us, that simulation is actually a 'language' of a kind that is beyond/outside words and sentences, which reaches into the visceral domains of knowledge where feelings, emotions and non-verbal knowledge can yet be reached and shared. A next step towards professional status for simulation is to further develop that body of knowledge about simulation and gaming to provide all those who are (or will in time) be using it for any reason. It is up to all of us to teach those encountering simulations and gaming for the first time, about their power and strengths, as well as their constraints and limitations since no profession, or tool, is suitable for all purposes at all times. We already know that simulations and gaming provide access to that emotional base of knowing that precede more formal and verbalised ways of recording 'knowing'; it is up to us and those we teach and work with, to extend that awareness ever more widely.

Combining simulations and gaming with the tools of Knowledge Management like the Cynefin Domains and its associated concepts and principles provides strength in diversity and allows the fun and playfulness of learning to reach greater heights.

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DETAILS OF COMPLEXITY

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Abstract
When picturing the future one could choose to see a completely different reality, or simply more of the same of what we are faced with today. The reality that gaming simulation has to represent is complex, and it has always been that way. That has been a fact ever since the first theories of simulations and games have been presented. What changed with time was the degree of complexity they had to work with and replicate. With this is mind, the present contribution discusses how different degrees of complexity have shaped the field of gaming simulation so far, and offers some new challenges that might reshape it still further. These challenges stem from our understanding and use of social systems and from meaningful changes in social interaction. The future, I believe, is not so different after all, except for some small, but maybe relevant, details.

Keywords
social systems, social interaction, complexity, emergence

1 Introduction

Setting out to map the future of gaming is definitely no easy endeavor. While delighted to be part of this initiative of going "back to the future of gaming" I was, at the same time, presented with the huge dilemma of where to start. The big issue for me was not what to think and talk about in relation to simulation and gaming, but *how far* into the future should I project, and *how much "different"* I should imagine. I remember when the year 2000 seemed so far away, that everything you pictured about it could have been science fiction with people living in space and surrounded by weird "all purpose" technology. 2000 happened, and it is fourteen years later, and we are still here and probably still dreaming of the "all purpose" technology. Agreed, things have changed, but not to the extent we could have envisioned.

I feel the same about the future of gaming simulation. My premise here is that, since games are social systems (Klabbers, 2009), what will shape things to come are the changes that currently reshape social interaction, both in work settings and in daily life. But these changes are, for the most part, subtle and that is how I believe they will translate to gaming simulation. Not a big *BANG!* that completely transforms the field, but small nuances that are discernible in the design specifications. This does not, in any way, reflect a gloomy attitude towards the future. Rather, it stems from the belief that the important steps have already been made. What is relevant now is not to reinvent or redefine, but to keep up to speed with the changes in our reality.

So, in looking forward, I thought I'd start with taking a step back. Hence, I will shortly provide an overview of what I believe are the relevant changes in the theory and practice of social systems and the way they have been introduced to gaming simulation. I will then discuss the new challenges that reshape social interaction in today's work settings, and lastly, consider how these translate into practice and influence the future of gaming in terms of theory and design.

2 Taking a step back

A while back work was straightforward. You had a man and a machine, and the man had to perform a certain specific action the machine would respond to, and the task was done. In the era of Taylor's scientific management it was all about being productive and recalibrating work, and the actions of workers, in ways that would increase productivity (Daft, 2013). Performance was task related and demonstrated by a reduced number of errors and a high number of good products. It was the perfect illustration of linear cause and effect relations in work settings.

Fast forward a few decades and things grew more complicated than that. Productivity was no longer the only relevant outcome. Tasks changed and not all of them could be performed by the one man and one machine. Teams became a better means of dealing with the new reality. Task performance could no longer cover organizational needs on its own. Because of the fact that people worked more closely together, the ability to help others and support the team while doing your own job became highly relevant. The concept of contextual performance was introduced to describe extra-role, proactive behaviors - as opposed to role behaviors required by job descriptions that are the domain of task performance. This enhanced organizational effectiveness by supporting its social core and contributing to the creation of a positive psychological environment (Borman & Motowildo, 1997). It was a direct result of the changes in the nature of work and the nature of social interaction at work. Interdependence is representative of this new found complexity.

Organizational theory recognized these changes by integrating concepts from the natural sciences and conceptualizing organizations and teams as open systems (Harrison & Shirom, 1999; Katz & Kahn, 1978; von Bertalanffy, 1950). This theoretical development made it possible to better understand teams as embedded systems. First of all this meant they existed within an environment with which they were connected and relied on for their functioning by using feedback to adapt to the requirements of this environment. Secondly, it emphasized the fact that we are dealing with multiple components that are interconnected and system outputs are dependent on these interconnections (Harrison & Shirom, 1999).

Fast forward to the present day and things are more complicated still. Teams are virtually everywhere and almost taken for granted as the key factor for success in modern organizations. They were initially developed to respond to the increasing complexity and constant changes of the work environment. But external complexity and variety can only be regulated and accommodated by systems who themselves are complex and have variety (Axley & McMahon, 2006; Weick, 1979). Performance at work could no longer be limited to doing your job and having contextual performance. Adaptive behavior (i.e. handling emergencies or crisis situations, handling work stress, demonstrating interpersonal adaptability) and adaptive performance became the new norm (Pulakos, Arad, Donovan & Plamondon, 2000). By the beginning of the 21st century it was evident that the linear cause and effect relations that were integrated by previous organizational theories were no longer appropriate to describe organizational and group level reality. As a result, organizations and teams were reconceptualized as complex adaptive systems (Anderson, 1999; McGrath, Arrow & Berdahl, 2000). Complexity science offers a more profound view of social interactions. Relationships between system elements are considered to be primarily non-linear. Multiple simultaneous feedback loops, that close at different levels in the system, work as *self-organizing* mechanisms. This framework recognizes *variety* and *diversity* as fundamental systems components (Axley & McMahon, 2006). The system has a state of optimum functioning (aptly called "the edge of chaos") when balancing this internal variety and flexibility with structure and stability. Functioning on *„the edge of chaos"* means „being only partially structured" (Brown & Eisenhardt, 1998, p. 11) and it allows the system to balance that which is predictable with the unpredictable in order for it to develop and change (Anderson, 1999).

These are some of the most relevant changes in our reality that organizational theory has integrated for the sake of a better understanding of the functioning of social systems. Taking note of the increasing complexity of everyday life and work settings, and ultimately social interaction, is not a new concept to the field of gaming simulation either.

3 Recognizing complexity

Dick Duke introduces his book and his theory on gaming with the following assumption: "the reader has experienced the play of a serious gaming/simulation exercise or will do so; the author does not believe the character of such an experience can be convincingly conveyed through prose" (Duke, 1974, p. xvii). In stating this he suggests complexity is inherent to gaming simulation.

Even at that time he stressed the importance of taking into consideration the growing and multiple complexities we are faced with and the fact that they will only increase with time. The 1970s and 1980s show some of the first efforts to use gaming as a means to capture complex social interaction and to use it as a research tool in systems theory (Klabbers, Hoefnagels, Truin & Van Der Hijden, 1980; Norton, 1979). By the 1990s gaming had become "an emergent discipline". This was mainly because of the advantage it slowly developed over other research and intervention tools (Duke, 1995). As a combination of methods it was best suited to illustrate the complex dynamics of the social systems it modeled and to provide a medium where different knowledge domains could be integrated (Klabbers, 1994; 1996).

Once the basis was established, gaming simulation was used to deal with or theorize about different aspects of complexity – to manage change and uncertainty (Wenzler & Chartier, 1999), to foster flexibility (Borodzicz, 2004) and of course, to enhance individual and organizational learning (Fischer & Barnabè, 2009; Spector, 2000; Tsuchiya, 2011). Designing a game from a complex system' perspective means altering the learning process as well. Learning can no longer be simply a function of knowledge acquisition. It becomes a function of social interaction (Klabbers, 2000). Through social interaction new knowledge is created, transmitted and assimilated at the same time.

In 1974, in his introduction Duke refers to "the experience (of playing the game)" and not to "the game" as being difficult to capture in writing. This is important to note because it marks a significant distinction between the *game in itself* and *the game put in use,* when played. Klabbers (2009) emphasizes this distinction by discussing the dual nature of games. They are, at the same time social systems (complex self-adapting systems) and models of social systems. When building a simulation game one strives for accurately modeling a certain social system of interest. When the game is built it is in essence a model. However, once the game is played it changes and takes a life of its own and a new social system emerges.

Klabbers goes as far as to use complexity theory as an integrative framework and presents a theory of games as complex self-adaptive systems and then presents design specifications for it (Klabbers, 2009).

Going back to my initial argument, the important steps into securing a future for gaming simulation have already been made: changes into the nature of social systems and social interaction have not gone by unnoticed; theories of gaming simulation have also recognized this ever increasing complexity; there has been consistent effort to adapt game design and usage so that it incorporates the dynamic nature of social systems. Therefore I do not expect the near future to bring about any changes that could shake and affect gaming simulation to its core. At the same time, I do not expect social systems and social interactions to stop from growing even more complicated any day soon either. What I do, however, look forward to is to see how the newest challenges that organizational theory – and more specificaly group and team theory – currently faces will be included into the theory and practice of gaming simulation. In the following section I shortly present what these challenges are, and then procede to hypothesise how they will potentially influence gaming components and processes.

4 New challenges: the devil in the details

Teams have been conceptualized as complex adaptive systems for over a decade now, so their dynamic nature is widely recognized. The literature provided, over time, a series of definitions of teams that, while having individual particularities, also had some underlying common characteristics. Consider, for example, one of the better known definitions: teams are "collectives who exist to perform organizationally relevant tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity'' (Kozlowski & Bell, 2003, p. 334).

Analyzing this definition, as well as other similar ones, we can easily identify some clear boundaries within which team characteristics are contained. These limitations, however, seem to have been set in place by some reasoning derived from past experiences with teams and not by a thorough analysis of current practice in the "real world". And here is why. Common understanding of team characteristics includes: a mostly fixed team membership (or mostly stable over time), clearly defined roles, relatively consistent tasks and a high degree of dependence on the larger social system within which the team is embedded. The larger system is the one that imposes these limitations and the teams' responsibility is to keep them in place.

Now, try and picture an emergency hospital dealing with a sudden and large number of casualties. In situations like these, every available surgeon, resident, scrub nurse and anesthesiologist is called in to deal with the crisis. Depending on specific medical intervention needs at that time, the personnel on call *can* and *will* team up with anyone among their colleagues. It might be someone they already know well and have previously worked with, but just as well it might be someone they have never even seen before. However, no matter what the team looks like in the end, they need to be almost instantly efficient, coordinated and make no mistakes. And if this doesn't seem complicated enough, at some point during the medical intervention one member of the team might finish his/ her job and join a different ad hoc team that needs the particular expertise they have to offer. If that is the case and, for example the chief surgeon leaves for another intervention, residents or other surgeons need to pick up where he left off and finish the job. And still they need to be efficient, coordinated and make no mistakes.

There are a few things that become clear when using this example. First, team membership is not always fixed or stable in time. Team composition in this case may be an outcome of multiple variables like human resources availability, or difficulty of the medical procedure needed to be done. Second, once they are part of a team that deals with an emergency, everybody does what needs to be done even when actions sometimes go beyond official tasks or roles. Therefore, the needs of the team overcome personal preferences or habitual actions - but of course still within personal expertise limits. Third, at the time of such an event there is no "higher power" that organizes the activity. While there is an official emergency hospital team structure and composition, people on call self-organize based on input from triage. Asking for help, determining whose expertise is needed where, it all happens on site, not in an office far away. This means leadership is not an attribute of one particular person but it is distributed based on situation specific needs.

Tannenbaum, Mathieu, Salas, and Cohen (2012) argue that these are some of the issues that team science currently has to deal with and that, while teams are constantly changing, research and practice have not entirely caught up with these changes. They identify three significant themes for team functioning: dynamic composition, technology and distance, and empowerment and delayering. In the example above I have showed how some of these changes (i.e. dynamic composition, empowerment and delayering) affect team functioning and alter core team characteristics. Even if the situation described is mostly relevant for emergency and crisis intervention teams and incident management teams, Tannenbaum and his colleagues (2012) argue that such flexibility will eventually describe teams in any field of activity.

A new kind of team emerges – the team with fluid membership (Bedwell, Ramsay & Salas, 2012; Bushe & Chu, 2011). It is still a complex adaptive system, and therefore functions as one, except is has some little detail that makes it different.

Fluid membership cannot be overlooked, and it complicates things for researchers and practitioners alike. Empowerment and delayering have a similar function. Dynamic composition and empowerment are simply two examples of the *degree* of complexity current reality has to deal with.

Although they are merely details in the larger frame of team science, they will have to be integrated in any initiative to model social interaction in the future. The relationship between the two knowledge domains – gaming simulation and team science – is in fact mutually beneficial. As social systems themselves, gaming simulations will at some point have to incorporate such new quirks that reshape social interaction. At the same time, teams, and social systems in general, need gaming simulation for research and intervention purposes since it can provide a replica of reality and incorporate much of the natural complexity within the system (Bedwell et al., 2012; Bushe & Chu, 2011; Salas & Wildman, 2009).

The question that remains is to what extent these details will affect the theory and practice of gaming simulation. Considering the much larger framework of complex self-adaptive systems has already been applied for both team science and simulation gaming, I don't believe there will be any significant theoretical developments for the latter. These details will, however, most probably translate into practice by influencing game components - content, structure and process (Duke & Geurts, 2004). Here are just a few examples, top of mind, of what we should look for.

As the complexity of the environment increases, the tasks become different and therefore new competencies are required. In fact, sometimes tasks are almost entirely dissipated and their previous function is taken on by roles in the emergent team. Unlike tasks, which are essentially pieces of work assigned to an individual, roles are part of a dynamic social system and are associated with personal responsibility (Daft, 2013). Hence, training needs change accordingly. They will be less oriented towards task completion and more oriented towards rapidly adapting ones behavior in such a way that it can effectively fullfill a certain role even across several teams in short time spans. Open form games and frame games that leave enough room for emergent rules, complex interractions and multiple feedback loops, as well as changes in role/ participant composition will probably present the optimum medium for observing these new details. To contrabalance this chaotic image brought by self-organization and non-linear interaction, debriefing and evaluation should be rigurous to a fault or the game could overlook its purpose. Since these systems are self-governing, debriefing should also be at least partly integrated in their interaction processes and self-organization. But this just as long as we keep in mind the previous warning and build in rules that will stop it from becoming something else entirely.

The biggest challenge I forsee here is to balance that „edge of chaos" within the game design. Make sure that participants have enough freedom with their interaction that they are able to self-organize, but at the same time introduce some hard rules that stop the game from collapsing if self-organization becomes too chaotic. Maybe a sound theory-oriented design and evaluation process could make that happen.

5 Concluding remarks

A few years ago, de Caluwé, Hofstede, and Peters (2008) set out to find what they called „the active substance of gaming", or the element that drives simulation games to actually work. The answer to their question came in many different forms. Mayer (2008) discussed this issue from a complexity point of view and identified ***emergence*** as the active substance. If there is one thing that allows simulation games to continuously reflect different degrees of complexity from the real world than I believe its emergent nature would be it. Emergence and system dynamics are intricately related and build on each other. Together they confer gaming simulation with the wonderful ability to accurately reflect social interaction and its complexity. It is this ability of games that I believe makes them work.

Consequently, in order to "keep working", simulations and games will have to keep up with all of these changes, in terms of content, theory development and design process, and may even have to anticipate further evolution. So, it is possible the future of gaming simulation might not look all too different from its present. We are already aware of the complexity we need to recognize and incorporate into the theory, and need to instill into the design. Maybe the difference (and the devil) is in the details.

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THE TITLE ITSELF

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1 Introduction

Imre Salusinszky (1987) begins the introduction to his book entitled *Criticism in Society,* that contains transcripts of interviews with six prominent literary critics, with the sentence, “Literary criticism, if it is a discipline, is surely that discipline which has been most exclusively concerned with the question of its own function.” In each interview he asks the interviewee to comment on the poem that Wallace Stevens wrote and entitled “Not Ideas about the Thing but the Thing Itself.”

I am going to substitute “gaming” for “literary criticism” in Salusinszky’s (1987) initial sentence and begin with, “Gaming, if it is a discipline, is surely that discipline which has been most exclusively concerned with the question of its own function.” The poem that triggers the six interviews recorded in *Criticism in Society* (Salusinsky, 1987) asks the interviewee to consider the “thing itself,” as contrasted to “ideas about the thing.” I have been so enamored by the clever, elegant and provocative title of Richard Duke’s book, Gaming: *The Future’s Language* (1974) ever since I saw it, that I want to limit my comments to the “thing itself,” where the “thing” is the *title*, not the author’s ideas about the title contained in the book. Limiting myself in this way allows me to probe the issues involved in the title in ways that reflect the importance of the topics suggested by the “title itself.”

2 The Question Involved in the Title

Oddly enough the seemingly most unimportant word in the title, “the,” is part of an important question. Does the definite article “the” refer to just *language concerning the future* or does it refer to *all language in the future*? The possessive form of the word “future’s” is ambiguous. Thus the construction “the future’s language” can mean either one. The former interpretation is more modest even if the definite article is used instead of the indefinite article, “a.” But when one seriously considers the latter interpretation it may indeed be a reasonable one.

Language by its very nature is not limited to references to the past or present: language has a future tense. If gaming spreads, as it has indeed spread and more and more gaming infiltrates the mind of almost everyone, an argument can be made that in the future, gaming may have a critical effect on the way people experience life and think about life, thus affecting language in general. I want to give this interpretation serious thought.

3 Language *Is* a Game

Several decades before the publication of *Gaming: The Future's Language* (1974), Ludwig Wittgenstein (1958) was using the term *language-game* instead of the one word, language. As reported in Malcolm Norman's *Ludwig Wittgenstein: A Memoir,* when Wittgenstein happened by "a field where there was a football game in progress the thought struck him that in language we play *game* with *words.* A central idea of his philosophy, the notion of a 'language-game', apparently had its genesis in this incident." (1958, p. 65) I won't be the first person to say that I have probably not understood Wittgenstein's thoughts accurately, but the idea of an intimate relationship between language and games is abundantly clear in his later years.

Wittgenstein (1958) evidently rejected his picture-theory of language that he had developed in his *Tractatus Logico-Philosophicus* in favor of what might be called a game-theory of language. In the "Biographical Sketch" by Georg Henrik von Wright, included in Norman's memoir, we learn the following:

» Wittgenstein told me how the idea of language as a *picture* of reality occurred to him. He was in a trench on the East front, reading a magazine in which there was a schematic picture depicting the possible sequence of events in an automobile accident. The picture there served as a proposition; that is, as a description of a possible state of affairs. It had this function owing to a correspondence between the parts of the picture and things in reality. It now occurred to Wittgenstein that one might reverse the analogy and say that a *proposition* serves as a *picture*, by virtue of a similar correspondence between *its* parts and the world. The way in which the parts of the proposition are combined – the *structure* of the proposition – depicts a possible combination of elements in reality, a possible state of affairs. (Malcolm, 1958, pp. 7-8)

Since Wittgenstein reversed the analogy between a picture and a proposition to get to a picture-theory of language, in order to get to a game-theory of language, why not assume that he reversed the analogy between a game and a proposition? By virtue of a similar correspondence between *a game's* parts and the world, the structure of the proposition (that is, a sentence in a language) would correspond to parts of a game, depicting a possible combination of elements in reality, a possible state of affairs.

Evidently Wittgenstein (1958) was troubled by the thought that there was no identifying characteristic in all the varying activities called games. There is "a complicated network of similarities overlapping and crisscrossing: sometimes overall similarities, sometimes similarities in detail. … I can think of no better expression to characterize these similarities than 'family resemblances'; …" (p. 32)

4 Bernard Suits' Definition of a Game

Bernard Suits (1978) thought Wittgenstein was wrong to conclude that there was no distinctive element that served to separate things called games from other activities. He spells out at great length in his book, *The Grasshopper: Games, Life, and Utopia,* his rationale for calling an activity a game. Boiled down, it amounts to this, "playing a game is a voluntary attempt to overcome unnecessary obstacles" (p. 41). I like this definition because it encompasses a wide variety of activities commonly referred to as games. Furthermore, it *adds* a constraint to an activity rather than *removing* a constraint because the additive constraint restricts people from doing what they otherwise might do.

For example, the constraint added in the game Americans call soccer is that no players except goaltenders may touch the ball with their hands. It is natural to make use of your hands and extremely inefficient not to use them. In the game of checkers the players are not allowed to move their pieces in any direction but forward until earning the right to do so. The available space and time in games are limited by regulations. The goal or point of a game is specified, even if it is hard to judge when a player deviates from the required pattern of behavior. For example, such deviations might occur when young children play the game of "school," when players limit themselves to behaving as they should when required to play a specified role or when they are to behave as some particular person would behave. In every game there is some restriction that doesn't limit the players outside the game. When the game ends, the players simply remove the added constraint and behave "normally."

In informal games, the added restrictions are policed by the players themselves. An informal game of basketball played on a playground is likely to get rougher and rougher, perhaps even ending in a fight, when players deviate from the game's restrictions and retaliation gradually sets in. In more formal games, referees or umpires are provided to interpret and enforce the game's rules. In many cases, elaborate appeal mechanisms are developed.

Much as I agree with Suits (1978) that "playing a game is a voluntary attempt to overcome unnecessary obstacles," I think there is another factor to consider.

There is something else going on in an activity that is worthy of the name *game*. Not all games are fair, but *fairness* is an attribute of a "good" game. It even could be said that if a game is less than fair, it is less a game. In a sense a game *should* be fair. I would even go so far as to say that the fairest *play of a game* is one that ends in a tie or "draw."

The tension between a game ending with a winner with complex rules for how to prevent a tie and an equally complex set of rules for how to score a game that ends in a tie is testimony to the importance of fairness. And, fairness is the focus of complex handicapping, "odds" or "point spreads" procedures to adjust for perceived inequalities when games enter the "real world" of establishing reputational or financial payoffs. A game's rules are supposed to inhibit favoritism at the start and render the outcome equally available to all players' choices, however subjective. Any advantage has to be earned by players through their conduct during the game, although the assumption is that some players might have an advantage over others due to factors that those people have when they enter the game. Indeed a good simulation game might require some players to enter the game at a distinct disadvantage to other players to reflect the designers' perception of the "real world." To argue that *dominance* in a system is an important element to be disclosed by, say, the application of mathematical game theory, in a sense proves my point. For dominance is departure from fairness. Put simply, if a so-called game is such that a person knows the secret to always winning, I submit that a better name for the activity is a *puzzle*. A game, as I have argued on many occasions is a *mystery*: it should not be dependent on a *secret*.

5 Mathematical Game Theory

John Von Neumann (von Neumann & Morgenstern, 1944), considered by many as the father of mathematical game theory, has defined games this way. Games have two kinds of rules, move rules and termination rules, and must have two or more players. A move rule specifies when a player can or must make a choice, whether or not the choice involves chance, and how much information is available when a choice is to be made. A termination rule specifies when the game begins, when it ends, and how much the winner wins by. If the game does not involve at least two players, it's not a *bona fide* game. If it has only one player, it is a solitaire game; and if it has no players, like Conway's *Game of Life*, it is a zero-player game.

Game theory approaches decision making scientifically and logically. Like any analysis of games, uncertainty, conflict and cooperation are central concerns. Optimum strategies and the presence of dominance are frequently the targets of study.
Game theory is assumed to have relevance to, for example, economics, politics, biology, psychology and computer science.

6 The Word Gaming

Gaming is a gerund, a verb used as a noun. Since the verb *game* means roughly "to gamble" or even "to cheat," gaming means gambling or even cheating. I hasten to add that "cheating" may be interpreted as more artificial or "less than real," rather than implying an illegal activity. Games do have, to many people, an aura of being artificial or "less than real," as in the oft-heard request to "stop playing games." But in policy or academic circles, *gaming* does not necessarily have these negative connotations, especially with the advent of mathematical game theory. Gaming implies the use of and/or the study of incidents or "plays" of rule-governed systems.

But the first time I use the word *play* in this article, I want to call attention to the fact the word also means a dramatic portrayal of a script, as in a Shakespearean play. There is also an important distinction that is crucial to note between a *play of a game* and a *game*. You never can *see* a game. You can see or hear a description of a game, including especially the rules of a game. You can only see, and be involved in as a player, a *play* of a game. But as two fans rooting for rival teams know, the odds are high that two people never witness the exact same play of any game even when there is only one play. There is also an infantile, juvenile, animalistic, luxurious, less than real, less than important, slightly loose or wobbly connotation to the word play.

Gaming may also be a broader term than game on grounds that it includes game-like exercises. Game-like exercises might just "feel like" games because they borrow parts of familiar games but do not define what it means to win and/or allow players to define their own move rules.

7 Different Kinds of Rules

In his 1962 book, *Models and Metaphors*, Max Black analyzed several kinds of rules. Regulations are rules made by humans. Because they can be made, they can also be unmade or repealed. Regulations are of two kinds, restrictive and constitutive. Restrictive regulations restrict what is otherwise possible. Constitutive regulations make something possible that is otherwise impossible. Speed limits are restrictive regulations. They don't make it possible to drive at very high speeds. Chess rules are constitutive regulations. Without them you can't play chess.

Instructions are guidelines. They only need to be followed "as a rule," meaning, curiously, *most of the time*. An example of a constitutive regulation from the game of bridge is, "You must play a card of the suit that is led, if you have that kind of card in your hand."

Otherwise the game will stop. An instruction is, for example, the advice to play the, "third hand high," meaning if you are the third player to play a card in a trick, play the higher card that will win the trick even if you have a lower card that will win. That strategy is designed to prevent your rivals from winning a "cheap trick" by playing a lower card than is necessary to win the trick, thus saving the higher card. It won't stop the game if you don't follow the rule, but if you don't follow it, you might be in trouble with your partner.

Scientific principles are not made by humans, although humans can know more or less about them. Since they aren't made by humans, humans can't repeal them. Humans cannot repeal the law of gravity, though they can escape its familiar effects by escaping from its effects on our planet.

Then there are moral principles, rules that are generalizations distinguishing between what is morally right and morally wrong. They are the most controversial kind of rules since people argue whether they are more like regulations, instructions or scientific principles or even whether they exist at all.

Clearly, Max Black (1962) makes distinctions crucial in any discussion that is dependent on rules and rule-like constraints. Rules come in two forms, written and unwritten. Even extremely important constitutive regulations, sets of rules called constitutions, do not have to be written. The United States has a written constitution, and many American school students are examined to see if they know what is meant by the unwritten Constitution of U.S. The United Kingdom of Great Britain and Northern Ireland does not have a single document that serves as its constitution.

8 Is Language Found or Made

What kind of rules are the rules of grammar? What kind of rules determine the meaning of words?

Richard Rorty's first sentence in Chapter 1, entitled "The Contingency of Language," in his 1989 book, ***Contingency, irony, and solidarity***, asserts that "About two hundred years ago, the idea that truth was made not found began to take hold of the imagination of Europe." (p. 3). Rorty goes on to say explicitly, relative to language:

> *But if we could ever become reconciled to the idea that most of reality is indifferent to our descriptions of it, and that the human self is created by the use of a vocabulary rather than being adequately or inadequately expressed in a vocabulary, then we should at last have assimilated what was true in the Romantic idea that truth is made rather than found. What is true about this claim is just that languages are made rather than found, and that truth is the property of linguistic elements, of sentences. (Underlining added; Italics in the original; Rorty, 1989, p. 7)*

When a little girl first learns to speak her "mother tongue," it is difficult to specify whether she *finds* the right word or she *invents* the right word. She finds it in the sense that it was there to be found; but she invents it in the sense that after a number of experiments, she invents a word that satisfies her. But after a while the rules that other humans have invented are relevant, both the rules of grammar and the rules that apply to what words mean, as in a dictionary. These rules are what Black calls *constitutive regulations*. Humans made them, and such regulations make communication by language possible. But humans come in many clusters. Not all children consider the rules that are taught in school as important or effective as the rules that are ascribed to by family or friends.

The relationship between words is especially interesting; moreover, endless variations can be invented. Furthermore, rules of grammar can be used to create endless numbers of combinations of words into stories.

9 Fiction and Non-fiction

I've long been mystified by the fact that no label seems to have been established to replace the term "non-fiction" to distinguish books that purport to contain facts as contrasted to fiction. Games may be thought to lack "reality," but fiction, in my youth, lacked "reality" too. Fiction was created entirely by language, by words. One of the important aphorisms of my childhood was "sticks and stones may break my bones, but words can never harm me." When I started reading books like *How to Read and Why* by the premier literary critic, Harold Bloom (1986), I soon got over my naïve impression of the distinction between fact and fiction.

For several reasons I want to single out Iris Murdoch (Bloom, 1986) in order to describe my present attitude towards of fiction. Murdoch is known to have written both philosophical books and novels. She certainly seems to have lived an extraordinarily unorthodox, complex and rich life. Her philosophical work resulted in books with titles like Sartre: *Romantic Rationalist and The Sovereignty of Good*. She also published twenty-six books of fiction. Harold Bloom, in his 1986 introduction to a collection of essays about Murdoch which he edited for a series of books called *Modern Critical Views*, wrote, "Her formidable combination of intellectual drive and storytelling exuberance may never fuse into a great novel but she has earned now the tribute that she made to John Paul Sartre more than thirty years ago. She too has the style of the age." (Bloom, 1986, p 7.)

Relative to Murdoch's first novel, *Under the Net*, Peter Conradi, her biographer, says that "the title alludes to Wittgenstein's *Tractatus*, 6, 341, the net of discourse behind which the world's particulars hide, which can separate us from our world, yet simultaneously connect us." (Conradi, 2001, p. 384)

Murdoch relies on storytelling to paint pictures of the dilemmas involved in power and love, evil and good, and other extremely durable and important concepts. She crafts characters from people whom she actually knew, intimately or casually, but claims to never have had a single character in one of her novels drawn fully from one person. They all were imaginary as contrasted to real. Her biographer summarized, "Life, Iris (like Dostoevsky) believed, is so fantastic that we mix in a little fiction to render it plausible." (Conradi, 2001, p. 503) But also, "She described the novel as a good textbook to learn history from,…" (Conradi, 2001, p. 461) Non-fiction may be devoted to "real" episodes, and fiction may be devoted to "less than real" episodes; but I've long since gotten over my upbringing that taught me stories were lies. Non-fiction just sets a limit on the kinds of stories being told.

10 The Difference between Fiction and Gaming

In Salusinsky's (1987) *Criticism in Society* with which I began this article, the epigram that Salusinsky chose to introduce readers to his chapter on Harold Bloom was, "There are no texts. There are only ourselves." (p. 45). Language mediates the space between an individual author and an individual reader. The author of fiction has many individuals, perhaps known and unknown, who have influenced her or his writing. So too does the reader of fiction have many individuals, perhaps known and unknown, who have influenced his or her reading. There is always the possibility of a reader "misreading" a novel. Literary critics even call a "strong misreading," a positive, creative reaction.

But the act of writing and reading a text is always a solitary event mediated by language. With the exception of solitaire games, games inevitably involve interactions with other people. No reader may have exactly the same reaction to the author's words; and subsequently, he or she may be influenced by other readers who have read the same text. However, that is not the case with a game. In what Von Neumann calls a *bona fide* game, one person *must interact* within the course of the game with at least one more person. This interaction with other players is also in addition to the players' interaction with the author of the game rules and those who interpret and enforce the game rules. That, I submit, is an all-important difference between reading a work of fiction and playing a game. Both fiction and gaming step back from everyday life to offer perspective on everyday life.

11 The Importance of Metaphors

Stephen Jay Gould (1996), a professor of zoology, a professor of geology at Harvard and a baseball enthusiast, opens *Full House*:

The Spread of Excellence from Plato to Darwin, in a chapter entitled "Huxley's Chessboard," with these words:

» We reveal ourselves in the metaphors we choose for depicting the cosmos in miniature. Shakespeare, unsurprisingly, saw the world as a "stage, and all the men and women merely players." (p. 7).

George Lakoff (2008), a cognitive scientist and linguist at UC-Berkley, asserts that there is a very large "percentage of thinking your brain does that you're not aware of." (p. 3). He goes on to say:

» Language has a moral force; it can bring out the best in people and the worst. Memories are never just "stored"; they are always created anew. Language does not just evoke memories; it can change them and shape them, and thereby change history – the story of the past (p. 331).

Language can also change a person's perception of the present and the future as the role of *conceptual* metaphors illustrates. Metaphors were once primarily discussed in school in English classes. Largely because advances in technology have made the study of the inner workings of the brain possible, the adjective "conceptual" has been added to the word "metaphor." A conceptual metaphor is a *"grounded, inference-preserving, cross-domain mapping,"* as defined by Lakoff and Nunez (2000) in *Where Mathematics Comes From* (p. 6). My argument is that a cogent example of what *grounded* means is what people experience when they play, watch or even think about games. Games are intrinsically about success, failure, strategies, excitement, uncertainty and mystery. The impact of specific judgments about what is fair or foul, safe or out, details about what is allowed or penalized, call attention to the importance of the need to interpret and enforce rules fairly. What's more, the fairer the game, the better the game.

Conceptual metaphors *preserve inferences* from games to non-game *domains* in a *map-like* way. According to cognitive scientists, this is a basic way that language works, *quite unconsciously*. It is the unconscious aspect of conceptual metaphors that makes the more flamboyant, albeit immodest interpretation of the title *Gaming: The Future's Language* plausible. That is, the spread of gaming in our culture inevitably, unconsciously, influences our language in highly important ways.

12 Under the Net

The idea of concluding the task of exploring the provocative reach of Richard Duke's (1974) wonderful title was actually suggested by one of the elements of the title *Gaming: The Future's Language*, i.e., the colon.

A colon in the title of a book is normally used to separate the main title from a subtitle. I don't believe that is the case here. I think it is part of the main title.

A colon also has another use, separate from meaning simply "is." It can mean "is to" in an analogy.

For example, *hand : glove* as *foot: shoe*

Means *hand* is to *glove* as *foot* is to *shoe*

I want readers to embark on a quest to complete an analogy. An analogy involves memory, attention, classification, decision and perhaps metaphorical thinking, all basic functions of the mind. And remember, according to many cognitive scientists, the brain mixes most of these factors *unconsciously*. One of Wittgenstein's (1958) observations that I most like is, "The work of the philosopher consists in assembling reminders for a particular purpose." (p. 50). So every analogy is a little exercise in philosophy.

One of the reasons that I selected Iris Murdoch to describe the differences between fiction and non-fiction is that she chose to name the first of her many novels, *Under the Net* (Murdoch, 1954). I already quoted her biographer as describing the net as "the net of discourse behind which the world's particulars hide, which can separate us from our world, yet simultaneously connect us." I want to describe the net as a simple analogy that invites the reader to play with the words:

Gaming : Language

What : What

?

My candidate to start the process off is:

Playful rivalry : Communication

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BETWEEN NO-PLACE AND NO-TIME

Paola Rizzi

Repräsentation der Ewigkeit in jedem Augenblick – Uchronie vor Utopie.

Abstract
The aim of this article is to emphasise some aspects of gaming simulation in the specific context of urban planning. Designing, planning, and managing a city refers to time, space, and people who must communicate. This prompts some reflections regarding the alternative times and places a gaming simulation creates. These are confronted with linguistic analysis of language as well as meta-language of the game itself.

Keywords
utopia, uchronia, future, time, space, meta-language, design

Gaming simulation has had its ups and downs in relation to various disciplines. It has gained greater importance in economics, linguistics, and humanities, while struggling in the social sciences. Its spread and use as an educational tool have consolidated over time as can be especially witnessed in the field of environmental education. The target audience of gaming simulation extends from schools of all levels to teaching and training in the areas where it has been considered a useful tool from the start, in business schools to management activities, but also in the more difficult areas, such as urban planning, where actually we are now witnessing its revival.

In the last 50 years, gaming simulations encountered varied fortunes: the years of glory in the 60's and 70's, the decline in the late 80's and at the beginning of the 90's, and the triumphal return in this millennium. And these rebirths have many names: simulation and game, played simulation, gaming simulation, not to mention many linguistic nuances. The one that seems the most appropriate is ***gaming simulation, defined as a*** gestalt (form, scheme and representation) where a significant model of reality (simulation) is working (on the basis of rules) due to participants' decisions (players/roles). It is an elaborated version of the definition by Duke (1974) that attributes to gaming simulation the function of a continuously updated physical, symbolic, conceptual, etc., map. This map becomes the only instrument capable of bridging the idea of the present with one of possible futures.

This is why already over half a century ago, both theory and practice have acknowledged the role of this hybrid technique (gaming simulation) in the processes of "designing" the future.

To put it simply, urban planning is an attempt to do something for the *future* on the basis of the *past* (data) in the fleeting *present*. If we take a look at contemporary urban design the concept of sustainability and participation is evident at a single glance. Being so, urban planning is all about communication – a design process from abstraction to reality through a fleeting and constantly changing *language*.

At the moment the word game is used indiscriminately. Example abound in the territorial and urban practices, where we find diversified and often ambiguous meanings of the term. On the linguistic level there is confusion. There are discrepancies between the terms as well as superposition of definitions related to gaming simulation among which are: language, slang, jargon, meta-language [1], medium, tool, mode, technique, science and knowledge.

Among recent terms used to describe gaming simulation there is the one *"serious games"*. However, provided "serious" relates to an activity which has a define goal, which is documented and controlled and its results are applicable and/or have a certain "value", gaming simulation is serious by definition. "Serious" in this case becomes redundant as it simply substitutes the word "simulation" yet without substituting its meaning.

The playfulness of gaming simulation gave birth to another term that became popular this decade: *gamification*. It was introduced in order to make learning processes more attractive, to ease social as well as decision-making processes. However, if applied automatically without any deeper reflection, it may fall into frivolous use the only purpose of which will be the one of manipulating the behaviour of groups and individuals.

The word game has two souls: an emotional/natural and a rational one. The first one is characterised by vagueness and uselessness of the playful activity whose only purpose, as far as the awareness of the player is concerned, is the pleasure derived from it. The second one is understood as the organisation of that activity, which is derived from the system of rules which define its goal: success or failure, winning or losing, in any case some kind of result. By joining the two concepts we arrive at an activity that is partly organic and partly structured, organised with a purpose of achieving some goal.

What comes out of this ambiguity is the concept of *gestalt*, meaning unity formed by a joined phenomena where one depends on all the other ones and cannot exist without the relation to and because of the relation with the other ones.
In this hybrid nature the game and the simulation are joined in and by two dimensions: space and time. Through the gaming simulation we can face the processes of *designing* time and space. And to do so, we built utopias and uchronias.

To play means to enter the ("artificial world") where the rules have already been established. On the other hand, the players can interpret those rules and modify the scenario. Though they are based on models that simulate reality, gaming simulations detach from reality as much as the ideal constructions by Plato, Moore, or Bacon.

The word utopia comes from the Greek οὐ (not) and τόπος (place) and means "no place". In English it has a double meaning because of the identical pronunciation of utopia and eutopia (εὖ – good or well and τόπος – place, means "good place"). The word uchronia was coined in 1876 by Charles Renouvier by replacing τόπος with χρόνος (time). Some gaming simulations, just to mention VaDDi, are both utopias and uchronias. Sometimes however, as far as gaming simulation is concerned, the term utopia shall not always be understood as a simple geographical in-existence, but as an alternative (future?) reality. New WAVE for instance, can be considered an utopia not due to the lack of geographical coordinates, since the city of Venice it relates to is real, but due to its creation of an alternate, non-existing, potentially ideal city.

At the same time, gaming simulation creates a temporal void, a sort of dilatation combined with acceleration of time. In this artificial world where the everyday continuity of time and space is split, the fleetingness of time is accelerated. This allows a perceptive construct of the possible future. This is because memory is an imaginative means if not a tool rather than an archive of a lived past, as Aristotle and Galeno pointed out. A gaming simulation reaches a "pre-vision" of the future through emotions it generates. We can face hypothetical scenarios before making decisions. This is what makes gaming simulation such an efficient tool for planning: future thinking. Gaming simulation is almost all about future thinking. It is building uchronias that, once built and explored, have impact on decisions made in the immediate present.

Language is not very good at dealing with time. For instance tense, in grammar, is a verbal category relating the time of a narrated event to the time of the speech event. In many languages the concept of time is expressed not by the verb but by other parts of speech. Time is frequently perceived as a continuum with three main divisions: past, present, and future. The past and future times are defined in relation to the present time (now). Past tense refers to any time before the present time, and future tense refers to any time after the present. Not all languages perceive this relationship as a linear one, nor do these categories characterise all possible times.

Tense, then, is a grammatical expression of time reference. The correlation between tense and time is not necessarily one-to-one; languages do not recognise as many oppositions of tense as they have conceptions of time.

Gaming simulation initiates the comparison with the real world through descriptive or critical communication that makes the language as well as the debriefing element so important.

As Duke has pointed out already in the 1974, to design is to know how to communicate. A new language – conceived, learned, and shared – which emerges during a session, reveals the intrinsic capacity of gaming simulation to design a new environment. This new environment is usually a projection of the future, however there are no obstacles to making it a reconstruction of the past.

Utopia is also a definition of an environment where everyone is understood, where people know how to communicate and where all eventual misunderstandings are solved without conflicts. In a relatively safe environment of gaming simulation, participants construct their own utopia through a language that gradually starts to be common one. And this is what allows them to analyse the final result by defining the actions or measures to be taken into the real world.

It is worth recalling the words by Wittgenstein (1996) who stated that "work on philosophy – like work in architecture in many respects – is really more a work on oneself. On one's own conception. On how one sees things (and what one expects of them)". In the course of running a gaming simulation there are some perceptive passages. The first one is disorientation, the second one is orientation and control, and the third one is acquisition of a competence. At that point the game is abandoned if it doesn't offer some 'alternatives to explore' that could put to test the new competences achieved, in other words: the higher level of consciousness of the game and its rules. The phase of leaving the world of the game is when the players face the real world. But the way they face it is different – now they share a common language developed in the course of the game. The language that has become 'their' language, the language of the players is referred to as *game slang*.

Both Duke (1974) and Klabbers (2006) focus on the construction of a slang taking into consideration the concept of language as well. Most users and designers from Feldt and Rycus to Duke point out the communicative nature of gaming simulation. Therefore the game has its specific value of a language and yet being a language it can describe the experience of learning another language. Nevertheless, you can't describe the experience of learning how to use a language, because to do so it would be necessary to imagine a state without any language, something similar to thinking what would not-to-think be like.

If a language includes all that is necessary to give symbols a meaning and if a game is a language, it seems useful to understand whether gaming simulation, which includes a game among its constitutive elements, can be considered a meta-language.

If you open a dictionary (or if you search the Internet), you will find that *meta-language* is 'a language to analyse language'. If you search further, you will discover that, in fact, 'it is a system that provides analysis of general linguistic structures and, for this reason, belongs to logic and not to the science of actually existing languages'. Following this definition, the term corresponds to the dual nature of gaming simulation: naturalness of the game on the one hand and meta-logic of the simulation on the other. As a meta-language is an artificial linguistic system, through which it is possible to analyse structures and symbols of a real language, gaming simulation represents the complex systems of an anthropic environment.

The concept of *ludification* is quite complex and its communicative and interactive dimensions are unimaginable without the concepts of a bluff, communicative and non-communicative manipulations, applications of demagogies and *simulacra*. At the same time, it implies the acceptance of plurality and multiculturalism that entails changing game codes and symbols. By accepting causality and unpredictability as factors of the social construction of reality, these differences are taken into account. Regardless of any opinion, it offers new perspectives for studies on the theory of gaming simulation: in the evaluation of failures and collapses of the system during the gaming sessions, the 'unpredicted incidents' become the beginning of the new circle of activity rather than a catastrophic end. Therefore, the gaming simulation is a meta-language able to make the participants aware of the control of their own destiny, managing the complexity, and ruling the uncertainty that accompanies it. It may be considered a poetic synthesis of a generating system of meta-language, similar to the one of gaming simulation – endless.

'Soigner soigner les sauriens du calcul et les
bipeds qui pourtant savant compter parler
compter parler soigner soigner parler compter
compter compter compter compter compter compter
soigner soigner soigner soigner soigner soigner
parler parler parler des sauriens du calcul
et parler [2]*'.*

Endless will lead us to what is eternal, eternal to what is time resistant or better, according to contemporary urban concepts, time resilient. The language we use to communicate, as well as the language we use for the design and research purposes is something that keeps the world of the project and reality going.

The understanding of gaming simulation as the future's language gave rise to some interesting considerations shifting from the linguistic concept towards a design one. Since historical forms of the future are independent innovations in the development of specific languages (see: entry *Tempo* (time)), (Tempo, 2014), the modalities in which a design process is developed are independent in their fields and meta-languages.

In the past, a planner's approach was close to the one of God and therefore planning was by definition a personalised utopia. Gradually, as many different professional fields had entered into the scene of planning, one's own individual point of view became a set of sometimes integrated, sometimes competitive, differing points of view. Some frame games, such as IMPASSE, attempted to overcome that obstacle by confronting various professional meta-languages.

A method used by Jan Klabbers (2006) must be mentioned here. It is precisely the gaming simulation he uses to construct a common language in order to face and solve problems among which to design environments. It is a structured confrontation in which participants, following the rules, contribute to the definition of a common linguistic basis according to one's own background and competences. This method not only allows the avoidance of misunderstandings, but also promotes alternative visions of reality.

The evolution of gaming simulation gave birth to critical design as defined by Anthony Dunne: "the way of using design as medium to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life". This new type of practice Antonelli (2008) refers to as *Design for Debate*, "does not always immediately lead to 'useful' objects but rather to servings of exotic food for though whose usefulness is revealed by their capacity to help us ponder how we really want our things to fit into our lives". And yet, gaming simulation is one of the most effective design-related learning techniques. Its capacity to communicate how we really want our time and space to fit into our lives is one of its most promising boundaries and applications in the short- and long-term perspective.

A conclusion may be found in Wittgenstein's (1996) words written, or typed to be precise, in the so-called *Big Typescript* of 1932:

> *'The whole of language must be thoroughly ploughed up. Most people, when they want to start a philosophical investigation, behave like someone searching frantically for an object in a drawer. He throws some papers out of the drawer – what he is looking for may be underneath – and riffles through the rest hastily and carelessly. He throws some back in the drawer and gets them all mixed up and so on. You can only say to him: hold on, if you are going to search like that I can't help you. You must begin calmly and methodically to look at one thing after another. If you do so, I am ready to help you search and to adopt your method'.*

A contradiction between construction of an utopia/uchronia and gaming simulation is apparent. They are intrinsic since gaming simulation is all about adding pragmatic implementation to the visionary.

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[1] For the term "meta-language", see, for example: Giacomo Devoto, Giancarlo Oli, Il dizionario della lingua italiana, Le Monnier, Firenze 2002, entry: metalinguaggio.
[2] 'Man knows how to speak, to count and to take care of [machines], and they know how to speak, to count and to take care of themselves. (..) what sounds in the end where cosmogony melts into the universe of words is Laverdure the parrot saying to Zazie: tu causes, tu causes, c'est tout ce que tu sais faire sounds'. Italo Calvino, Piccola guida alla Piccola cosmogonia, (1978-81). In: Raymond Queneau, Piccola cosmogonia portatile translated in Italian by Sergio Solmi, Einaudi, Torino 1982.

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GAMING FOR POLICY, URBAN PLANNING, COMMUNITY AND ORGANIZATIONAL DEVELOPMENT

EARLY JAPANESE POLICY GAMES

Arata Ichikawa

Abstract

This paper will try to present what is known about the first and second Japanese policy games developed and conducted between 1941 and 1944. While it is unfortunate that the documentary record for the games is somewhat fragmentary, the results were quite prescient. The first game was created at the "Total War Research Institute", which in spite of its name was not a military organization. It was a national gaming graduate school for civilian authorities created by the administration of the then civilian Prime Minister's office on September 30, 1940. The second game was created at the "Economic Policy Institute of Gaming", a not-for-profit public research organization founded on September 18, 1942 by Ayukawa Yoshisuke. (Ayukawa's name is mostly unknown outside Japan, but you will recognize the enterprises he created.) The most important policy conclusions of the two games were that immediate and then continuing military actions on Japan's part would be unlikely to achieve a favorable resolution to the conflict. Instead Japan should adopt policies to improve its economic strength and independence for the first, or to sue for peace for the second. From the perspective of policy games research, I would classify the first policy game to be an event-driven or discrete simulation and the second policy game to be a time-driven or continuous simulation. But the remarkable feature of the two games is that even at that early primitive time, emphasis was put on using the gaming simulation as a means of communications among the policy makers. Previously, and even now it is all too true that policy makers work in vertical silos without any real common understanding. In an alternate universe where the recommendations of the games were taken seriously, Japan would not have initiated or continued a doomed military adventure.

Keywords

early games, event-driven game, dynamic game, gaming as a language

1 The Japanese war game in gaming literature

Almost all of the papers and books on the history of gaming simulation commonly used by gaming researchers quote from the single RAND report (Specht, 1957) published in 1957. That was just before the first well known business game was conducted. The following excerpt is what is most frequently quoted from the report:

> *"This was the Total War Research Institute, established in October 1940. Here military services and the government joined in gaming Japan's future actions: internal and external, military and diplomatic. In August 1941 a game was written up in which the two year period from mid-August 1941 through the middle of 1943 was gamed, was "lived through" in advance and, of course, at an accelerated pace. Players represented the Italo-German Axis, Russia, United States, England, Thailand, Netherlands, East Indies, China, Korea, Manchuria, and French Indochina. Japan was played, not as single force, but as an uneasy coalition of Army, Navy, and Cabinet, with the military and the government disagreeing constantly – on the decision to go to war, on X-day, on civilian demands versus those of heavy industry, and so on. Disagreements arose and were settled – in the course of an afternoon, at the pace of this game – with the military group, by the way, as the more aggressive one, winning the arguments. Measures to be taken within Japan were gamed in detail and include economic, educational, financial, and psychological factors. The game even included plans for the control of consumer goods – plans, incidentally, which were identical with those actually put into effect on December 8, 1941."*

This quotation is still referred to by almost all gaming researchers in the introductions to their papers and books. For example, Duke and Geurts (2004, p.34) refer to the Japanese policy game as follows:

> *"Japanese Total War Research Institute conducted extensive games. Here military services and the government joined in gaming Japan's future actions: internal and external, military and diplomatic. … The game even included plans for the control of consumer goods, which, incidentally, were identical with those actually put into effect on December 8, 1941."*

Specht, Duke, and Geurts categorized this policy game as a war game. Yet, I will concentrate on the precise definition of a war game to be a game used as a part of the tools for analyzing and evaluating military tactics, equipment, procedures, etc (Duke & Geurts, 2004, p.33). In comparison with war games, a policy game is explicitly created to aid policy makers study specific issues of strategic management, and it allows the players to experience the complexity of the strategic problems and their environmental settings (Duke & Geurts, 2004, p.38).

2 Original research motivationn

Ever since I read a short paragraph (McGinty, 1981) mentioning a Japanese war game in a little booklet distributed by the Center for Multidisciplinary Educational Exercises (COMEX) at the University of Southern California in 1983-4 I have wanted to learn more. COMEX provided me the opportunity of observing the METRO-APEX exercise, a regular course for students in public administration. Ten years later, during my stay in the University of Michigan in 2002-3, I set out to restart my research after the long hiatus. This was a good opportunity in that the university library network has a well regarded Japanese library. Reading references on war games there led to finding mention of a social game in the book "Pearl Harbor."

> *"In the course of the prewar part of the game, which was projected in time from mid-August to December 15, 1941…. Japan in this game did not initiate the war with America. Italy and Germany became involved with America first (no details are given in the existing papers), and Japan followed….*
>
> *This political game, unlike the tactical games played during September at the Naval War College, does not seem to have been an actual testing of alternatives, but rather a sophisticated way of demonstrating or arguing as a set of convictions." (Wohlstetter, 1962, pp. 355-356).*

After finding Woshlstetter's unexpected statement that Japan *"did not initiate the war"* in the game, I started to read the record of the proceedings of the International Military Tribunal for the Far East, in particular, serials 100 and 101. Eventually that led me to believe that the war gamers at the time were more interested in the war game aspect over the social game aspect which was completely new to them. I conclude this by observing their emphasis on war games topics. The result has been that historically and academically the first policy game would be ignored, at least in Japan. The following section is structured to explaining the primitive game using Duke's modern terminology (Duke, 1974).

3 The first policy game in Japan

The School of Gaming

The Total War Research Institute, a school of gaming set up for civilian authorities, was established under the administration of the civilian prime minister on September 30, 1940. The institute was charged with undertaking basic studies into conducting a total war, and with the education and training of public administration officials and leaders of industry who would have to implement policies for total war. The Institute was discontinued in March 31, 1944. For each session the academic year ran from April 1 until March 30 of the following year.

The school's enrollments in 1941, 1942 and 1943 were 35, 39 and 40 respectively. As a school of gaming, the institute designed a policy game only once, for the graduate students of the first academic year. That exercise was conducted between June 11 and August 28, 1941. No doubt it was discontinued because a military government was established on October 18, 1941.

Game Objectives

Merely conducting this policy game was deemed highly necessary because the leaders of the institute thought that the general social dynamic in Japan was leading to a divergence of opinion and to conflicts between government departments as well as between different private and public organizations. The institute tried to foster cooperative thinking and cooperative action to enable the participants to break out of their vertical silo outlooks.

The faculty believed that lectures alone were not sufficient to carrying out the objectives of the institute. To achieve more practical training of the students mental faculties, mental efficiency as well as the efficiency of cooperative action, and to develop over-all efficiency in their studies, certain hypothetical conditions and different paths through the studies were postulated. Players belonging to different specializations in their studies were assigned on the basis of those hypothetical conditions to work out specific tasks. A prosecution's witness gave testimony: "Those who participated in these table-top studies or maneuvers would readily understand how – what kind of hypothetical conditions were conceived for study purposes – ..." Notice that in his testimony, the new word, *"table-top maneuver",* was used instead of *"map maneuver"* making a distinction between the two maneuvers. I infer that an early policy game was developed from the war games conducted in Japan.

Purpose

The prime purpose of the game was to establish a dialogue among the players for the exchange of opinions. Various hypothetical conditions were posed by the several members of the faculty and given to the students to be worked out in all their various ramifications. The students would individually work out the problem assigned to him and after completing his study he would introduce his work at a full group meeting of the participating game students for the exchange of opinions. By repeating these rounds, it was possible to foster a consciousness of the overall interlocking relationships and achieve a bringing together of minds in order to work out problems cooperatively.

Game construction

The game was designed, constructed and carried out in the form of an *"Experts-to-Experts mode"* dialogue to foster a more effective communication about all aspects of planning for a total war. It is possible to infer that the game consisted of cycles of self-study, team-learning, game execution, debriefing, and a post-presentation summary.

As for the 1941 schedule, it is probable that the self-study phase was carried out between June 11 and July 11, the issue seminar between July 12 and 30, the play of game between August 5 and 26, and finally the post-presentation on August 27 and 28 with the participation of the prime minister and his cabinet ministers.

Participants

The players of the game were selected from different sectors. Most of 36 players were governmental officials. Eight of them were from the private sector. Only six players were from the military, and they were not operational commanders, rather they were budget officers. Their ages ranged from 30 to 37; with an average age of 33. Therefore, the players were highly educated with career experiences of 10 years or more in planning and decision making roles as junior leaders of larger organizations.

Game directors

The board of game directors was organized with a chief director, two directors, ten referees, and three secretaries. The directors had two functions in running the game. Firstly, the directors were responsible for the operation of the game. Secondly, the board itself produced predominantly political and military hypotheticals for the model components. The model components took the form of simulations and heuristics. The referees were involved with the overall simulation with inputs from the accounting system for scoring. The three directors probably involved themselves by introducing heuristics representing the positions of the Emperor as the supreme command of the Army and Navy. The secretaries recorded all the game messages interchanged between the board and the players' team.

The procedures of play

Figure 1 shows a simple representation of the game components. The blue government was a team of players with gaming-roles. The chief director assigned one of the graduate students from the private sector to the role of prime minister. This player was assigned a role completely different from his profession in order to avoid the negative "capture" effects of his bureaucracy. The other players generally were assigned roles related to their professions. The play consisted of a series of cycles, in seven rounds. Each round started with a mini-critique time, probably for a couple of hours. The chief game director managed this critique by providing players with the latest situations that developed based on both the outputs of the accounting system and the heuristics of the supreme command. Following the chief director's critique the next phase of a round was a survey, discussion, and interaction. The output of the phase was a report of decisions taken. The decisions were processed through one of the four domains of the accounting system according to their administrative authorities.

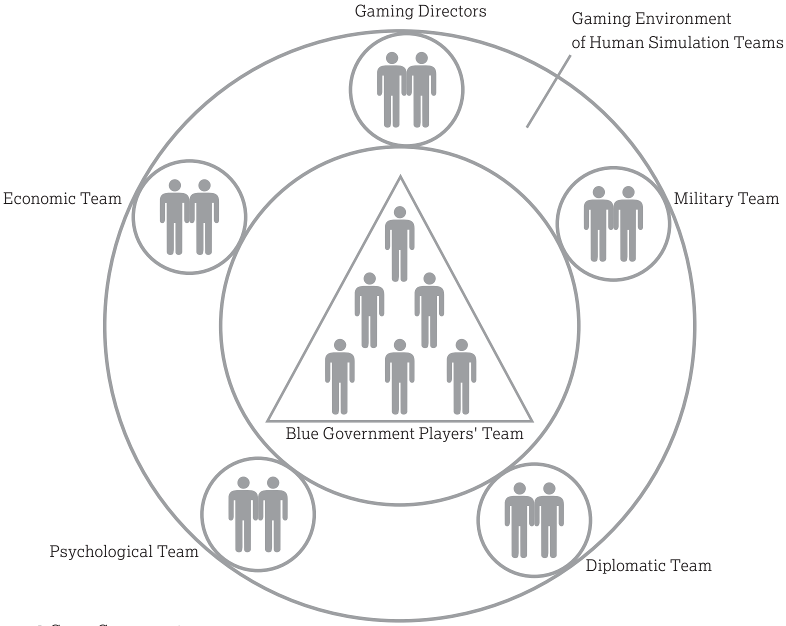

Figure 1 Game Components

Accounting system

The accounting system for the game seemed to be a complex one because it involved 34 specialists. Such a complex model was chosen because players were supposed to pursue the totality of war planning. The range of domains the human accounting system had to respond to was extended to social dynamics as well as to military operations. In this paper, I should call the accounting system a human simulation system because this system consisted of probably over 30 human agents who were divided into four teams, an economic simulation team; a psychological simulation team; a diplomatic simulation team; and lastly a military simulation team. Each team in the accounting system had its own domain responsibility in forming the decisions made by the *"Ministers"*.

The economic team composed of 14 experts and two secretaries, simulated economic problems, material mobilization, human resources, food production, transportation, communications, and finance. The psychological team, with seven experts and a secretary, simulated education in general, thought control, physical education, land security, and media strategy. The diplomatic team, with five experts and a secretary, simulated diplomacy in general and in particular the U.S., Europe, South Sea states, and the Soviet Union. The military team, eight experts and a secretary, simulated military operation in general, preparedness for land engagement, naval engagement, and air defense.

Rounds of play

Round 1 ran between June 11 and July 11, 1941. This round consisted of assignment work given to all of the players, in particular: the investigation of national policy, strategic planning for total warfare, and the criterion for judging the situation. In Round 2 the principle organs of "Blue land" involved all of the players who were required to do the following work: the planning of total war strategies and preparations for the development of total war strategies. In Rounds 3 to 9 the players repeatedly participated in the cycles of each gaming round. Each round lasted two or three days for game times or imaginary times, from August 1941 to October 1942. In this sense, the game was the exercise of policy formation for the future.

Exogenous review

The tentative report of the debriefing was that Japan could lose a war against the US in a few years because of lack of adequate economic power. The game directors and players gathered in the official residence of the prime minister and presented the report to the prime minister and his cabinet members including the ministers of the Army and Navy in August 27 and 28, 1941. The minister of the Army, who would be appointed to be the prime minister two months later by the emperor, immediately banned them from releasing the full contents of their simulation report.

4 Aside: A brief biographical sketch of the life of Ayukawa Yoshisuke, *a Japanese business tycoon*

Witzel (2003) lists the lives and ideas of influential people who have helped redefine the way we think about management. The fifty key figures include Alfred D. Chandler, Henri Fayol, Henry Ford, Bill Gates, Philip Kotler, Abraham Maslow, Henry Mintzberg, Tom Peters, Michael Porter, Herbert Simon, etc. And as for Japanese key figures, the list includes Ibuka Masaru (Sony), Matsushita Konosuke (Matsushita/Panasonic), Toyoda Kiichiro (Toyota), etc. It is not surprising but disappointing that his list misses "Ayukawa Yoshisuke." The reason is straightforward; there have been very few comprehensive articles on Ayukawa Yoshisuke available in English, with the exception of an excellent book recently written by Iguchi (2003) "Unfinished Business: Ayukawa Yoshisuke and US-Japan relations, 1937-1953." (Note that the names of the Japanese businessmen are in the Japanese order with a family name first and personal name last.)

Ayukawa was born in western Japan in 1880. In 1903, he received a B.E. from Department of Mechanical Engineering, University of Tokyo. In spite of being a degreed engineer, he began at the bottom working for Toshiba as an unskilled manual worker. In 1905, he visited United States in order to work for the Malleable Iron Company, Erie, Pennsylvania, pretending to be an ordinary foundry worker. He had the help of some local managers who were the only ones knowing his true identify. After two years there, he returned to found many companies including Nissan Motors and Hitachi Works. He had the Kuhara Mining Company renamed to be Nihon Sangyo Industry, which became Nissan in 1928. He was the founder and first president of the Nissan Group between 1931 and 1945.

In 1937, as head of the Nissan Conglomerate, he moved to Manchukuo (Manchuria as it was called by the Japanese during their occupation from1932-1945, now a part of China.) He formed a close relationship with the Army administration there. He took charge as the chairman of the Manchurian Industrial Development Company, also known as the "Manchu Industrial Conglomerate". In that position he guided all industrial efforts in the country, implementing two five years plans during the 1930s, these following the economical and industrial plan guide lines for that nation as determined by the State Secretary of Manchukuo. He arranged some investment loans from American steel industrialists to support the Manchukuo economy in the initial period of the Japanese administration, before 1941. Besides this, he proposed the Fugu Plan, which brought Jewish refugees to Manchukuo. He predicted the German defeat and clashed with the army. Because his global capitalism began to conflict with the nationalism of the army, in 1942 he resigned as chairman of the Manchurian Industrial Development Company, and moved back to Japan.

He was imprisoned in 1946-1947 as a suspected Class A war criminal, but was freed when found completely innocent of all charges. He then was able to play a key role in post-war economic reconstruction and purchased a commercial bank to organize loans to small companies. With the help of Nobosuke Kishi, prime minister, 1957-1960, he achieved his goal in implementing a merchantilistic economic-control law and policies as leader of a strong pressure group that became *Keidanren*, the main federation of small and medium sized companies in the 1960's. He died in 1967.

5 The second policy game in Japan

The economic policy research institute of gaming

Midway through my literature survey for the first Japanese policy game, I discovered at the National Diet Library of Japan that another gaming simulation had been conducted in 1943 and 1944 by a private research institute (Iguchi, 2003, pp. 188-190), established by Ayukawa Yoshisuke.

He adapted the basic concept and gaming structure from the first policy game to his own economic policy needs, probably for predicting how the Japanese industry would recover after the end of the war. At this point I am just beginning the analysis of this second Japanese policy game.

Ayukawa tried to mix his economic-business policy game with the national policy game but the Japanese military government did not permit him to pursue his ambition, probably because the result of the gaming was expected to be against continuing the total war policy. On December 27, 1942, at the 10th stockholders' meeting of the Manchurian Industrial Development Company, he announced his retirement as chairman. At the same time, his announcement continued to inform them of the creation of the ***Giseikai***, a economic policy research institute for gaming. The establishment of the research institute had been authorized by the metropolitan government on September 18, 1942, with Ayukawa's funds of JP Yen 135 million, which was the equivalent of 0.3% of the annual national budget! In 1945, the ***Giseikai*** was shut down by the order of SCAP, the General Headquarters of the Allied Forces. Research and practice in gaming simulation in Japan was halted for a long time, until the 1960s when *"Business Game – Play One"* would be "imported".

Design concept of the second policy game

The mission of the economic policy research institute of gaming was to conduct research with a holistic approach that is gaming simulation, into the future planning for the national economic policy. Ayukawa's own design concept was made public at the first board of directors' meeting dated January 25, 1943 in his opening speech (excerpt below). "ENREN" is a now obsolete Japanese term for "Gaming simulation."

> *I am motivated to endow this institute by my serious concerns for the future. Research, experiment, and ENREN are some of the ways used in trying to pursue any undertaking. I would put my emphasis on ENREN. ENREN would correspond to map maneuver in military parlance and can be also called a mock war operation. ENREN is an economic, financial mock war operation. An experiment is performed with the use of test tubes in an initial state in a laboratory. Research is well known to all of you.*
>
> *You may know of the recent establishment of "The Total War Research Institute." They have started with the research concept for long term planning, for a "The Hundred Years War," which performs ENREN based on the world situation. I consider it praiseworthy that ENREN is being used in this research.*
>
> *At present, although there are experiments in industry and exercises in the military, nothing similar is being done for economic policies. For example, take the Ministry of Agriculture, whatever they want to do, they just call it a cabinet decision, and proceed to push through with the project. Without performing any trial studies, aren't they making the citizens into guinea pigs for their process?*

> *What about using some amount of money to perform a small-scale trial? Doing things by armchair work alone neglects such factors such as real world time scales. Their policies make for a poor path from the past to the future. There is a need for a research agency to do this kind of study.*
>
> *As an example of ENREN, suppose we consider how an amount of money should flow, whether to the bank as a deposit, or to change it into public bonds so that the money flows to the Bank of Japan. This can be imitated first through the use of pipes, tanks and pumps with yellow colored water to represent cash flows and then with green colored water to represent government security. Through imitation of flows we can foresee bad and good cash flows. If there are 50 experts involved in this project, 50 experts will come together in a laboratory to separately operate valves at joints and separators of the pipes to adjust and control the flows of colored water in such imitation. We can try out government fund policies and foresee possible oversights and illusions in the process, better than when we do it by arbitrary deskwork.*
>
> *(Japanese-to-English translation by the author)*

Ayukawa Yoichi, the eldest son of Yoshisuke, presented to Joseph B. Keenan, chief of the International Prosecution Section, a petition, dated April 8 of 1946, insisting that his father was innocent of the charges against him. He wrote in the petition that his father had organized the *Giseikai* for studying clearly the deficiencies in the economic and industrial organizations of the time, and that his father had started a new peace movement in midst of the war basing its guiding principle on the economic theory espoused in James D. Mooney's book *"The New Capitalism"* (1934). The models of economic phenomena in that book suggested many similarities to those of systems dynamics or social dynamics as pioneered by Jay Wright Forrester (1961). *"The limit of growth"* and *"The beer game"* are practical applications of this system thinking and its simulation.

The policy game of stocks and flows

I have not yet discovered what the details of the steps or rounds that formed the Geseikai gaming simulations were. Ayukawa Yoshisuke did put down some of his memories in 1953. They were never published; however, a draft is available for reading at the National Diet Library in Tokyo. In the draft, he mentions first how efficient business organizations should be formed, and what the purpose of governmental agencies' administrative directions should be. This gaming approach seemed to have been applied to major industrial segments such as coal, iron and steel, shipbuilding, etc. What I have just discovered in connection with gaming simulations is a five page report about a scenario for the shipbuilding industry. Probably another few years will be required to reconstruct Ayukawa Yoshisuke's gaming simulations.

At the present I am writing this paper with only very sketchy information about the following gaming simulations being available:

» Economic-business gaming simulation 1: This exercise was developed and conducted between December 1942 and February 1944. The model represented the shipbuilding industry. About 30 players were involved including three top executives from an automobile corporation, a railroad corporation, and an oil corporation.
» Economic-business gaming simulation 2: This exercise was developed and conducted from June 1943. When the game ended and other details are unknown.
» Economic-business gaming simulation 3: This exercise was developed and conducted from September 1943. Again nothing more is known now.
» Economic-business gaming simulation 4: This exercise was developed and conducted from March 1944. When the game ended is unknown. This economic-business gaming simulation tried to establish linkages with the policy-economic gaming simulation of the Total War Research Institute.
» Economic-business gaming simulation 5: This exercise was developed in July 1944. Whether the gaming was conducted or not is unknown. The game was designed to include about 60 players, dividing them into six teams. Unfortunately research into these gaming simulations is still in the initial document retrieval stage.

6 Remarks about Simulation as a language for the future

From a historical view of gaming, Japan is one of the leading countries in developing this discipline. Interestingly and importantly, the main phase of the first policy game was called a table-top discussion or maneuver in the testimony. During those two days of the tribunal, a Russian prosecutor pointed out that it was a game. *The prime purpose of the game was to establish dialogue among players for the exchange of opinions. As testified, the most important feature of this game was that it was communication-oriented.*

A game is an abstract representation of human-made complex institution. From a well-known game designer's point of view (Duke, 1981), a game should have twelve basic elements: (1) scenario, (2) pulse, (3) cycle sequence, (4) steps of play, (5) rules, (6) roles, (7) model, (8) decision sequence, (9) accounting system, (10) indicators, (11) symbols, and (12) paraphernalia. These basic elements that a game is supposed to consist of were all exhibited in the court proceedings. From a theoretical perceptive, I should point out that where the first and second gaming simulations differ is whether they use discrete or continuous simulation. If changes occur as a series of discrete events; then there is or can be some causal relationship between events.

If changes happen in a series of continuous events; there is or can be an unexpected amplification between events. This is a tentative conclusion that any gaming scientist can draw.

Hopefully, this paper can also provide some useful bibliographical references for further research into the early history of gaming science. Neither gaming simulation was for educational use, but rather they served a research and practical application. I have been forced to rethink the true beginnings of gaming science. I now believe that the war gamers involved were more interested in war game aspects, rather than those of a policy game, so that they placed their emphasis on the more usual topics found in war games. Nevertheless these two policy games, at least in Japan, have been ignored by both historical research and current academic lore. Unfortunately this research into the existing records is a time-consuming task and at worst may never be completed adequately because almost all materials and documentation relating to these games were routinely incinerated or otherwise lost with Japan's defeat. The major literature sources, and probably the most reliable, are the proceedings of Tokyo Tribunal, and needless to say the prosecutor and defending attorneys were not concerned to enquire into their academic aspects. Little information relating to Ayukawa Yoshisuke's gaming simulation can be found in the record of the Tokyo Tribunal, as he was exonerated of war crimes charges. However, the materials returned from the International Prosecution Section are now retrievable for historical research.

In fact, much more material on these two early Japanese gaming simulations may be available in English; they are kept in the custody of the American National Archives and Records Administration in Maryland.

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ESTABLISHING GAMES, GAMING, AND POLICY EXERCISES AS TOOLS FOR URBAN AND REGIONAL PLANNING – ARE WE THERE YET?

Andrea Frank

Abstract

Ever since the 1960s, serious games and policy exercises have had a lingering presence in supporting urban and regional planning tasks. In particular, games and policy exercises (German: "Planspiel") were used and occasionally are still used to test for potential impacts and effectiveness of planned policy changes or as pedagogical mechanisms to induct students into the field. Similar to forecasting, foresight studies and scenario development - gaming and serious games have not become part of mainstream planning. Consequently, the development and use of games remains a fringe activity practiced by a handful of enthusiastic planning academics, consultants and practitioners. However, now, a decade into the 21st century, there seems to be a resurgent interest in interactive urban planning games. This chapter explores the trend in light of the latest planning concepts, approaches and theories. It is argued that multiplayer collaborative games, interactive simulations and role play represent appropriate tools for solving problems in complex environments. Moreover, ubiquitous access to multimedia technology supports a playful and immersive approach in and for learning and engagement which has led to the development of a new generation of serious games designed to facilitate public participation and community development. The establishment of various specialist research laboratories that are developing but also researching the impact of (multimedia) games on learning and behavior can considered indicative of the rise of gaming as a future's language beyond recreational entertainment and edutainment.

Keywords
urban and regional planning, serious games, complexity, playful public participation

1 Introduction

Looking at a 2013 article from the inflight magazine of a major airline stating that "gamification will revolutionize business" (Holland Herald, September 2013, pp 40-42) together with press headlines on public participation games deployed in American cities, one could almost believe that the bold vision of Duke's 1974 book "Gaming: The Future's Language" has come good some 40 years hence. The report "Connecting citizens to their government by turning it into a game" (Schiller, 2013), for instance, stresses the usefulness of *Community PlanIt*, a game developed by Emerson Engagement Lab, in successfully involving people of all ages in discussing the management of their communities and neighborhoods in Philadelphia, Boston, Detroit and Cape Cod. Other cities and communities are likewise interested in utilizing this tool. According to Professor Baldwin-Philippi (Anzick, 2013) the *Community PlanIt* game serves as a platform for deliberation and debate of ideas – ultimately leading to more consensual decision-making in community planning. Efforts to develop technology frameworks to support playful public participation (PPP) as well as other serious games for urban and environmental planning are not limited to the work at Emerson College, but are also pursued for example at the University of Wisconsin-Madison's Institute for Discovery, HafenCity University Hamburg (Germany), Queensland University of Technology (Australia) and commercial providers such as IBM through its *CityOne* game (CityOne: a smarter planet game was initially launched in 2010). So, does this mean games as tools for urban and regional planning have now finally and truly arrived?

Unlike in the 1960s and 70s, gaming nowadays appears practically always associated with video, computer, multi-media or online applications. While computer-based simulations and training (for pilots, bus drivers and other professions operating complex machinery) have a fairly long tradition – according to Poplin (2010; 2012) the use of serious games for public participation, urban and regional planning and indeed, more broadly, for research and education (Zyda, 2005) represents a relatively novel field for the computer games industry. Since its beginnings in the 1970s this industry has developed in leaps and bounds, thanks to advances in processing speeds and visualization technology. Nevertheless it has stayed mostly entertainment focused to date possibly due to a desyncronisation of technological developments and education systems which has delayed the recognition of the educational potential of computer games (Gee, 2003).

With greater ease of use, scientists and practitioners from a wide range of fields are now starting to explore how to adapt highly sophisticated video gaming techniques for knowledge acquisition and research.

In urban and regional planning, the use of gaming simulations and operational games has been relatively patchy, despite Meier and Duke (1966) and Feldt (1966) demonstrating credibly the significant value of such tools for both, practice and education. One possible reason for this might have been a method-theory disconnect. By embracing complexity and uncertainty the propositions underlying simulation games contradicted the rational planning model prevalent in 1960s; it thus required first a theoretical and conceptual shift toward the more subjective, communicative-collaborative planning paradigm to sanction methods such as gaming in the planning field (Hanzl, 2007). Elaborating on this reasoning, this contribution reviews the potential of serious games (Abt, 1970) and their derivatives as tools for research, education, decision-making in and for urban and regional planning against the backcloth of complexity science (Roo & Silver, 2010; Roo, Hillier & Wezemael, 2012) and 'third generation planning theory' (Schönwandt, 2008, p. 24). There are three sections. The first section outlines key aspects of this theoretical discourse and its implications for planning processes and decision-making. It also assesses how games, policy exercises and gaming simulation relate to the methods proposed in the literature for planning in complex settings. The second section offers a cursory exploration of current applications of games and gaming in planning research, education and practice. Findings hint at a revival in the use of games in planning education and practice, especially in respect to novel gaming applications for playful public participation (PPP). The third section offers an outlook and some recommendations as to future contributions of gaming to urban and regional planning tasks.

2 Current theories and approaches to planning

Amongst planners, there is considerable consensus that the rational planning model is too positivistic, apolitical and ahistorical; however, little agreement exists over what is best to replace it (Alexander, 1984). Schönwandt (2008) identified six alternative approaches none of which has been fully embraced by the planning community. The communicative social planning (Burke, 1979; Healey, 1997) approach has possibly the broadest support. It seeks to create solutions based on a deliberate dialogue between planning experts and affected stakeholders though its narrow focus on politics and process, and a tendency to neglect scientific facts quite regularly spurs backlashes into more positivist traditions.

Notwithstanding this pluralism in approaches, considerable greater unanimity exists over the nature of cities as problems of organized complexity (Jacobs, 1961). Indeed, the idea of urban complexity and non-linear dynamics of urban and regional systems, including a general uncertainty of development trajectories and their path-dependency on historical conditions have become well accepted. Building on research into complexity from a variety of different disciplines (Simon, 1962; Weaver, 1948; Holling & Goldberg 1971), Roo et al. (2012) suggest that "complexity thinking" is (a) useful as a theoretical approach to understand cities, and (b) can (and should) therefore be used to guide and manage urban development. At a more abstract level, 'third generation planning theory' (Schönwandt, 2008) seeks to offer an alternative, middle ground between a general and objective perspective (first generation) and an excessively individualized, subjective perspective on planning problems (second generation). Third generation planning theory draws on systems theoretical concepts and the system-environment paradigm. It assumes that information is never completely known or available and courses of action are subjective. This means, stakeholders involved in the situation have different preferences and values which are likely to evolve and change over time as their understanding or the policy environment changes. Moreover, the formulation of the problem is linked (not separate) to finding a solution. Essentially, 'third generation planning theory' postulates that while planning deals with ill-defined, "wicked" problems (Rittel &Webber 1973) for which no single, or optimal solution exists, it is also unproductive to declare every problem as unique. The latter suggests that even for similar problems, solutions are not transferable (Alexander, 1992; Schönwandt, 2008, p. 22). Yet, we know pragmatically that certain policies and actions tend to lead – on the whole – to certain (predictable) reactions and behaviors. In other words, we can rely on certain linkages within a system which enable us to generalize behavioral typologies as in for example the development of prices in relation to supply and demand of goods in an open market. However, third generation planning theory also cautions of the traps inherent in not validating assumptions. As planning relies heavily on value laden concepts different solutions are likely to emerge when our understanding of concepts change (e.g., from garbage to resource and energy supply). It is therefore imperative that planners spent time to explore any problem definition thoroughly before seeking solutions.

3 Methods for planning in complex settings

Once we accept that cities and regions are complex systems, then, the challenge turns to translating complexity concepts and theories into appropriate practical methodologies and processes for plan- and decision-making. Recent literature on planning and complexity (Roo & Silva 2010; Roo et al. 2012), suggests a number of different methodologies, which can be crudely divided into two categories.

The first approach is a computational, mathematical one which is essentially rooted in systems dynamics (Prigogine, 1996). Its proponents argue that computer simulations represent important toolkits for theory building, testing ideas and hypotheses, and evaluating plans and policies (Weaver, 1948; Devisch, 2012, p. 370; Torrens, 2012, p. 409; OECD, 2011). Bottom-up, cellular automata, (multi-)agent-based, or geographic automata which model urban systems behavior based on individual and group behavior and interaction are possibly the most sophisticated models to date. They can serve as mini-laboratories where attributes and behavioral rules can be altered and repercussions of such alterations can be observed in simulation runs to help test different policies and scenarios (Crook, 2012, p. 388). The newest generation of agent-based, bottom-up models are being coupled with Geographic Information systems (GIS) to link dynamics and events to features and actual coordinates. This will allow for a more realistic exploration of global outcomes of local actions (Crooks, 2012, p. 396). Notwithstanding availability of ever greater computing powers, the development of comprehensive urban models remains a challenge, as it will inevitably require the simulation of an immense amount of dynamic and interacting agents and agencies with many-to-many relationships at different scales which act and interact based on a range of different fluid and contingent feedback mechanisms. Thus, most existing models to date focus on particular subsystems and functions (e.g., property markets, land values and transportation) at a relatively modest spatial scale. The fundamental problem of calibrating and verifying models with sufficiently detailed data persists. In future, new ways of collecting comprehensive sets of on-time data through sensors, or volunteered crowd sourcing may offer possibilities to overcome this problem (Batty, 2005; 2013).

The second approach derives from qualitative, descriptive methodologies building on multiple narratives, values and perspectives. Scenario development is one method by which different solutions and futures can be developed. Following complexity thinking, different internal drivers and values or external events will lead to different development paths. Scenario development or foresight studies can be expert driven or pursued in partnership with the public and stakeholders. On occasion, creative thinking techniques may be employed to stimulate divergent thinking and widen the solution pool.

The narrative approach to complexity can be seen as directly and explicitly aligned with the communicative, participatory social planning approach and as such any problem statement and solution would have to be negotiated, discussed, selected and realized in a participatory dialogue with stakeholders. One of the difficulties in pursuing the participatory collaborative approach is to not preclude the emergence of divergence by pre-conceived notions of problem boundaries as Hillier (Roo et al, 2012) aptly illustrates through her examinations of the constraints imposed by expert-run engagement activities.

Neither of the above approaches is deemed ideal. Hence, a number of scholars (van Bueren, 2009, pp. 282-283; Deardon & Wilson, 2011) have suggested that the most promising path forward are mixed methods that integrate advanced computer modelling with collaborative management processes that can reference the political dimensions of complex systems. Collaborative decision support systems, participatory simulations or gaming simulations represent such mixed methods (Devisch, 2008). It is also helpful and beneficial if data can be visualized and mediated by artefacts. Visualization greatly supports the learning about data and relationships, understanding, exploration, and engagement with complex systems not only for experts but also lay persons (Batty, et al. 2004). Here, Devisch's (2012, pp. 372-74) categorization of advanced data visualization as mirror worlds, virtual worlds, augmented reality or life-logging is instructive. *Mirror worlds* are digitally computed reflections of our physical world of which certain aspects can be updated more or less in real time (e.g., Google Earth). *Virtual worlds* are alternative realities – many of which are created and re-created through playing games such as SIMCityTM or CityOne: A smarter planet game. While many commercial games have a focus on winning, educational games often emphasize collaboration and developing players' understanding of urban environments. Some virtual worlds promote the development of online communities as in the popular Second Life® application where avatars are constructing objects ranging from furniture to entire villages. *Augmented reality* can be used to enhance our physical world by providing intelligence or information to physical objects and locations. An example would be community members sharing personal stories and memories associated with particular places in neighborhood via some kind of shared GIS platform to bring to life all the different perspectives that people have of the district. *Lifelogging,* finally refers to the continuous recording (and mapping) of data e.g., of our shopping route, travel speed and stops which then can feed into a geographic agent based model. While much of the technology can facilitate rich data visualizations to help us explain and explore the status of our cities and environments, predicting the outcome of interventions is still far from easy due to the complexity of urban dynamics.

Yet, Devisch (2012, pp. 379/80) suggests that small-scale experiments in collaborative planning could be organized by inviting residents of a city district to redesign their neighborhood park in *Second Life* based on a *mirror world* environment. And the city of Sydney (Australia) already uses a real world replica model of its CBD which is continuously updated by real world data to support the city's emergency response planning (Strachan, 2013).

4 Games as Models for complex, chaotic and emergent systems

The incorporation of key characteristics of reality in any model is essential to the success of the model. As indicated above, it is difficult to develop computational models of complex open systems such as cities due to the vast number of interactions, actors and influences involved while mere narrative approaches also fall short in encapsulating all aspects of complex system at a different level. It has been argued (Devisch, 2008; Deardon & Wilson, 2011) that mixed methods such as participatory simulations or gaming simulations and policy exercises as described by Duke (1974), and Duke and Geurts (2004) come possibly closest to mirroring emergent complex systems and co-evolution as observed in urban environments. To illustrate, Table 1 lists equivalent elements and characteristics of complex systems and their representation in serious, multiplayer gaming exercises. As a result of the high degree of incorporation of complex systems characteristics in gaming simulations and equivalent activities it is proposed that they are highly suitable in helping us to understand the system as well as possible outcomes of interventions.

Table 1 Characteristics of complex systems and gaming/simulations

Complex systems	**Gaming Simulations**
Contain key many individual elements, actors, with (hierarchical) and lateral connections, flows and relationships	Are based on game model which reflects reality with selected key actors, artefacts and processes
Self-organizing	Have some (learnable) rules
Encompass manifold parallel interactions, signals and messages	Enables 'Multilogue': (players) in game can interact simultaneously with others and artefacts
Development/change is shaped by institutional or individual's decisions	Key actors are typically represented by humans who can make decisions within their role
Development is changed/disrupted by external forces	Events can be introduced to create disturbances/ turbulence

Unpredictable and uncertain	Humans do not act always rational, or mechanical; unpredictable
Emergent	individuals may change behavior, policies based on external events or previous (cycle) experience
Path dependent on initial conditions	Information, or initial resources will influence outcome
Natural science rules persist	Certain rules will be set to be unchangeable

5 Gaming in current Planning Practice, Research and Education

Games and especially gaming simulations have been used in urban and regional planning practice and education since 1960s, yet, alongside methods such as modelling (Devisch, 2008), they have not become a standard element in the planner's toolkit. An invitation to teach a seminar on the use of games and gaming for city and regional planning in 2012 provided impetus to re-examine the current status quo. The significant number of hits from a search of the web and German and English literature databases such as *Web of Knowledge* on terms like "serious games AND urban planning", "Policy Exercises," "gaming simulation," "Planspiel" etc. suggests a renewed interest in gaming and policy exercises. Examples of recent gaming applications appear centered around three general arenas: (1) Research and development; (2) Education; and (3) Public participation and community engagement.

Gaming examples in research and development use deliberate methods which could best be described as policy exercises (Duke & Geurts, 2004). These are usually custom-designed and often combine sophisticated computer models with human interaction or role play (Dearden & Wilson, 2011; Devisch, 2012; van Bueren, 2009). As such their creation and use require considerable investment (Duke & Geurts, 2004) restricting them to applications for large scale projects and problems of considerable implication. One such example is a multi-year project (2004-6) funded by the German Federal Institute for Research on Building, Urban Affairs and Spatial Development which employed a series of policy exercises exploring land consumption patterns by municipalities. Expert level policy exercises were first run with traditional planning tools and followed-up with another round of exercises in which new policy tools and their potential uptake and impact were tested. Study results informed the revision of policy guidelines for land use planning at Federal and State level (Bundesamt für Bauwesen und Raumordnung, 2006). The city of Berlin also successfully used a policy exercise to explore and evaluate different car parking strategies.

Participants found the activity highly valuable as a means to find practicable solutions and to study potential impacts of different formats of parking provision and charging prior to implementation (Preuß et al. 2009).

The merit of games as a pedagogical tool is well rehearsed in the education community; for planning education it was specified decades ago for example by Feldt (1966). Findings from my 2012 informal straw poll showed that a considerable number of faculty members have been exposed to urban planning games in their own education. Nevertheless, the use of games and more importantly learning about games as a planning tool has never been systematically embedded in planning curricula the world over. So, planning students participating in the 2012 seminar albeit familiar with the terms of gaming simulation and policy exercise claimed to never have seen a policy exercise in planning practice. Some seminar participants had experienced game-based exercises (e.g., Frederik Vester's *Ecopolicy* or entrepreneurial management games) which are used to teach principle dynamics of interconnected eco-systems, stock markets, or large organizations in their secondary schooling. However, students failed to see any relationship in concepts or pedagogies. Computer games such as SIMcity™ were discounted outright as entertainment lacking any real value toward their professional skills development. These sentiments resonate with reflections from academics who explored the benefit of generic computer games such as SimCity™ for planning education (Gaber, 2007; Minnery & Searle, 2014). Commercial games primarily developed for entertainment have clear limitations for education. However, substantial insights into complex processes, power relations, or dynamics can be developed if the focus is purposefully shifted from mere use of the game to post-game exploration of the underlying game model, discrepancy with reality and constraints (Salen, 2008).

Somewhat unexpected and positively surprising findings emerged in respect to planning practice. A number of planning consultancies seem to have (re-)discovered gaming simulations for traditional land use planning problems and specifically for facilitating communications with stakeholders. Heer et al. (2010) proclaim that gaming is "serious business" in urban planning based on their comparison of standard and game-based social participation processes in discussing the contentious redevelopment of a military airbase. They assert that the use of a game with role play, basic paraphernalia and some support for accounting from a computer resulted in a better and more efficient discourse amongst key stakeholders.

While public bodies in many democratic states today have a legal mandate to engage the public in planning, getting the public to participate remains challenging. Using games and game-like activities, mixing role play, board games, visualizations and groupware online platforms may help attract segments of the population that are unwilling or unable to participate in traditional formats of public engagement.

The use of 'game' or 'gaming' is often deliberately avoided in advertising such activities although they clearly have characteristics of serious games Proponents of this new approach to playful public participation (Poplin, 2011, 2012; Gordon, Schirra & Hollander, 2011) suggest that a key element for sustained public engagement is to make it 'easy' and enjoyable to participate. Learning processes required to engage must not entail inordinate amounts of time and effort. To this end, visualization and the gaming environment are helpful as they facilitate expedited learning-by-doing which is active and emotionally engaging rather than passive, one-directional and theoretical. Mallan, Foth, Greenaway, and Young (2010) experiments in co-design and participatory planning with pupils using Second Life technology is a particularly effective example of future possibilities. Specific gaming formats and applications for public participation are currently being developed and tested and one can hope that games and gaming simulations will soon become a new standard for this planning task.

On a final note, it was somewhat startling how little awareness some authors appeared to have of previous work in the field although at least Heer et al. (2010) refer to Bekebrede (2010) which in turn draws extensively on Kriz (2003), Duke (1974), Duke and Geurts (2004), Cecchini and Rizzi (2001), Greenblat and Duke (1975) and many others. One reason might be a lack of access to out-of-print texts and scientific journals, which are generally restricted to academics and university library systems and possibly language barriers. A second reason might be the lack of coverage of the topic of gaming and simulations in planning curricula.

6 Future outlook and Recommendations

In urban and regional planning, gaming simulations, serious games and policy exercises appear to experience a renaissance. Research labs have sprung up in the past decade to explore the use of computer games, models, simulations and so forth for planning purposes. A particularly exciting, novel use of games is developing around participatory planning and public engagement. These new games draw extensively on advanced visualization methods together with online social platforms or face-to-face interactions to create exciting, attractive and fun ways to engage communities in collaborative planning. This revolves around developing consensual strategies and values in how to develop their neighborhoods and regions (Gordon et al., 2011; Poplin, 2010; 2012; Mallan et al., 2010).

Observers familiar with the history of games in urban planning will recognize that most the arguments on the usefulness of gaming and games for problems-solving in complex settings and learning are well rehearsed (Duke & Meier, 1966; Feldt, 1966; Duke, 1974) but a more widespread adoption of the method might have been delayed due to a theory-method disconnect. By contrast, the emergent use of games in and for playful public participation at present is consistent with the social, communicative planning paradigm.

Acceptance of the use of gaming for serious tasks might further be helped by the fact that younger generations are growing up in a gamified world (Salen, 2008) where boundaries between fun and work, entertainment and making decisions that have potentially significant impact are becoming increasingly blurred. The development of computer games is becoming easier and educators are considering the development and creation of games as a learning element in itself as it requires the development of a narrative, the understanding of problems and relationships of how things work in the real world. Thus, games are perhaps not seen as a 'new (futures) language' per se, but as tools for learning or to learn from (Salen, 2008).

One concern in my view is that at present there is limited use and promotion of gaming simulations in the planning education curriculum. Cutting edge research and developments of games and gaming seems to be lodged firmly in special research centers linked to engineering, computing, and visual media faculties or education. The development of games for particular subject specific task and proper facilitation is however key to their effectiveness. Debriefing and reflection is vital to learning from gaming.

If planners want to reclaim a more prominent role, they are in need of tools that will enable them to effectively engage in processes and facilitate the involvement of the multitude of stakeholders in the city. This tool just might be policy exercises and games. Future planners may not need to be all able to design games but it may be advisable that they become artful users of games (Devisch, 2008). Skills in gaming simulation should become a learning outcome for future planning graduates whereby all students are at a minimum exposed to the basics of the gaming methodology (possibly as part of training for public participation and community engagement or as part of planning theory teaching).

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GAMING AS THE "FUTURE'S LANGUAGE": CASE STUDIES AND DEVELOPMENT

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Abstract
This paper examines the possible functions of simulation/gaming, including Duke's (1974) suggestion that such modes of communication and knowledge creation will constitute a "future's language". The paper focuses primarily on two issues. First, the author introduces two examples of gaming: "Crossroad" (Kikkawa, Yamori & Ajiro, 2004) and "KEEP COOL" (Sugiura & Kikkawa, 2009), which can be interpreted as examples of gaming that constitute the future's language. Although these examples were briefly introduced by Kikkawa (2012), the author adopts a perspective rooted in policy gaming to explore how they could evolve into the future's language. Second, the author presents a theoretical perspective on gaming as the future's language and elaborates on the argument made by Duke (1974) regarding the future of gaming.

Keywords
simulation/gamingaming, the future's language, policy gaming, case studies

1 Introduction

In his seminal book on gaming, Duke (1974) defined gaming as the "future's language". Simulation and gaming (hereafter, s/g) is a hybrid communication mode that enables engagement in "Multilogue". This is closely related to a key concept in his book: "The simultaneous dialogue in a game of multiple actors in pursuit of greater understanding of the topic and the topic at hand." (Duke & Geurts, 2004). The effects of this book have been dramatic in both Japan and the world in general, as comprehensive textbooks on s/g were rare at the time of its publication. Additionally, the Japanese translation by Mieko Nakamura and Arata Ichikawa, published in 2004, reinforced the book's impact by expanding its audience to readers other than s/g researchers, which contributed to the increase of those interested in s/g in the long run.

In this article, I focus on the Japanese perspective on the effects of this book, especially on how the future's language and the use of multilogue have been realised in s/g. First, I will introduce two case studies focused on games that have the typical characteristics of a future's language.

2 The Game of "Crossroad"

The game "Crossroad" was originally designed as a tabletop exercise to teach disaster preparedness and responsiveness (Kikkawa et al., 2004). The game is played as follows. First, each group of five to seven players reads an episode card, each of which describes a situation before or after a disaster. Every episode card follows the same three-part format (see Fig. 1). The first part describes a certain role that is to be played when faced with a dilemma in a disaster situation. A short description of the situation follows. The third part consists of a description of both YES and NO decisions. After an episode card is read, each player predicts the majority opinion by selecting the YES or NO card provided. Players receive a blue miniature zabuton (point) if they correctly predict the majority opinion. When a player in a given group offers a prediction that differs from that offered by the rest of the group, s/he gains a gold miniature zabuton (point). A zabuton is a traditional Japanese cushion that signifies approval of an utterance. (see Photo 1). The cushion has a symbolic meaning for many Japanese people in that the person whose opinions are regarded with the most respect is often given the zabuton on which s/he has been sitting.

Photo 1 Zabutons used as points in 'Crossroad'

The ostensible purpose of the game is to obtain as many zabutons as possible. However, the true objective of the game is engaging in a discussion about the situation that follows each round (see Photo 2). Personal experiences evoked by, or lessons learned from, the situation described in the episode cards are shared during the discussion. This game originated, in part, because of Japan's history of multiple natural disasters, including the disaster of March 11, 2011. Crossroad has many of the characteristics of what Duke (1974) described as the future's language (p. 49–54). I will focus on three of these. First, the game involves active simultaneous dialogue among the players. Duke (1974) has used the term "multilogue" to describe this dynamic, which is shown in Photo 2.

Photo 2 Discussion during 'Crossroad'

Second, although Crossroad was originally designed for disaster preparedness, "its basic structure, or frames, can be employed in different situations through the device of altering the content" (p. 50). In other words, it has both "universality" as a frame game and "specificity", as the content of the episode cards can be changed (Kikkawa, 2014). Indeed, many variants of this game have been produced and played since its publication (Kikkawa, Yamori & Sugiura, 2009), and the themes of these variations have not been restricted to natural disasters. For example, situations involving food risks and infectious diseases form the themes of two of these games. Because the rules and the game structure are relatively simple, people other than game designers can create original episode cards and play the game.

Third, during the discussion, many "what if" questions are spontaneously posed by the players and discussed. To the extent that the descriptions of the situations feel realistic, the players discuss alternative courses of action. For example, use of the cards shown in Figure 1 can lead to discussions about policies related to building disaster-resilient communities. Although many kinds of natural disasters occur in Japan, each is unique. Therefore, it is necessary to learn to flexibly respond to each disaster. Crossroad may offer an opportunity to expand our thinking about the future.

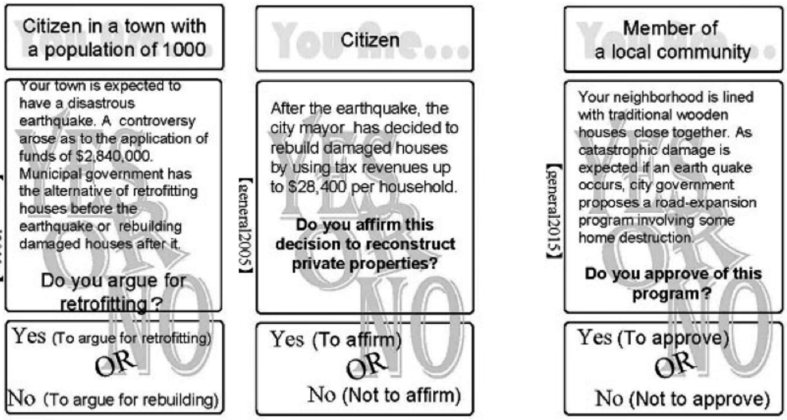

Figure 1 Example of episode cards of Crossroad

3 The Game of "KEEP COOL"

Another example of a game that can be seen as a possible future's language is "KEEP COOL", a board game developed by Spieltrieb in 2004 in cooperation with the Potsdam Institute for Climate Impact Research. It was translated into Japanese and has been gaining popularity since 2009.

Its primary aim is to foster learning about environmental issues. Additionally, it is a type of negotiation game involving many countries with conflicting interests. The game is played by up to six players, each representing a country or, more precisely, a group of countries mimicking the real world. The six groups are the US and partner countries, Europe, tiger countries, developing countries, former Soviet republics, and OPEC. Players try to achieve two objectives, described below, that deal with disasters caused by global warming; such disasters, in turn, are triggered when players draw "disaster cards" during play.

Although not an exact reproduction of reality, the game starts with countries with unequal resources and unequal power or privilege. Reality is also reflected in the presence of an “economic target”, namely the number of factories that each player aims to construct; this is one of the objectives that players must meet to win the game. The other objective involves a “secret target”, which is given on cards that players draw at the beginning of the game. Whereas economic targets are visible to all players, secret targets are not visible during play.

Secret targets influence the policies pursued by countries in the game. For example, an “environmentalist” target card requires the player to construct environmentally friendly factories, symbolised by green factories in the game, and the “climate sceptic” target card directs the player to construct factories that use oil, symbolised by black factories. Because the cards are drawn by chance, the secret target may not coincide with the economic target. As both the economic target and the secret target must be achieved to win the game, players must sometimes act in a contradictory manner, as befits the roles of the designated countries. For instance, the US and partner countries usually try to construct many factories even if they are not environmentally friendly (i.e., they consume considerable oil). This economic target is in accordance with the nations’ real-world preoccupation. However, if the player representing the US and partner countries draws the environmentalist secret target card, s/he should try to reduce the number of black factories and even try to persuade other countries to construct green instead of black factories.

KEEP COOL also contains many characteristics of the future’s language, especially with respect to the roles of the two objectives of the game (i.e., the economic and secret targets). By introducing the two targets, KEEP COOL has “an ability to present a future orientation” as a future’s language (Duke, 1974, p. 52). For example, the contradictory behaviour of the US and partner countries makes it likely that players, including the US and partner countries, will think about the hypothetical but possible future that might emerge if the US adopted or promoted environmentalist policies in the real world. In short, the contradictions that occur in the game may inspire efforts towards change among players during and after the game. This may be an advantage of gaming. If we think about the future ***without*** gaming, our thoughts may be strongly constrained by reality, whether consciously or unconsciously. For example, we may consider possible future policies only in the context of our knowledge of the current political situation and rarely venture into more imaginative scenarios. In contrast, games such as KEEP COOL enable us “to explore alternatives, to develop a sophisticated mental response to ‘what if’ questions, and to permit the formulation of analogy for exploration of alternatives where no prior basis for analogy exists” (Duke, 1974, p. 52).

Indeed, recent history contains examples of drastic changes that were not imagined in the Cold War era, such as the fall of the Berlin Wall in 1989 or the Maastricht Treaty, which led to the creation of the Euro in the European Union. If we were to think about the future in the absence of gaming, that is, in terms limited by our knowledge and imagination, we would find it difficult to envisage what might happen, and might be less able to adapt to future developments.

With respect to Duke‘s claim that "Gaming/Simulation has a very high capability for conveying gestalt, or holistic imagery" (Duke, 1974, p. 27), the designer of KEEP COOL, Meyer, offered a similar perspective on the educational effects of gaming (Meyer & Stiehl, 2006). He noted that two types of information can be conveyed by educational games: factual information and system information. Factual information is concrete information pertaining to reality. In the case of KEEP COOL, the factual information includes, for instance, the names of countries (the US and allied countries, tiger countries, etc.) and data about economic power that are reflected in the game rules. In contrast, system information conveys information about the systems, not explicityly but implicitly, described in the game. For example, KEEP COOL includes notions such as the imbalance of political power among countries. The system information is more abstract and does not precisely reflect reality. System information could be interpreted as what Duke (1974) referred to as "gestalt" imagery. Additionally, Meyer and Stiehl (2006) noted that games are more suitable for teaching about system information than they are for relaying factual information, which can be taught more efficiently by lectures.

4 The "Predicted" Future of Simulation and Gaming

Crossroad was developed by Japanese researchers, including the author, who were strongly influenced by Duke's book (1974). Our game can be contrasted with KEEP COOL, a commercial board game created by trained game designers. Indeed, these two games have little in common (e.g., origin, game designer, theme, etc.), but close analysis of what happens during the games, including the communication among the players, reveals characteristics of the "future's language" in both games. Additionally, there may be other examples, both in Japan and internationally, of the progress predicted by Duke (1974). In this sense, his seminal book predicted the progress of s/g, which has been realised 40 years after its publication.

The author does not intend to claim that all the games that followed Duke's book should be interpreted as the "future's language". However, any game has the potential of "guiding speculation about future circumstances" (Duke, 1974, p. 44) if it includes the characteristics mentioned in the book.

The progess of s/g continues, and the author believes that the value of games as the future's language will increase given that the world of the future will be more complex than it was in 1974. Indeed, in the context of the changes that have occurred in the world since the end of the Cold War, a plethora of new threats (e.g., terrorism, regional conflicts, environmental problems, etc.) have emerged. Therefore, the importance of s/g is increasing both in Japan, as underscored in this article, and in the rest of the world. The use of properly designed games offers "abstract symbolic maps of multidimentional phenomena" (Duke, 1974, p. 64) with which we benefit from "the comprehension of totality which is necessary for the intelligent management of any complex system" (Duke, 1974, p. 65).

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GAMING AS AN "EFFECTIVE" TOOL FOR COMMUNITY-BASED DISASTER REDUCTION

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Abstract

Technology for the early warning of natural hazards has become widely developed. In parallel with this, the division of tasks for mitigation, prevention and response have proceeded accordingly. As a result, this system contributed "efficient" disaster reduction and response activities. However, the recent unprecedented disastrous situations posed problems. Even though early warnings are issued with correct timing and appropriate expectation on the hazard scale, sometimes many people do not evacuate as instructed by the warning. To improve these situations, the importance of risk communication among the actors was recognized and Gaming can be utilized as a way of risk communication. In this chapter, I explore the past, present and future context of disaster reduction and reveals that although many of the points the points extracted from the Richard Duke's (1974) work, "Gaming: The future's language," are still true, the essence of gaming has not been diffused into the disaster reduction community. There are challenges to overcome related to the use of gaming in disaster reduction. Firstly, we must change our mindsets about the relationships between real world actors and their gamed counterparts so that risk communication in the form of interactions through gaming would become imbedded in the process of developing future directions. Secondly, we need to find a way to induce real world actors to accept the uncertainties stemming from complexities of the situation. We must focus the discussion through the use of gaming so that it becomes efficient to search for future directions of the various practices employed for community-based disaster reduction. We have missed "effective" ways to achieve disaster reduction, especially because of our belief in the "efficiency" of task division.

Keywords

complexity, community, disaster reduction, risk communication, task division

1 Introduction

Technology for the early warning of natural hazards has become widely developed. In parallel with this, the division of tasks for mitigation, prevention and response have proceeded accordingly. In previous times when technology was much less developed than it is now, hazard[1] reaction (monitoring, warning, response, and so on) was mainly charged by local community members working together (even though they had division of roles, it was not as clear as it is now).

Take the tsunami as an example. At the present time, disaster specialists pursue ways to reduce risk by doing research along such themes as the mechanism of a tsunami; psychological modeling to promote quick evacuation behavior; and/or developing new devices to mitigate damage such as earthquake-resistant construction methods for an earthquake followed by tsunami.

Administrators at various levels of government publish disaster mitigation plans, prepare evacuation facilities and provide necessary information such as evacuation instruction. They also issue early warnings to the public through sirens, TV and communication tools to insure redundancy of information distribution. On the other hand, residents are supposed to prepare for a tsunami and react appropriately according to information provided by administrators.

On one hand, this system contributed "efficient" disaster reduction and response activities, saving more human life than ever. On the other hand, the recent unprecedented disastrous situations posed problems. This division hid other actors' tasks (Yamori, 2013). This confusion further imperiled human life. Early warnings are sometimes mistakenly issued: no tsunami or a much smaller scale tsunami comes after early warning. Or a much more serious problem occurs when a more disastrous tsunami than expected devastates communities.

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[1] In this chapter, I define natural hazards as natural phenomenon that possibly affect human life. On the contrary, I define natural disasters as the impact of natural hazards to our society. Disasters are formulated with natural hazards (a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage [UNISDR, 2009, p. 17]); vulnerability ("the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard" [UNISDR, 2009, p. 30]); and exposure ("people, property, systems, or other elements present in hazard zones that are thereby subject to potential losses" [UNISDR, 2009, p. 15]). Therefore, disaster is an output from interactions between natural and human systems, and disaster reduction means to reduce damage on our society as well as to mitigate natural hazards if possible.

Even though early warnings are issued with correct timing and appropriate expectation on the hazard scale, sometimes many people do not evacuate as instructed by the warning. This is explained by the normalcy bias (this is a bias by which we, even in an emergency, tend to consider that the situation is normal to keep peace in our minds).

To improve these situations, the importance of risk communication among the actors was recognized; and a search is underway to improve communication. Gaming also provides players with a rich experience in its virtual world, which is impossible or difficult to experience in the real world. Richard Duke's work "Gaming: The Future's Language" seems to directly reveal the essence of community-based disaster reduction. Based on the complexity of disaster reduction (not only natural hazards but also societal needs) and reflection on the problem of risk communication, relations between actors and their communication modes need to be considered.

In this chapter, I explore the past, present and future context of disaster reduction with specific focus on local communities using the points extracted from the book. My review of the present situation reveals that although many of the points from the book are still true, the essence of gaming has not been diffused into the disaster reduction community

There are challenges to overcome related to the use of gaming in disaster reduction. These obstacles are two-fold: first, we must change our mindsets about the relationships between real world actors such as officials and their gamed counterparts so that risk communication in the form of interactions through gaming would become imbedded in the process of developing future directions. In addition, we need to find a way to induce real world actors to accept the uncertainties stemming from complexities of the situation. We must focus the discussion through the use of gaming so that it becomes efficient to search for future directions of the various practices employed for community-based disaster reduction. We have missed "effective" ways to achieve disaster reduction, especially because of our belief in the "efficiency" of task division.

2 Contribution of Gaming to Disaster Reduction

To begin, I would like to introduce the advantages of gaming and how they can contribute to disaster reduction. Crookall (2004) mentioned two areas where gaming may be able to help in terms of crisis management. First, gaming offers the opportunity of providing people with crisis experiences that they would otherwise not be able to experience. By experiencing disasters and facing the difficulties or failure in the virtual world (designed into the game), the participants can grasp an understanding of the lack of preparation.

Moreover, because a gaming model contains lessons learned from past disasters, the participants can recognize its importance in a safe virtual world of gaming.

Furthermore, Crookall (2004) pointed out that gaming moves us to change our mindsets and encourage participants to be more flexible in their thinking and behaviors, which is certainly helpful during crises. In 2011 a bigger than expected tsunami hit the coast of the Pacific Ocean mainly in the Tohoku Region. One of the important lessons learned from this Great East Japan Earthquake is that we need be flexible to tackle crises that are beyond expectation. Besides those who did not evacuate even in known hazardous areas, many others who lived in safety areas (as displayed on the hazard map) were killed by tsunami. This is due to their belief based on the hazard map. However, some reacted flexibly and evacuated to higher places according to the situation and saved their lives.

Moreover, simulations that are essential components of gaming can be used as an assessment tool for crisis management, as presented by Boin, Kofman-Bos, and Overdijik (2004). Simulation is an effective tool for using groups to identify the weaknesses and strengths of a plan or a policy statement. This is true for local communities, local administrations, and other groups as well. This is more focused on utilizing gaming as a tool for directly promoting crisis management activities rather than education. In addition, I would like to add that gaming goes beyond learning-by-doing methods. Not only providing experience and changing mindsets, gaming provides players with a common arena to discuss the issues presented in the exercise. In addition, gaming lets the participants play different roles. As researchers have their own mindsets (even among researchers different mindsets can be seen), other actors also have their own mindsets. These mindsets would be usually tacit and not easily shared with others through verbal conversation. However, in the virtual world of gaming we would expect the participants to find some differences between their own ways of thinking and the roles that the participants play.

Participants might face difficulties playing assigned roles as their own ways of thinking would be different from developed in the roles. Moreover, interaction with other players would let the participants see their own ways of thinking reflectively.

If an officer of a local government plays a role of resident, he might interact with a player of a local government in the game. This situation gives him an opportunity to see the local government's way of thinking from the viewpoint of the resident).

In sum, although it is not a comprehensive framework, at least these four main aspects of gaming are critical for disaster reduction. All of the above experienced by the participants would be discussed and summarized in the final phase of the exercise (debriefing). Lessons learned in the game will be used for further activities in either education or practice for disaster reduction.

3 Reviewing Richard Duke's Points in the Context of Community-based Disaster Reduction

In this section, I review points posed in Richard Duke's 1974 work from the viewpoint of someone who has been making use of gaming for community-based disaster reduction (As the main theme of this chapter is risk communication through gaming, I would like to postpone a discussion of the Game Design Process).

3.1 Gaming as a tool for confronting complexity

> *"Many existing complexities do not readily yield to scientific study."*
> *"Increasing complexity is expected in the future."*

"Future's Language" predicted that gaming would emerge as a valuable approach in situations where a small group struggled to exchange ideas based on limited data, wisdom as available, and intuition. As computing technology have become highly developed and much more data is available (e.g. such as Big Data), computer simulation is highly progressed; none-the-less gaming also expanded its scope. Accordingly, gaming should become an ever more useful approach to policy making.

Table 1 shows the evolution of environmental hazard paradigms. According to Smith (2013), before the 1950s engineering was the main realm used to tackle disasters; engineering was constrained by a limited understanding of the interactions between natural hazards and people. From the 1950s to the 1970s, scientists started to understand that human decisions (such as land planning) are related to natural hazards. During the 1970s, scientists focused on the less industrialized countries that were having more severe impacts from natural hazards including large losses of life. In this paradigm vulnerability, such as economic dependency, shed light on understanding social causes of hazard impacts.

In the 1990s, two contrasting views were still evident. One is the realm of physical science such as civil engineering and the other is social science such as economics. At present the paradigm is called 'complexity'; it meshes disaster reduction with a realistic development agenda that secures a more sustainable future. It means to embed hazards and disasters within global issues like climate change and sustainability. It clearly indicates a challenge we are facing as complicated interactions between natural and human systems related to disasters.

This level of complexity has not readily yielded to scientific study until now. Taking an example, as Chen, Kwan, Li, and Chen (2012) put it, a simulation would only be useful if it is realistic and able to integrate all types of social and environmental factors into a single model. For this reason, the validity of simulation models is often questioned.

Moreover, as we say fusion of studies between arts and sciences has been promoted; with some exceptions, we still need to admit the gap between them.

We have been facing with unprecedented events such as massive flooding, storms and other natural hazards that many believe are linked to climate change. The Great East Japan Earthquake also forced us to face desperate situations. Although we now recognized that the same scale of tsunami hit the same area more than ten centuries ago, we had endorsed the belief that it was 'beyond expectations.' Complexity in natural phenomena that cause disastrous hazards is beyond our expectations and complexity in human behavior that made people determine not to evacuate is beyond our imagination. Hazard information such as hazard maps are made under some assumptions or scenarios, however; this information does not translate well for residents. A well designed game would encourage residents to understand the complexities of natural phenomena. In turn, the uncertainties behind hazard information would be provided in a form that was in an understandable format.

Researchers are also struggling to find mechanisms or factors to promote preferable behaviors such as prompt evacuation. Although we can see much progress in this field, we need to admit that a great deal is unknown. Of course, there is much that is unknown in the intersection between natural and human systems.

Table 1 The evolution of environmental hazard paradigms

Period	**Paradim name**	**Main issue**	**Main responses**
Pre- 1950	Engineering	What are the physical causes for the magnitude and frequency of natural hazards at certain sites and how can protection be provided against them?	Scientific weather forecasting and large structures designed and built to defend against natural hazards, especially those of hydrometeorological origin.
1950- 1970	Behavioural	Why do natural hazards create deaths and economic damage in the MDCs(Mdde Developed Countries) and how can changes in human behavior minimize risk?	Improved short-term warning and better longer-term land planning so that humans can adapt and avoid sites prone to natural hazards.
1970- 1980	Development	Why do people in the LDCs (Last Develped Countries) suffer so severely in the natural disasters and why are the historical and current socio-economic causes of this situation?	Greater awareness of human vulnerability to disaster and an understanding of how lo economic development and dependency contribute to disaster.
1990	Complexity	How can disaster impacts be reduced in a sustainable way in the future, especially for the poorest people in an unequal and rapidly changing world.	Emphasis on the complicated interactions between natural and human systems, leading to improvement in the long-term management of hazards according to local needs.

Source: Smith, 2013, p.15

Gaming, especially in the field of community-based disaster reduction, often contains simple models of social and environmental systems. However, if the gaming is mainly for education or promoting risk communication it can contain some uncertainties stemming from the complexity of the situation. The complexity and uncertainty in themselves are a target to be discussed by participants. Working together with some of my colleagues, I am developing a game "Arrival City"; this prototype was suggested during the ISAGA Summer School in Atlanta, USA 2012[2]. In "Arrival City" players, especially the role of city government, face population growth pressure while tackling environmental, housing, electric, and many other pressures. Players in this game explore the meanings and format of a "resilient city." The model in this game is simple. However, interactions among players embedded in a social and environmental system make for complicated situations and create uncertainties from the viewpoints of players (their scopes of thinking is limited given the scale of the complexity in the gaming). "Arrival City" lets players search for resilience in complexities and seeks to find some clues to adapt to the real world.

If gaming is properly designed for its purpose and in a manner that is attractive to people, it has much potential in risk communication, disaster reduction and community-based disaster reduction.

3.2 Gaming Lacking Pervasiveness as Future's Language

"Existing communication modes are proving inadequate to the task."

"Policy gaming is an emerging discipline."

"Gaming is a Future's Language."

As the complexity of the society is revealed, it is getting harder to comprehend the individual systems and their interactions. Moreover, each actor manages problems together with other actors who possess different backgrounds and ways of thinking. This difference makes the systems more complicated and makes us unable to understand them in their entirety. In addition, this communication, using sequential languages of the past, requires a lot of time to gain a deep understand.

Legitimate Peripheral Participation (LPP) is introduced as a way to bridge the division of work especially between specialists and non-specialists in the context of risk communication (Yamori, 2013). LPP is originally suggested to explain learning.

According to Lave and Wenger (1991), LPP describes how newcomers become experienced members and eventually old timers of a community of practice or a collaborative project.

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2 It was originally created with Prof. Paola Rizzi, Mr. Sarunwit Promsaka Na Sakonnakron, Mr. Pongpisit Huyakorn and Mr. Gary Coyle. At the present it is being developed by a research group beyond the original members.

The essence of LPP in the context of risk communication can be summarized as non-specialists, such as residents involved in real disaster activities (legitimate) also having even a small part of a task that they can do (peripheral). What we need to keep in mind is that "peripheral" is not an opposite concept to "center." Participants in peripheral realms are not always supposed to approach the center as they get more knowledge and wisdom. It is important for a community of practice to stay involved in the peripheral realm itself.

The 'peripherals' could potentially pose constructive naïve perspectives and inquiries to the center where the specialists are found. As the division of works proceeds, the process, in specific fields, can become a black box. With the peripheral involved in the community of practice, the process becomes a glass box and help to avoid communication gaps in division works.

In the context of disaster reduction or risk communication, by involving residents (the peripheral) in making risk information such as hazard maps (legitimate), the division between specialists and non-specialists could be bridged. An example would be the ones who make and distribute risk information (such as hazard maps) and those who get the hazard maps and react. Some disaster activities with the title of "participatory" (or I guess many including my past activities) treat participants as objects that specialists need to transfer the knowledge to. This attitude would stabilize divisions and not promote risk communication.

However, a question can be posed if LPP is adequate for disaster reduction that tackles future natural phenomena (natural hazards) with future societal changes. Disaster reduction is not for the present but for future challenges. In gaming, participants can experience expected future scenarios and can produce some outputs such as disaster plans in collaboration with others in the artificial gaming world. Moreover, by changing their roles (from the center to the peripheral or vice-vasa), gaming is a strong tool for making the process of creating risk information as a glass box.

Hopefully the process would make it possible for specialists to accept constructive (albeit naïve) perspectives and inquiries. No other artifact than gaming can connect specialists and non-specialists and make them work together under future scenarios. In this sense, a policy game is a kind of "language" by providing a common arena with oral languages for actors to discuss matters under consideration.

In the context of disaster reduction, however, policy gaming is not widely disseminated. Some disaster games are developed and widely used such as "DIG" (Disaster Imagination Game; for English explanation, refer to Maiko High School, 2006) and "Crossroad" (2006), however, these games are more for letting participants recognize what needs to be done or how to think about tackling disastrous situations.

My colleagues and I devised a virtual world "EVACAUTION SIMULATION TRAIN ING" (Toyoda & Kanegae, 2014) for participants to experience evacuation after an earthquake. This game impacted personal information management systems related to a disaster in a local community. However, these attempts do not reach the level of a policy game that could affect major future scenarios.

In sum, in general policy gaming is still in the process of emerging in disaster field, because gaming itself is an effective communication tool with common arena to discuss futures.

4 Future Perspective of Gaming for Community-based Disaster Reduction

In the final section, I would like to discuss future perspectives and challenges of gaming from the viewpoint of disaster reduction and Richard Duke's (1974) points, let's say, for the next twenty-five years.

As I mentioned, although a policy game for disaster reduction could be a new tool for policy makers in disaster reduction, it is not yet developed and thus not disseminated. Will the technique become more popular and used by a wider range of practitioners in disaster reduction realms? A key point would be related to complexity mentioned above, both in natural systems and human systems.

In gaming related to disaster reduction, players usually experience lessons learned from past disastrous situations and/or based on disasters expected by scientists. In gaming, the main focus is on social mechanisms to cope with disasters so that players could realize challenges in the mechanisms or could try to challenge the mechanisms. On the other hand, natural phenomena itself are regarded as granted. In this sense, simply distributing disaster maps and gaming have no difference. A problem here is that experience sometimes works adversely. As with the Great East Japan Earthquake, residents experienced small tsunamis before the main earthquake. When the main earthquake came, some residents believed that it was a part of intermissive earthquakes and its result would not be much different from others that they had experienced.

Disaster experience works by giving invaluable lessons to residents who tend to believe it is the answer. However, we would not find any answers especially because of complexities imbedded in each unique local community. What we expect is flexible thinking and behavior based on lessons learned and a given situation in disaster. To do so, besides scenario planning that resounds in the planning theory realm, changing roles in a virtual world of gaming is an effective way to widen players' viewpoints toward the complexities under discussion in the game and promote communication among participants.

For gaming to become a solid discipline, as projected in The Future's Language (Duke, 1974), each exercise must be designed to facilitate communication about alternative futures.

We need to keep making an effort to change players' mindsets from searching for answers to searching ways of thinking with flexibility based on complexities and uncertainties to be faced in the coming twenty-five years. If we can overcome this challenge gaming will be recognized widely as a powerful tool for policy making and reconsidering future scenarios. Even though this communication mode is less efficient than distributing hazard information in terms of time, etc., more effectiveness could be expected.

After another twenty-five years I believe that our changed mindsets will lead gaming to this future situation that I imagine! This will result from mankind being forced to accept and understand the existence of complexities and the uncertainties stemming from them.

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"GAMING: THE FUTURE'S LANGUAGE" IN ORGANIZATIONAL LEARNING SETTING: A JAPANESE EXPERIENCE

Shigehisa Tsuchiya

Abstract

From my extensive research experience in Japan, I am a firm believer in "Gaming: The Future's Language" by Professor Duke.

My personal journey regarding simulation and gaming started about 25 years ago when I happened to realize how powerful computerized simulation could be for organizational change. The metaphors created by this approach enabled me to transform a stagnant university into a high-performance organization. Through extensive surveys, I found that gaming/simulation could be most effective for organizational learning. In 1997, Professor Duke gave me a rare opportunity to acquire tacit knowledge about the process of developing policy exercises. With this new skill I started to create policy exercises. These clients included a national agency as well as several Japanese companies and local authorities. Based on my gaming experience, I can claim that, as Professor Duke explored in his book (1974), gaming/simulation, properly conceived and employed, is a powerful tool for organizational learning through conveying gestalt and improving commensurability of interpretative frameworks. From my extensive research experience in Japan, as well as my field experience with this methodology, I have become a firm believer in the message presented in "Gaming: The Future's Language" by Professor Duke.

Keywords

computerized simulation, commensurability, future's language, gaming/simulation, gestalt, interpretative framework, metaphor, organizational learning, policy exercise

1 Introduction

In his book (1974), Professor Duke explored the character and utility of gaming activity as a Future's Language – a form of communication that could explain social interaction in our increasingly complex world. He suggests that gaming/simulation, properly conceived and employed, is a powerful tool both for conveying gestalt and for explaining alternative situations that could not otherwise be managed (Duke & Geurts, 2004). From my extensive research experience in Japan, I am a firm believer in "Gaming: The Future's Language" by Professor Duke.

25 years ago, at the age of 51, I resigned my post as bank director and became the secretary-general of a Japanese private university. I was quite surprised to learn that administration of universities was quite different from management of companies. When I was struggling to transform the university, I realized how effective computerized simulations could be for organizational learning. The university had been completely stagnant for over 20 years. Since (1) universities are, typically, loosely coupled organizations, and (2) the problems of ambiguity are most conspicuous in universities, it is extremely difficult to change their culture. However, using computerized simulations, I was able to transform the university into one of the high-performance universities in Japan in less than five years (Tsuchiya, 1992).

Why were my computerized simulations so useful in dramatically changing the university through organizational learning? Are there any other technologies more powerful than computerized simulation? Why do they work? Can I create effective tools for organizational learning in loosely coupled environment? These questions were the starting point of my research work.

2 Organizational Learning

My case study about this university revealed that almost no new organizational knowledge had been created during the preceding 20 years because of incommensurability of the interpretative frameworks. Since all knowledge is either tacit or rooted in tacit knowledge, it can only be expressed and transferred indirectly by means of metaphor, or language in a broad sense. The senders articulate their knowledge through their own interpretative framework and the receivers interpret the metaphor using their interpretative framework. Therefore, when interpretative frameworks are incommensurable, the new insights, knowledge, and mental models of individuals cannot be shared and become organizational knowledge (figure 1).

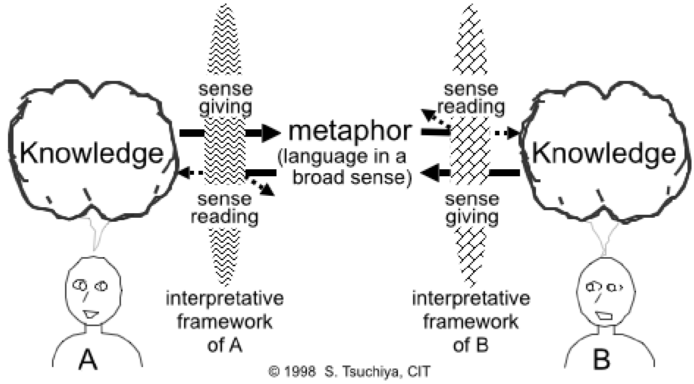

Figure 1 A Model of Communication

However, the metaphors that I produced using computerized simulations, such as financial outcomes of various strategic decisions, penetrated through the incommensurable frameworks, conveyed my knowledge to other members and created new organizational knowledge of the university. Apparently, computerized simulations provided appropriateness of the process and gave legitimacy to the metaphors and knowledge (Tsuchiya, 1996). The new knowledge changed the decisions and actions, and by interpreting the outcomes of the new decisions and actions, the university succeeded to improve commensurability of the interpretative frameworks.

Double-loop learning for culture change occurs when mismatches between the design for action and the outcome are corrected. This is achieved by first examining and altering the governing interpretative framework, and then changing the actions. However, double-loop learning is extremely difficult because interpretative frameworks are resistant to change. Individuals and organizations seldom acknowledge any mismatch between intentions and outcomes that can only be corrected by altering governing interpretative frameworks.

In my opinion, the improvement in its interpretative framework alone can explain the sudden change of the university. My computerized simulations made it possible for the university to make organizational learning and improve its performance. I wrote a doctoral thesis on this subject and received a doctorate from the School of Engineering of the University of Tokyo in 1995. I became a professor of Chiba Institute of Technology in 1996. A few years later, I found that the method I used was what Peter Senge called ‘micro-world’ technology (1990).

3 Policy exercise

I made broad literature surveys in Philosophy of Science, Social Psychology, System Dynamics, and Gaming/simulation. I also joined academic societies of Simulation & Gaming, Organizational Science, Management Information, Artificial Intelligence, and Knowledge Management.

Through the surveys, I concluded that gaming/simulation could be the most powerful tool for organizational learning. We learn best through first-hand experience. But "learning by doing" only works so long as the feedback from our actions is rapid and unambiguous. When we act in a complex system the consequences of our actions are neither immediate nor unambiguous. Gaming/simulation can permit its participants to make experiential learning in a simulated world, overcoming what Senge (1990) called the "dilemma of learning from experience."

3.1 ISAGA and Professor Duke

In 1993, I started attending regularly the Annual Conferences of ISAGA. Thanks to David Crookall, the Steering Committee of ISAGA accepted me as a member in 1995, which made it possible for me to be acquainted with many prominent gamers including Professor Duke of the University of Michigan.

In 1997 Professor Duke, the author of Gaming the Future's Language (1974), gave me a rare opportunity to acquire the tacit knowledge about developing policy exercises. I spent four months at the University of Michigan as a visiting professor and created a policy exercise with his graduate students.

3.2 Why do policy exercises work?

Tomoaki Tsuchiya and I made detailed case studies of the 'ITS Policy Exercise' and the 'Balancing the Budget Policy Exercise' developed by a team working with Professor Duke. This gave us the opportunity to get involved in the process of creating the exercises. Based on the well-proven theories of Polanyi (1966) and Argyris (1978), we induced hypotheses about the reasons as to why policy exercises work for organizational learning (Tsuchiya & Tsuchiya, 1999; Tsuchiya & Tsuchiya, 2000). These assumed reasons were (1) enlargement of interpretative frameworks, (2) expansion of the learning horizon, (3) acceleration of the learning process, (4) provision of a risk-free environment for trial and error, and (5) facilitation of shared experience.

We verified the hypotheses by studying about 22 policy exercises created by Professor Duke. In each case, policy exercise made a unique contribution to the facilitating of double-loop learning and the creation of a shared mental model among participants.

To clarify these points further, I developed about twenty policy exercises for organizational learning with Mr. Tanabe and Mr. Sekimizu of Aitel Corporation and my students. Several utility companies, a national agency, and several local governments in Japan used these policy exercises and found them effective in organizational change. Some of the policy exercises are (1) The Hidden Formula (Tsuchiya, 2001), (2) The Transfer Student (Tsuchiya & Tsuchiya, 2003), (3) Rescue Team (Tsuchiya, 2003), and (4) King of Fishermen (Fujiie, Tsuchiya, Tanabe, & Sekimizu, 2004; Tsuchiya, 2005).

3.3 Key success factors for effective policy exercise

Based on my experience of developing policy exercises in Japan, I suggest that the key success factors of policy exercises for organizational learning are (1) confidence in the product and (2) trust in the designer and the facilitator. Without these essential factors, participants in policy exercises will not open their mind for learning.

To win the confidence and trust of the participants and stakeholders, exercise designers need to address two key elements: participation and transparency. Participation of the stakeholders in creating a policy exercise is important because it generates confidence and trust of the participants and stakeholders. Transparency of the policy exercise is important because it can create confidence and trust by providing exercise participants and stakeholders with satisfying explanations about the validity of the policy exercise.

Taking two policy exercises as examples, I discuss the success factors of policy exercise for organizational learning.

'THE HIDDEN FORMULA'

I created this policy exercise to improve implicit coordination of nuclear power plant operators by enhancing their ability to develop shared mental models. It is based on the analyses of crew training sessions with simulators (Tsuchiya, 2001).

Primary objective: To cope with an emergency, a crew has to make critical decisions collectively under high task-related and ambient stress. The primary objective is to open crew members' minds to learning about the critical role of shared mental models in group decision making under stress.

Brief description: There are three perspectives: a leader, sub-leader, and three operators. The leader must guess the three hidden numbers in the displays of the three operators and deduce the numerical formula applicable to these numbers.

A part of three figures is hidden behind the panels on each display. A small part of the panel opens randomly for one second at regular intervals, revealing part of the figure. The operators make a verbal report to the leader about what they see in the display, and the leader records the reports with the assistance of the sub-leader. Recording all utterances is difficult because two people have to cover three reporters. In addition, since each operator has only a few seconds to report, a detailed report will force other operators either to make overlapping utterances or to skip a report.

Analysis of the results: After many in-house test runs, we ran the exercise six times for trainers at the BWR (Boiling Water Reactor) Operator Training Center Corp. We analysed the results using analysis formats, video recording of debriefings, and questionnaires. Based on the results of the analyses, the BWR Operator Center decided to use this policy exercise in its training programs for reactor crews.

'THE KING OF FISHERMEN'

The 'King of Fishermen' (KOF) policy exercise was created to encourage nuclear power plant (NPP) operators to increase openness in order to improve their team performance. The questionnaire survey to all NPP operators at the Tokyo Electric Power Company (TEPCO) revealed that the most important factor in an 'ideal team' is openness. Based on the analysis, TEPCO and I developed this exercise together with Aitel Corporation (Fujiie et al., 2004; Tsuchiya, 2005)

Primary Objective: Openness is essential for creating shared mental models that allow team members to predict the needs of the task and to improve performance as a team. Creating and maintaining open communication among team members, however, is a most difficult challenge although almost everybody is aware of its importance. The objective of this policy exercise is to open the minds of operators to learning about the subject of both participative and reflective openness. The exercise provides them with insights into their theory-in-use and any discrepancies with their espoused theory, as well as the causes of lack of awareness of the discrepancy.

Brief description: A fishing fleet, consisting of a mother boat and five fishing boats, sails out to fish in a stormy sea. The fleet aims to catch as much fish as possible. The mother boat can see all ocean space on a radar screen, while the fishing boats can see only a narrow ocean space, but they can see everything near the boats. The grey clouds on the screen are typhoons. If a boat enters a typhoon and cannot escape within a limited time, its catch will amount to zero.

If a boat collides with another boat, both will lose the entire catch. The fish and typhoons move automatically. In order to increase the catch, the mother boat and fishing boats need to exchange information and/or opinions actively and frequently. This corresponds to 'participative openness.' Furthermore, a mother boat must listen to the opinions and ideas of the fishing boats. If its own opinions differ from those of the fishing boats, the mother boat should doubt the validity of its opinions. If it can do so, the mother boat has 'reflective openness.'

Analysis of the results: The KOF was applied to the Human Factor Training curriculum for operators in the TEPCO nuclear power plants in the 2002 fiscal year. They ran the exercise over one hundred times and almost all 600 nuclear power plant operators played the KOF. The company and a majority of participants thought that the exercise had helped them reflect on their participative and reflective openness in their daily work and to realize the necessity of improving it. TEPCO evaluated the openness of the team by analysing communication and actions during the exercise.

Analysing these two policy exercises, I claim that confidence and trust of the stakeholders and participants are essential for a policy exercise to be effective for organizational learning. Participants will not open their mind for learning unless they confide and trust in the exercise designer and the facilitator, and believe validity of the exercise (Tsuchiya, 2008). Participation and transparency are two key elements of a policy exercise to win confidence and trust.

Validity: Transparency requires solid scientific grounds in creating a policy exercise for organizational learning. Policy exercise is an operational model entailing abstraction and representation from a larger system. Transparency can give the exercise validity of being a realistic representation of the real world system. If we are not able to give satisfactory explanations about validity of the exercise, participants will not open their mind for learning.

'The Hidden Formula' was created based on analysis of a large number of behavioral data collected by the researchers of Tokyo Electric Power Company and Toshiba Corporation.

'The King of Fishermen' depended on the analysis of TEPCO researchers about 'ideal team' for its validity. They created questionnaires on 'ideal team' through brainstorming sessions among BTC (BWR Operator Training Center) instructors and people with experience of operators, and sent the questionnaires to all NPP operators in TEPCO.

Operators selected three items as important. Those were (1) directions and chain of command are clear, (2) team members are active in expressing their opinion, and (3) advice, indication and suggestion can be given freely. These factors belong to the dimension of 'openness.'

Participation of stakeholders: A participative process of exercise design is also essential to win confidence and trust. Without participation of stakeholders, we cannot draw a proper conceptual map to identify root causes and find leverages. Participation of stakeholders is important not only because it brings in experience and knowledge, but also because it makes the exercise transparent to stakeholders and participants.
A policy exercise often becomes a 'black box' for people who have not been involved in the process of its development. Participation of stakeholders in exercise development is an effective way to win their confidence and trust.

Analysability of results: In the case of a policy exercise for organizational learning, to win confidence and trust of stakeholders and participants, we need to make the results of an exercise transparent so that they can evaluate the effectiveness of the exercise.
Especially when a policy exercise aims at organizational change, the results should be objectively analysable. If not, stakeholders and participants will have difficulty in implementing (transferring) these results in the organization.

'The Hidden Formula' and 'The King of Fishermen' are for organizational change and have special features that make their results analysable. The process as well as the results are recorded in the computer system and video recorder. They can be fully analysed later to assess the effectiveness of group decision making of a team – openness, communication skills, accuracy of recording, supporting behaviour, and leadership.

The facilitator can also let the participants compare their performance with other teams. After several months, the participants can play this exercise again to see if they have actually improved in sharing mental models and in making group decision.

4 Policy exercise for organizational learning in unorganized settings

In 2003, I won a three-year research contract with the Nuclear and Industrial Safety Agency of the Ministry of Economy, Trade and Industry. This research contract made it possible for me to pursue the ultimate goal of my research work to create effective policy exercises for organizational learning in unorganized settings (Tsuchiya, Sekimizu et al., 2005).

The title of this research was ‘From scientific safety to elimination of anxiety’ and its purpose was to make a survey of risk-communication problems related to nuclear facilities and solve them using a policy exercise.

The first year was spent on extensive surveys to identify the problems related to risk communication with local residents near nuclear facilities. I visited twelve municipalities, seven Offices of the Inspectors for Safety Management of Nuclear Installations and three nuclear power plants in Japan. I also made several overseas trips to visit competent authorities, municipalities, nuclear power facilities and researchers in Norway, Sweden and USA.

Based on the findings of my surveys, I built a causal-loop model regarding nuclear risk communication (figure 2). According to the model, the root cause of the problems is lack of trust, and the leverages are public participation and transparency, which can create interactive organizational learning environment in non-organized setting.

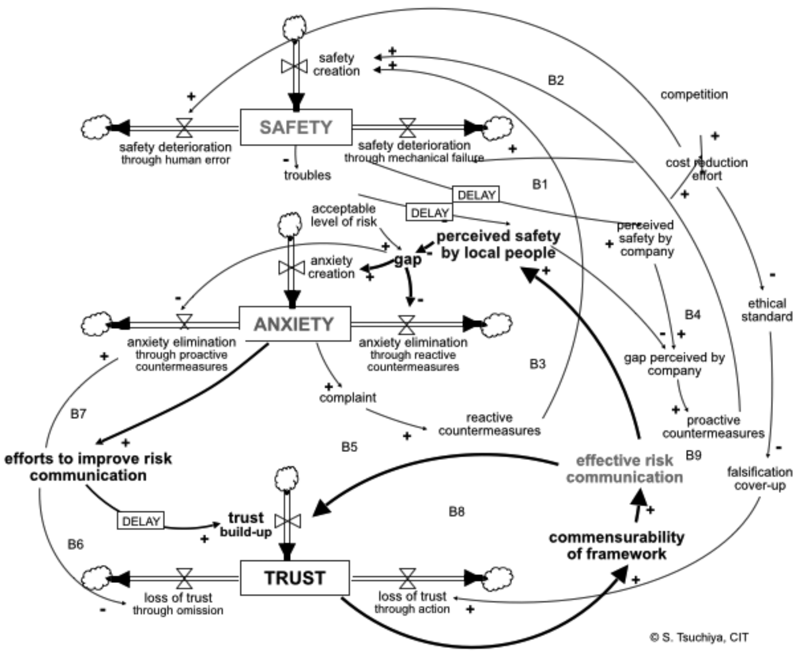

Figure 2 Risk communication

The model clarifies the following:

- Scientific safety and perceived safety are often quite different. Scientific literacy and public education are important, but they are not central to risk controversies. It is not safe until it is perceived as safe.
- Elimination of anxiety is only possible by improving 'perceived safety' by local people.
- Perceived safety by local people depends on trust.

Based on the findings, I created two policy exercises - 'TREASURE HUNTING' and 'DISASTER PREVENTION GAME.' for organizational learning in unorganized settings. Since these two are similar, I will describe 'TREASURE HUNTING' below (Tsuchiya et al., 2005).

'TREASURE HUNTING'

Primary Objective: Nuclear public education programs are not communicating the critical safety information that would be needed to eliminate their anxiety. The typical examples of risk communication failures are:

- Contrary to the recommended actions, most emergency planning zone residents say that they will try to contact family members, or simply leave the area.
- Most people still believe nuclear power plants (NPPs) could blow up like nuclear bombs.

The primary objective of 'TREASURE HUNTING' is to minimize anxiety about nuclear plant accidents by providing the local residents with a space (environment) of two-way communication with nuclear disaster prevention experts in order (1) to deepen understanding of nuclear risk, and (2) to build up a relationship of mutual trust with the experts.

TREASURE HUNTING exercise during play

Brief description: The winner is the one who obtains the largest number of treasures. The leader (one for each team) must lead members to their treasures and the members are to go inside the castle and find the treasures. Only the leader has a map of the whole area, showing the location of the treasure for each member and the location of the gates, which move clockwise. Each member has a detailed map (information) covering only a small area around him/her.

In the first cycle, every member has the same speed, and can find and retrieve the next treasure as soon as he or she has the first. The prize money is given to the highest scorer. In the second cycle, however, one of the members is much slower than the others, and the next treasures do not appear until every member in the team has retrieved his or her treasure. At the end of the exercise, (to the surprise of the participants) the facilitator gives a championship prize to the member who stopped the gate and helped others get treasures.

In debriefing, the facilitator guides the participants to think together about nuclear accidents. He or she encourages the local residents to ask any questions and/or express their anxiety about nuclear accident to the nuclear disaster prevention experts on hand. In order to open up conversation, the facilitator gives the participants several scenarios, and asks them what they would do in such a situation.

Analysis of the results: We have run 'TREASURE HUNTING' and 'DISASTER PREVENTION GAME' for almost 300 local residents near NPP in Matsue City after running them thirteen times throughout Japan for teachers, students, city office employees, etc. Most participants enjoyed the exercises and responded affirmatively to questions in the questionnaires. 75 percent of the participants replied affirmatively to the most important question "Did today's exercise give you an opportunity to think together about nuclear accidents?" Many hoped that these exercises would be run repeatedly at small local meetings so that many local residents could participate and learn (Tsuchiya, 2011).

5 Conclusion

The main objective of my research work for over a quarter of century has been to prove the validity of the message of "Gaming: the Future's Language" for organizational learning in Japan. Now I believe that gaming/simulation, properly conceived and employed, is a powerful tool for organizational learning through conveying gestalt and improving commensurability of interpretative frameworks.

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GAMING/SIMULATION AS AN INTERACTIVE INTERVENTION FOR CHANGE[1]

Jac Geurts, Annemieke Stoppelenburg, Léon de Caluwé

Abstract

In this chapter we analyze thirteen big consultancy projects in which a game/simulation played an important part.

We summarize our insights using the following structure:

» 1 Challenges and change objectives in the projects: there may be very different change objectives

» 2 Leading theoretical concepts: there is an array of leading theoretical domains that we used

» 3 Design and modeling: there is a wide variation in abstraction, detail, role play or simulation

» 4 Pregame, game and postgame activities: preparing the activities, getting people ready for it, good debriefing and follow up are crucial.

The projects share the ambitions and characteristics of other collaborative non-gaming interventions, but they add a number of design characteristics to the repertoire.

Keywords

consultancy projects; change; interactive interventions

1 Problem statement and approach

Richard D. Duke has called it ‘his good fortune’ to work for more than forty years intensively and productively with Dutch gaming professionals.[2] In this chapter, three of his (early) Dutch disciples look back on this cooperation and its impact on the consulting practice in the Netherlands. The empirical base of this paper is a systematic comparison of 13 consulting projects for organizational strategy, learning and change in the Netherlands in which a tailor made gaming/simulation was the core method (see the Appendix for short descriptions of the 13 projects).

All projects, some of which Richard Duke participated in himself, are based on three central elements of Duke's contribution to the gaming discipline:

» His conceptualization of gaming/simulation as communication, language and multilogue for informed and mature players,
» His innovation of praxis, i.e. his breakthrough and exemplary projects in which he shows the value of gaming/simulation for consulting on difficult (messy, meta-) problems in organizations,
» His stepwise interactive methodology for game design that combines his ideas on gaming/simulation with techniques of systems analysis, creative design and project management (Duke & Geurts, 2004).

In our comparison we conceptualize these 13 gaming projects as all belonging to a class of consulting modes that are labeled in the literature as 'interactive interventions'. Together with methods like Large Scale Interventions, Group Modeling, Open Space, Learning Histories, Scenario Writing and Story Telling, Gaming/Simulation can be understood as member of a family of interactive consulting approaches.

Our questions are: what are the 'working ingredients' of these Dutch game-based consulting projects and how do the designers/consultants combine the many project elements into a consistent, integral, practical and creative interactive trajectory that fits the unique character of each problem and client organization?

Together with clients and consultants we have developed dense descriptions of the 13 projects. Next we compared the projects using a generic analytical model that structures interactive interventions and identifies their key components (Geurts, Altena & Geluk, 2007).

An intervention is a task-oriented activity for an organizational unit: it is (extra) work. An intervention is almost always a form of professional service, making it a co-production between a supporting professional and a client system. The professional has the expertise to design projects, but the participants are co-producers of the service and therefore of the effects. Interaction, co-creation and communication are key characteristics of Richard Duke's gaming approach. The efficacy of a gaming/simulation depends profoundly on the (re-)actions of the participants.

To explain the contribution of gaming to change, one needs a causal model with at least the following four categories of independent variables and one dependent variable (effectiveness):

» 1 context (task) variables (including characteristics of task and client),
» 2 client variables (characteristics of the participating 'organization unit'),
» 3 consultant variables (experience, personality and such like),
» 4 intervention (process) variables.

Given our focus, we will identify below four building blocks of variable 4 in the list above: the intervention variables. As we searched for a framework with which to order and compare the thirteen projects in a methodical way, we were struck by the analogy with other disciplines that develop interactive interventions. We concluded that the thirteen interventions described in the Appendix can be understood as forms of interactive model-building. A model is a system that is used to develop understanding about another system. A model can be a physical artefact, but it can also be symbolic. Interactive model-building can focus on the cognitions as well as on the affections, ambitions and skills of people.

The four building blocks of an interactive modelling project are (1) conceptualization, (2) methods, (3) loading and (4) operations. Conceptualization is placing phenomena in an ordering and explanatory framework of concepts. Concepts are our mental constructs of giving meaning to phenomena. Method is understood to be the way in which, or the rules according to which, people work to reach a certain goal.

The concept 'loading' refers to the fact that every project is different. A method is general, and must for that reason be 'loaded' with information about the characteristic features of the specific case. The 'loading' is everything that documents the uniqueness of the case: interview protocols, reports of 'stories', scores on questionnaires, company statistics, discussion reports, etc.

For the participants, an intervention is of course first and for all a collection of activities that are usually performed outside of normal work. The concept of 'operations' refers to that. It encompasses all manifest, intended and unplanned actions, meetings and events during and directly connected to the intervention.
Figure 1 (Geurts, Altena & Geluk, 2007) links the above concepts together.

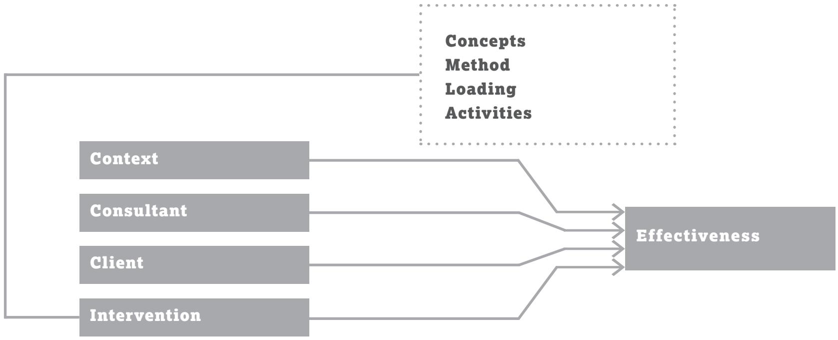

Figure 1 Explaining the effects of an interactive intervention

Grounding a game in a relevant conceptual base has two functions: it steers the intervention, but it is also an independent effect-producing element, because the conceptualization supplies new insights for the client group. If no methods are used, the operations will be more strongly steered by the consultant and client variables (experience, personality and suchlike of consultant and clients) than if methods are used. Loading, the search for and ordering of information, feeds the operations during the intervention but can also have a useful separate effect if the participants are involved in the loading. The participants learn from the process of research and systems analysis. And finally, a gaming intervention consists of operations like negotiations, decisions and meetings. They are the 'gaming steps brought to life', both those that are planned as well as everything that was not planned but happens anyway.

We have translated the variables and building blocks discussed above, into language that is common in the discipline of gaming/simulation. This resulted in four main dimensions and a number of sub-dimensions for the comparison of the projects in the Appendix. In the next four sections we will summarize our insights using the following structure:

» 1 Challenges and change objectives in the projects.
» 2 Leading theoretical concepts
» 3 Design and modeling
» 4 Pregame, game and postgame activities.

In the final section we draw some conclusions.

2 Challenges and change objectives in the projects

In this section we will compare the change objectives that the client organizations faced in the different projects. We will analyze the special factors in the context in which the game is used and what the function of the game was in the process of change.

Differences in change objectives

We noticed three very different change objectives in our change projects (for the short descriptions and labels of the projects see the Appendix).

The first one we have called: to react with a policy on policy. The participants in the game of Rubber Windmill looked for a way of reacting to the market driven policy of the Thatcher Government. How can we do this in an acceptable way and what might be the unforeseen consequences? Futura, @llure and Columbus allowed managers of schools to explore the desirability of a flexible school (Futura), to find their own model of a flexible school (@llure) and to see how such a school functions in practice (Columbus). The concept of a flexible school was the basis of a policy program of the central government.

The second change objective we discovered was the design or improvement of the learning organization. In those cases existing practices did not lead to renewal or innovation. It was necessary that participants reflected upon this phenomenon. AMC had successfully introduced decentralization in such a way that the collective capacity to make communal policies had disappeared. Also in Trellis-work we see that the learning capacity had to be improved. The matrix organization had always caused tensions and had not resulted in stability nor quality performance. The game showed a way to cope with the inherent problems in a matrix organization.

The third change objective we have labeled: top down introduction of new methods for work, cooperation, organizing or managing. A new model or policy had been designed and finished. Next it had to be introduced in the organization in such a way that all employees and managers understood the change, and would execute it in a professional and motivated way. WOLEM taught the principles of contract management; in the KLM game participants learned new competencies for management in networks; the Superman game allowed store-managers to work with decentralization and autonomy.

Phase in the change or strategy process

Rubber Windmill is an example of the use of a game early in the change process. The game was a test of the possible (unknown or unexpected) effects of an intended policy still under debate. In the TOP game the focus was on the implementation of the change. The policy was set: participants had to learn to work in the 'new future' which would be team based.

The game is part of a larger change or strategy process

In most cases the games were embedded in a process in which a lot of other (change) activities took place. LINK for instance could actually be used in different processes. It was designed for mixed groups of different parties involved in the design and building of infrastructure. But it could also be used by a single building team effort or in training programs for negotiation skills. WOLEM was designed as an integrating and closing exercise of a training program for public managers. This training program was part of a large change process introducing a new governance model within a ministry. The program was an investment in the competencies of future internal change agents and managers. The AZC game was based on the insight that a 'cold-turkey' implementation of a redesigned process is not a good idea. The game is designed to contribute to a better a priori understanding and feeling about the essence of the new work process, the logistics in the work process and the interdependencies between tasks.

Complexity of functions

The TOP game at Delta Lloyd is an example of a strategic culture change: 1500 employees had to think and act in a different way and jointly create a new culture. This was a deeply felt strategic need and the employees were considered the human capital to realize this. Trellis-work was a simpler project: individual employees experimented with their behavior to remove blockages in their practice. The game facilitated reflection upon this behavior.

Three variations in the functions for games stood out:

» From awareness about the coming changes, the design of new policies and changes up to the implementation of new thinking and doing
» From the exploration of a new framework, policy or strategy up to the making of a new culture
» The acquisition of new knowledge and insights up to the learning of new skills and attitudes.

3 Leading theoretical concepts

Which leading concepts and theories from the different disciplines did the projects use? How was the problem in the game conceptualized? There proved to be three broad sources of theories that influenced the conceptualization of the games.

The first theoretical influence came from the literature on change, learning and strategy development. This influence was not only apparent in the development process of the game, but also in concepts and ingredients in the process of the game itself. Examples of concepts are: learning by doing; awareness raising; feedback loops, debriefing; learning cycle, mirrors and windows; giving meaning; narratives; role models; efficacy; self-steering and many, many more.

The second source was the discipline of gaming/simulation. Here the projects borrowed primarily from the work of Richard D. Duke. He developed gaming/simulation as a discipline in its own right: theories; academic discourse; methodology; empirical research; professional practice and an international journal. System thinking became combined with experience-based learning. Duke's ideas and methods guided the design decisions like: steps of play, combination of roles, scenario, decisions, symbols, paraphernalia and much more.

The third area of concepts and theories were linked to the uniqueness of each game project. Many concepts focused on the specific case and project: the problem, the history of the situation and the desired solution.

Research and theory from economics, business science, policy science and organization science have been used to explain or understand complex problems. We recognized the well-known discussions and trends in these areas: the ever-lasting movement between centralizing and decentralizing, like in WOLEM, LANS, Superman and UMC. We also recognized the 'new speak' like: integral management, contract management, responsibility for results and management reports. Management of chains and cooperation in networks was built into LINK and KLM. We saw the changing role of the government (PLAN E, Delta 2000-8), flexible organizations (Futura, @llure, Columbus) and self-steering and multi-functional teams (TOP-game).

The universal concept of experienced based learning and the concept of coupling of thinking and doing was part of every project and game. In UMC participants thought about collective policies and tried them out. In AZC participants constantly answered the question: what do we need to make this new action plan work in practice? Effective decision-making is an essential part of Rubber Windmill. Leaders look for 'common ground' and improve their decision-making capacity in different contexts.

System thinking was also an element in every game. The games stimulated the thinking in a larger whole and in an organization open to its environment. There was always a relation between the individual and collective acting and the development of dynamic capacities of individual and team. The task was to see one's own individual role in the big picture, to create system awareness and to develop personal mastery in these complex contexts. Gaming/simulations are in this sense: "Theory made operational in an open dynamic model". One can play with and within theory. Game designers translate the theories into 'multilogue': language, artifacts, process and situations that fit and augment the experiences of the participants. During debriefing facilitators will use the theory and concepts, discuss them and will couple experiences, insights and theory. "Nothing is as practical as a good theory", said Kurt Lewin.

4 Design and modeling

The third theme we used to compare the projects was the design and modelling of games. All the games we refer to in this chapter were tailor made based on client specific needs and contexts and designed in a planned and systemic way. The profound influence of Richard Duke's Paradigm for Game Design is clear in every project. Nevertheless the cases show differences as well. In this paragraph we will elaborate on the characteristics of the design and the modelling.

Variation in abstraction and detail

During the design phase the project teams explored the ‘terra incognita’ of the desired change. Abstract change goals had to be translated into ‘real life’ and relatively vague concepts had to be operationalized. The cases showed great variation in degree of abstraction from reality. Some of the games had a strong similarity to the reality of the organization while other cases were more abstract or even metaphoric. Via Nova was a fairly accurate simulation of the work processes in real practice. This was needed because the game was designed to practically explore ways to improve the primary process of the library. Via Nova was intended as the vehicle for redesign, and therefore a realistic simulation of, daily practice. The Trellis game was an example of a more metaphoric game. The game designers did not look for strong similarity, but chose a powerful metaphor to evoke the necessary behavior to work effectively in a matrix structure.

Designing for more abstraction (metaphoric/iconic) or similarity often goes together with the level of detail used in modelling the game. More detail is applied in more ‘real to life’ type games, which are usually part of change or strategy trajectories. In such cases detail is desirable to ensure that learning about the change is recognizable, attractive, challenging and implementable.

Role play or simulation

Another interesting difference between the cases is the way in which social interaction and decision- making was linked to future effects of those decisions. In all cases, organized behavior was simulated by placing participants in roles. And in all games we saw efforts to determine the effects of decisions made by players, and to use this as feedback and input for new behavior. All games gave players the collective opportunity to build –step by step- a future and to jointly look back on that. However the way in which this was done varies.

In the UMC game, mainly the roles of the key players were pre-designed and the players were confronted with a series of critical incidents, derived from the underlying scenario. The critical incidents referred to potential future situations requiring collective decision-making. Most of the participants took on the same role as in real life. Less detail was needed to effectively simulate the outcomes of decisions, because it was the process that mattered. The very experienced participants were quite able to assess which decisions would lead to positive outcome and which to ‘disaster’.

In many respects, Rubber Windmill can be considered similar to UMC, but the modelling was far more detailed. An actual situation in a real life region was the environment in which players explored the way the intended market mechanism could be played out.

The new governance and relationships were part of the role-play (matchmaking, negotiating) between many parties. In this game, the impact of the players' decisions was discussed and simulated explicitly to evaluate the market mechanisms.

In this section, we compared the cases on two different design dimensions. The first dimension is the degree to which the games vary in abstraction and detail. The second dimension takes pure role-play as one end of the continuum and formal simulation (for example with a computer) at the other end. Note that only man-computer simulations are the type of games we discuss in this chapter, because in all of the gaming/simulation there is always interaction between players, with or without a computer.

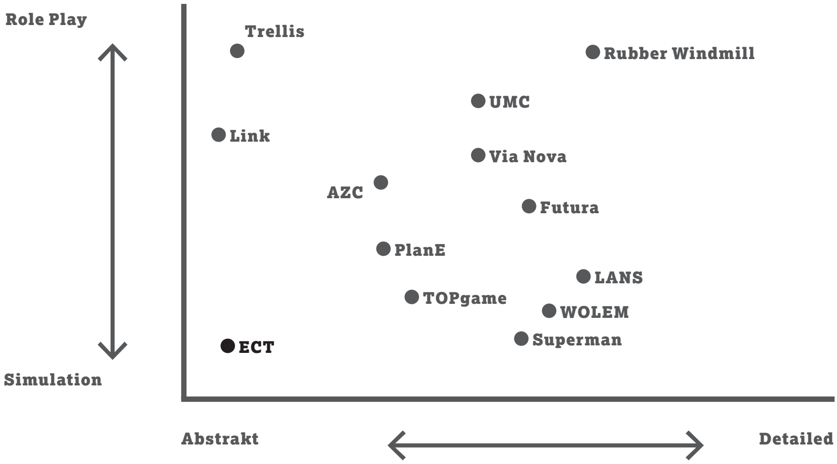

Figure 2 Ordering the 13 cases on two dimensions

Combining both dimensions and plotting the 13 cases in figure 2 shows that highly generic (abstract) games with a strong emphasis on simulation are hardly present. Obviously designers of games for change or strategy objectives choose for a detailed exercises and transparent models. All other quadrants are represented in the 13 cases and the distribution of the cases over the two dimensions is evident. There is a small number of projects where role play is combined with little detail, but it seems also attractive and possible to combine role play with much detail and real life data see e.g. Rubber Windmill and WOLEM. So detail without simulation proves to be an option, however in our cases simulation is not present without detail.

5 Pregame, game and postgame activities

The fourth and final theme for comparison concerned the nature of the participants' activities and the conditions created to gain a harvest from the game activities. A game is an intense and hybrid activity: thinking and doing, ratio and emotion, reflection and action are strongly coupled. Nevertheless the learning, communicating and changing will be different in each game. They vary from more individual to more collective action, from focus on the whole of the organization or system to more attention for personal roles and contributions, from growing awareness of a desired change to practicing new ways of working and new behavior. Therefore, a relevant question was how the thirteen projects were designed as an 'orchestrated activity or set of activities'. In this respect, several lessons can be learned from the cases.

An important step proved to be to conduct a good debriefing. Evaluating the experiences in the game and harvesting the 'lessons learned' was an essential element to stimulate the learning and the transfer to practice. But the cases indicated that good debriefing was not sufficient. The interventions showed more returns if follow-up activities had been planned to reaffirm and deepen the learning. The lessons from the game needed converting and being put into practice in a real life situation. Action planning was employed as an effective method to support the steps from insights to practice. Preferably during the debriefing, learning experiences had to be translated into specific actions for the player's work situation. Continued coaching, peer-group learning or additional training were part of such an action plan. The Top Game illustrated: action planning combined with a follow-up session (8-10 weeks) after the training program, strongly increased the value of the gaming/simulation for the daily work situation.

The cases also emphasized that as a pre-game activity a good intake was a must. Besides providing an introduction to the game and its objectives, it stimulated the important buy-in to the use of the game in organizational change. The intake eliminated uncertainties and reduced resistance. Its value was increased if the leadership participates in the intake.

Above all, the actual game-activities of participants proved most important to evoke the actual learning. Much depended on the purposeful creation of the interactions, decisions, operational work and evaluations in the game. In the KLM game, for example, the activities were specifically selected to realize two objectives: to support the learning of the new way of working as well as to refine or fine-tune the communication and co-operation between all parties involved. The designers choose to place all activities in one room and to visualize the system in its totality. This resulted in an overview of the whole process and insight into the considerations of all parties when making decisions. In practice this whole system interaction would never be so completely nor directly observable because of the different locations and communication by telephone and email.

The role of the facilitator stuck out as a crucial element as well. Besides being the director of the game, through his behavior and attitude he was able to make an important contribution to the intended organizational change. A number of cases (LANS, TOP, WOLEM) showed positive effects of game leadership formed by a trainer from outside together with a manager/staff member from inside the organization. In this way facilitation is combined with knowledge about the organization or intended change.

Another important element was to have participants play their own role and work from a more or less familiar perspective. This was done in most of the games, e.g. Rubber Windmill and AZC, and it augmented the real life feeling in the game sessions, because the designer could rely on the inputs of participants. Some games were designed to allow role change to learn a new perspective. Playing different roles strengthened the insight into the overall issue or system. Good examples of this are Via Nova, TOP game and Futura.

6 Conclusion

In this comparative chapter we have analyzed 13 cases of tailor-made gaming/simulation as formats of interactive interventions for change in organizations. Huizinga (1938) has conceptualized 'play' as any form of human behavior through which the individual or a group temporarily steps out of the rules that govern everyday life to freely experiment with new or self-chosen rules. This means that the label 'play' fits many formats for collaborative work; it also applies to the work of change consultants, although they do not refer to their work as gaming or play. A scenario workshop, a world café, a workshop in a hotel, even an outward-bound activity in the park with your colleagues - from the perspective of the Homo Ludens these activities all have elements of play. In most interactive processes the goal is to have teams work creatively together, in a different and safe environment, to develop innovative content or processes for the regular job.

The gaming/simulation projects we have analyzed shared the ambitions and characteristics of collaborative non-gaming interventions, but they added a number of design characteristics to the interactive repertoire. The most focal features making these projects different were:

» Imitation: creating an open, dynamic model that simulated (behavior within) their own organization;
» Acting as if: participants played a role; and as actors in a play, they created, step by step, a new reality.

These two we see as the design decisions that made these projects into proper gaming/simulations, a distinct subclass of interactive intervention. They have been developed and applied on the basis of a coherent and functional methodology that helped the consultants to introduce and optimize the element of play in their projects.

Our comparative analysis showed that the results of projects, guided by the methodological principles that Richard D. Duke developed, emerged from a complex though disciplined interplay of design and application activities that started long before the game was played and continued when the game was over.

Regarding game design, three observations are salient:

» As far as the projects created results, this harvest did certainly not only depend on the skills of the consultants to build an elegant and evolving game/simulation; that skill was important but general consulting skills and change management capabilities proved essential. A good consultant can survive without a great game; a great game will not deliver when not in the hands of a skilled consultant.

» The central element of all the cases was a gaming/simulation, but 'some were more game/simulation that others'. There exists a wide variety of game-design options and these professional designers were aware of them. As craftsmen, they molded the game to the specific challenges and functional specifications of the projects. A good game is a functional game.

» Concepts and theory fragments from many disciplines played a pivotal role in the projects. Gaming/simulation proved to be valuable theory operationalized into an open, interactive model. These change projects using a game derived much of their value from the purposeful selection of an enlightening theoretical (explanatory/interpretive/predictive) perspective and of the skills of the consultant to make valid and useful connections between the conceptual base and the unique situation in which the clients lived. As Richard Duke put it: 'a gaming/simulation is a model of a model'.

The analysis also revealed a number of challenges or dilemmas for the gaming-consultant:

» From the projects we learned that custom-made-game design can involve creative pressures and concessions through new time constraints, changing deadlines, priorities, demands, expectations and the erosion of resources. One challenge was to balance the principles of 'good gaming' with the often limiting and sometimes changing projects specifications and client support.

» The second challenge was inherent in the process of design itself. On the one hand, coproducing the game with a client group – usually novices to game design – proved of great value, on the other hand independence of the consultant/designers helped the speedy development of a creative, innovative game format.

- Designing the game together with the client introduced the game designer to a relevant (explicit and tacit) organizational knowledge. In a number a projects the members of the client organization who participated in the design, became important champions of the project and role models to the rest of the participants. However, the projects also needed the freedom of the designers to step 'out of the box' and create, sometimes in a seemingly inefficient way, a game that did surprise the client. Also game design should be play: safe and creative, while the client might think the designer is wasting time and money.
- The third difficulty was to choose the right moment for the game-consultant to become involved in a program for change. Consultants found it difficult to accept an assignment when they had not been involved in the decision to apply a gaming/simulation as the important element of the project. A professional dilemma emerged when the consultant was offered a commercially very attractive gaming assignment, while he or she believed that gaming was not the adequate tool and the client should in fact look for a different approach and a different consultant. A comparable dilemma emerged when a very motivated client approached a game-consultant at a stage when it was not possible anymore to optimally design a tailor made game. Should one go 'quick and dirty' and use an existing successful format? It might do the job.

In all the case histories of the projects, the designer presented to us a storyline of the project that proved they were very aware of the fact that game design for change is a multi-criteria juggling act. In their 'reconstructed logic' of the project, they told us the story of searching for consistency in the many choices they had to make, of the need for flexibility and of their constant effort to keep on analyzing and (re-) interpreting the change objectives and challenges in the projects. We witnessed a focus on a select number of theoretical concepts and intensive preparatory inquiry and systems analysis. Design and modeling and the resulting pregame, in-game and postgame activities emerged from a conscious and disciplined effort to create a change adventure that was highly effective, had acceptable economies of scale and created joy, courage and pride in those who participated. A good game, the designers told us, is an adventure that becomes a narrative in the learning history of an organization. Later generations of employees should envy the chosen who were so lucky to participate.

In summary, gaming/simulation emerges as a distinct form of interactive intervention. It is not (only) based on text, words, and talking in meetings. Gaming is interactive action learning in a safe environment. Together the participants create a future while entering uncharted territory. And only then they reflect on it: 'what is it that we take from here to the 'real' world?' As interactive intervention, gaming operationalizes the three core processes which Karl Weick (2001) has identified as the base from which all organizing emerges and evolves: enactment, selection and retention.

Ultimately gaming/simulation allows us to 'come back from the future' bringing with us new insight, skill and courage to improve the way we shape our 'real' future.

Notes

1: This chapter is based on chapter 4 of the Dutch handbook of Stoppelenburg, de Caluwé, and Geurts, (2012), see References. This book is a completely revised and enlarged edition of an earlier text. Chapter 4 is based on new research which has not been published in English. For the names of the designers of these games, see the book.
2: See Richard Duke's preface to the book mentioned in note 1.

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Appendix: Tailor made gaming/simulation for change: thirteen cases

WOLEM, designed for a Dutch Ministry, was extensively used in senior management courses for (teams of) civil servants. It was a complex simulation, lasting for three days and it simulated the processes of contracting, resource and task management, political pressure and negotiation, and policy operations.

Futura was constructed for managers of secondary schools to develop their entrepreneurial skills, systems understanding and integrative policy development aimed at 'the school of the future'. The sponsor was the ministry of Education. As a next step Allure and Columbus were developed. They both provide an environment in which different school leaders and their management team can experience what it means to work in a 'flexible' school.

PlanE, made for KLM Royal Dutch Airlines, was part of a companywide transition to a whole new way of working, the 'block'-system, which had far-reaching consequences for the interaction between operational and support staff. In the game employees from different departments worked together in a network to test and improve the new system.

LANS was commissioned by the Dutch Army to introduce, in line and staff groups, the new principle of 'result-responsible units' that are administered using management contracts. It is essential to for the leadership to focus on their individual units while at the same develop internal and external relations of trust and cooperation. LANS operationalizes this transition in a simulated military environment.

Superman a game for Albert Heijn Supermarkets, trained managers of individual shops to take more individual responsibly e.g. by reacting more proactively toward local markets. This very detailed simulation that looked very much like an actual AH store has been played by more than 400 employees.

ECT-Delta 2000-8 was a project of European Container Terminal (ECT). With the Rotterdam Harbor Authority, ECT started a project to develop eight new terminals. To integrally design the control structure for these terminals, they opted for a systems schematic that would support the decision making on the road to a coherent system of operations. From this schematic a game was developed.

TOP was created for Delta Lloyd Insurances and assisted this firm in a complete 'turnaround' towards a flatter, more flexible, market oriented company by reorganizing into a structure of multifunctional teams. A simulation of such a team based insurance company was developed and in five moths time some 140 actual teams used the game to explore the new structure and develop new routines.

LINK was a multi-client project in the building and construction industry where more and more large projects were commissioned via the new procedure of 'competition oriented dialogue'. A relatively open program of specification is the starting point for a dialogue between the principle and potential builders to improve the design and reduce its cost. The game Link was a tool to help the parties developing effective behavior for this unfamiliar process.

AZC helped the staff of the Centre's for Asylum Seekers (independent governing organization) to experience a completely new process model for the whole chain of activities from arrival to departure of the refugees. Earlier on, a more traditional teaching process had been used in the project, but there was still so much confusion about the essence of the changes, that this gaming/simulation was designed as hands-on experience in a safe environment.

Via Nova was a gaming/simulation of the dynamic world of the modern public library. Digital products and services are becoming progressively important. The Royal Library funded this project. Remarkable is the way this successful game was designed. The entire game was researched and designed by a team from within the Royal Library. The consultant was only there to help.

Trellis-work. The Province of Flevoland had been (re-) organized into a matrix structure with many projects and project teams receiving resources and staff from different departments and disciplines. The matrix did not solve all problems of efficient and effective project management. In a game based on the metaphor of the Trellis, the employees explored the pros and cons of working in a matrix structure

Rubber Windmill. During Mrs. Thatcher's "reign," she presented drastic proposals to bring market mechanisms into the UK's national health system. However, some forty managers, clinical staff and policy-makers who were actually involved in adopting the changes were worried: they foresaw problems. For three days in a row, they engaged in a simulation that dealt with health care in two districts. They negotiated and concluded contracts, all under the proposed new system. The results (in the simulated world) were catastrophic.

UMC. A University Hospital had introduced a new organization structure that assumed the division managers would be willing and able to balance divisional and general hospital interests. This proved to be a problem. A gaming/simulation was designed and played within the hospital organization. As a result hospital management became more aware of the problems that resulted in proposals for more productive ways of making decisions that were vital for collective success in the future.

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3

GAMING DESIGN CHALLENGES AND DEVELOPMENTS

THE FUTURE OF GAMING: CHALLENGES FOR DESIGNING DISTRIBUTED GAMES

Heide Lukosch, Geertje Bekebrede

Abstract

In the 1970s, Duke described the value of gaming as a new language between stakeholders solving complex problems. People are still confronted with ill-structured, complex tasks, being located within complex networked socio-technological systems including multiple (distributed) stakeholders and interests. To solve such tasks people actively participate in collaborative work processes or in teams. Regularly, these teams are operating on distance from each other. Tools to support this distributed teamwork are necessary. Distributed games could be one of these tools. Based on insights of the Computer Supported Collaborative Work (CSCW) field, we explore what this means for the design of such games, and if they still are used as a means for Multilogue communication.

In this chapter, we especially focus on using games for developing situational awareness (SA) in teams. SA is crucial for effective collaboration in teams. As this may be rather straight forward in traditional analogue games where people interact directly in the same physical space, it becomes much harder to do so in games for distributed groups of players that interact in a distributed way. It shows that with the use of advanced technology and a balanced game design with an adequate level of realism, or fidelity, it is possible to create distributed games allowing players to enter fictional worlds. These games not only foster a Multilogue communication, but even multidimensional collaboration.

Keywords

distributed gaming, fidelity, game design principles, interaction, teamwork

1 Introduction

In this chapter we will take a look into the future of distributed games and the consequences for their design to support distributed teamwork processes. In 1974, Richard Duke introduced simulation games as an answer to a core societal challenge, namely communication. The more complex the world becomes, the more difficult communication becomes, too. Duke introduced gaming as a future language that enables members of modern society to coordinate joint action and to solve complex problems. Nowadays people are still confronted with tasks, being located within complex networked socio-technological systems including multiple (distributed) stakeholders and interests. To solve such tasks, people have to be enabled to actively participate in collaborative work processes, like cooperating within a team (Bolstad & Endsley, 2003). Teams have the potential for greater adaptability, productivity and creativity, and can offer more complex, innovative and comprehensive solutions to complex problems (Beers, 2005; Salas, Sims & Burke, 2005; Van Den Bossche, 2006). Nevertheless, the performance of a team heavily depends upon the coordinated efforts of the individuals (Cannon-Bowers, Salas & Converse, 1993). Furthermore, being aware of what is required in the work process is a prerequisite to coordination and cooperation. "Becoming aware" takes time and effort, and could interfere with the task itself (Carroll, Rosson, Convertino & Ganoe, 2005). Problems occur because members of a team have to develop a common frame of reference, a shared understanding of the situation, and have to negotiate about joined decisions and actions (Barron, 2000; Rosschelle, 1992).

People that are co-located in time and space already need awareness support to succeed in joint actions, like the use of social cues in face-to-face interaction (Walker, Collings & Richards-Smith, 1998). Moreover, a lot of working teams are spread over time and space, which makes them even more dependent on collaboration supporting means (Bolstad & Endsley, 2003; Schümmer & Lukosch, 2007). Olson & Olson (2000) analysed groupware technology in how far it allows geographically distributed teams to work together as if they were co-located. They came to the conclusion that distance matters and that the analysed technology is not mature enough to enable virtual co-location yet. Also Gaver (1991) underlines the importance of supporting awareness information to help actors shifting from working alone to working together.

Simulation games are one alternative to foster awareness and understanding of complex problems within a team. They have the ability to represent consequences of decisions and to enable team members to reflect upon and share their experiences from the game world within a de-briefing phase (Kriz, 2003). Distributed games, defined as games that can be used by players who are distributed in time and space, are a new form of simulation games.

They answer the needs of today's working spaces, which are distributed in time and space. We propose distributed simulation games as one approach to support the challenges of distributed teamwork, namely awareness. We explore the concept of situational awareness as the core principle for the design of distributed games, especially the design of the fidelity of games.

2 Back to the future: Distributed Games supporting Situational Awareness in Teams

2.1 A brief introduction to situational awareness in teams

Awareness of a situation is, and always has been, of crucial importance to human survivability and well-being. In today's networked society, awareness in everyday life is becoming increasingly complex (Castells, 2011). To participate in any single endeavor requires interaction with others, bridging multiple systems in which individuals participate, like working environments, infrastructural systems, or neighbourhoods. All actors within systems require a level of situational awareness (SA), many require a level of shared situational awareness (SSA). The most accepted definition of SA is the one of Endsley (1988), and refers to SA as the perception of a situation, its comprehension, and the ability of predicting a situation's future state. Fuks, Raposo, Gerosa, and de Lucena, (2004) give group awareness a central position in their model of collaboration because it influences the communication, coordination and cooperation of a group. Within a group or a team, the members have to communicate and coordinate themselves in order to cooperate. New communication might be demanded when unexpected situations emerge. In such communication, new tasks and commitments might be defined, which again have to be communicated and coordinated. Within this cyclic process, each team member generates information. Some of this information is needed by more than one or even by every team member. Based on the information shared, teams are able to build up a shared understanding of the team's objective and to synchronize their cooperation (Gerosa et al., 2004). A team is defined as "a distinguishable set of two or more individuals who interact dynamically, interdependently and adaptively to achieve specified, shared and valued objectives" (Morgan, Glickman, Woodard, Blaiwes & Salas, 1986).

Awareness of a situation is always related to an analytical process, which is the perception of a situation and its objects, a synthesizing process, meaning the comprehension of the situation, and an evaluation process, or the prediction of the development of a situation in time.

Dourish and Bellotti (1992) connect this issue to shared workspaces and define awareness as "an understanding of the activities of others, which provides a context for their own activity" (Dourish & Bellotti, 1992, p. 107). We identify these three processes as the processes a distributed game should foster to support awareness in teams. In the following, we briefly introduce how simulation games in general are conceptualized as helpful tools to support team awareness and teamwork processes, before we show how distributed games contribute to the performance of distributed teams.

2.2 Awareness support in teams: From simulation games…

Simulation games are broadly defined as 'a special type of model that uses gaming techniques to model and simulate a system' (Duke & Geurts, 2004). They combine the representation of a reference system, like working organizations or infrastructure systems, with engaging game mechanics and elements like competition, rules, roles and scoring. This combination makes them powerful tools for simulating social dynamics, as it enables them to simulate real world actions and to illustrate actions' consequences (Kriz, 2003; Klabbers, 2006).

Thus, gaming is seen as a representation of systems that provides a shared experience and offers a possibility to develop an understanding of that system. Gaming achieves this by delivering realistic insights in the composition of a system such as its physical, technical, economical or communication and information processes.

As we explore the potential of simulation games to support teamwork in complex systems, we approach them as systems themselves. Constructed out of roles, rules and resources, they have the ability to emulate real complex systems (Klabbers, 2006). With simulation games, players and teams of players can train and probe actions and re-actions in a real-life safe environment, without the risk of real-world consequences. In simulation games, experts are able to mentally simulate possible outcomes of actions and decisions (Visschedijk, 2010). Having these characteristics, simulation games are able to support the perception of a situation, foster its comprehension and illustrate a possible future state of a situation; thus they are excellent tools in developing SA.

There is a widely held belief that simulation games are most effective when designed with a high degree of fidelity, meaning that they capture and represent as much of "reality" as possible (Beaubien & Parker, 2004; Hays & Singer, 1989). On the other hand, low-fidelity simulations have also shown that they can influence learning processes (Toups, Kerne, Hamilton & Shahzad, 2011). One way or the other, research shows that the degree of fidelity of a simulation game has impact on the processes within and the outcomes of a game (Alexander, Brunye, Sidman & Well, 2005; Burke, Salas, Wilson & Priest, 2005; Harteveld, 2011).

We need to take into account three different levels of fidelity, which have been identified from the literature.

- » 1 Simulation games can represent roles, processes and tasks of simulated agents (players) that match with roles, processes and tasks of the reference system. This would be described in terms of *functional fidelity* (Lehmann, Lempert & Nisbett, 1988). For example, in a computer-aided simulation game, a police officer from the Netherlands is able to take over the role of a police officer of any rank the Dutch police would offer and would fit to the tasks assigned in the game. The player is able to move around, represented by a virtual agent in the game world, and is able to look, hear, communicate, and take appropriate action. The task in the game is based on a daily task description of a Dutch police officer of the rank and function that is represented in the game. This would be high functional fidelity. Low functional fidelity would be when a game would offer fictive ranks of space trooper brigades, would limit the actions of an agent to only move up or down and would assign tasks like "Walk out on the street and rescue all space-cows that have run away!"
- » 2 The surrounding in which the game takes places, its objects and agents, would be related to *physical fidelity.* This level of fidelity refers to the degree in which the environment of a game (e.g. the objects in a computer game world including textures, colour and movements), the agents and their behaviour, and the sound match with the system the game refers to (Feinstein & Cannon, 2001). For example, the computer-aided representation of a tree has a high degree of audio-visual fidelity when its texture, including shadow and light, has a very natural look. This is achieved when it corresponds properly with its environment regarding colour and size, when it blossoms move with the circulation of the air, and when it is growing upwards from the ground, with roots, trunk and branches seeming to grow like any other tree in the physical world would do. A low-fidelity tree could be a white paper stroke with some branch-like extensions on one side, located on a board game, or the word "tree" on a game card.
- » 3 *Psychological fidelity* defines the degree in which the emotional and cognitive reactions of the player match with those in reality (Alexander et al., 2005). It includes the perception of the game play process, the feeling of flow and experience of immersion within the game. A simulation game includes high psychological fidelity when players report that they experience realistic stress and time pressure, joy or anger while accomplishing their assignments in the game. When players only feel joy while playing a game that is supposed to train stress-handling capacities, psychological fidelity would be low.

So far mainly the physical fidelity of simulation games (such as visual, spatial, auditorial and kinesthetic design) have been considered (Feinstein & Cannon, 2001). Furthermore, which level of realism is necessary to make a simulation game effective has not yet been answered (Alexander, Brunye, Sidman & Weil, 2005; Harteveld, 2011). Nevertheless, from recent research with computer-aided simulation games and with table-top games, we see that a high level of functional and psychological fidelity is more important than a high level of physical fidelity or audio-visual representation of reality (Lukosch, van Nuland, van Ruijven, van Veen & Verbraeck, 2014; Meijer, 2012). A fourth dimension of fidelity, which has not yet been addressed in the literature, is the level of social fidelity. This describes the interactions and relations between roles within the game; this also includes the agents within the virtual world of the game. Like Gerosa et al. (2004) describe for collaboration processes in general, it is important for simulation games to allow for communication and coordination amongst the players to enable team awareness and effective collaboration. An appropriate level of fidelity to foster awareness and collaboration should be included in the design of the game, as also Meijer and Lo (2014) propose.

2.3 towards distributed games

For the design of distributed games, we face some further challenges. We conceptualize distributed games as having at least two players involved, which are distributed in time and/or space and which can be used to facilitate working processes of distributed individuals and teams. There are a number of other tools to support (distributed) teamwork than distributed games, called groupware. A groupware application is defined as a combination of software, hardware and social processes that supports groups in their interaction. The groupware thus is what mediates interaction in computer-mediated interaction (Schümmer & Lukosch, 2007). Experiences with groupware in general can inform the design of distributed games, even as most of them seem to be not as pervasive as would be wishful. For example, shared workspaces seem to be not broadly accepted, because most shared workspaces are designed to support planned, formal collaboration sessions, but it appears that much of the shared work that happens in co-located work groups is informal, unplanned, and opportunistic (Whittaker, 1994; Kraut, Fish, Root & Chalfonte, 1993). Thus, successful tools have to be able to support informal collaboration. But even more informal, innovative platforms like "SecondLife" seem to be unattractive when it comes to the use for serious purposes, because of its complexity and because of the fact that it is technical, managerial, and perceptual challenging (Harteveld, Warmelink, Fumarola & Mayer, 2008).

While in single user tasks, such as word processing or image editing, only one actor interacts with an artefact. Contrast this with groupware, which needs to support the interaction of many users with each other (Schümmer & Lukosch, 2007). Distributed games allow players to solve tasks jointly. Thus, they should support a number of coordination functionalities for that purpose. Schümmer and Lukosch (2007, p. 6) locate what they call multiplayer games, and we conceptualize as distributed games, within a two-dimensional graph relating a groupware application's level of support for coordination to the degree of communication and cooperation that an application supports. In this conceptualization, distributed games allow a high level for communication and cooperation, but support cooperation only to a certain extend. Communication in distributed games is mainly short and used for coordination, while they are focused on supporting the cooperation of the players (Schümmer & Lukosch, 2007).

Juul has argued that a computer game creates a "fictional world" (Juul, 2005), an environment that encompasses limitations and affordances, which a player must adhere but also use, in order to play the game. For distributed games, this fictional world is distributed in time and space, and has to overcome more than these two borders alone. When we think of globalized teams, the fictional world of a distributed game also spans e.g. cultural and language zones. Thus, there are more levels of fidelity we have to take into account in distributed games. Looking at the characteristics of fidelity, we assume that functional and physical fidelity are rather similar in traditional simulation games and distributed games. The challenges arise in the psychological and social fidelity, as distributed games should support engagement, and allow for collaboration within the distributed team.

In summary, distributed games, similar to "traditional" simulation games, have to take into account the fidelity of the game as well as design for the interaction between the participants. A personal example shows that designing interaction is not always straightforward. One of our games was redesigned from an analogue game to a distributed game. In the analogue version the game was played synchronously at the same place, and communication problems and distance between the different roles are tangible and visible. While playing this game in a distributed manner, it was seen only as a technical puzzle. Participants with different roles just sat together to solve this technical puzzle, without being aware of their different perspectives. Below we introduce some experiences with a distributed game, which has been developed and evaluated during the last years.

3 Designing distributed games to support team awareness

The objective of the "CharliePapa" game was to foster shared situational awareness (SSA) and communication skills within reconnaissance teams. Teams had to collaboratively explore a virtual 3D-environment, which represented parts of the city of The Hague, The Netherlands, in order to detect deviant objects and behaviour. Subsequently the team members had to run through the simulation game scenario, thus were distributed in time. We explored how different levels of fidelity affect the playing experience, and the usability of the game as a learning tool. Expert teams evaluated the game in an experimental setting. All sessions were observed by two researchers in person and by video. Questionnaires were filled in before and after playing the game, with regard to expectations and experiences of the players. The de-briefing of the game was also used as part of the qualitative evaluation. The design process of the scenarios is described in detail in (Lukosch, van Ruijven & Verbraeck, 2012), the game and its evaluation in (Lukosch, 2013). The realistic virtual environment showed the ability to enhance teamwork skills, especially communication skills. Team situational awareness could be fostered to a certain limit. Virtual objects could be used for team awareness training, but virtual agents of the game scenarios still lack realistic behaviour and expressions, thus a higher level of physical fidelity is needed here. Regarding the balance of the three levels of physical, functional and psychological fidelity, it showed that functional fidelity is relatively easy to include in a game scenario, when actions and tasks are translated properly. Physical fidelity is much harder to reach, as it takes a lot of effort to create a simulation game environment that is near-to-reality. When game mechanics are well developed, it shows that psychological fidelity as immersion and the feeling of flow reaches a high level. In this case, psychological fidelity was high due to the fact that the tasks had to be accomplished within a time limit, and that different teams competed against each other in detecting as much objects as possible. The interaction of the players was enabled through a simple communication tool, which provided at least a low level of social fidelity. Compared to each other, functional fidelity was mostly appreciated by the players in our study, and when both functional and psychological fidelity were high, it mattered less when physical fidelity did not reach the highest degree. High functional fidelity had a positive impact on how the players experienced their individual achievements within the game. As social fidelity, or the ability to interact with each other, was low, the players felt that the game supported teamwork only to a limited extend. In summary, the case study showed that all four levels of fidelity should be balanced to a certain degree, but that physical fidelity is less important than psychological, social and functional fidelity.

In this case, we did not support informal collaboration, as we evaluated the game within an experimental setting only. Cultural and language differences did not play a role. The high level of psychological and functional fidelity fostered the engagement of the players, which was reported in the de-briefing and the questionnaires.

4 Conclusions and Future Work

Complex problem solving often requires a team of experts to physically meet and interact with each other. Identifying the problem and creating a shared understanding seems to be a prerequisite for efficiently solving a problem and is one of the major challenges. Unfortunately, it is not always possible to bring a team together to jointly handle a complex situation. This is due to experts' availability, critical timing issues or accessibility of a location. Groupware is a software approach towards fostering distributed group or team processes, but is limited in its success. We have introduced distributed games as an alternative to support experts who are not physically co-located, where at least two players are distributed over time and/or space. Our approach focused on the concepts of fidelity of distributed games, as they are identified as being central for team processes and game effectiveness. Richard Duke conceptualized simulation games as Multilogue communication, which provides players a possibility to enter a discussion on complex problems. Distributed games are mainly focused on fostering cooperation instead of focusing on communication. We can conclude that distributed games enhance Duke's concept by providing not only Multilogue communication, but also Multilogue, multidimensional cooperation.

One possible way to develop distributed games lies in the combination of simulation games with augmented reality. With making use of the advantages of both technologies, environments of high fidelity and immersion can be provided. A feeling of "being there" (at least within the fictional world) can be achieved, supported by a very realistic training experience. With augmented reality technology, like camera-equipped mobile devices, players are no longer bound to an experience provided only by a computer interface or a physical environment, but can enter an enriched physical world, with virtual objects and agents that add real-time information. In order to enlarge the game experience with augmented reality technology, both for entertainment and for serious purposes such as complex problem solving, augmented reality games have firstly to address all human senses, i.e. sound, smell, taste and touch (Lukosch, Lukosch & Verbraeck, 2014). Secondly, users will have to be aware of each other's activities by using an augmented reality environment for spatial remote collaboration.

The final and most difficult challenge seems to be to create a realistic interaction between real and virtual objects (Schraffenberger & Van der Heide, 2013).

In our opinion, when distributed games are designed to answer the three challenges mentioned above, namely addressing all senses, supporting (team) awareness, and allowing for realistic interaction, a realistic multi-modal, multi-user game experience can be created that is in many ways indistinguishable from reality in most senses. This will enable a whole new generation of applications that will benefit from distributed people interacting naturally with each other and with their synthetic environment. Based on related and our own work, we extracted some design challenges for distributed games. Distributed games should support informal collaboration, and be easy to play. While designing a distributed game, one should take into account that time, space, language and cultural differences may play a role. Distributed games face the challenge to support engagement while the awareness of the players for each other cannot be supported by means of face-to-face communication, and thus have to seek for other ways to allow for collaboration. Future research will also address issues such as trust, privacy and the feeling of presence in distributed games, as such concepts are also crucial for the design of those games.

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THE FUTURE OF GAMING FOR DESIGN OF COMPLEX SYSTEMS

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Abstract

The use of gaming simulation for design purposes can be extended beyond the current state-of-the-art by looking better into ways to design in the game so that the transfer to reality is easily made. In this chapter, we introduce a framework, consisting of a Product, Social and Institutional Space, that supports interpreting the problem and routes to its solution(s). We explore the role of gaming in the light of this framework and conclude that by using gaming simulation to bridge the 3 spaces, the design process of complex systems can be improved.

Keywords

design, gaming, design theory, complexity, testing

1 The Future of Gaming for Design of Complex Systems

In a world of interconnected systems - through function, network technology, data exchange and financial ties - the design of such systems is getting ever more difficult to manage. In this chapter, we describe how gaming simulation is a well-suited method for the design of complex sociotechnical systems. The design framework is called PSI, which embraces a Product, Social and Institutional space for situations with many stakeholders and layers of abstraction. This recently introduced framework is firmly rooted in the institutional economics theory of Ostrom (2005, 2010). It explains the feedback loops to the institutional, people and resource components of her action framework.

Dick Duke's (1974) original notion of Gaming as a way to formulate the language of a future system, or state of that system, has been followed enthusiastically, especially since the mid-1990's. In later work on the empirical and methodological underpinning of Duke's concept, it has mainly been the function of experiencing and understanding the complexity of a system that has yielded a significant number of quality publications.

Duke's notion of gaming to actually design future systems, however, has seen less spreading as is reflected in the sparse scholarly follow-up. It is the, often poorly understood, work of Klabbers (2003, 2006) that provides the current platform for what he calls 'design-in-the-small' that can be taken as input to a 'design-in-the-large' implementation in society.

In the increasingly more complex system design of large systems like transport, health care, energy and IT, gaming has become a default method for designing in a not-for-real simulation to prepare for the design process of the real system. However, the design as done in the game, is rarely transferable to reality. It is in the tradition of policy gaming that these games deliver results on Duke and Geurts' (2004) five C's: Communication, Creativity, understanding Complexity, building Consensus, and Commitment to action. This means that the result of the game is embodied in the players, not in the design of the game. Games used in this sense implement Klabbers' design-in-the-small as design of teams and processes, not of the new artifact itself.

2 Design and the act of designing in complex systems

Duke's concept of gaming as language formulation fits well with a school of thought in the design science/theory world that is focused on the inter-linked multi-scale/multi-dimensional nature of socio-linguistic network in design (Monarch, Konda, Levy, Reich, Subrahmanian & Ulrich, 1997; Subrahmanian, Reich & Krishnan, 2013). It is interesting to state that language as it evolved over millennia did so slowly to allow restricted conversations between a limited number of people for co-operative tasks, thus limiting the size of the problem and the system. In today's open world, in which people, information and processes are connected, the need for improved and more coherent design frameworks is eminent.

Designing is a collective act or verb rather than an act of individual prowess alone. This view does not preclude the need for individuals playing significant roles in the theatre of this collective act. It also does not preclude the role of leadership or co-ordination role in making the collective verb function effectively. The collective verb not only determines the problem to define and solve to achieve the target, but also binds to it processes of negotiation, mutual learning, identifying the known and unknowns in building disciplinary, and cross disciplinary bridges to bring to life 'the object' under design.

Defining the context of designing is inherently multi-dimensional as there are contexts embedded within contexts. In designing a building in a city, its context of use and function is embedded in the context of history and rules and regulations of the city.

It is in this sense that the multi-dimensionality of designing is set in a recursive set of contexts. This complicates characterizing the design problem precisely a priori. In the light of this, we define a model of designing that can be used to structure design contexts and allows for understanding the consequences of different contexts. The three spaces of the model characterize the nature of the problem, the skill and perspectives of the people that are involved in defining and solving the problem and the institutional arrangements (rules, norms and practices) that govern the process of designing. We shall elaborate on these spaces further in the next section. The spaces, while they provide a framework to describe the context within which designing takes place, do not address in detail the mechanisms that facilitate the act of designing. Designing means moving from one state in the PSI spaces to another state. The path has some sense of efficiency, sustainability and social acceptability, and the end result addresses a need. Through this process, we arrive at a point in the PSI spaces that is consistent in all its aspects and supports the solution developed.

Why can't we do this perfectly by default? We are embedded in contexts recursively, there are limited resources and we can only approach a desired solution and exercise temporary closure. This closure could relate to the technology, the institution, or the social system, or to any combination of them. We do not know the path initially, nor the final point. We may use games to envision the final point but it might not be straightforward to move from the present to the final state in one iteration. Moves in the PSI space are finer grained than bold discrete jumps if we only had to care about technology (or the product space). Not knowing the path requires that we probe and advance in it incrementally. A radically new technology or process can lead to previously unrecognized location in the PSI space. For example, the change by Ford towards mass production was such a move; a disruptive move with respect to design and production of automobiles.

3 Designing – Product, Social and Institutional spaces

Based upon a long set of earlier work (Konda, Monarch, Sargent & Subrahmanian, 1992; Reich, Konda, Levy, Monarch & Subrahmanian, 1996; Monarch et al., 1997; Subrahmanian & Reich, 2006; Subrahmanian, Konda, Levy, Reich & Westerberg, 1993; Subrahmanian, Monarch, Konda, Granger, Milliken & Westerberg, 2003; Subrahmanian, Reich, Smulders & Mejer, 2011; Subrahmanian et al., 2013), we identified three spaces that characterize the location in the space in which the collective act of designing for a problem takes place, embedded in a larger socio-economic-cultural context.

They are the Product, Social and Institutional space, each consisting of three base dimensions. These dimensions span the minimum complexity of each space, but are not exclusive. Particular design problems may introduce more dimensions to be added to a space.

4 Product Space

In this space, the most visible part of the design is characterized. The product can be either a physical artifact or a service, and is geared towards solving the problem.

Disciplinary complexity is the number of disciplines (and their relationships) that are required to understand and create the product. The notion of disciplinary complexity is important as for each of the disciplines there are models, vocabulary and languages that need to be stitched together to create the theory of an artifact and the product. One can observe this trend from the industrial revolution till now. Machines and theory of machines were sufficient from a mechanics point of view to build a wide range of products and equipment (Le Masson & Weil, 2011). These theoretical codifications still required knowledge of production techniques, material properties and processing of materials and so on. In more recent times we have increased disciplinary complexity in many products. Cars are not just electro-mechanical systems but are a combination of computer hardware, software and electrical and mechanical systems working together. Modern cars are connected to their environment, concepts of sustainability, the law and other disciplines much more tightly than ever before.

Structural or mereological complexity is the decomposition of the product or problem into parts and their relationships. It is the number of parts and their relations that are embodied in their creation. Structural complexity is what Simon had in mind in his article on “Architecture of Complexity” (Simon, 1962). However, Simon’s notion of complexity is limited as it only deals with the idea of near decomposability and hierarchies as a means to deal with complexity. Structural complexity in our case extends beyond hierarchical decomposition to address the interdependence of the parts that earlier were often mostly independent in their functional performance (De Weck, Roos & Magee, 2011).

Knowledge availability is crucial in developing products or services, either within or outside an organization. This may include formal, tacit and informal knowledge that is embedded in the models, theories and practice. If all knowledge is available then the product requires no new knowledge. If not all knowledge is available, the unknown part of the knowledge has to be generated and fitted into the puzzle that is the development of a theory of the artifact.

The theory of the artifact is the state of the current understanding of the designed artifact, the process with routines and methods and the knowledge that was mobilized. The unknown knowledge might stem from the need to bridge disciplinary boundaries, which requires meta-knowledge to dialogue between these disciplines. The creation of this new knowledge would often require the need for a 'bridge' vocabulary (eg. pidgin or creole) and new models to make the unknown known and verified. This creation of knowledge has to be designed through experiments, research, skunk works, and also development explorations like games and scenarios. So designing of products now recursively involves designing of the research and development methods that are required to discover the new knowledge (Nonaka & Takeuchi, 1995).

5 Social Space

This space characterizes the social unit that creates the product space in terms of specifying, producing and adoption the product. It is important to note that this space deals with those who are needed for the specification of design that meets a solution for the problem, and not just those who create the design. Here games have an important role, as they can make the ones included in the social space part of the design process at different stages. The recursive nature of design requires that the social space operates in conjunction with the characteristics of the Institutional space to effectively mobilize the social space.

Inclusion in the social space can be limited or open in terms of the inclusive participation of the different perspectives. For example, if the problem in the problem space has all the knowledge that is needed then the social space may assume a limited (closed) set of predefined competences and skills. In the case of lack of availability of all knowledge, the social space will assume an open world characteristic with the lookout and intension to possibly extend the perspectives and languages that need to be incorporated. Important here is that a limited social space may also limit the quality and relevance of the solution. For example, let us say the problem is to figure out the complex interaction between road traffic, pollution and potential health effects of a traffic interchange in a neighborhood. To address this problem requires that the social space supports an open world-view. This allows diverse people and skills to be included in both defining and solving the problem. This could include the perspectives of those who live in the area, the drivers who will use the interchange, health experts, traffic experts, and so on. However, one could frame the problem as one of just dealing with traffic congestion and use only traffic experts as the required skills view of the problem.

The extent of inclusion in terms of limited or open will depend on the boundaries that are drawn around the problem and at times as to how the boundaries themselves are negotiated.

Number of perspectives is a characterization of the number of points of view that are critical in discerning the product definition and solution from conception to implementation. This idea of perspectives is interesting if one observes the evolution of computing. Early on, it was all about computing algorithms; theory and programs were the focus due to the use by a narrow set of people. The idea of bringing the needs of the user perspective as the computer became individualized was first illustrated by Xerox and commercially by Apple. This has led to a new field of design of user interfaces over the last 20 years. Consumer perspectives, maintainability and numerous other abilities are perspectives. There is no limitation on different perspectives even within a discipline. Perspectives are not just views form the disciplinary knowledge but also views of practical knowledge derived from practice and knowledge of those who use the product. Some of this knowledge is often not a priori known or codified.

Capabilities and Skills characterize the required abilities in the social space to do something such as creative thinking, critical thinking or system thinking. Similar to a product having parts, a design process has tasks requiring different skills: careful management of requirements, creative generation of concepts, systematic analysis and test of concepts and their selection etc. Skills could be considered as parts of the whole process. Different definitions of competence, capabilities and skills have proliferated in business and evolutionary economics literature. Each of these definitions has its limitations and a more detailed exposition of the differences and incompleteness of the different definitions as elaborated by Dosi, Nelson, and Winter (2000). In our context, defining and identifying the skills and capabilities in terms of knowledge that is needed to be included to address the end-to-end design problem at hand is the focus. They cover the possible range of knowledge from the codified to the tacit from all the needed disciplines.

6 Institutional Space

This space is about the rules we need for organizational structures to manage the process in defining and producing a product to properly address the articulated problem. These structures are meant to realize or use the needed contribution from all participants to design the best possible product.

A complex product, requiring extended participation with multiple perspectives, would require flexible procedures that allow for continuous evolution, maintenance of shared memory, evolution of the team, and the evolution of the product requirements. It actually requires that the rules allow procedures to evolve in response to new situations.

Ties characterize the strength of interconnections between different individuals and entities that are part of designing. Social networks are characterized in terms of the strength of connections; weak or strong (Granovetter, 1983). Weak ties are characterized by transactions with low exchange of knowledge and co-operation between the parties. These ties are often market structures when talking about inter-firm exchange, but can also exist within a firm due to institutional routines, processes and structures. For example, in the days of sequential engineering, the ties between different departments were weak as the knowledge transfer and reconciliation of knowledge was not made routine in the process. In the transition to concurrent engineering, the ties were made strong by changing the process of knowledge exchange and reconciliation between different functional departments.

Knowledge accessibility describes both formal and informal barriers to accessing knowledge both within one organization and in between organizational networks. Within an institutional structure, the knowledge is dispersed in different individuals and different parts of the organization. There is resident knowledge in the institutionally codified formal knowledge, in informal knowledge that is tacit and in knowledge that is recorded in personal notes, etc. While this knowledge is accessible, it is often not accessed as we pointed out in the difference between over the wall engineering and concurrent engineering. In many organizations people at the cross roads of information flow have unique knowledge at the interfaces. It is only accessible through them as it is not often publicly accessible. The other means by which knowledge that is not accessible but available outside the organization are made accessible through joint ventures, buy out, mergers and technology markets.

Institutional structure describes the structure of the institution that is chosen to address the problem at hand. This can range from spot markets to inter-organizational structures like supply networks and inter-governmental structures. There have been studies in economics and management on the relationship between variants of organizational structures and products (Baldwin & Clark, 2000; Marengo, Dosi, Legrenzi & Pasquali, 2000). Ostrom (2010) in her work extended the notion of organizational structures from states, hierarchies and markets to polycentric organizations that are locally governed by those who manage the resources. Her work is especially well developed for common pool resources. Ostrom's (2005) work on institutional analysis and development of management of public resources has led to a grammar for analysis of such public institutions and to describe the potential design of new institutions.

She argues that design of institutions should be done in the same manner as engineers deal with complex products (Ostrom, 2005). Sunder (1999) identifies the differences in the organizational structures that are needed in the context of public and private goods.

The institutional space is different from the social space as it relates to the issues of rules, norms, routines and other formal and informal organizational structures. Within an institution, the rules and norms can both hinder and enhance the possibility of using the social space and the knowledge embedded in it. For example, the American car companies and Japanese Car companies had more or less the same capabilities in the seventies when the Japanese firms started making major inroads into the American market by improving the quality of the products far beyond the American products. However, the fundamental difference was in the institutional rules and norms of how information and knowledge was created, processed and exchanged in these organizations. Fujimoto (2000) in describing the Toyota Production System illustrates the nature of alignment and realignment taking place through continuous improvement, debates over directions, design and production experiments and decision-making authority on changes in the production system.

7 (Re)alignment of design

Over time, a problem positioned in the PSI spaces could move its location along several dimensions. For example, knowledge that was once at the cutting edge and scarce becomes common practice or a product once innovative becomes obsolete. In addition, as time passes, products tend to involve many more disciplines, and become more complex to reflect the changes in social needs and requirements that are imposed on the product. Each of these dimensions themselves also trigger change in the other dimensions. For example, McMasters (2004), in his work on the history and future of human flight points out that the number of disciplines needed to create an aircraft changed dramatically from aerospace, material and mechanical engineering to the need for environmental, computational, chemical engineers and others. He also makes the case that the future of aircraft design would require people with cross-disciplinary skills who he classes 'deep generalists' in greater number than ever before. This observation fits with Dosi, Hobday, Marengo, and Prencipe's (2003) observation that economics of system integration requires that all the knowledge distributed across suppliers is still needed with the integrator even if part of the design and production are outsourced in a networked organization. The need for co-designing the problem to be addressed, the mobilization of social resources and the appropriate institutional structures become necessary because they mutually are dependent on defining of the specific location in each of these spaces for the design to be effective in specific context, location and time.

Beyond co–designing, the transformations in location of the problem in the problem space, social space and institutional space have to evolve to changing conditions and technology. One could only imagine the complexity of re-alignment of design when dealing with design problems that are complex by themselves. Such complexity calls for new tools and methods.

The (re)alignment of the PSI spaces is quite difficult to do. Organizations often muddle along and at times arrive at acceptable solutions. Through gaming, it is possible to do the associated experimenting in a faster and cheaper way, potentially leading to better solutions. Of course, some organization by virtue of their market power may get away with the cost inefficiencies because they can pass it to the customer. Many economic development projects have failed due to these misalignments of incentive and institutional models (Easterly, 2001).

8 Gaming as the method of (re)alignment

The fundamental question the problem of (re)alignment raises is one of how do we address this problem systematically and if so what methods could be useful. While the problem posed is complex and messy, we believe that there are methods that can be brought to bear to address this problem. In this chapter, we explore the use of games as a possible method and present an example of its use in the redesign of railway services in Netherlands. Games are not necessarily the only method to address this problem; other methods will have to be designed to address the co-design of a product/service organization based on the analysis of the PSI spaces and desired outcomes. This again demonstrates the recursive complexity of designing manifested even through the need to design new design tools.

To the readers of this book, we assume the history of gaming and its current state are well known. Gaming for training is beyond the scope of this chapter, however we will discuss the three other uses as distinguished by Van Lankveld et al (forthcoming), depicted in Table 1.

	Focus on player	**Focus on outcome**
Transfer	Training	Research
Creation	Policy	Design

Table 1 Four uses of gaming (Van Lankveld, van den Hoogen & Meyer, forthcoming)

In the original Duke book (1974), and the subsequent Duke and Geurts book from 2004, the game as so-called ‘policy exercise’ was clearly about the creation of the future, both in the shared language about this future, as well as by hitting new, creative solutions for the real-world itself. In the framework in table 1, these two functions are split into the two lower categories, being gaming for policy, and gaming for design. The stream of gaming in the policy domain, as reviewed by Mayer (2009) *‘highlights the recognition that the success of gaming for policy making derives largely from the unique power of that gaming to capture and integrate both the technical-physical and the social-political complexities of policy problems’.*

However, when critically reviewing many of these papers, we see that most games use highly abstracted, or analogous systems in their game play. The relevance of the solution found in the game is therefore no ‘design-in-the-small’ as Klabbers (2006) defines it, but a trigger to change the participants themselves and their interactions. In terms of PSI, this only concerns the S and I spaces, with an often-trivial P space design.

Gaming as a research method to test hypotheses is less known, but also of prudent importance to the design process. As Klabbers (2006) discussed by making a difference between artifact assessment and theory testing in games, and as proven by Meijer (2009) on behavior and organization in supply chains, it is possible to use a game as a test environment, by properly experimenting over a large number of sessions to collect sufficient data on behavior to allow for statistical analysis as in any experiment. The last decade has seen a dramatic increase of behavioral studies in leisure games, and it would be very good if those methods could be transferred to those games that aim to design the real world.

Gaming for design mostly implements Klabbers’ function as assessment of a potential (in-between) design artifact in its full PSI space. Here the key is that the game can expose a theorized artifact to allow experimentation with the social space along with the changes in the environment (governance and other institutional structures) to both explore the importance and interactions of roles and possible institutional routines, norms and governance structures.

In our work for the Dutch railways (Lo, van den Hoogen & Meijer, 2013; Meijer, 2012), we have observed exactly the function of gaming for design in PSI. Many of these games started with the request to test (formally) the effects of a new artifact, being either a track layout or a new timetable (Meijer, Kracht, van Luipen & Schaafsmal, 2009). While setting up these sessions in the frame of gaming for research, it increasingly appeared that the artifact wasn’t complete.

The design lacked proper development on the effects on roles and institutional rules, like the responsibilities of train traffic controllers and network controllers, and the balance between the public and private actors on the railways, being infrastructure and train operators. In the running of the sessions, the games changed to assessment of artifacts, delivering worthwhile (but also complex to interpret and manage) lists of potential bottlenecks in the social and institutional space in case the artifact would be put into operations. Since the game participants in these sessions were always operators in their own, or a closely associated role, gaming in such a way gave influence to the design process of a layer in the organization that is usually not present in the design activity itself.

The number of perspectives and set of skills required in the social space appeared to need change, for instance, when assessing a new control layout of Utrecht Central station, which was a technical product space change in itself (NAU Game in Meijer (2012)). Similarly, the institutional space required changes in both the ties and institutional structure (moving towards a public good), when testing a new timetable with 50% more trains under disrupted conditions (ETMET Game in Meijer, 2012).

The games for design were sometimes the consequence of games for policy making (Meijer, Mayer, van Luipen & Weitenberg, 2011), and sometimes lead to games for true theory testing (Lo & Meijer, 2014). Given the focus on players or outcomes, and on creation or transfer, the validity settings then change, calling for different games. This process leads to a series of games, continuously coming back to experimentation of different combinations of P, S and I.

9. Conclusion

Coming from the world of design research, games are cognitive artifacts that give the ability to understand the possible pitfalls in the existing rules and structures. They enable to define new models of rules and norms. Games serve as boundary objects across disciplines to collaborate and explore the process of negotiation. More recently, games have been used for teaching and understanding design negotiation (Bucciarelli, 1999; Grau & Sheppard, 2012). In the context of PSI, it is not just about the problem of arriving at a negotiated solution to an underdetermined technical problem, which all design problems are. It is predominantly about the process of identifying the problem location in the problem space, the composition of the social space and the location in the institutional space. This process is underdetermined in all three spaces.

Further, in existing organizations, any shift in the location of a solution to the problem situated in the firm in any of these spaces will require another round of realignment. If such realignment does not take place, then the potential for failure of the firm increases dramatically overtime. In effect, the necessity to realign the locations in the P, S and I spaces becomes critical for defining the future. It is in this context that gaming can serve as a method for changing the characteristics of one of the spaces and observe the outcome of this change to allow for changes in the other spaces. This iterative process of designing using rapid prototyping of the context of designing through games provides a novel approach. This view provides a framework for design thinking as a socio-technical and cultural process to the entire design context of the problem as characterized by the PSI Spaces.

If games are means to realign the PSI spaces in an iterative design process, and if in the context of games, actual solutions are developed and not only teams, then we can benefit from design tools that are embedded in games. Properties of such tools include simplicity and integration. Simplicity is one of the important features of Quality Function Deployment (Akao, 1990) that was part of Japanese car-makers' advantage over American car-makers mentioned before. Simplicity allowed all organization members including assembly line workers to contribute to the improvement of designs, thus breaking traditional boundaries between departments and allowing extended participation. Integration on the other hand, allows supporting complex designs in the early stages of design when games could be used to align the spaces, create language bridges, and formulate the problem and some conceptual solutions. Methods, when designed properly and integrated in games could facilitate realignment of the PSI spaces in a more comprehensive fashion because the solution that can be prototypes in games would be closer to the real design.

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THE EVALUATION OF A DISCIPLINE: A FRAMEWORK FOR EVALUATING SIMULATION GAMES

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Abstract
Evaluation is considered as an important issue in relation to gaming and simulation. Many studies deal with this subject, but yet it is hard to get an overall picture of the strengths and the quality of gaming simulations at the aggregated level, also referred to as the discipline. In this chapter we look at the issue of evaluation of simulation games from a methodological perspective: the 'why', the 'what' and the 'how' of evaluation of simulation games. Concerning the 'why' nine concepts are distinguished in which evaluation can be connected to gaming simulations. For the 'what' we elaborate four levels on which the evaluation may focus (appreciation, cognition, behavior and performance). For the 'how' we point at the drawbacks of the experimental design for evaluation studies and we point at the strengths of theory based and qualitative evaluation in case studies. Throughout this chapter the central focus point is the question how the results of the evaluation of single simulation games can contribute to insight in the quality of gaming simulation as an instrument that may be used in varying situations.

Keywords
effectiveness; efficiency; evaluation; experiments; gaming as a discipline; simulations games; qualitative evaluation; theory based evaluation

1 Introduction

One of the famous statements of Dick Duke about the effectiveness of simulation games is "It works, that is all we have" (Duke & Geurts, 2004, p. 211). This has been his answer for many years (in the eighties and nineties) to the question why simulation games do what they are supposed to do.

His answer reflected the situation that there was a lack of empirical evidence for the effectiveness and efficiency of simulation games. Since then many evaluations of the use of simulation games have been reported, and also models for evaluating simulation games have been developed. Hense (2004) and Hense and Kriz (2008) have come to the conclusion that one way to improve the evaluation practice in the field of gaming and simulation is to let the evaluation of simulation games be explicitly driven by theoretical notions and expectations. They have developed an evaluation model and they refer to their approach as 'a theory-based evaluation approach.

This approach is an important impetus for the practice of evaluating simulation games. However, we think that we may add something to the evaluation of simulation games by looking at the evaluation practice from a methodological perspective.

In this chapter we shortly discuss the concept of evaluation and its purposes, how the field (discipline) of gaming simulation can profit from evaluation studies, and next we elaborate on three themes that may help to improve the practice of the evaluation of simulation games:

» *why_* what kind of questions do we want to be answered by means of evaluation?
» *what_* what kind of variables could / should we involve in the evaluation of simulation games?
» *how_* how can we design an evaluation study on simulation games, which research designs are fruitful?

2 The concept of evaluation

Evaluation is a concept that has many connotations and is used in different ways. A well-known definition of evaluation (in an educational context) is given by Cronbach (1983, p. 101-102): "…we may define evaluation broadly as the collection and use of information to make decisions about an educational program. […] Many types of decisions are to be made, and many varieties of information are useful. It becomes immediately apparent that evaluation is a diversified activity and that no one set of principles will suffice for all situations." Rossi and Freeman (1989) give a definition of evaluation, that can be considered as an elaboration of the terms 'collection and use of information' in Cronbach's definition: "Evaluation research is the systematic application of social research procedures for assessing the conceptualization, design, implementation, and utility of social intervention programs" (1989, p. 18).

These definitions refer to 'educational programs' and 'social intervention programs', but we are convinced that these terms may be replaced by the term 'simulation games' without doing any harm to the tenor of the definitions.

An important distinction that is made in relation to evaluation is the distinction between informal and formal evaluation. Douglah (1998, p. 2) contrasts these two types of evaluation in the following way:

Informal	**Formal**
Casual	Deliberate
Spontaneous	Designed and planned
Criteria are implicit	Criteria are explicit and clear
Evidence is quickly and insufficiently ascertained	Evidence is systematically collected
Judgment is hastily made	Judgment is carefully made

Earlier, Stufflebeam, and Shinkfield (1998) have formulated three criteria that should be met in order to consider an evaluation as a formal evaluation:

» the criteria that are used for the evaluation have to be clear and unambiguous
» the methods used to come to a judgment are adequately selected and applied
» the evaluation process is reproducible and the criteria are public.

The combination of these definitions tells us something about the 'why' and the 'what' of evaluation: the objective of evaluating simulation games is to inform us about the quality of simulation games in order to enable us to make decisions. Investigating and assessing the conceptualization, design, implementation and utility of the simulation game accomplish this evaluation.

These definitions and distinctions also show us, that evaluation is more than just assessing the learning outcomes of using simulation games. In the next section we elaborate in what ways evaluation may serve our understanding of simulation games.

3 The purpose of evaluating simulation games

When looking at the purpose of the evaluation of simulation games we have to distinguish two different purposes this evaluation may serve.

In the first place, evaluation may be interesting and important from the perspective of a specific simulation game in order to assess the quality of that specific instrument. Evaluation gives information to the game designer, the facilitator, the user (client) and the players whether the participants, by playing the simulation game, meet the objectives it was designed for. If a simulation game has proven repeatedly to be successful, one may come to the conclusion that this particular simulation game is an effective instrument (for the purposes it was designed for). In addition to the question of effectiveness, one may also be interested in the question of efficiency: is it worthwhile to use this instrument or are there other tools or instruments that may realize similar results against lower efforts or costs. This kind of evaluation questions help the designer and facilitator to understand whether they have an effective and efficient instrument, and it may convince potential users (clients) that playing the game will contribute to e.g. new behavior, skills or attitudes.

In the second place, evaluating simulation games may serve another purpose, especially if we look at the issue of evaluation from the perspective of 'simulation and gaming as a discipline' (cf. Crookall, 2010) or the gaming society. The gaming society is interested in assessing the quality of simulation games on a more general level: are simulation games in general effective and powerful instruments? For what purposes can they be deployed? And under what conditions can they be used successfully?
The gaming society cannot do with the adage: "it works, that is all we have". There is need for more scientific evidence on simulation games as a tool for teaching, training, change, and research.

The responsibility for these efforts was put in the hands of academics: "It was a plea towards academics in the gaming discipline to do more research, share their results and jointly build up gaming/simulation as a true academic discipline" (Duke & Geurts, 2004, p. 211). In stimulating and coordinating these efforts there may be an important role for organizations like Isaga, Absel, Sagsaga, Saganet, Jasag and the other 'local saga's' to initiate and coordinate studies, in which the 'academics in the gaming discipline' will jointly try to answer these important research questions. However, since these organizations are rather informal and do not have the means (in terms of organization, research programs, personnel and money) to set up this kind of ambitious research projects, we as gaming society will have to rely on other sources of evidence, such as the accumulation of the findings of evaluation studies of single simulation games.

In recent years there have been many researchers who have conducted meta-analyses in order to compare and accumulate the findings of evaluation studies on single simulation games (see e.g., Greenlaw & Wyman, 1973; Pierfy, 1977; Wolfe, 1985; Dorn, 1989; Keys & Wolfe, 1990; Randel, Morris, Wetzel & Whitehal, 1992; Wolfe, 1997; Faria, 2001; Vogel, Vogel, Cannon-Bowers, Bowers, Muse and Wright, 2006; Sitzman, 2011). By accumulating the findings their overview articles try to reveal the strengths and weaknesses of simulation games as a category of instruments.
However, what hinders drawing conclusions from this kind of accumulating studies is the fact that the single evaluation studies are very different on many aspects like the theoretical background, the kind of variables involved, and the research methods used. In order to provide a framework for comparing and accumulating evaluations of simulation games, we investigate in the next part of this article the 'why', 'what' and 'how' of the evaluation of simulation games.

4 The 'why' of evaluation: concepts of evaluation

4.1 Purposes of evaluation

Based on a comparison of several publications on evaluation and of articles in which simulation games are evaluated, we come to a distinction between nine different ways the concept of evaluation is used in the context of simulation and gaming. In Table 1 these concepts of evaluation are mentioned; after that they are described shortly (Mayer, Stegers-Jager & Bekebrede, 2007).

I. Evaluation as assessing the performance of participants in a simulation game.
II. Evaluation by using simulation games.
III. Evaluation as assessing the quality of the game design and the design process.
IV. Evaluation as assessing the quality of the simulation game.
a. the quality of the game-in-the-box.
b. the quality of the game-in-use.
V. Evaluation as assessing the effectiveness of the simulation game.
a. the degree of effectiveness of the simulation game.
b. how and when are simulation games effective.
VI. Evaluation as assessing the efficiency of simulation games.
VII. Evaluation as assessing the effects of a gaming based intervention.

Table 1 Concepts of evaluation in relation to simulation and gaming

I Evaluation as assessing the performance of participants in a simulation game.

The term evaluation refers in this context to evaluating the behavior / performance of the participants in the simulation game, not the game itself. The use of the word evaluation in this sense relates to identifying adequate performance indicators and to computing scores on each of these indicators within the simulation game (Anderson & Lawton, 1992; Rising, 2004; Olson, Scheller, Larson, Lindeke & Edwardson, 2010).

II Evaluation by using simulation games.

Simulation games are used as experimental conditions in which e.g. new policies are tested before they are actually implemented (ex ante evaluation). Alternatively they may be used as a setting in which hypotheses can be tested. Examples of this application are Keys and Wolfe (1990), Quanjel, Willems, and Talen (1998), Mastik, Scalzo, Termeer, and In 't Veld (1995), Kriz and Brandstätter (2002) and Kuit, Mayer, and De Jong (2005). Bowen (1978) and Vissers, Heijne, and Peters (1995) (among others) have published about this application of evaluation as a research method.

If simulation games are used in this way, they have to match the rather strict criteria for validity and reliability that are formulated for all research methods and instruments.

III Evaluation as assessing the quality of the game design and the design process.

This concept of evaluation is explicitly included in the design steps as formulated by Duke (1981), where it has to be assessed whether the game design is in accordance with the specifications. The evaluation may also concern the entire design process, i.e. the path and procedures to build the simulation game. An example of a study focusing on the evaluation of design principles can be found in Mayer, Bockstael-Blok, and Valentin (2004).

IV Evaluation as assessing the quality of the simulation game.

Vissers, Peters, Heijne, and Geurts (1998) make a distinction between 'the-game-in-the-box' (the simulation game as it is designed) and 'the-game-in-use' (the simulation game as it is used).

IVa Evaluation as assessing the quality: the game-in-the-box.

Several authors have defined criteria a simulation game should match in order to be considered a good simulation game. Dukes and Waller (1976), Thiagarajan and Stolovich (1979), Geurts and Joldersma (2001) and Hindle (2002) are examples of authors who come up with characteristics that simulation games should have. Feinstein and Cannon (2002) have investigated several publications and come to three criteria:

» fidelity the level of realism of the simulation game;
» verifiability is the model built in a proper way? Does the model work as it is supposed to work?
» validation did we build the correct model; are the conclusions drawn from the simulation similar to conclusions based on the 'real life situation'?

Peters, Vissers and Heijne (1998) and Vissers et al. (1998) have published on the validity of simulation games. In the context of computer-based games, the issue of fidelity has got a new dimension and new studies have been conducted (Visschedijk, 2010; Lukosch, 2014).

IVb Evaluation as assessing the quality: the game-in-use.

Even though we did not come across any references to this aspect in our set of publications, we think that this form of evaluation should not be forgotten in this overview. This concept of evaluation focuses on the conditions in which the simulation game is used, and addresses questions like: 'Is the simulation game played according to the directions for use?', 'Is it used for the proper group of participants', 'Is the debriefing done in an appropriate way, addressing the right themes?' and so on.

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V Evaluation as assessing the effectiveness of the simulation game.

Following the distinction Boocock and Schild (1968) make concerning the evaluation of social technologies in the 'engineering' and the 'science' approach, we see two different connotations for evaluation:

Va Evaluation as assessing the degree of effectiveness of the simulation game.

From the perspective of the 'engineering approach' evaluation research tries to assess how successful simulation games are in bringing about desired changes in the behavior, skills, attitudes, knowledge, or emotions of participants.

Evaluating the effectiveness of simulation games implies that we have to ask and answer at least three questions:

» Is there a change in the target behavior (i.e. behavior, skills, attitudes, emotions, et cetera)?
» Is this a change in the desired direction?
» Is the simulation game the cause for this change?

The answers to these three questions give us insight in the effectiveness of the simulation game and provide us with information about the value of the instrument.

Vb Evaluation as assessing how and when simulation games are effective.

In terms of a 'science approach' evaluation research focuses on the conditions that facilitate or hinder the simulation game to be successful in realizing effects. Getting insight in these factors and conditions focuses on issues like:

» the conditions for using the simulation game;
» characteristics of the participants;
» approaches for debriefing the results and experiences.

The study of Hense, Kriz, and Wolfe (2009) is an example of a study where a large number of characteristics of the participants and the game environment are included in order or investigate what their role is in the way the simulation 'SIMGAME' operates.

VI Evaluation as assessing the efficiency of a simulation game.

The next concept of evaluation in relation to simulation game has to do with assessing whether the simulation game is the most efficient instrument to bring about the desired changes. The simulation game may be effective, but perhaps the costs (in terms of efforts, money, time) to bring about these changes are higher than for other instruments that may realize the same or similar results. St. Germain and Laveault (1997) and Hindle (2002) stand up for this type of research. Especially when designing computer-based games the design costs may become very high.

Research questions focusing on the efficiency of simulation games are:

» Is our simulation game the best way to bring about these changes?
» Are there any side effects (positive or negative, wanted or unwanted)?

VII Evaluation as assessing the effects of a gaming based intervention.

The last concept of evaluation is the one that is applied and reported the most: do participants have or show the desired skills, knowledge, attitudes, and/or behavior after playing the simulation game. In this case the evaluation mainly focuses at the question 'Do we see a change?' without drawing conclusions about the instrument itself (in contrast to the above mentioned concept Va, where one wants to draw conclusions about the simulation game). There are many publications describing the results of this kind of evaluation.

4.2 Consequences for the practice of evaluating simulation games

As the above enumeration demonstrates, evaluation studies of simulation games may concern very different subjects and serve various purposes. In the context of this article the first two concepts seem not very relevant in relation to our search for 'evaluation of the discipline' since they do not help us to get more insight in the quality of simulation games themselves.

The other concepts of evaluation can be seen as contributions to the 'design-in-the-small' as a part of the 'design science', as distinguished by Klabbers (2009).

The third concept focuses on the role of evaluation in the design process. On the one hand one may say that this kind of evaluation is very specific for a single simulation game (does the design match the specifications and objectives?). On the other hand, explicit descriptions of these evaluations and their findings may help the gaming society to improve the game design process and thus help to improve the image of the 'discipline'. Kaplan (1964) has made the distinction between the 'logic in use' and the 'reconstructed logic'. 'Logic in use' refers to the way a researcher (or game designer) operates in a concrete case, while 'reconstructed logic' refers to more generic methods or procedures that are based on a reflection on the 'logic in use' descriptions. Reconstructed logic often forms the basis for a methodology.

The steps for game design, as described by Duke (1981) and Duke and Geurts (2004) can be considered as 'reconstructed logic'. If more game designers describe (in detail) the steps and procedures they have followed in the game design process (and the advantages, restrictions, pitfalls, required skills, and so on), it would be possible to integrate these experiences into a new or improved reconstructed logic. Therefore, from the perspective of the discipline, descriptions of the 'logic in use' are very important.

The evaluation of the 'game-in-the-box' (concept *IVa*) is interesting since it gives information on the quality of the simulation game as it was designed. However, additional evaluative information on the game-in-use (concept *IVb*) may inform users on the applicability of the simulation game in specific circumstances, different than the conditions where the simulation game was originally designed for; e.g. in relation to other themes, other groups of participants, different time frame, et cetera.

The next three concepts of evaluation (*Va, Vb* en *VI*) may help us to get insight in the quality of simulation games in terms of the effects, the conditions that enhance or hinder the effectiveness, and in terms of the efficiency. This insight is important, as well from the perspective of a specific simulation game, as from the perspective of the instrument of simulation game in general, i.e. the discipline.

Evaluation according to concept *VII* is only interesting for the gaming society if the results of this research can be accumulated in meta-studies. In order to accumulate the information provided by evaluation studies it is a prerequisite that the evaluators explicitly indicate which off the above-mentioned concepts of evaluation form(s) the basis for their study.

5 The 'what' of evaluation: variables in the evaluation

When we want to judge whether a simulation game is successful or effective, there is a great diversity of variables that can be investigated. The selection of these target variables is dictated by the objectives of the simulation game. Dependent on the specific objective of the simulation game, the target variables will also vary in the type of effects that are measured: behavior, skills, knowledge, attitudes, emotions, interactions between people, et cetera. From the perspective of accumulation of the results of single evaluations this variety of target variables may seem disastrous: if each evaluation study has it's own set of target variables, how can we then compare these studies and how can we draw conclusion about simulation games at the level of the discipline?

A solution is that we do not look at the specific variables when comparing or accumulating separate evaluation studies, but we look at a more abstract level e.g. to the directions or the strengths of the effects that were measured, regardless of the specific variables.

There is another dimension on which the target variables may differ that may be useful to streamline the evaluations. Kirkpatrick (1967, 1998) distinguishes four levels on which an evaluation can focus. These four levels are:

1. reaction	indicating "…how well the trainees liked a particular training program" (1967, p. 88);
2. learning	referring to "…the principles, facts and techniques which were understood and absorbed by the conferees" (1967, p. 96);
3. behavior	which "can be defined as the extent to which change in behavior hasoccurred because the participants attended the training program" (1998, p. 20);
4. results	i.e. "the final results that occurred because the participants attended the program" (1998, p. 23).

Phillips (1997) has added a fifth level to the four levels of Kirkpatrick:

5. ROI	return on investment, to quantify the monetary value of training investments, "what do I get back for my investment".

Since this fifth level focuses exclusively at monetary aspects, we will discard it in the context of this article.

The levels are hierarchically ordered and effects on a previous level can be seen as preconditions for the effects on the next level. If a simulation game is deployed to contribute to the solution of a problem, we are in the end interested in the question whether the problem does not exist anymore and whether this change can be attributed to the simulation game (level 4). Before we can answer this question we have to assess whether the 'message' that was in the simulation game is understood and absorbed by the participants (level 2) and whether they were able to apply the newly acquired knowledge in practice, i.e. whether they behaved accordingly to the 'lessons' of the simulation game (level 3). The first level focuses on the extent to which the participants consider the used tool (the simulation game) as a nice and supporting tool.

We believe that for by far most of the situations where simulation games are deployed, the intended effects are aiming at the fourth level.

We will elaborate the four levels of Kirkpatrick in the following sections. For each of the levels, which we will give a slightly different name than Kirkpatrick, we will describe the focus of the evaluation and we address some methodological considerations.

Level 1: Appreciation

The first level is the level of 'appreciation'. When people have participated in a simulation game, the facilitator is interested in the extent that participants liked the simulation game. This concept of 'appreciation' (Kirkpatrick refers to the term 'customer satisfaction') involves more than only the 'liking of' the game. The game designer or the facilitator may also want to have information on other aspects of the simulation game or of the conditions it was used in. The following questions are examples of research questions that may be formulated and investigated at this level:

» Do the participants like the simulation game; do they appreciate it as an instrument for training or intervention? Did they have fun? Did they feel challenged by the simulation game?
» Do the participants understand / appreciate the metaphor of the simulation game? Does this metaphor facilitate or hinder them in getting insight in the real life situation? Do they see a relation between the situation and processes represented in the simulation game and the real life situation and processes this simulation game refers to?
» How do they value specific aspects of the simulation game, such as the scenario, the materials, the role descriptions, the time pressure, the complexity of the assignments, the symbols used, the level of abstraction?
» How do they value the debriefing? Does it help them to understand and interpret their own experiences in the simulation game, and to translate experiences in the simulation game to the real life situation? Does it help them to draw conclusions about their own performance?
» Do the participants feel secure in the simulation games? Do the see it as a safe environment?

Answering this kind of research questions serves two purposes: a) they inform the game designer and facilitator about the quality (as perceived by the participants), and b) it gives information that can be important to interpret the results of the evaluation on the next levels (cf. the aspect of the psychological validity of the game; Peters et al., 1998).

This type of evaluation is very valuable for the evaluation of single simulation games since it helps game designers and facilitators to improve the instrument. Since the kind of variables used in these evaluations varies and since the attention is narrowly focused on the specific simulation game and the specific context in which it was used, it is hard to draw general conclusions on the quality of simulation games in general from the kind of variables we referred to above.

In the last subsection we will come back to the evaluation from the perspective of the discipline.

Level 2: Cognition

In simulation games that are used to effectuate changes in 'behavior' there is a cognitive component involved (We use the term 'behavior' here in a very broad sense; it includes knowledge, skills, attitudes, habits, emotions, interactions between people, et cetera. It may concern new 'behavior', but also unlearning old routines, knowledge, et cetera. To distinguish it from actual behavior we put the term between quotes.) This cognitive component, or the 'message' may include several types of information, such as the content of the desired 'behavior', arguments for adopting this 'behavior', procedures involved, criteria for the 'behavior', et cetera. The desired 'behavior' is described, explained and discussed, at the very least in the debriefing phase. At the level of cognitions evaluation focuses on the question whether the participants have understood the message that was embedded in the simulation game and whether they have made themselves familiar with this message.

Examples of specific research questions for this level are:

- Do the participants get the message? Do they learn what they are supposed to learn?
- Do they understand what they have learned? Do they know the importance of the new 'behavior' in relation to the objective of the simulation game?
- Are they able to distinguish the essentials from the details?
- Do they draw the right conclusions?
- Are there other elements they have picked up from playing the simulation game, wanted or unwanted?

The information yielded at this cognitive level helps the game designer to improve specific elements in the simulation game (e.g. to articulate specific cognitive elements in the scenario or other gaming elements), and it helps the facilitator to decide to put more or less emphasize on specific elements in the briefing or the debriefing. Looking at the desired outcomes of the simulation game, the information at this level is primarily important for understanding and interpreting the effects (or lack of effects) measured at the subsequent levels.

Level 3: Behavior

In order to improve a situation or to solve a problem, it is not sufficient that the people involved know what is happening, why it should be changed or what should be done (the cognitive level). They will have to apply this new information in their activities and routines in their real life situations. Only if we can assess that participants apply the new 'behavior' (or do not use the routines they have to unlearn) we will be able to draw conclusions about the relation between changes in the real life situation and the simulation game. Therefore at the level of behavior the evaluation focuses at the following types of questions:

» Do the participants apply the 'behavior' they acquired during the simulation game in their real life situation the simulation game referred to?
» Do they apply this behavior in a proper way?
» Are they able to abandon old behavior and replace it by new behavior?

Measuring these effects has some pitfalls. A rather easy way to measure participants 'behavior' in the real life situation is sending them a questionnaire in which they are asked to report on their 'behavior'. Because of a possible discrepancy between reported or intended behavior and the actual behavior it is questionable if this method yields valid results. A more valid procedure for assessing effects at this level is to work with so-called unobtrusive measures, i.e. measuring without affecting the system or process under investigation. Possible ways to accomplish this are: assessing documents that have been produced, asking other people to describe the behavior of the person under investigation, and observations.

Another way to collect data on the behavior of participants in their real life situation is to have in-depth interviews with them. An interview gives the opportunity to ask rather detailed questions if the participants apply the newly learned 'behavior' in the real life situation, but it also gives opportunities to check for socially desirable answers e.g. by addressing an aspect once again from another angle.

However awkward evaluation research at this level is, it is interesting and necessary from the perspective of transfer of knowledge and skills from a simulation game to a real life situation (Percival, Lodge & Saunders, 1993).

Level 4: Performance

The fourth level, finally, is the level where the evaluator tries to assess whether the aims of the simulation game are met. Simulation games are often deployed in situations where persons or organizations have to overcome problems, perform better, cooperate more, et cetera. So the final test for the effectiveness of using the simulation games is to assess whether the performance in the real life situation has improved after playing the simulation game. Evaluation at this level focuses on research questions like:

» Has the real life situation changed?
» Has it changed in the desired direction?
» Can these changes be attributed to the simulation game?

This type of evaluation is even more awkward than the evaluation on the third level. The methodological issues mentioned in the previous section are also valid for the evaluation at this level. But there may be complicating factors.

An extra complicating factor is that there must be enough time between the simulation game and the measurement of effects to allow the real life situation to change. If we teach people new procedures in a simulation game it will take some time before the effects of these new procedure are noticed in the real life situation. So we should wait long enough before measuring the effects. However, the longer we wait, the harder it will be to control for all kind of factors that may influence the performance, making it hard to assess the extent in which the effects may be attributed to the simulation game that was deployed.

The 'what' of evaluation from the perspective of the discipline

Specifically from the perspective of the discipline there are other important evaluation issues to be investigated, than mere the effects or outcomes. It is interesting to investigate whether the results that are measured at each of the four levels depends on the context where the simulation game is used or on characteristics of the participants. Wellington and Faria (1995) have distilled from a large number of studies factors that may affect performance in business simulations. They have identified the following factors (p. 205): personality characteristics of team members, previous academic achievement, ethnic origin of team members, team size, previous business experience, team organizational structure, degree of instructor explanation, and simulation grade weighting. This list may be expanded with other concepts and variables, like gender, age, learning style, education, occupation, experiences with simulation games, degree to which participants feel secure in the simulation game, do people participate as individual or as member of a group, et cetera. In the analysis of the results of a single simulation game it will be difficult to look for influences of these type of variables (because of the relatively small numbers of participants), but especially at the aggregated level these analyses will be possible by combining the data of single evaluation studies. This type of evaluation can be seen as evaluation of what we called type *Vb* in section 4.1, investigating the conditions that influence the effects of simulation games.

6 The 'how' of evaluation: research designs

In case of the evaluation of an instrument like simulation games the research focuses on the question whether playing the simulation game has contributed to changes in the desired direction on the level of cognition, behavior and performance (in terms of Kirkpatrick: levels 2, 3 and 4). The predominant research design for this kind of evaluation questions is the (quasi) experimental design: a pretest, the simulation game, and a posttest; the analysis focuses on determining the difference between the pretest and posttest. A control group may be added in order to improve the interpretation of differences between pretest and posttest.

How powerful the experimental research design may seem in analyzing differences between pretest and posttest and between separate groups (conditions), there is one big disadvantage of this research design: the experimental conditions are considered as black boxes. We assess the situation before, we assess the situation afterward and we look at the differences. However, this design does not give information about what happens within the simulation game that causes the changes. Other possible difficulties may threaten the quality of experimental studies for the evaluation of simulation games; we only mention them here briefly:

» the lack of control over the experiment, especially in a natural context
» the necessary elapse of time between the simulation game and the posttest
» changes in behavior and performance (level 3 and 4) have to be assessed in the real life situation, and therefore it is hard to design standard situations for the posttest, a prerequisite of the experimental design.

If we only have experimental studies to rely on for the evaluation of simulation games we will in the end still have the statement "It works, that is all we have"; however, we will have more proof for this statement. But if we want to know why simulation games work, we need other efforts that help to look inside the 'black box' and try to explain what happens in simulation games, in terms of input – throughput – output – outcome.

One example of an effort to look inside the 'black box' is the book 'Why do games work' (De Caluwé, Hofstede & Peters, 2008). Several authors, each from a different theoretical perspective, have investigated (theoretically) what is the 'active substance' in simulation games that facilitates people to learn or change.

Another way to get more insight into what makes simulation games work is to perform more in-depth research in the way simulation games are used and in the effects they have on participants. The before mentioned approach for theory driven evaluation as proposed by Hense and Kriz is an example of such a study, in which the effects of simulation games are investigated in relation to a multiplicity of variables.

Another way of in-depth investigation of (the evaluation of) simulation games is by designing the research as a case study (Yin, 2003). Mallon and Webb (2006) give a good example of this kind of research, referring to it by using the term phenomenological approach.

Studies such as Wilson, Bedwell, Lazzara, Salas, Burke, Estock, Orvis, and Conkey (2009) and Pavlas, Bedwell, Wooten, Heyne, and Salas (2009), investigating the relation between attributes of simulation games and learning outcomes, may also be very helpful.

What these in-depth studies have in common is that they are rather laborious and time consuming. But in the end they will help answering the question why simulation games do what they are supposed to do.

7 Conclusions

In this article we have looked at the issue of evaluating simulation games from a methodological perspective. The importance of evaluation for the designer, facilitator, users or players of a specific simulation game differs from the importance and interest of evaluation from the perspective of the gaming society. As long as there are no large scale evaluation projects that try to assess the quality of simulation games at the level of the discipline, the small scale evaluation studies, focusing on the effects of a single simulation game, are the most important pieces of evidence for general conclusions about the strong and weak points, the effectiveness and the efficiency of simulation games, and about the conditions under which simulation games may be applied.

Given the diversity of objectives of evaluation studies we should not try to prescribe one methodology for the evaluation of simulation games. Instead we should put effort in setting up the evaluation studies and in describing the results in such a way, that they are better comparable and that it will be easier to accumulate or aggregate the results of the separate evaluation studies.

Based on what we investigated and described in this article we formulate five recommendations for studies on the quality of simulation games:

- If the gaming society wants to learn from the results of the evaluation of simulation games, it is a prerequisite that these evaluation studies are set up as formal evaluations; this implies that these studies are designed in a well-considered way and that the procedures, variables, criteria and conclusions are transparent.
- Evaluation of simulation games may serve different purposes; evidence about the effectiveness and efficiency of simulation games will help to present simulation games as a powerful tool. But also insight in the conditions that influence the effectiveness of simulation games is essential.

- In addition, systematic studies on the design process, building up the 'reconstructed logic', will help game designers in the design process of their simulation game and in the end it will contribute to the image of the tool simulation game.
- The most interesting information about the value of simulation games will be found in evaluations on the third and fourth level (behavior and performance); evaluation on the first two levels, the type of evaluation that is most frequently done, is especially useful for the evaluation of single simulation games, but for assessing the quality of simulation games from the perspective of the discipline, evaluations in the higher levels are also necessary, however laborious and awkward these studies may be.
- There is need for evaluation research that tries to look inside the black box, i.e. that tries to understand and explain which characteristics and elements of simulation games contribute to the effects that are assessed. This implies that in addition to experimental studies there is a need for studies that incorporate many explaining variables and/or in studies that are set up as small-scale case studies that try to reconstruct what happened during the simulation games and what caused the effects.

We have stressed the importance of the single evaluation studies for building up a total view of the quality of simulation games. But this should not imply that we put the responsibility for the evaluation of simulation games with the evaluators of single games. Their primary interest is to get information about that specific simulation game in order to improve it or to sell it, not to device research questions and research strategies that will give more generic information. Therefore, there is a need for support and coordination from the level of the discipline. We think that should be considered as an important and challenging task for the "saga's", organizations that represent the community of gamers.

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GLOBAL DOMINATION OF GAMES

Marcin Wardaszko

Abstract
Games are present in every aspect of our life, nowadays. Mobile devices, on-line platforms are full with games. We can play in exquisite games everywhere. Gamers population is constantly growing and it reaches billions of people around the world. Educational games are one of the hottest trends recently and serious games find its way to the schools and universities. The last stand of the grave world is workplace, but it yields to the gamification and gamified IT systems design. This paper aims at analyzing current state and context of gaming and name the most promising trends in gaming. Trends like multi-layer games, cloud gaming, augmented reality games or gamification will shape the future of gaming.

Keywords
on-line gaming, gamification, cloud gaming, virtual worlds, IT systems design

1 Introduction

Games have dominated the world and exceeded "real" life experience. The video and computer games industry will break 100 billion $ mark in value in 2014 (Gartner, 2013), and is getting close really fast to the value of the global movie industry. Video and computer games are challenging, engaging, and artistically exquisite. Games have successfully invaded entertainment at homes and on all mobile devices. Gamers have grown from a minority to a majority in modern society, and it is estimated that more than 1.2 billion people play games on-line (Spil Games, 2013), more than half of the US households have a gaming console (The Entertainment Software Association, 2013), and that more than 90% of youngsters play some sort of video games. Games have been progressing into education, professional training, and public dialogue for half a century. Educational games are popular and the number of applications in use has grown since 1997 already to the level of 97.5% among all US-based universities associated under AACSB (Association to Advance Collegiate Schools of Business), where business games and/or simulations are applied for educational purposes (Faria, 1998).

Many new education projects are being introduced to all levels of education, and the global educational games market is expected to double its value every year (Adkins, 2012). Companies and global corporations use serious games for training and recruitment on a growing scale, and many of them have reported to start their own gamification projects; 40% of the members of Fortune 500 are already doing that, and it is predicted that this number will grow to 70% by 2015 (Burke, 2013). Gamification rose from an idea to a billion dollar industry in just a few years (Meloni, 2012). Gamification itself can be seen as *"the use of game elements and game design techniques in non-game contexts"* (Werbach & Hunter, 2012), or *"the process of game thinking and game mechanics to engage users and solve problems"* (Cunnigham & Zichermann, 2011) but it is basically a new approach to social systems and IT systems design with playcentric focus.

If we look at the Mass Multiplayer Online Role = Played Games, we can also observe how they become a common language of people from every culture and continent. The language of games is making a substantial impact on the world we live and breathe in. One of the perfect examples is iconization of play, work, and life. Everybody knows what the green and red receiver icons are for, and how to use arrows for navigation and play. In games, if you have some previous gaming experience, you will be able to play a game even if this game is installed on your computer or other device in any other language pack.

2 Attraction

The attractiveness of games, combined with their unique culture-creating ability (Huizinga, 1985) makes them powerful tools of personal and social development. People have strong and urgent needs for self-development fueled by curiosity (Kavtaradze, 2006). This is perfectly in line with the nature of games as they offer a safe and creative environment for play. Moreover, this development is reachable and tangible from the player perspective. It is described by the goals players must accomplish in order to win or move to a higher level. Such state is most effective for learning according to Vygotsky's (1933) model of Zone of Proximal Development, because it is both possible and challenging at the same time.

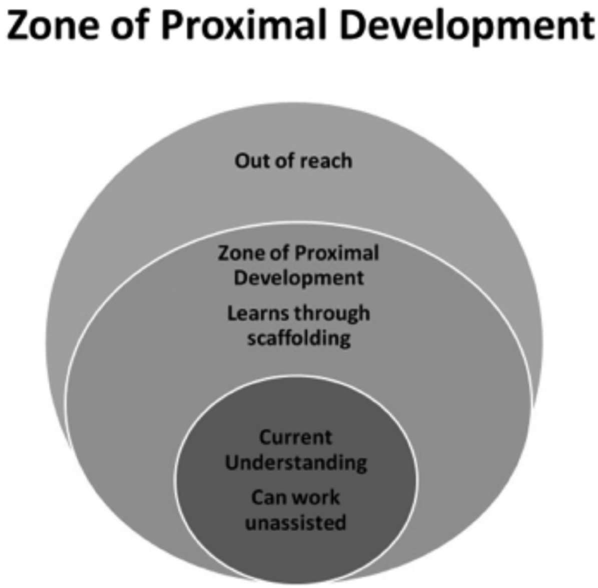

Figure 1 Zone of Proximal Development, Gray (2012).

Kavtaradze (2008) shows this process in detail, but from a different perspective. Through time, civilization changes and the goal of building a safe and predictable society concentrated mostly in the cities. Life became organized around work, school, and family, and thus became deprived of stimuli for the more advanced brain operations. Thus Kavtaradze names games as super-stimuli for the brain. Games stimulate higher brain functions and thus are a way of satisfying our natural curiosity, and a bridge to self-development.

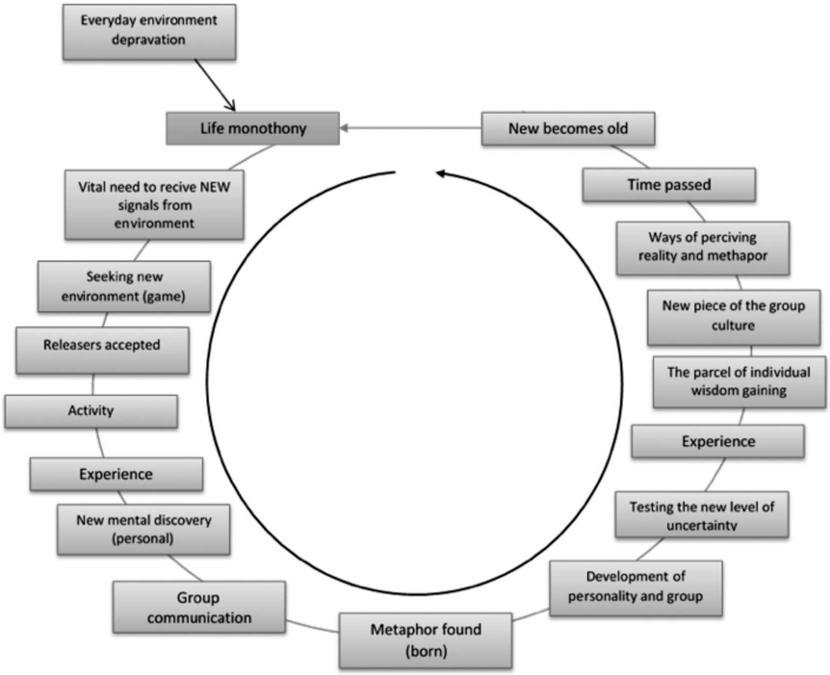

Figure 2 Parts of the learning system. Source: Kavtaradze (2008), p. 54.

Some authors are going even further and claim that games actually 'exit' reality (McGonigal, 2011). McGonigal claims that people began to exit life in the common sense and "exiled" themselves into the virtual world by spending more time in the virtual world than in the real world. Both of the abovementioned authors (Kavtaradze, 2008; McGonigal, 2011) agree with the thesis that the sources of depravation and frustration come from the surrounding environment or the "real" life. Virtual worlds, on the other hand, have become visually attractive and appealing. Dynamic game mechanics and user-centered design follows us through this reality, making sure we are always in the right spot of the optimal experience called 'flow' (Csikszentmihalyi, 1990), which is a state when the player is so immersed in the game that self-consciousness disappears and the sense of time becomes distorted, and we provide our brains with a new stimulus on every step. The cult movie *"Matrix"* by the Wachowski brothers serves as a metaphor of this situation.

The reality for the characters in the movie is not really attractive and the "game" system called Matrix is luscious, even magnetizing. The Wachowski brothers reflect those attributes in the visual layer, portraying the reality in grey colors, while Matrix is always shown in a sharp, vibrant, and colorful manner. Matrix is a trap for humanity, but it is a beautiful and necessary trap; players want to return to the game even if they know the truth. The basic question of this metaphor is the definition of reality. Is reality our world with its physical attributes that surrounds us, or is reality a layer of perception that we perceive as real regardless of its physical representation? In my opinion, games have shown that the virtual world seems more "real" to the players than the physical world. Gamers tend to build stronger social bounds in multiplayer games than in reality (McGonigal, 2011), virtual world economies are booming with activity, goods and services are being offered, exchanged and demanded, transaction are being closed for both virtual and real money.

The border between the physical world and the virtual world is being pushed to the limit and blurred. The sophistication of games is growing, and the ability to access them is changing as well - from exclusive access to open access.

3 The Game

Looking at the history of games, we can clearly observe that games have been changing in leaps, but certain elements of the game structure have been changing at a different pace.

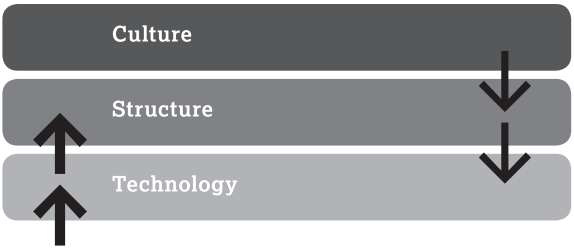

Figure 3 Different layers of game. Source: Klabbers (2006), p. 39.

The layers of the game system are common to every game. However, if we look at the dynamic side of this model, we can observe that particular layers have been developing faster than others, and thus are forcing other layers – as well as the whole system – to change.

For many thousands of years the culture creating layer of games has been the center of attention and the main driver of gaming (Huizinga, 1981).

At the beginning of the nineteenth century games started evolving, more sophisticated structures arrived and thus they became the main driving factor. Board and card games became popular on a mass scale in the cross-cultural context, and people from different cultures were playing the same games – based on the same structure. During the past forty years computer technology has started shaping the gaming scene. Since the first computer games and single-player environment to the mass multiplayer on-line games, technology has significantly evolved, and the rapid pace of development has forced structures and culture to "catch up". In particular, the cultural layer was in need of changes; with the rise of popularity of multiplayer on-line games, players were left with purely empty social and structural space – on a global scale. In an on-line game you can be anyone you want thanks to the anonymity of the avatar, you can also play in an international environment free from the socio-cultural context. Owing to the universality of the language, players can build their own cultural and social structures. Changes in the culture of gaming triggered other strong changes that affect the whole global culture. The cultural layer became again the most important driving factor in gaming.

4 The player

Player perspective goes far beyond the pure player-versus-the-game-environment perspective. It also reaches to the player-versus-player level and the social level. Players created entire social systems where the basic cell is not the player, but the social organization among players. Those social cells are different, they can be thought of as guilds, networks, or parties. They have a very similar structure and behavioral patterns among players in terms of both hierarchy and functioning. They have goals, formal rules of behavior, and virtual goods distribution system. If we look at them from a typological perspective, they seem to be almost perfect learning organizations (Senge, 1990). All members of guilds are qualified and judged based on the personal mastery of the members, and they strongly encourage members to constantly improve their personal performance. They demand better results in more and more challenging encounters all the time. In order to reach their goals, they must also improve team-thinking skills and teach their members to understand how they act as a team and how they as a group can use their strengths and minimize their weaknesses. One of the best ways to improve their standing and performance is to understand how every player and how the game mechanics work and operate; taking into consideration how complicated MMORPG game worlds are we can see their systems thinking. Gamers create their own formal language (Baron, 2005; Roberts, 2009), which is a code and trademark their affiliation.

Gamers distinguish themselves from one other with the usage of digital language divide, which is redefinition of the communication employing specific words and abbreviations. Through the process of language creation they also build their very own mental models, which are unique in the gaming world. Separation of the 'me' in the game from the 'me' in the off-line world is done through understanding of the language and by means of a semi-secret code known only to players. Every guild needs a strong leader with a vision of goals and success. Without a strong leader a guild stagnates and perishes into a mass of other groups and guilds. The leader must be charismatic because nobody pays the players to participate in the game, they choose to join the social group themselves; keeping them motivated is the central role of the leader. Leadership is mainly created through developing a shared vision of progress, i.e. where we want to be, or a vision based on competition, i.e. we have to beat other groups/guilds in rankings.

The business world has already started to recognize this trend in the form of gamification. So far, business has acknowledged its utility in management and organizational development, as well as in IT and HR systems design. An interesting observation is the fact that workplace was the last bastion of defense against games usage. Although most businesses accepted serious games as a training method, they also separated them from the "real" workplace and work environment. Through gamification and game-based systems design both workplaces and work environments have yielded to the world of games. With this act of accession to workplaces, games will make their final step towards global domination.

The world domination of games (Duke, 1974) has actually led to a boost of social proliferation and social interaction. However, if games dominate every area of our lives, where will we go further on? Games have dominated many fields of our reality, but not every aspect of it, and we will continue to see their further expansion following the two trends described below.

During the last 40 years, games and gaming systems, oriented towards social elements, have been targeting a growing number of people. In the last 20 years, through on-line and mobile gaming, the core of mechanics was to target the social aspect of games, i.e. playing together. We have reached the moment when everyone can play with everyone in real-time. Now, social engagement through gaming can reach its full potential.

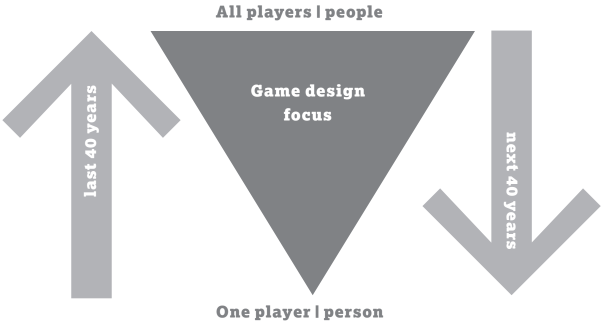

Figure 4. Game design focus.

The next 40 years will focus more on the needs of one person. Expansion of big data usage and multi agent systems will make it possible. It will be also possible to create detailed ad-hoc games and simulations for individual situations or for whole systems. Simulated actors will base their decision-patterns on knowledge drawn from big data analysis. Such games and simulations will bring a new level of engagement and experience gained form interaction with game systems.

5 The future driving forces

Predicting the future in gaming is a really tough job. Gaming is at a cross-road at the moment and it can evolve in many different directions. There are a number of factors that tend to shape the future driving forces:

Game within a game. Playing a game is nice but it may become dull and boring in the long run, thus a multilayer system of games will be introduced (Wardaszko, 2013). More complicated, inter-correlated gaming systems will be the answer to boredom and the recurrence of game mechanics. Such game systems will require much more sophisticated strategies and systems thinking, which will be much more emphasized in the future world.

Cloud gaming. A constant technological race is not going to take us anywhere. New games will require stronger equipment, and, in turn, stronger equipment will handle more demanding games. Both players and the industry have been suffering from this technological spin. Progress in the telecom business allowed streaming games directly from the cloud to the chosen device. Any game, anywhere, anytime is the motto of cloud gaming. This will allow us to enjoy gaming on different levels, without never-ending investments in our hardware (VGI, 2014).

Gamification. Many people claim that gamification is just a fad and after the initial hype it will disappear from the gaming and business surface. They may be right, but one thing is for sure – even if gamification is just a short trend, it will undoubtedly have a big impact on the way the IT systems are and will be designed (Kumar & Herger, 2013).

Macro worlds. The end of micro worlds draws near (or at least the way they are built and used at present). Micro worlds have a great past and their use is full of benefits, but they have one common flaw. They are restricted to the micro mechanics and its predetermined range of varieties (Gonzalez, Vanyukov & Martin, 2005). Through experience with alternative reality gaming, expanding augmented reality technology and interconnectivity, the surrounding world can be a playground with added layers of game interface enhanced with augmented reality.

Ad-hoc games and simulations. Big data allow us to store and analyze a lot of data in a real-time mode. Such systems have a lot of potential for super-customization of games and simulations according to the needs of potential users. The concept of creating and offering games and simulations in the current context of the player (on the micro level) focused on a particular situation or conversation but offered ad-hoc and immediate accessibility seems very appealing.

6 Conclusions

Gaming is changing the world; yet, every year brings new and unexpected results and changes to the world of gaming itself. Duke (1974) saw it coming and we can clearly see the impact of gaming on today's reality. Changes are rapid and we tend to stop at cross-roads over and over again, choosing different paths and experimenting. Whichever direction gaming takes, it will certainly have a huge impact on the global society in the long run.

Technology will play an important role in that process. Gaming has always closely followed the abilities and potential that technology offered. In fact, gaming has forced new technology or new ways of applying technology to emerge many times.

However, a terra incognita for social structures and layers was born from the combination of gaming structures and technology. Players inhabited those new worlds and created new and effective social environments, building them from scratch. Through free experimenting with social structures and through the ability to communicate effectively many interesting observations have been made, and the whole gamification movement takes its origins precisely in such observations (Read & Reeves, 2009; McGonigal, 2011).

Although we have to recognize technology as the main driving force of future changes, we still have to admit that the effects of those changes in the end lay grounds for a new form of culture. We can be certain that through feedback, effective communication, and problem-solving approach, gaming will surely find its way into the future in the next 40 years.

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4

GAMING FOR EDUCATION AND LEARNING TRANSFER

THE IMPACT OF RELEVANT EXPERIENCE AND DEBRIEFING QUESTIONS ON PARTICIPANTS' PERCEPTION OF GAMING SIMULATION

Mieko Nakamura

Abstract

Two recent study results are reported and discussed in the context of Duke's principles on game design and of possible future research on g/s. The first research was conducted from 2009 to 2013. About 600 participants were asked to rate their perception of g/s on a 5-point sematic differential scale. The result showed that students' perception of g/s changed from simplicity to complexity after experiencing g/s over a 15-week course. In the post-survey, those who perceived it as complicated also conceived of it as attractive and exciting. The overall impression of g/s changed from lightly enjoyable to enjoyably worthwhile. It is discussed that various activities during debriefing process such as filling in a debriefing form and reading fellow-students' reports would change participants' perception of g/s.

The second study was on debriefing. Immediately after a game run, a debriefing form was distributed, in order to focus players' thoughts on what had happened during the game and what it meant for them. To assess the effect of specific questions, slightly different questionnaires were prepared. Type A asked about the application of g/s experience and Type B asked about the learning content. The result of 114 answers showed that the question about learning content linked listening attitude to satisfaction. It is discussed that the promotion of learning depends mainly on debriefing. We must explore questions that will promote a meta-cognitive perspective. We should investigate what to ask and the effect of it more deeply.

Keywords

participants' perception of g/s, debriefing, learning, effective question, meta-cognitive perspective

1 Introduction

I first encountered g/s in 1991, at ISAGA in Kyoto, and have been fascinated by the practice ever since. Initially, I spent most of my time learning, selecting, obtaining, and facilitating games. However, I later came across *Gaming: The Future's Language* (Duke, 1974), and then had an opportunity to be a visiting fellow at the University of Michigan, working with Prof. Duke in 2001-2002. This experience altered my perception of g/s, especially game design. I was motivated to work with people in designing a game, and joined several game design projects (Nakamura, 2010; Nakamura, Kikkawa, Shigematsu, Sugiura, Kato & Nagoka, 2012). Currently, I primarily facilitate a number of games in courses on "decision making" and "society and human beings". I also organize a game design project for a seminar on behavioral science.

When I organize a game design project, my work is based on Duke's (1974) *Gaming: The Future's Language;* this book introduced me to the notion of constructional design. Of course, merely having access to such a source in no way guarantees an excellent result. I have gone through my share of trial and error, and am still very much on a learning curve. I feel that the more I learn in this respect, the more I need to learn.

I would like to introduce and discuss two recent study results, in the context both of Duke's principles on game design and of possible future research on g/s. But first I should give a sense of my students' typical perception of g/s.

2 The student's perception of gaming simulation

When I give notice of an upcoming gaming session to students, most express looks of curiosity. Typically, g/s is associated with an image of something easy, simple, and fun. But there is far more to g/s than that; it can trigger new ideas, behavioral changes, deep thinking, and creativity. Were students aware of this, I wondered? How did they truly perceive g/s? Hence, I began recording typical words expressing perceptions of g/s on the part of those who had played several different kinds of g/s. Dozens of words related to the perception of g/s were recorded, with a wide range of import, from positive to negative. Based on this study, 15 pairs of words were selected from the basic words in the Semantic Differential Method (Inoue & Kobayashi, 1985): (1) bright-dark, (2) soft-hard, (3) hot-cold, (4) active-inactive, (5) loud-quiet, (6) serious-unserious, (7) rational-emotional, (8) close-far, (9) tough-enjoyable, (10) difficult-easy, (11) free-bound, (12) complicated-simple, (13) intensive-mild, (14) deep-shallow, (15) interesting-uninteresting. Participants were asked to rate their perception of g/s on a 5-point semantic differential scale: "very", "to some extent", "neither", "to some extent", "very".

For the purposes of calculation, these were located on a line segment at equal intervals, and then converted to values from 1-5, respectively.

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       very         to some extent        neither       to some extent          very
bright I--------------------I--------------------I--------------------I--------------------I dark
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The aim of the research, conducted from 2009 to 2013, with roughly 600 students answering the questionnaire, was to characterize students' perception of g/s, and the changes in this perception after experiencing g/s over a 15-week course. My concern here was not with the perception of a particular game, but with that of g/s as a whole. The participants were freshmen at a Japanese university who took the decision-making course, among the main topics of which were communication, leadership, social dilemmas, and optimal production technology. From 2009 to 2013, 11 groups of students took this course, and in each case the questionnaire was distributed twice, at the beginning and at the end of the course. The course consisted of 15 classes, and several g/s were conducted during the course. Basically, three classes were scheduled as a unit, with exceptions in the case of the first class (introduction), the eighth class (midterm exam), and the last class (term-end exam).

In a typical unit, the first and second classes were for conducting games, and the third was for debriefing, with the following being a typical procedure. Students were randomly divided into groups and instructed to work together as a team. In each of the two gaming classes, they received oral and paper instruction using a large-screen display. The groups worked in parallel, and after completing their work, participants filled out a debriefing form and shared their opinions within the group. The students took these forms home to prepare reports for the third-class debriefing session. In the third class, students presented the reports with their thoughts about the two gaming sessions, with reference to given keywords. This debriefing session consisted of a mini-lecture, exchange and silent reading of roughly 10 fellow-student reports followed by discussion. In each class, students worked with different members in different groups.

Table 1 shows the mean for each item, in the pre- and post-surveys, and the results of the t-test. Data with missing values were excluded and 570 data items were analyzed. Figure 1 shows a diagram of the respective means in Table 1, arranged in pre-survey ascending order. As shown in Table 1 and Figure 1, the three lowest mean scores in the pre-survey were for Q1 bright-dark, Q4 active-inactive, and Q15 interesting-uninteresting. That is, respondents perceived g/s as bright, active, and interesting.

This perception did not change in the post-survey. On the other hand, the three highest mean scores in the pre-survey were for Q9 tough-enjoyable, Q10 difficult-easy, and Q12 complicated-simple, all beyond the mid-point of the scale (3). Therefore, respondents initially perceived g/s as enjoyable, easy, and simple. At the end of the course, the highest mean scores were recorded for Q7 rational-emotional, Q9 tough-enjoyable, and Q10 difficult-easy. Respondents continued to perceive g/s as enjoyable, but no longer perceived it as easy or simple.

Focusing on the differences between the pre- and post-surveys, 8 items differed significantly, with the values for Q10 and Q12 crossing the mid-point as aforementioned. The remaining 6 items were Q3 hot, Q5 loud, Q7 rational, Q13 intensive, Q14 deep, and Q15 interesting; after the course, g/s was conceived as hotter, louder, more rational, more intensive, deeper, and more interesting than before.

Table 1 Mean for each item in the pre- and post-surveys, and the results of the t-test

	n	**Pre-survey**		**Post-survey**		**t-test**	
		Mean	(SD)	Mean	(SD)	t-value	(p < .01)
Q1 bright-dark	570	1.78	(0.66)	1.78	(0.73)	0.19	
Q2 soft-hard	570	2.28	(0.79)	2.27	(0.85)	0.17	
Q3 hot-cold	570	2.39	(0.81)	2.26	(0.88)	2.95	(**)
Q4 active-inactive	570	1.77	(0.84)	1.84	(0.77)	1.67	
Q5 loud-quiet	570	2.42	(0.85)	2.26	(0.90)	3.49	(**)
Q6 serious-unserious	570	2.71	(0.80)	2.62	(0.88)	1.74	
Q7 rational-emotional	570	2.93	(0.86)	2.70	(0.96)	4.46	(**)
Q8 close-far	570	2.41	(0.81)	2.40	(0.86)	0.20	
Q9 tough-enjoyable	570	3.81	(0.95)	3.71	(1.05)	1.85	
Q10 difficult-easy	570	3.14	(1.03)	2.94	(1.04)	3.62	(**)
Q11 free-bound	570	1.93	(0.81)	2.05	(0.89)	2.50	
Q12 complicated-simple	570	3.21	(1.04)	2.66	(0.98)	9.85	(**)
Q13 intensive-mild	570	2.86	(0.99)	2.69	(0.98)	3.19	(**)
Q14 deep-shallow	570	2.31	(0.95)	1.97	(0.94)	7.00	(**)
Q15 interesting-uninteresting	570	1.88	(0.85)	1.71	(0.84)	4.01	(**)

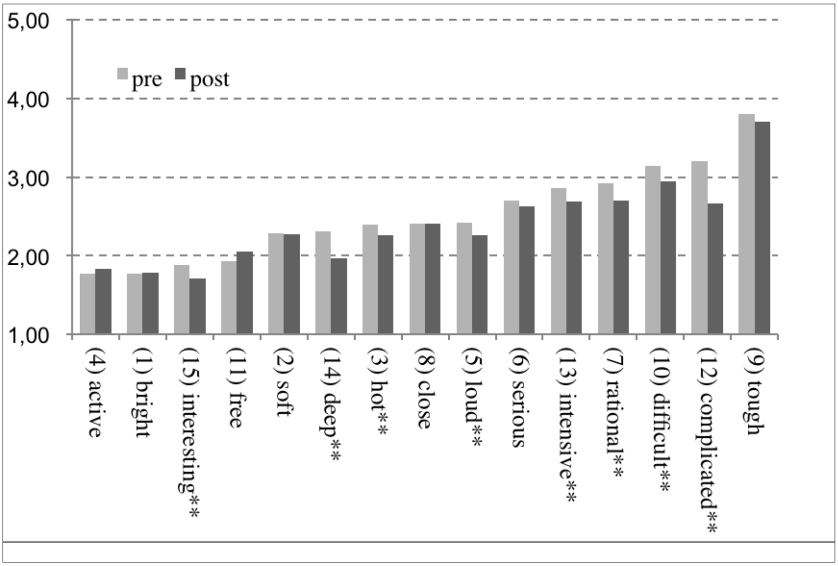

Figure 1 Means for each item in the pre- and post-surveys

To more thoroughly investigate the differences between the pre- and post- survey, the same data were analyzed using explanatory factor analysis, seeking differences in the core perception of g/s before and after the course. The 7 items showing no significant difference in Table 1 were excluded, and the remaining 8 items (Q3, 5, 7, 10, 12, 13, 14, and 15) were analyzed.

From the results of explanatory factor analysis of the pre-survey, three factors were identified with eigenvalues over 1.0. Table 2 shows the factor loadings for each item. The first factor, labeled “simplicity”, consisted of “simple” and “easy”. The second factor, labeled “attractiveness”, consisted of “interesting” and “deep”. The third factor, labeled “excitement”, consisted of “intensive”, “loud” and “hot”.

As shown in Table 3, there were weak negative correlations between Factors 1 and 2, and Factors 1 and 3, suggesting that simplicity was not associated with attractiveness or excitement. There was a moderate positive correlation between Factors 2 and 3, suggesting that attractiveness and excitement were associated.

Table 2 Results of factor analysis of the pre-survey
(maximum likelihood method, promax rotation)

	Factor 1	**Factor 2**	**Factor 3**
Q12 complicated-simple	.995	.232	-.062
Q10 difficult-easy	.503	-.204	.143
Q15 interesting-uninteresting	-.186	.806	.071
Q14 deep-shallow	.099	.408	.066
Q7 rational-emotional	.090	.187	-.143
Q13 intensive-mild	.196	-.075	.557
Q5 loud-quiet	.000	.000	.523
Q3 hot-cold	-.067	.153	.403
Eigenvalue	1.885	1.554	1.186

Table 3 Interfactor correlations in the pre-survey

Subscale name	**Factor 1**	**Factor 2**	**Factor 3**
Factor 1: simplicity		-.117	-.138
Factor 2: attractiveness			.389
Factor 3: excitement			

Based on the explanatory factor analysis of the post-survey, three factors were identified with eigenvalues over 1.0. Table 4 shows the factor loadings for each item. The first factor, labeled "attractiveness", was very similar to Factor 2 in the pre-survey analysis. The second factor, labeled "excitement", was very similar to Factor 3 in the pre-survey analysis. The third factor, labeled "complexity", was similar to Factor 1 in the pre-survey analysis.

As shown in Table 5, there was a moderate positive correlation between Factors 1 and 2, suggesting that attractiveness and excitement were associated; and this was true for both the pre- and post-surveys. In Table 5, there were positive correlations between Factors 1 and 3, and Factors 2 and 3, suggesting that complexity was associated with attractiveness and excitement. Since complexity is the opposite of simplicity, this result is supported by those shown in Table 3.

Table 4 Results of factor analysis of the post-survey
(maximum likelihood method, promax rotation)

	Factor 1	**Factor 2**	**Factor 3**
Q15 interesting-uninteresting	.881	-.088	-.092
Q14 deep-shallow	.441	.100	.242
Q5 loud-quiet	-.046	.618	-.144
Q13 intensive-mild	-.072	.565	.100
Q3 hot-cold	.307	.410	-.055
Q12 complicated-simple	.060	.016	.702
Q10 difficult-easy	-.160	-.020	.492
Q7 rational-emotional	.119	-.114	.244
Eigenvalue	2.235	1.339	1.100

Table 5 Interfactor correlations of items in the post-survey

Subscale name	**Factor 1**	**Factor 2**	**Factor 3**
Factor 1: attractiveness		.472	.283
Factor 2: excitement			.333
Factor 3: complexity			

Overall, how had the perception of g/s changed after the 15-week experience? First, there was a shift in perception from simplicity to complexity. Second, there was a tendency, in the pre-survey, for those who perceived g/s as simple to also conceive of it as unattractive and unexciting; whereas, in the post-survey, those who perceived it as complicated also conceived of it as attractive and exciting. In sum, the overall impression of g/s changed from lightly enjoyable to enjoyably worthwhile, that is, intriguing and challenging.

Now I would like to discuss these results in two relevant contexts: potential avenues for future research, and Duke's work in *Gaming: The Future's Language*. First, let us consider future research. The semantic differential method appears to be a useful method for characterizing perceptions, and a number of studies have employed the method in assessing perceptions of experiential activities. Tatsuki, Ichikawa, Iwasaki, and Fushimi (2004), for example, evaluated university students' emotional perception of manufacturing activities in primary schools, using 38 items on 9-point scales.

They conducted factor analysis on data from the university students, and found four factors: vividness, preference, value, and familiarity. Ito (2007) investigated the perception of group work, using 28 items on 7-point scales, and found that the perception changed positively after the experience of actual group work. In addition, she did factor analysis on the post-survey data and found six factors: pleasantly fulfilling, complicated, independent, active, responsible, and important. Ito (2010) also evaluated the perception of nursing practice, using 35 items on 7-point scales, and again found that the perception changed positively after experience of the practice. Generally, 7- and 9-point scales are considered more rigorous than a 5-point scale. In the present study, I used a 5-point scale for greater convenience for the respondents; however, use of a 7-point scale would produce more detailed and nuanced results. Another potential modification would be the incorporation of further items, to scale the perception of g/s. In Ito's surveys (2007, 2010), 27 out of 28 items and 30 out of 35 items, respectively, showed a positive shift. In light of these studies, some potential word candidates here would be "important", "heavy", "strong", "fulfilling", "useful", "intelligent", "sophisticated", "necessary", etc. If such words were incorporated into future research in this area, significant differences between the pre- and post-surveys would likely be observed.

Next, let us consider how the above results relate to the work of Duke (1974). He writes, "there is a direct and positive relationship between the success of a game in conveying information and the degree of player involvement achieved" (p. 141). When g/s is properly functioning, players tend to get deeply involved in the experience. Duke notes an elusive quality he calls "gameness", which indicates a player's enthusiasm and willingness to participate (p. 140). For example, "the judicious use of a combination of cooperation, competition, and cross-pressuring can involve players rapidly in game playing" (p. 141). According to the results of my study, g/s had the power to attract and excite people from the beginning, probably owing to participants conceiving of it based on the broader analogy of games in general. After experiencing g/s, participants' perception of g/s changed from simple to complicated, and one reason may simply be that they became fully involved in the g/s experience. Another reason might lie in the process of debriefing; in fact, this additional practice may have been a primary factor in the shift in perception. In this course, debriefing included a series of activities: filling in a debriefing form, sharing one's answers, writing a report, reading fellow-students' reports, listening to a mini-lecture, and conducting a discussion; all critical activities, one would assume, in shaping participants' perception of g/s.

Next I would like to report the results of my second study, on debriefing.

3 Effect of a specific question on participants

In 1974, Duke regarded g/s as yet in its infancy; and in a sense I think this is still true in 2014, because the potential of g/s has yet to be fully realized. To realize this potential, debriefing must be carefully considered. In particular, the questions asked in debriefing must be carefully prepared. What kind of questions should be asked? Vogt (1994) proposed a number of capabilities central to any powerful question: to stimulate reflective thinking, challenge assumptions, be thought-provoking, generate energy and vectors to explore, etc. Nakamura (2012) suggested that positive, future-oriented, and concrete questions would be thought-provoking in debriefing. Examples are "What did you learn?" and "How will you apply what you learned?" Here I would like to investigate the effect of specific debriefing questions, selecting a particular game and considering questions asked as a part of the debriefing form.

In the 15-week course described above, several games were conducted. Immediately after each game run, a questionnaire (referred to as the debriefing form) was distributed, in order to focus players' thoughts on what had happened during the game and what it meant for them. To assess the effect of some specific questions, slightly different questionnaires were prepared. The details were as follows.

The third class of the 15-week course in 2013 focused on a game called *Hakonori* ("Box-building"). In Hakonori, players work as a group of five. The required kit is ten cube-shaped boxes and a set of five cards. Group members sit around the ten cube-shaped boxes. Each member receives one card at a time. They are not allowed to show their cards to the others. Each card shows a picture of a two-dimensional diagram, which represents one of the views of a three-dimensional object, from five different directions: from above, and from each of the four horizontal directions. The three-dimensional object is built of ten boxes. Each box is a cube with 20-cm sides. Nine boxes are white and one is red. The task of each group is to combine the boxes such that the shape of the resulting three-dimensional object fits all five two-dimensional pictures.

One purpose of the game is to reveal differences between the respective group members' perspectives, and to encourage members to imagine other members' perspectives. One task takes about two to five minutes. Some are easy and others are difficult. When all members of a group say that the picture on their cards fits one of the five different views of the central object, they can proceed to the next task. There are 15 tasks in total. After every five tasks, the facilitator calls for a few minutes break, to maintain a good pace; groups finishing early should wait for this, and groups not finishing should give up. During the break, the facilitator asks for problem-solving tips from successful groups, to share the knowledge with those who had difficulty.

A total of 119 students participated in this gaming session. They were randomly divided into groups of four or five. When a group consisted of four members, one member played a double role. There were 25 groups in all: 19 groups of five and 6 groups of four. After the gaming session was completed, two types of questionnaire (Type A and Type B) were randomly distributed to roughly equal halves of the participant body. The questionnaires consisted of six questions. All the questions except the third were identical in the two questionnaires. Here are the questions.

(1) How much did you express your opinion during the gaming session?
(2) How much did you listen to your teammates' opinions during the gaming session?
(3) Type A: In what kinds of future situation do you think you can apply what you learned in this experience?
Type B: What did you learn from this gaming session?
(4) How much are you satisfied with the results?
(5) How much do you feel you got involved in the gaming session?
(6) Please feel free to write your feedback.

Participants answered (1), (2), (4), and (5) based on a 6-point scale from 1 ("never") to 6 ("fully"). Questions (3) and (6) called for free description. Of the total of 119 students, 114 submitted answers, with 57 answering the Type A questionnaire and the other 57 answering the Type B questionnaire.

Table 6 shows the mean and SD of each item in Type A and Type B, and the results of the t-test. According to the t-test, there were no significant differences between the means of Type A and Type B. Therefore, the two groups of respondent are considered to be homogeneous. All the mean scores were quite high, and data clustered around the mean, as all the SDs were about one; suggesting that participants expressed themselves well, listened to others well, were well satisfied, and became deeply involved.

Table 6 Means (SD) for Type A and Type B questionnaires, and respective t-values

	N	Type A	Type B	t-test	
		Mean (SD)	**Mean (SD)**	**t-value**	**p**
(1) express oneself	57	5.04 (1.133)	4.88 (1.070)	.785	n.s.
(2) listen to others	57	5.04 (1.034)	4.93 (0.904)	.579	n.s.
(4) satisfaction	57	4.44 (1.225)	4.37 (1.371)	.288	n.s.
(5) participation	57	5.18 (1.020)	5.09 (0.912)	.484	n.s.

Tables 7 and 8 show the correlations between items in Type A and Type B, respectively. All items except (2) and (4) in Table 7, and all items in Table 8, were correlated positively. As noted above, the difference between the two questionnaires lay in the content of Question 3, which focused, respectively, on the application of g/s experience in Type A, and the learning content in Type B. This difference might affect the relationship between "listening attitude" and "satisfaction with the result". When people were asked about what they had learned in the gaming session, those who listened to their teammate's opinions more carefully were more satisfied with the result; however, the same correlation was not observed when people were asked about the kinds of situation in which they would be able to apply their experience. The question concerning learning content may have directed student's focus toward what they had heard from others.

Table 7 Correlations between items in Type A (**: $p < .001$)

	(1) express	**(2) listen**	**(4) satisfaction**	**(5) participation**
(1) express oneself		.456 **	.400 **	.752 **
(2) listen to others			.213	.468 **
(4) satisfaction				.452 **
(5) participation				

Table 8 Correlations between items in Type B (**: $p < .001$)

	(1) express	**(2) listen**	**(4) satisfaction**	**(5) participation**
(1) express oneself		.416 **	.482 **	.816 **
(2) listen to others			.555 **	.419 **
(4) satisfaction				.431 **
(5) participation				

What might lie behind this difference? There is no clear answer to this question at present. However, a clue may lie in the function of debriefing. Duke (1974) distinguishes three phases in debriefing: 1) escaping from the game, 2) endogenous review, and 3) exogenous review; which offer participants the chance, respectively, to gain distance from the involved situation, challenge the given situation, and apply their experiences to the real world. Duke (1974) further notes that "this exogenous review should take from 25 to 30 percent of the total time of the game play" (p. 131).

Duke and Geurts (2004) combined the first two phases into one, and outlined two distinct phases, in the first of which participants review the performance of the game, and in the second the real world issues brought into focus by the game (p. 347). In the present study, five identical questions in the two questionnaires were all related to reviewing the performance of the game; only in the third question, different in Type A and Type B, was real-world review at issue: Type A (on the application of g/s experience) focused on reviewing real world issues related to the game, and Type B (on the learning content) reviewed both the performance of the game and real world implications. Recall that the debriefing form was distributed immediately after the game run. In this context, Type B may be more appropriate than Type A; and in addition, the Type A question is more difficult to answer than that of Type B, as it requires respondents to speculate on the future.

The act of debriefing is meant to encourage and aid participants in reviewing their experience from a meta-cognitive perspective. Regarding this perspective, there is an interesting study on participatory learning in elementary school children. Hayashibara (2009) investigated the efficacy of participatory learning in terms of children's "Big Five" personality traits and cognitive reflective-impulsive tendency. He found that those who best understood the lessons typically had greater agreeableness, conscientiousness, and cognitive reflective tendency than those who least understood them; and inferred that participatory learning required interaction among members, which was in turn promoted by agreeableness. He also inferred that a meta-cognitive activity such as debriefing required conscientiousness and cognitive reflective tendency. And of course, debriefing helps participants understand lessons better. Hayashibara also found that activity-oriented children typically had less conscientiousness, cognitive reflective tendency, and understanding of lessons; suggesting that those with lesser conscientiousness and cognitive reflective tendency tended to be attached to activity *per se* and failed to have a meta-cognitive perspective. Therefore, if we could generate effective questions for promoting a meta-cognitive perspective, participants with less conscientiousness and cognitive reflective tendency may be better able to understand the meaning and significance of g/s.

By way of conclusion, let me briefly consider "flow" theory in this context. When players are deeply involved in g/s, they are in a flow-type situation. According to Nakamura and Csikszentmihalyi (2005), the conditions requisite for such flow include: 1) perceived challenges, or opportunities for action, which stretch (neither overmatching nor underutilizing) existing skills; a sense that one is engaging challenges at a level appropriate to one's capacities; and 2) clear proximal goals and immediate feedback about the progress that is being made (pp. 89-90).

Duke (1974) explains how to build this situation into the process of game design, noting that "the most critical element of game design is the choice of an appropriate level of abstraction" (p. 89). He also refers to the importance of appropriate information loading in order to achieve a high degree of player involvement (p. 141), stressing that "players should be given no more information than is essential at any given moment. As a game moves through its cycles, each becomes successively more involved and each deals successively with more and more information"; and, "as each cycle passes and the sophistication of the player increases, succeeding rounds become increasingly challenging" (p. 142). As he summarizes it, the promotion of such flow is mainly a matter of game design; but the promotion of learning depends mainly on debriefing.

In terms of future research, we must explore questions that will promote a meta-cognitive perspective. We found, for example, that a question about learning content linked listening attitude to satisfaction. The reason for this is not clear, but the fact itself is suggestive. As a facilitator, it is difficult to design an experiment which assesses the comparative impact of debriefing and non-debriefing. However, it is not difficult to gather data through a debriefing form as described above. My tentative conclusion is that we should be more heedful of the precise nature and significance of the questions used in debriefing, and should investigate such questions, and the effect of such questions, more deeply.

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SIMULATION AND GAMING AS THE FUTURE'S LANGUAGE OF LANGUAGE LEARNING AND ACQUISITION OF PROFESSIONAL COMPETENCES

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Abstract

At the time Gaming: *The Future's Language* was published, gaming was coming of age. Duke in 1974 announced that, "…the high priests of technology speak only to the high priests of technology". Society was becoming more complex and communication seemed to be a major problem (according to Duke, "God is dead and the citizen … can hardly get a word in edgewise"). Simulation and gaming hinged well between complex models and society; it was predicted to become the future's language of many disciplines. Approaches in educational design pointed towards strategies that immersed individuals in environments where not only specific competences were needed to understand complexity, but also professional/generic competences to be able to deconstruct that complexity. What few seem to have realised so far is that language learning and s/g have been forerunners for almost half a century in answering many of the pedagogical questions raised regarding the teaching, learning and assessment of competences, and gestalt learning in particular. S/G is a language in itself that speaks vertically of specific knowledge, as well as horizontally in stimulating professional competence acquisition. The purpose of this chapter is to step from language learning to professional competences through s/g, which is a methodology that enables and enhances the acquisition of competences such as working in teams, cross-cultural interaction, understanding the ethical responsibility of professionals, efficient negotiations, communicating effectively, understanding global solutions or engaging in lifelong learning. These capacities, skills and attitudes will ultimately lead to learners and practitioners that carry out tasks with the standards of quality required in the working world. In summary, language learning can be said to be, via the language of s/g, a way to achieve both the linguistic and the professional competences helpful in unraveling tangled scenarios.

Keywords
simulation and gaming, professional competences, language learning, future's language

1 Introduction

Europe is engaged in a process of harmonizing structures in higher education that began with the signing of the Declaration of Bologna in 1999. The definition of a European Higher Education Area (EHEA) set in motion a series of reforms needed to make European programs more compatible and comparable, more competitive and attractive to students and scholars from other continents. "Quality", "competences", "skills", "innovation", "active learning" and "know-how" have become watchwords that are driving the interest in learning methodologies and assessment in all concerned. This interest matches the trend in the United States that emphasizes the importance of what the Accreditation Board for Engineering and Technology (ABET) calls professional skills, which are related to process and awareness skills rather than to specific competences. Communication, multidisciplinary teamwork, a broad education for understanding professional and ethical responsibility as well as different contexts and scenarios of society, the ability to engage in lifelong learning and knowledge of contemporary issues are all considered by ABET to be indispensable in exemplary curriculum design.

The Organisation for Economic Co-operation and Development (OECD), through its Assessment of Higher Education Learning Outcomes (AHELO) initiative, has focused on the assessment of student performance at a global level, in which generic skills, such as critical thinking, analytical reasoning, problem-solving or written communication, are essential to stimulate economic progress and world trade. The pedagogical questions raised regarding the teaching, learning and assessment of competences have been addressed and answered by – few seem to have realised this so far – language learning and s/g for almost half a century. S/g in language learning is a language in itself that speaks vertically of specific knowledge as well as horizontally in stimulating professional competence acquisition.

2 The prime of language learning and simulation and gaming

Comenius (1592-1670), considered by many the father of modern education, advocated in his *Didactica Magna* a method of instruction by which lecturers would teach less and learners would learn more. Since the 1950s, after the integration of war gaming, operations research and computer science, s/g has encouraged meaningful experiential learning at no risk (Cohen, Dill, Kuehn & Winters, 1964).

Thus regarded an active learning methodology, s/g is in keeping with what Comenius advised.

In language learning, the many theories that have been embraced since that of the innate ability of the human being for learning a language (Chomsky, 1965) have become the basis for the concord between the psycholinguistic and sociolinguistic principles that nourish the communicative approach to language acquisition. In the sixties, language learning was in the death throes of audio-lingual theories, in which the aural-oral aspects of the language had triumphed over grammar and written aspects. It was then that interpersonal relations, communication and cultural differences began to be regarded along with the application of knowledge to practical situations. Teachers began to use role-plays and dialogues – sometimes too parrot-like and lacking in flexibility, but aimed, in any case, at real use – and the beginnings of a methodology similar to s/g came into use.

In 1971 Hymes used the term competence for the first time, specifically communicative competence, meaning a person's ability to communicate in an appropriate manner. Before then, language had been considered a question of rule-governed behaviour, following Chomsky's theories, or as a stimulus-response reaction, following Skinner's behaviourist ideas (1938), as opposed to humanistic psychology. Hymes (1979) added the dimensions of appropriateness and register in a cultural context to the cognitive and behaviourist antecedents, which is a step further in language learning theories. According to Hymes, to understand a language the user must possess the ability to know when, when not, how, where, to whom or in what manner to use it. These abilities are not linguistic abilities per se, but rather cognitive capacities also defined as professional or generic competences, which s/g encourages.

Around the same time, in 1971, the Council of Europe recognized the importance of dividing the task of learning a language into smaller units, each of which could be achieved separately, as well as the need to base curricula on learners' needs rather than on language structures. A model for the description of language ability based on the premise that language teaching should meet learners' personal communication needs or functions was proposed instead. Immersing learners in situations or mini-simulations was found to be the way to learn best.

In 1980, Canale and Swain elaborated on Hymes' concept of competence by including four types of knowledge or abilities. Competence in grammar included knowing the linguistic code and vocabulary. Sociolinguistic competence took into account the situation and purpose of communication following the norms and conventions of use. Competence in discourse was related to the different genres of written or spoken texts. Strategic competence had to do with getting the message across effectively (García-Carbonell, Rising, Montero & Watts, 2001).

In 1985, Krashen's work postulated that language is acquired, not learned. Language acquisition, therefore, is a subconscious process whereby the learner acquires language in an informal or natural environment (not a classroom), whereas language learning refers to conscious knowledge of the language in which the rules are known and can be discussed, but which does not lead to natural, effective production. The role of the classroom was thus brought into question. The methodology of s/g came to the rescue because it answered the questions posed by Krashen's tenets, allowing for the introduction of practice time and authentic registers in the classroom. It also corrected the disproportion of teacher-student talk. In most language classrooms, and even more in classrooms in other fields, the teacher holds the floor most of the time, whereas in s/g the methodology requires the teacher to become a facilitator, refraining from interfering in the progress of the game or simulation, thus allowing the students to grapple with their own communication in an authentic but stable environment. This approach also optimizes the possibilities for language acquisition through the amount and quality of exposure to language.

Foreign language learners who participate in games or simulations are put in what Vygotsky (1978) called "the zone of proximal development" and receive much comprehensible input, which Krashen defines as i+1, input which is one slight step beyond the learner's current level. Another important aspect in Krashen's theory of language acquisition was the "filter" produced by affective variables, such as attitude, motivation, anxiety, self-confidence, etc. which act to facilitate or impede the psycholinguistic process by which linguistic data are stored in memory. Again, s/g responds to this problem by creating low-anxiety environments which foster positive affective learning atmospheres (Hill & Lance, 2002; Clark-Brooks, 2007), permitting participants to try new language or behaviors with a minimum of stress (Halápi & Saunders, 2002). Interaction with others in the simulation leads to the negotiation of meaning and the internalization of language.

Another step forward in language learning – and its connection with the methodology of s/g – was taken by Nunan in designing tasks for the communicative classroom that involve learners in comprehending, producing or interacting in the target language by focusing on meaning rather than on form (Nunan, 1989). In the context of s/g, a wide range of speech acts involve the negotiation of the tasks required. Through the task-based approach, the learner has the chance to initiate and respond in communicative exchanges where s/he is able to interact by using a full variety of grammatical-semantic notions and communicative functions, at the same time as other professional skills that are part of interpersonal and networking competences are exercised.

In 1990, Bachman used the term "communicative language ability," which helped to clarify the possible confusion between competence as an ability or skill and competence as part of the competence/performance dichotomy which existed at the time. Bachman and Palmer later revised the model by relabeling Hyme's competences to encompass multiple types of knowledge, as well as allowing for a metacognitive competence. Accordingly, language knowledge includes the two broad categories of organizational knowledge and pragmatic knowledge; the former is subdivided into grammatical and textual and the latter, into functional and sociolinguistic knowledge (Bachman & Palmer, 1996).

The melting pot of the communicative language movement gave rise to a growing interest in s/g due to its potential for interdisciplinary, intercultural and interpersonal interaction. Participants could undertake activities where cooperation was essential and the outcome was open and negotiable. Process became even more important than product and participants had to take responsibility for their own learning. Brumfit (1984) asserted that when learners are placed in certain situations that entail spontaneous communication, they develop the ability to use the language creatively. S/g facilitates a natural context in which learners are allowed to communicate with one another (Halleck, Moder & Damron, 2002) and, therefore, develop their own linguistic idiosyncrasies. The immediate feedback (Klabbers, 2000; Crookall, 2010) that is offered in a natural context of language use indicates to learners if their communication is effective and appropriate.

In the eighties, the use of technology was incorporated into both s/g and language learning, leading to the design of games and simulations based on or assisted by the computer, and subsequent research into the effectiveness of the combination. Project ICONS or Project IDEELS are two clear examples of computer-based multidisciplinary simulations, where participants display their linguistic and professional competences (Ekker & Sutherland, 2011; Watts, García-Carbonell & Rising, 2011; Angelini & García-Carbonell, 2014). Participants have to deal with specific knowledge guided through scenarios and professional competences by working in groups, discussing and negotiating situations, taking decisions or reaching agreements.

The focus after 2000 has remained on communicative language ability and the learning thereof. Language is viewed in an increasingly globalized society as the necessary means for negotiation between people, countries and disciplines and as a critical need for a more global life. Language and communication play an intricate part in the generic competences recommended by the European Tuning Project (2000) in harmonizing educational programs. The generic competences, or professional competences as they are termed by ABET, can be viewed as the bridge between foreign language learning and s/g, given that both of these involve models, representations, realities and negotiated meanings. S/g allows participants to intervene and interpret the world, generating language models in agreement with the content (specific competences) and the context (professional competences), as well as making the product and the process part of the learning practice.

Having reached the second decade of the twenty-first century, in the midst of social constructivism, s/g and language learning are in their prime. In the last decade both fields observed a spread of their principles and greater interaction among disciplines and materials. It should be noted that some simulations and games used for language acquisition, especially those for language for specific purposes, i.e. relating to a specific field such as business (Faria, Hutchinson & Wellington, 2009), nursing (Bartfay & Bartfay, 1994; Nehring & Lashley, 2009), political sciences (Crookall, 1990; García-Carbonell & Watts, 2012; García-Carbonell, Watts & Andreu-Andrés, 2012), writing (Scarcella & Stern, 1990) or engineering (Mayo, 2007;), among others, were not designed to be used for foreign language acquisition, and perhaps, for this very reason, they have served as valid instruments for the purpose.

Various studies and reports (Crookall & Oxford, 1990b); Crookall, Coleman & Oxford, 1992; García-Carbonell, 1998; Rising 2009; Andreu-Andrés, García-Casas & Mollar- García, 2005; García-Carbonell & Watts, 2009; 2012; Angelini, 2012) look at the appropriate steps within the methodology of s/g to suggest the best implementation in language training of the different stages in a simulation. In conjunction, these studies emphasize the basic underpinnings for language acquisition through s/g in line with the latest educational and language learning trends, that is, learning must be recognized by students as part of their responsibility. Learners must become involved in their own learning process.

Druckman (1994) pointed out that simulations could remove cultural blindfolds that hinder effective interaction with people from different backgrounds. Simulations recreating national and international cultures appear to be powerful instruments in heightening intercultural literacy (Wiggins, 2012). Gaming, when repeated in multi-cultural groups of players, can be used to uncover, debrief and understand cultural and behavioural differences among groups of people from other places (Hofstede & Tipton, 2010). Scarella and Crookall (1990, p. 226) remarked that "a process involving some form and degree of re-identification underlies the long-term motivation needed to master an additional language … Students in a relaxed, less-threatening environment forget that they are learning a language and concentrate on the task at hand, producing more natural exchanges and putting their knowledge and strategies for communication into practice".

S/g has a magic ingredient (Jones, 1998), one that provokes talk, since communication, function and duties are always real to the learner, even if the simulation is set more than one thousand years into the future. The methodology offers the opportunity to enhance communicative language ability, together with cultural literacy of the language and other types of pragmatic abilities. Biggs and Tang (2008) hold that to be successful in educating future professionals, it is crucial to design contexts – as realistic as possible – that facilitate acquisition of disciplinary knowledge at the same time that they guide learners to the attainment of professional attitudes and skills. Those skills can be explicitly achieved through s/g when learning a language.

3 Competent in professional competences

Concurring with the Bologna initiatives, higher education in Europe has begun to focus less on the traditional knowledge-based approach and more on competence-based learning strategy (Gillies & Howard, 2003). Corporations have begun to demand of prospective employees more than technical and specific knowledge. As a consequence, universities are beginning to work with corporations and make employment competences a part of their academic curricula.

The concept of competence comprises knowledge, capacities, skills and attitudes (Mulder, Gulikers, Wesselink & Biemans, 2009) and involves the ability to meet complex demands (De Buiskool, Broek, van Lakerveld, Zarifis & Osborne, 2010), i.e., it is multifaceted know-how (Lasnier, 2000; Fernández March, 2010). The Bologna Declaration states that higher education not only must provide specific knowledge, but also competences demanded by the job market that encourage the graduates' integration into the workforce. In the opinion of Marin-García, Aznar-Mas, and González Landrón de Guevera (2011), these competences refer to the qualified performance that derives from the knowledge, capacities, skills, attitudes and ethical values that guide carrying out tasks on the level demanded for a particular job. This definition is also endorsed by the *Centro Interamericano para el Desarrollo del Conocimiento en la Formación Profesional* (CINTERFOR), which highlights professional competences such as leadership, team-work, critical thinking, decision-making and orientation towards the client (Cinterfor, 2001; 2013). Academic contexts can focus on professional competences through language learning using s/g. To learn a language is not an end in itself any more.

In 2001, the ABET criteria for curriculum accreditation began requiring that undergraduate programs demonstrate that their graduates accomplish a minimum of eleven skills.

The criteria distinguish a set of five "hard" skills and six "soft" or professional skills (Shuman, Besterfield-Sacre & McCourty, 2005). The hard skills include abilities to apply specific knowledge, while the six soft skills cover the ability to function on multi-disciplinary teams; the understanding of professional and ethical responsibility; the ability to communicate effectively; a broad education to understand the impact of engineering solutions and the ability to engage in lifelong learning, as well as knowledge of contemporary issues (Brumm, Hanneman & Mickelson, 2006).

Passow (2012) states that, with few exceptions, graduates rate teamwork, communication, data analysis and problem-solving as the most important competences in their professional experience, regardless of their work environment. Different studies carried out by Buiskool et al. (2010), Villa & Poblete (2007), Schomburg & Teichler (2006) or García-Montalvo & Mora (2000), among others, also highlight that the competences most demanded by businesses are among the professional or generic, i.e., problem-solving, autonomy, communication, team-work, working under pressure, initiative, decision-making, together with the ability to adapt to multicultural environments. Hernández-March, del Peso, and Leguey (2009) add to this list other qualities that companies also appreciate in graduates such as flexibility and mobility.

Competences can be acquired within a favourable learning environment (Pisa, 2005). Most of the professional competences mentioned above are intrinsic to learning a language, the main goal of which is the ability for communication that calls for social and interpersonal competences. Similarly, s/g inherently leads to professional competences as well as specific knowledge by offering students many occasions for interactive experience that replicates reality (Watson & Sharrock, 1990), promotes creativity and learning (Knyshevytska & Hill, 2007) and aids reflection and feedback (Lederman, 1992; Thiagarajan, 1992; Kriz, 2003; Peters & Vissers, 2004). This is conducive to self-assessment and consequent changes in attitude (Andreu-Andrés & García-Casas, 2011; Greenblat, 1988; Ekker & Sutherland, 2011; Watts et al., 2011). By facing complexity in the tasks, learners make sense of the experience in their own way (Oertig, 2010), increasing critical thinking (Kovalik & Kovalik, 2007), collaboration and systems analysis (Johnson, Smith, Willis, Levine & Haywood, 2011), with ensuing maturity in decision-making and problem-solving. In s s/g, learners are expected to take the initiative and make their own decisions, thus becoming responsible for them (Herbert, 2010; Kriz, 2010). Learners, through the process, become aware of the skills needed to deliver successful professional outcomes (Montero-Fleta, 2013).

Becoming competent in professional competences is not accomplished in isolated practice, but rather while learning something else. Language learning in the context of s/g – *as the future's language* coined by Duke in 1974 – is in itself, too, a language for the acquisition of professional competences.

4 Model of simulation/gaming, language learning and acquisition of professional competences

Language learning has been a trailblazer in active teaching and learning strategies that reproduce real communication models, in which specific and professional or generic competences are part of the learning process. Active learning is experiential learning, since knowledge and competences are acquired and enhanced through reflection on doing and experimenting.

S/g, as the language of language learning, provides open-ended situations which facilitate the discovery and attainment through experience of certain abilities. If projected as a circle, the phases of s/g fit Kolb's experiential learning cycle (1984). By adjoining interlanguage a whole new model emerges. A learner's interlanguage is his/her evolving system of rules that results from a variety of processes that occur when learning a second language (L2). Interlanguage is based on the learner's experiences with the L2. In the first phase of our model, that of active experimentation, the language learner becomes aware of his/her language skills, a phase which we call interlanguage briefing. Second, in the concrete experience phase, the learner uses the language within an actual context, a phase which we term interlanguage action. Finally, in the reflective observation and abstract conceptualization phases, the learner reflects on and analyzes the experience, so as to enable the projection of future linguistic experience, a phase which we name interlanguage debriefing (See Figure 1).

Figure 1 Model of acquisition of professional competences through simulation and gaming in language learning

Going through a s/g interlanguage experience, reflecting on it, drawing conclusions and applying those conclusions to a new experience, either simulated or real, are steps that complete the learning cycle. Acquisition of specific and professional competences is interwoven in the entire process.

Learners, in their cognitive development, construct and assess their own knowledge by assembling experience (Piaget, 1947). Language learning through s/g produces broad-minded individuals who are able to act knowingly, i.e., use knowledge to think, discover, decide, interact, judge or create. In this way, individuals enhance their linguistic/specific and professional/generic competences simultaneously.

5 Conclusion

Forty years ago, s/g was predicted to become the future's language of many disciplines. Forty years may seem a long time, but when we consider that the beginnings can be traced back to approximately 3000 BC and that "gaming, in its many forms, may reasonably be regarded as the world's second oldest profession" (Duke & Kemeny, 1989, p. 166), it is clear that s/g, although it is still the future's language of many disciplines, has a longer tradition than many would suppose. It is, nonetheless, a methodology with an invigorating and promising future, as not only is what learners need to learn changing, but also how they learn.

The past forty years, imbued with the communicative approach to teaching and learning languages, is precisely the time in which s/g has been applied. Different aspects of s/g have been used, studied, revised and perfected in the field during this period. Language teachers have recognized the benefits and authenticity of the language of s/g. They have learned to frame the objectives and adjust teaching/learning tasks to match the potential that s/g offers.

Using s/g encourages the acquisition of professional competences while learning something else. The capacity for group work, for example, and other social, interpersonal skills are acquired by interacting and experimenting at no risk. Accordingly, language learning through s/g can be said to be a language for professional competences. As Duke (1974, p. 11) asserted, s/g is "a hybrid communication form" that emerges across many lands and situations, and that if it is "treated with the same precision and understanding as traditional forms of communication it will prove to be very useful to man in the approaching decades". In our opinion, Dick Duke was right.

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INCREASING COMPLEXITY OF BUSINESS SIMULATIONS AND GAMES IS EXPECTED IN THE FUTURE

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Abstract

In his book Gaming: *The future's language,* Duke (1974) has put great effort into discussing different aspects of complexity In 40 years, technical opportunities have increased colossally – from gigantic calculating machines with minimal capacity to small, powerful, smart devices. Data banks have evolved from hardly accessible local databases to the possibility of using cloud computing. Yet, complexity in simulation and gaming today is still equally relevant. In this article, business games and simulations (BG), mainly used in formal education, will be discussed. When making recommendations for increasing complexity, it is necessary to assess educationists' recommendations - games should be studied from the aspect of learner's ability to absorb the knowledge. The aim of this study is to examine the attitude towards complexity of BG and simulations regarding three aspects: designer, teacher (instructor) and user (player).

Keywords

simulation & gaming, business game, complexity, skills, education.

1 Introduction

The level of complexity of a real environment (organizational and managerial) is very high (Vasconcelos & Ramirez, 2011). In different business projects, complexity is considered and evaluated in various aspects; for instance, complexity of innovations, complexity of purchase situation, complexity of purchase decision, integration complexity, etc. (Kim & Wilemon, 2003). Education systems usually suggest that learner should processes in the training environment systematically (step by step). Designers are able to design very complex games, but they would be difficult to understand for our learners; this is due in part to the difficulty of explaining the results of player decisions.

The BG paradox problem was analysed by J. Wolfe (2005) using the *Global Business Game* example. J. Wolfe, S. Gold, R. Teach, E. Murff (Wolfe & Gold, 2007; Teach & Murff, 2008) analysed in detail the advantages and disadvantages of complexity of BG as well as the relation between complexity and realism. Students tend to perceive complex matters easier when a case study related to situation in BG is provided (Sauaia, 2006). Complexity can be perceived when the game intended for teaching business matters includes other matters that are not directly related to the business being taught. Irrelevant material makes it difficult to secure good performance in business.

Decision Support Systems and Information Systems are included among these matters. (Ben-Zvi, 2010; Patasiene, 2008; Lainema & Makkonen, 2003; Lainema & Nurmi, 2006; Palmunen, Pelto, Paalumaki & Lainema., 2013). In certain fields, when literacy skills are targeted for development, it is better to use simple games involving small number of cycles (Owston, Wideman, Sitnitskaya-Ronda & Brown, 2009; Brom, Preuss & Klement, 2011; Hall, 2009). Complexity of BG is strongly related to game architecture and algorithms (Thavikulwat, 2004; Patasiene, 2008). J. Hall suggests three ways of viewing simulation and game design: realism, functionalism (learning support) and engagement (Hall, 2009). J. Hall proved that cartoons used in BG could help players understand complicated situations. Usually, games of high level of complexity require more time and higher level of player competence. This, supposedly, should work fine on raising employee qualifications, however, for such persons, it is often difficult to stay off work for longer periods in order to attend training (Wolfe & Castroviovanni, 2006). Regarding the time necessary for game organisation, it is easier for students to adjust their timetable to their studies than for working people.

Summarising the development of BG, Faria, Hutchinson, Wellington, and Gold (2009) suggests distinguishing 5 stages of development: 1) the pre-1963 period (creation and growth of hand-scored games); 2) 1963-1968 (growth of commercially published games); 3) 1966-1985 (significant growth in BG complexity); 4) 1985-2000 (growth of PC-based games); 5) present period (the growth of BG on the Internet). Currently fast evolving Smart technologies sets the ground for emergence of a new generation of BG. The 21st century technologies allow the development of a complex game in a short time; new technologies allow a large number of players (competitors) to join the game. Thus, the game can be both complex and friendly. It is easy to organize super-gaming that has the potential to connect game participants from around the world both as competitors and as team members (Faria et al., 2009).

A 40 year old R. Duke's wisdom is still relevant today: *"Complex reality is here and must be dealt with. To the extent that good will exists among men, there will always be enormous difficulty in resolving these problems because each man's model of reality differs. We must find new ways to conceptualize complexity, to transmit it to one another, as well as to formulate specific models about future complexity from our known but limited base"* (Duke, 1974).

2 Participation of complexity in business games

Business games pass the transition from idea to practical use in several stages. History shows there are cases when improper organization of a simple BG would not perform in a way desired by the developers; it seemed very difficult for players as well. And vice versa – sometimes BG's of high complexity, when they are properly organized, are much better embraced by players who do not feel they are too difficult for them. In practice, BG success is very dependent on the means of organization used (Crookall, 2010). It can be generalized that there are several ways to achieve desired results of game implementation:

» Develop a game that could help with most of the subjects taught;
» Choosing the set of games that would allow different subject that served the study program best;
» Select a mixed type model – when implementing the study program, less difficult games are combined with more difficult ones by didactically increasing the level of complexity. The BG's should allow locking/unlocking activity of some variables.

The first way is more philosophic, as the analysis in the introduction showed, and as confirmed by various researchers. Study program committees tend to recommend using the second variant, but they would also like discussing the third way, the combination.

Practical experience shows that among the first year students there are both those who have played BG and those who have not. However, when making decisions, students from both groups very seldom relate games to respective theory. Even so, there are certain games (e.g. *Kvalitetas*) in which, before making a decision, a student is forced to learn respective theoretical background.

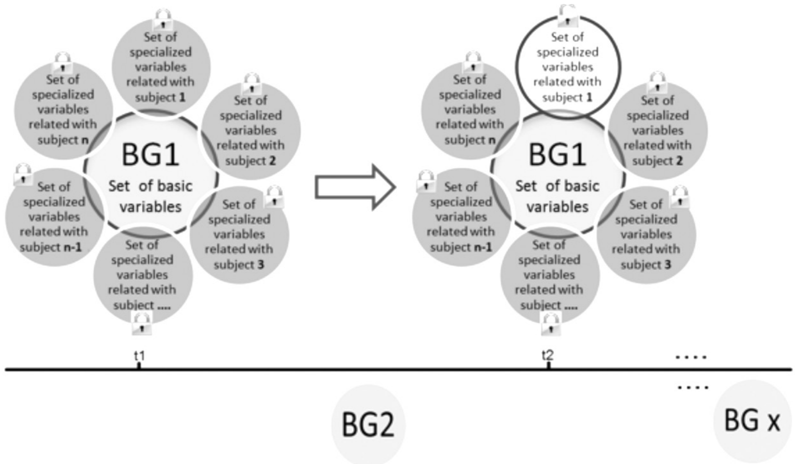

Figure 1 Mixed type model of using business games

In most games, most of the times, the possibility of guessing the variable value is left to the user. Such games work fine for checking intuition, yet, along with development of student's skills and competences, decisions should be based more on theoretical knowledge. The mixed type model allows encouraging the student to be keen on theoretical information and to strengthen his/her abilities to apply it in practice. The mixed type model is presented in Figure 1.It can be read in Figure 1 that at the beginning of their studies, a game can be presented which shows a high level of complexity. This can include basic variables and variables set for several subject groups with a default option of locking or unlocking the variables. When the unlocked variables become active, specialized knowledge is required for choosing their values.

3 Analysis of application of business simulations in Lithuania

Around the globe simulations are used widely in studying process, in employee training, consulting and carrying out various research in logistics, urbanistics, banking, medicine, different branches of industry, military, etc. (Skunčikienė, 2008). Early Computer Business Simulations *(CBS)* appeared at different times in different countries. In Lithuania, the first computer BG was developed in 1996. In Lithuania, the early simulation models for economy and business showed up in 1991-1992. These were brought in by consultants from various Western countries who trained businessmen to work within the market (Bagdonas, Patašienė & Skvernys, 1997; 1998). With the rapid development of information technology and the reduced price of computers and smart devices, (as well as their pervasion in business and education bodies), favourable conditions formed for the development of new CBS, their elaboration and application. Currently, in other countries, there are numerous active associations that analyse the CBS topic, and it is spreading into science and practice.

Business simulations and their applications have been relatively little researched in Lithuania, therefore, it is not backed strongly by theory or empirical research. Bagdonas, Patašienė, and Skvernys (2000, 2002) and Bagdonas, Patašienė, Patašius, and Skvernys (2010) analysed methodical and practical aspects of the use of CBSs. Čiegis, Skunčikienė, and Rakickas (2005) investigated the conception and purpose of CBS within information society. Skunčikienė (2008) carried out a research in which she found that in Lithuania, the meaning of implementation of CBS in employee training within organisations, as well as application of the competences developed in this process in occupational activities, is little covered by researchers. That is why such investigation is relevant from a scientific and practical point of view. Patasiene's (2008) research indicates that application of CBS architecture for integration into different study programmes for a multidisciplinary use remains a relevant academic issue.

Strazdiene (2009) was investigating the education opportunities of entrepreneurship when using the model of simulated business among college students. Marinkiene (2012) assessed the education of management competencies in simulated business environment. The aforementioned studies are related to investigation of the problem of complexity.

Summarising the completed comparative literary analysis on the topic of business simulations, it can be argued that, even though the benefit of application of BG in education process has been acknowledged and the need of such education method has been investigated, the lack of large scientist groups that would focus solely on the field of business simulations is still severe in Lithuania.

According to Skuncikiene and Rakickas (2006), Patasiene (2008), after analysing the CBS applied in Lithuania, it was found that in educational institutions, most of the products used are developed abroad or, in the best case, translated into Lithuanian, and financial reports in such products do not match the financial standards valid in the Republic of Lithuania. Therefore, one of the side issues is their compatibility. Characteristics of computer business simulations used in Lithuania are presented in Table 1.

Table 1 Characteristics of computer business simulations used in Lithuania

Name of business simulation	**Field of activity**	**Number of decisions**	**Description of business simulation**
Ekosys (OEKOWI)	State model	Group *Enterprise*, 36 decisions; 3 different variants for production and 3 variants for raw materials. Group *Household*, 27 decisions; 5 variants for living location / heating of premises / heating conditions, 6 variants for means of transport. Group *Government*, 54 decisions. *Activity instructor,* 88 decisions.	Economic model of a single state has been simulated and analysed. It includes the activity of households, enterprises, government and foreign affairs. In this BG, a proper environment has been created for perceiving the working principles among separate economic entities, for establishing short-term and long-term strategic goals that effect a sustainable state development. This simulation can be applied on education institutions of different levels, as well as for employee training within organisations.
Ecoman	Enterprise model	Throughout the activity, all teams make up to 228 decisions, instructor – up to 123 decisions.	This simulation can be applied in education institutions of different levels, as well as for employee training within organisations.

Hard Nut	Enterprise model	29 basic variables controlled by a student with option to extend BG. Number of users during the simulation period is unlimited, but it is recommended to limit the simulation to 5 financial years.	BG Hard Nut was developed in Kaunas University of Technology (KTU). The essence of basic version of BG activity is to disclose the correlation among different business functions – production, finances, marketing, intellectual resource management, etc. This BG can be applied in education institutions of different levels, as well as for employee training within organisations.
Enterprise model	Enterprise model	29 decisions controlled by a student, and 50 decisions controlled by instructor can be accepted.	This business simulation was developed in Lithuania, involving cooperation between scientists from Siauliai University (SU) and KTU. This BG can be applied in education institutions of different levels, as well as for employee training within organisations.
Bank competition	Bank of commerce model	6 variables controlled by a student.	This is a computer modelling of a bank of commerce management in competitive environment. Banking concepts and elements can be learned, such as, interest rate, credit, different types of depositions, loans and terms of provision. BG can be applied in education institutions of different levels.
VEMP	Enterprise model	5 variables controlled by a student.	VEMP is a competition regarding realisation, market share and profit issues. Competition forces thinking about production, marketing and finance basics, encourages striving for leader's position. This BG can be applied in education institutions of different levels.
Kvalitetas	Enterprise model	10 variables controlled by a student.	User is presented with several variants of variable values.

CBS complexity relies on the number of decisions that participants in the activity are due to make, as the process of decision making is related to problem solving in order to achieve the short-term and long-term goals in the group. Most of the times, the decisions made by participants are based on certain assessments, i.e. choices, determined by acquired knowledge or experience. It can be claimed that the process of making a well-balanced decision involves: problem diagnosis; assessment of alternatives; analysis of outcomes; selecting one alternative and, finally, implementing the decision.

When learners participate in a BG of the enterprise management level (e.g. *Hard Nut*), they face many questions such as how to: Prepare the technological decisions? Order the right number of required materials and fittings; choose the amounts of resources and inter-operational resources required?

Decide when it is the right time to take loan for a company and the amount of this loan, etc. Users' decisions in such activity are related to pursuit of profit for the simulated enterprise. Users participating in BG of the government level (e.g. Ekosys) have to make different decisions based on what work group they are assigned to (Table 1); however they also attempt to achieve the goals of each different group. The work group *Enterprise* mainly seeks for maximum profit; its decisions are related to organisation of production and sales processes. The main purpose for work group *Household* is maximum income and welfare; decisions are related to shaping household income and expenditure). The main aim of work group *Government* is universal economic and social welfare; decisions are related to revenue collection in state budget, as well as redistribution of the collected revenue when shaping the budgetary expenditure. The universal welfare of the state should be achieved by making respective decisions in order to solve economic, social and environmental issues.

Using the computer business simulations, one learns not only from the correct, but also from wrong decisions. Learners are allowed to immediately review and discuss the results of their choices made, and share their experience. Jenning (2002), Strazdienė and Garalis (2008) argue that simulation is an effective teaching-learning method, as realistic aspects can be modelled in a safe environment, and the wrong decisions made do not effect real organisation performance. With such activity, a safe learning environment can be thus created in which the learner can feel safe even when choosing a wrong decision, as mistakes are considered being part of the learning process. It can be noted that a learning environment can be created that would encourage curiosity, reduce fear of making a mistake, and if made, mistakes can be discussed, analysed, used for further learning by trying to figure out the causes for failing.

A good computer BG process has to increase the learners' ambition to perceive the interdependency of economic processes as quickly as they can. At the same time, seeking that learning would cause pressure and joy by helping to escape routine. The safe environment encourages the participants not to give up, even after losing one or several cycles (Patasiene, Zaukas, Patasius & Dapkus, 2013).

Using CBS, a qualitative situation analysis can be carried out when working groups make decisions. Special computer software can provide additional information on performance of different working groups, and present charts. Aims, activities, roles, limitations and outcomes, as well as relations among them, in simulation games simulate real-life elements. BG reveal and underline the interaction process, as opposed to playing different roles. Presumably, ideal conditions are formed in such an environment for information spread, acquiring new knowledge and experience, as well as applying possessed skills and competences in solving realistic problems (Bagdonas et al., 2002; Skunčikienė & Rakickas, 2006; Klabbers, 2008; Skunčikienė, 2008).

Today, when modern society is so much engrossed in technology and its development, CBSs and their application in different levels of education institutions as well as for employee training within organisations increasingly attracts interest.

It is assumed that during such learning, when simulations are used, *in relatively short time,* beginners are able to: reveal and develop both inborn and acquired personal features; acquire the necessary business knowledge; and, develop social competences. Experts from different fields can develop basic skills that are required at any professional activity (develop competence of entrepreneurship) as certain simulated business situations can be analysed. An example of presented mixed model of using simulations in real study programme of Business Administration at Kaunas University of Technology is presented in Figure 2.

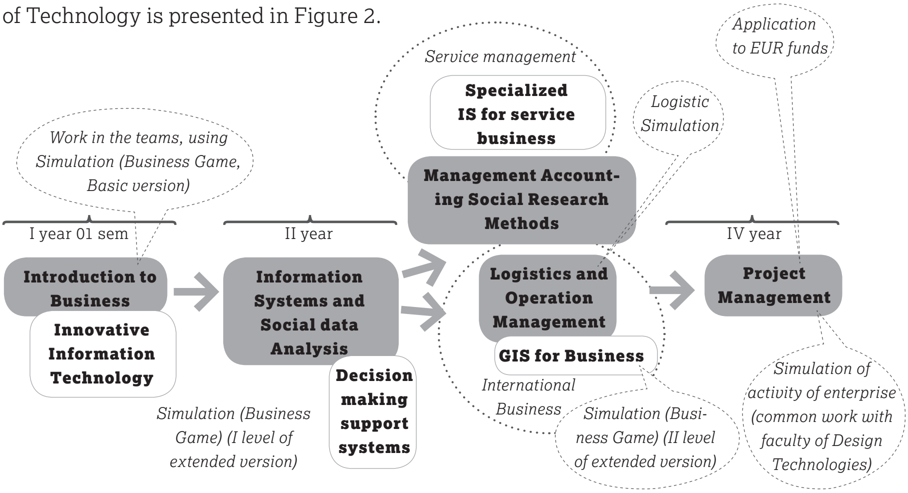

Figure 2 Using Simulation & Gaming in subjects of bachelor study program of Business administration in Kaunas University of Technology

First year students use the basic version of BG Hard Nut. Second year students use the first level of the extended version of BG Hard Nut. Students use a simple method for defining amount of production. It is used at studying Decision Support Systems. Students could clearly notice improving results (profit) after using the optimisation methods. During lectures on Information Systems and Social Data Analysis, students use Data Base (DB) of BG. Understanding the structure of DB of BG helps students understanding real DB of a real enterprise. Students are able to add some additional tables depending on their needs. Third year students use *ArcGIS* for improving decisions in the field of marketing, entrepreneurship. Forth year students are asked to use simulation *ManSimSys* for understanding technological processes in the enterprise (Patasiene et al., 2013). Collaboration with students from technology study programmes helps every player understand processes in enterprises easier.

4 Surveys of the efficiency of the BG

In order to prove and support the benefit and expedience of application of CBS at employee training, two empirical studies have been carried out:

» investigation of efficiency of using the BG *Ekosys;*

» investigation of efficiency of using the BG *Hard Nut*in the aspect of complexity.

For research purposes, questionnaires were given to respondents, and all of these were returned. Such situation arose due to the fact that 20 respondents participated in the survey; in such way, the researcher had an opportunity to survey each respondent before and after the business simulation, and to collect completed anonymous coded questionnaires from every participant.

In this research, BG Ekosys *(OEKOWI)* was used. It includes economic activities of one country, i.e. the game features complexity. A CBS is implemented when users, working in groups, make decisions, and record them on decision sheets. Instructors of the activity enter those decisions into a special computer software; this software subsequently processes the data and presents learners with new information. Also, additional information on different group performance can be provided, as well as graphic charts.

Survey results showed that to most of the respondents, during business simulation, proper conditions were ensured to reveal both inborn and acquired personal characteristics, such as ability to work in a team (98%), analytical thinking (97%), communicativeness (97%), diplomatic skills (93%), tolerance (95%), organisation skills (96%), activeness (94%), creativeness (92%), as well as charisma (32%) and persistence (14%) on a smaller scale.

Based on analysis of academic works and on results acquired from the research, it is safe to say that during business simulations proper conditions are ensured for developing employees' acquired and inborn personal features that are required in professional activities.

When analysing survey results after a business simulation, it was found that during such activity, learners are provided with conditions to develop such abilities as analysing and using basic conceptions of economics, finance and management (46%), analysing and controlling cash flows (31%), controlling emotions (33%), working within a team and communicating (30%).

The majority of respondents also pointed out that their knowledge and skills in economics changed after BG activities (understanding the pricing principles (82%), investment attraction and management (82%), understanding the principles of lending and saving (77%), understanding the main principles of state economics functioning (76%), etc.).

During the analysis of acquired results, it was found that respondents' knowledge and skills in preparing and using accounting documentation changed (89%), analysing enterprise's balance sheets and profit-loss statement (84%), using the main conceptions of finance sphere (85%), performing analysis of financial sources (82%), etc.

Summarising the results acquired from this research, it is safe to propose that computer business simulations area good instrument for teaching-learning in order to provide learners with knowledge and skills in the sphere of finance.

After activities, when analysing the acquired results, it was found that abilities of performing competitor analysis (78%), knowledge in personnel management (73%), ability of selecting marketing instruments (75%), understanding of an organisation as a system (64%), etc. increased for the majority of respondents.

On the grounds of research results, we can claim that learners acquire necessary subject knowledge and skills in the sphere of management in relatively short time. Summarising the results acquired from this research, considering the learning needs, it is safe to say that computer business simulations, featuring high level of complexity, can be used: for developing team/group work competences, for searching for leaders and revealing their personal qualities, for sharing experience in activity, for knowledge integration and searching for well-balanced activity methods, developing entrepreneurship competence, identification of problems and making decisions, developing skills of planning of activity and controlling emotions.

The second survey was intended for discovering the effectiveness and complexity of BG *Hard Nut.* In order to evaluate the effectiveness of the BG *Hard Nut,* 54 students from business administration study programme were questioned.

Students were split into 2 groups: beginners (those who had not previously played computer BG) and seniors (those who had experience in using BG).In the third year of simulation, the "seniors" were offered a different game situation (all firms started production of the second product), therefore they acquired more skills in that year. In the fourth year the "beginners" started preparation of the report. The game situation remained the same. However, at that time they got acquainted with different criteria for evaluation of the firm's performance. That could explain the considerable development of their skills. Senior students had to prepare the report every year. In the end of the 5th year, they had to summarise the results of their firm's performance and to defend the report in front of their colleagues.

The students were asked about the skills they acquired during every year of the BG (given that the skills acquired during 5-year period are evaluated 100%). Figure 3 shows the responses of the "beginners" and of the "seniors" who have had some economic courses.

In both cases the most skills were acquired during the first year of the BG. Diminished development of the new skills in the second year in our view can be explained by the fact that the game situation remained the same. Due to the same reason, development of the new skills of the “beginners” was not so intensive in the third year.

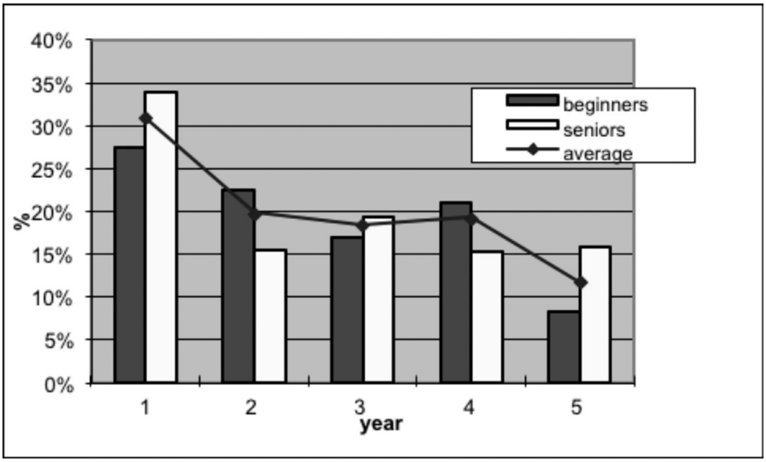

Figure 3 The average of skills per year

Therefore, we believe that a certain increase in skills can be noticed. Meanwhile for the “beginners” it took several weeks after the end of the BG to prepare the reports. The fact that in the 5th year there was no considerable development of new skills suggests that it does not make much sense to continue the BG without making considerable changes in the game situation.

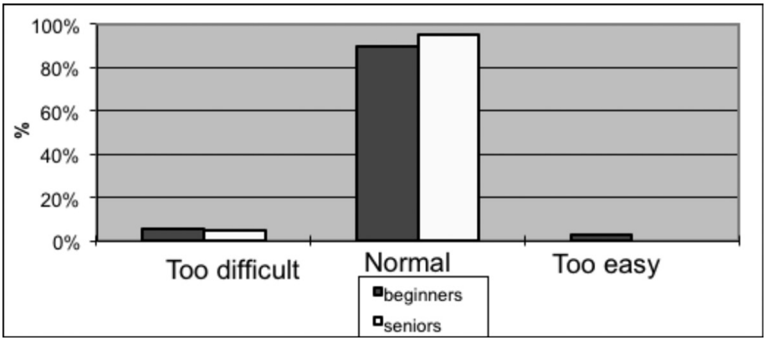

Figure 4 Opinion of players about difficulty of the game

Figure 4 shows the students' opinion about the complexity of the BG. Most of the respondents declared that the game was not very complex. Those who had played similar games evaluated it as quite easy. We believe that the "full complexity" version (with the second product) would be too difficult for the "beginners". That is why we applied different attitude towards that group - they played with only one product, had lower requirements to their reports, had more time for consulting before decision making, etc.). It is possible that this fact caused a very similar evaluation of the game by both groups of players.

The decisions sheet could have a dynamic structure. In the beginning of the game the instructor will be able to set the level of some parameters (e.g. to set the hourly wage system) and hide these parameters. That makes management of the firm simpler. Students would not be able to change these parameters. During different phases of the game, the number of "unhidden" parameters could be increased, thus making management of the firm more complex (a new game situation). Complexity of the game should be increased along with increasing experience of the players.

A new extended version of the game ***Hard Nut*** is developed with a more adequate imitation of the real performance of a firm. At the same time, the game becomes more complex for the players. That caused increase in the number of the game parameters.

5 Conclusions

Summarising theoretical considerations and the results acquired from empirical surveys, it is safe to say that both now, and in future, it is purposeful to combine simple business simulations with games of high complexity in study process, as well as in employee qualification lifting.

Each simulation tool helps users improve knowledge and skills not only in the field of business but in other related subjects as well. Using simulation in study programs at universities helps students improve practice experience in real-life situations requiring decision-making.

Multiple use of online BG revealed its versatility when applying it to educational process. Integrated combined application of different technologies allows students to learn analysing data better and make well-supported and more rational decisions more quickly. Although in the students' opinion the understanding of the business environment increased, some students still find it hard to perceive the whole essence of modelled processes; they find it difficult to make well-balanced decisions.

In the future, games of high level of complexity should not be avoided. Instead, educational and organisational tools should be found that would make the understanding of modelled environment easier. This, in turn, will allow improving the acquired financial results.

Using simulation by communities allows people to understand dependencies among factors. It helps government to increase good citizenship and literacy in the field of accounting.

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GAMING – AN ENVIRONMENT FOR LEARNING AND TRANSFER

A new perspective on the transfer of learning by using simulation games

Sebastian Schwägele

Abstract
Forty years ago Dick Duke wrote a quasi-philosophical book about a potential language of the future: gaming. Today we use games in many different situations. In recent years we have experienced hype for gaming in almost all aspects of life. The goal of this research is to improve on, and to extend the usage of, gaming simulations, especially as part of university curricula. The main topics of the program of research are to gain a better understanding of the transfer of learning and also of the process of learning transfer by using games. In addition to the "classical" transfer of learning, which usually occurs after the gaming process, I discovered a process of transfer which occurs *during* participation in games. This implicates a new perspective: Simulation games are not "just" an environment for fruitful learning but also for transfer. In this article the two processes of transfer of learning, their differences and possible conclusions will be discussed.

Keywords
transfer of learning, learning, university, simulation games, curricula

1 Introduction

Forty years ago, when gaming in civilian society was still in its infancy, Dick Duke wrote a philosophical and forward-looking book "Gaming: The future's language" (1974) about the phenomenon of gaming.

Duke's book remains a basis for game designers and researchers today. In the first half of his book gaming is described as a specific and sustainable kind of language and communication. In this article Duke's assumptions will be discussed and compared with current results of research concerning the characteristics of the transfer of learning with games. Transfer of learning describes the process of taking something learned in one context and using, applying, or enhancing it in another context.
In the first part of this paper Duke's characterization of gaming as a future's language will be discussed and the relevant aspects of the theme of this article will be developed. In the second part of the paper the two processes – learning and transfer – will be described and current findings focusing on the transfer of learning will be presented.

2 Characteristics of gaming as a future's language

Before proceeding it is important to take a close look at the thoughts and ideas of Duke from 1974. On the one hand, he was designing games for educational purposes while on the other hand he had already begun to shift into the direction of policy games. For the following decades Duke was mainly focused on games for consultancy and strategy development. Finding and defining a "common ground among competing stakeholder" (Duke, 2011, p. 348) is the most powerful aspect of his methodological approach. Duke himself describes simulation and gaming methods (g/s) in the early 1970s as "in its infancy" (Duke, 1974, p. 11). In his autobiographical review he presents "a theoretical basis for the use of games to achieve group consensus in complex decision environments" (Duke, 2011, p. 347) as the main objective of the book from 1974. Duke's goal was to uncover how and why games work.

For an analytical perspective on gaming it is necessary to differentiate between gaming as a methodology and gaming as the utilization of a game. In Duke's explanations it seems that one cannot be conceived of without the other. In the following analyses there is a special focus on g/s.

In Duke's argumentation gaming is described as a special mode of communication. He defines a communication mode "as the integrated use of language, communications technology, and the patterns of interaction of the respondents" (Duke, 1974, p. 15). In the following section the different elements of the communication mode of gaming will be briefly described:

Multiple languages including a game-specific language

A language "is a purely human and non-instinctive method of communicating ideas, emotions, and desires by means of a system of voluntarily produced symbols" (Sapir, 1921, p. 7). This means that language can be understood as codification of a message.

Communication is the exchange of ideas and interaction between two or more persons using a language. Duke differentiates between primitive, advanced and integrated forms of communication. Primitive communication (e. g. hand signals or navigation lights) is ubiquitous, understood by almost all humans and only usable for simple messages. With advanced forms it is possible to transmit more complex content. Advanced forms of communication include verbal conversation, written books or musical notations. In comparison to primitive forms advanced languages are not understood by everyone. In contrast, integrated forms combine different modes to reduce the limitations of advanced forms. An example could be a multimedia setting. However, once designed for a specific purpose, it "will be of value in only certain instances" (Duke, 1974, p. 19). As mentioned above gaming can be understood as an integrated form of communication including an additional game-specific language. The game-specific language is based on unique symbols of a game as part of the game model, learned and used during the course of play. It describes the conjoint dynamic of game components and players in the same setting (Duke, 1974, pp. 59).

Mixed forms of communication technologies

A communication technology is understood as the device for communication e. g. verbal, written, by video, or painted. G/s almost always uses a mixture of different forms.

"Multilogue" pattern of interaction

The pattern of interaction describes the setting of exchange between two or more persons. Different types of interaction can be identified. In a very simple form there are only two persons. Communication can be in a one-way or a two-way direction. If there are more than two persons, sequential dialogue and "Multilogue" (Duke, 1974, p. 23) can be distinguished. The sequential version is an interaction between one person as central figure and two and more who are interacting with the central figure. A typical example is a paper session at an academic conference. In contrast Multilogue situations, as in g/s, are characterized by a group of persons communicating about one objective. In contrast Multilogue situations, as in g/s, are characterized by a group of persons communicating about one objective (Duke calls it "pulse", Duke, 1974, p. 23) simultaneously. There is no central person in this pattern.

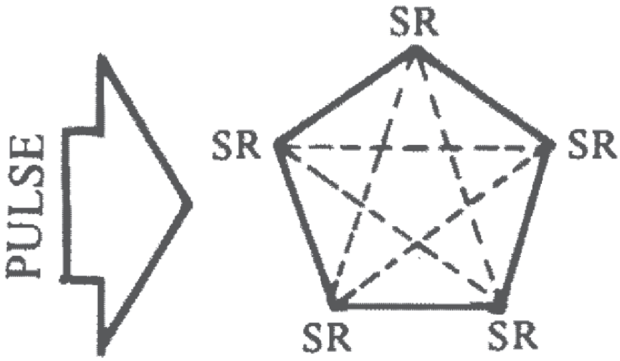

Figure 1 Multilogue pattern of interaction (Duke, 1974, p. 22)

In his autobiographical review Duke adds further information to the title of his book from 1974: "The term language in the title of the book stands for 'mode of understanding'" (Duke, 2011, p. 356). The difference between the two terms is striking. While language is an instrument to transmit a message from sender to receiver, mode of understanding is focused on a person supported to create and to realize its own message and conclusion.

Summarizing Duke and thinking ahead, g/s could be described in the following way:

» A game is a representation, translation, and interpretation of reality. It offers a "safe" environment for learning that allows the participants to deal with pulses/stimuli presented by designers, the game, facilitators, or participants.
» G/s offer participants possibilities to exchange and share ideas, experiences, and visions about the topic of the game and to create their own shared picture. A very important element of g/s is their "power to improve communication between competing stakeholders" (Duke, 2011, p. 343).
» Games use multifaceted languages comparable to reality. In contrast to "classical" communication modes, g/s is not a propagation of facts but an opportunity for participants to discover their own message. In the end of a gaming process a translation back to "reality" is needed.

While Duke was focused on policy games, the main focus of this article is on using g/s in educational contexts, especially at universities. There are many commonalities between the two different approaches. The common aim is to enable people to be prepared for the challenges of the future.

The essence of the methodology is the same: a communication mode combining different languages (including a game-specific one), different communication technologies and a Multilogue pattern of interaction.

3 Learning and transfer of learning

The two theoretical constructs of learning and learning transfer are interrelated and cannot practically be discussed separately. Only from a purely analytical perspective can you divide them. In the following section I will begin by discussing the terms separately from an analytical perspective and will conclude by discussing the terms jointly from a practical perspective.

3.1 The process of learning

If you look at the discussion of learning in games, especially in gaming simulations, there is one particular model that appears frequently. It is the Experiential Learning Cycle (ELC) by Kolb (1984). For Kolb, learning in an optimal way is a cyclic, four-step process always with an alternation between, and dialectic combination of, grasping and transforming experiences. The four steps are termed Concrete Experience, Reflective Observation, Abstract Conceptualization and Active Experimentation (Kolb, 1984, p. 42).

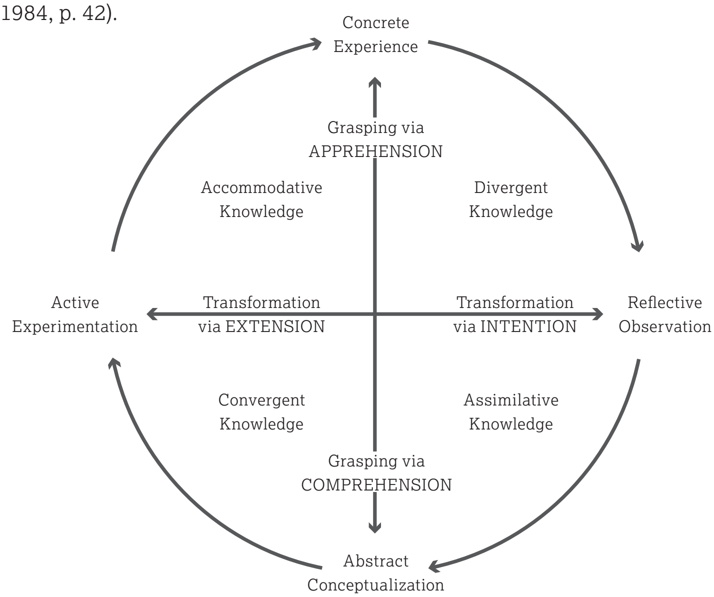

Figure 2 The Experiential Learning Cycle (Kolb, 1984, p. 42)

It is important to recognize that everybody has his or her individual biases. For example there are people who engage more in active experimentation and less in reflection or vice versa. Following the theory of experiential learning, the more evenly the individual goes through all the steps, the more powerful the learning effect. "The combination of all four of the elementary learning forms produces the highest level of learning, emphasizing and developing all four modes of the learning process" (Kolb, 1984, p. 66). If we look at simulation and gaming methods there are different reasons why this model is often used. In simulation games participants get offered an environment close to reality where they can experience situations and make decisions without the risk of getting into trouble in real life. In the ELC model the learning subject should reflect on and "work with" his or her experiences. The classical periodical structure of simulation games supports not only concrete experiences but also the completion of the other steps of the ELC. "Stops" for observation and conceptualization, before continuing with experimentation, are prompted. The very important debriefing is represented in the ELC (Reflective Observation and Abstract Conceptualization).

3.2 The process of transfer

The transfer of learning is a frequently discussed process in combination with learning and has been a topic of interest for more than one hundred years. In spite of the attention it has received, it is still difficult to analyze and measure the transfer of learning. As mentioned before the process of learning transfer describes the process transferring something learned from one context into another one. These two contexts are usually referred to as *"source"* and *"target"* (Mandl, Prenzel & Gräsel, 1992, p. 127). The *content* of transfer is the third important element of the transfer of learning (Gardner & Korth, 1997, p. 48). In a successful case, content learned in one context is transferred to another one, and used for a period of time. "For transfer to have occurred, learned behavior must be generalized to the job context and maintained over a period of time on the job" (Baldwin & Ford, 1988, p. 63).

For analyzing and classifying transfer processes, Barnett and Ceci (2002) developed a frame work that considers aspects of both content and context. The context dimensions support the differentiation between near and far transfer.

B Context when and where transferred					
	Near ⟵			⟶	**Far**
Nowledge domain	Mouse vs. rat	Biology vs. botany	Biology vs. economics	Science vs. history	Science vs. art
Physical context	Same room at school	Different room at school	School vs. research lab	School vs. home	School vs. the beach
Temporal context	Same session	Next day	Weeks later	Months later	Years later
Functional context	Both clearly academic	Both academic but one nonevaluative	Academic vs. filling in tax forms	Academic vs. informal questionnaire	Academic vs. at play
Social context	Both individual	Individual vs. pair	Individual vs. small group	Individual vs. large group	Individual vs. society
Modality	Both written same format	Both written, multiple choice vs. essay	Book learning vs. oral exam	Lecture vs. wine tasting	Lecture vs. wood carving

Figure 3: Taxonomy of far transfer (Barnett & Ceci, 2002, p. 621)

The greater difference between the source and the target on the various dimensions listed in the taxonomy, the farther the transfer of learning and the greater the difficulty of successful transfer. For successful far transfer it is necessary for the subject to generalize, abstract (Salomon & Perkins, 1989, p. 118; Fuchs et al., 2003, p. 294), and decontextualize (Lobato, 2006, p. 439; Gagné, 1970, p. 275) the learned content.

In addition to the analytical aspects described above, it is also worthwhile to mention a point made by Steiner (2006, p. 195). He stresses that the process of transfer of learning is *not bringing* something into a new context. It is *taking* something learned before and using it in a new context. This changes the perspective from the tradition of researchers and educators defining the target, to a more actor-oriented approach (Lobato, 2006). The second "approach focuses on the processes by which learners form personal relations of similarities across situations, whether or not those connections are correct or normative, and on the specific ways in which the instructional environment affords and constrains learners' generalizations" (Lobato, 2003, p. 20).

If we look at the process of transfer with source, target, and content we need to also consider influences on the process. One of the famous models describing *influencing factors* is the Baldwin and Ford model (1988). In their meta-analyses they identified three main factors: Training Design, Work Environment and Trainee characteristics (Baldwin & Ford, 1988, p. 65). They are called Training Inputs.

To analyze the entire process of transfer of learning it is not sufficient to simply start with the time after leaving the learning environment. It is necessary to recognize that the process begins at a time prior to entering the learning environment (Leifer & Newstorm, 1980, p. 43; Broad & Newstorm, 1992).

3.3 Combination of learning and transfer of learning

As mentioned above, learning and transfer of learning can be discussed separately from an analytical perspective, but in fact both processes are interrelated. This becomes clear if you have a close look at the process of transfer. When transferring content into a new context you usually need to adapt it - it is rarely possible to apply without modifying anything. This step of adaptation is also a process of further learning. Referring to the ELC, this corresponds with the two steps: Abstract Conceptualization and Active Experimentation.

Simulation and gaming methods are predestined to support transfer for a number of reasons. At first, content is not taught in an abstract version. The participants discover the learning content in a concrete situation. By sharing hypotheses, solutions, and personal theories about the content with others they begin to abstract the content. Acting in a situation that is little changed in the next period is not just a possibility to optimize the participants' own actions, but is also the starting point for the process of decontextualization.

4 Design of the empirical research project

In spite of the existence of theory and models on transfer of learning in both gaming and educational contexts, there have not been many empirical studies of transfer of learning via g/s. To overcome the difficulties of empirical research in this area, I chose to employ a different approach than conventionally used. The aim of the research project is to identify influences on the process of the transfer of learning as a consequence of participation in g/s.

The main point of this article is not to describe the entire research project in detail, but rather to identify the different transfer contexts (targets). The research study is based on 13 qualitative and problem centered interviews with participants of undergraduate business seminars that include simulation games in addition to six supplementary interviews from a pre-study.

The interviews were conducted at two different spaces of time: from three to six weeks into the seminar and at least six months after the end of the seminar. The idea was to get a description of both the "first steps" after participation and as well as the process of transfer after a relatively long period of time. All the interview partners were currently studying at a university and they participated in the games as part of their curricula. All the seminars took place in the second half of their studies. Most of the students were also working for companies (Eleven of the 13 interview partners were students at the DHBW – Cooperative State University of Baden-Wuerttemberg. The special curriculum defines cooperation between an external organization – the dual partner – where the students are employed and the DHBW. The students therefore have a dual program of both theory and praxis. After three years they finish their studies with a bachelor degree.) Only g/s focusing on a general management perspective in companies were considered.

5 Results and a new perspective on transfer of learning and g/s

During the first interviews we focused on the transfer of learnings from the simulation game into other contexts. The expected processes of transfer take place temporally after exiting the original learning environment, e. g. in on-the-job situations or situations at university.

Based on the aforementioned transfer contexts it is possible to define different clusters. Because all the interviewees were still attending the university it was not unexpected that they named situations in the context of the university. There is a big difference between the context of the university and contexts outside, for example in an on-the-job situation. In contrast the context of the university offers at least a theoretical opportunity for a didactical arrangement to support transfer or create links between the game environment and the lectures.

However even within the context of the university we could distinguish between two different kinds of settings. Many students identified university contexts like seminars, workshops, lectures, or other simulation games. The connecting attribute of these environments is the group situation. Links between the different elements of the curriculum may be designed on a higher didactical level. The second type of setting focuses on one-by-one situations such as theses or internships at the industry partners of the Cooperative State University. In contrast to the group situation, potential attendance and support is offered individually and from the perspective of the organization; as a consequence it is more difficult to assure.

In addition to these transfer situations within the environment of the university, the interviewees also described situations external to the university.

For example, they mentioned self-organized and voluntary internships where they could act more self-confident and assess the situation more realistically. They narrated situations of the politics of the day mentioned in the newspaper and evaluated them differently and more based on facts after the participation. They also described new teamwork situations where they acted more consciously. These descriptions unite the fact that the transfer of skills took place without didactical organized support.

Already while collecting data we began to see glimpses of other transfer processes beside the process after participating in the simulation game. We found indications for g/s itself as context for transfer of learning. Those interviewed described situations where they had to make a finance plan with the possibility of winning extra points based on the quality of their plan. This was one reason why they tried to understand, to reconstruct and to apply their knowledge from former semesters. The students often established relationships to theoretical content from former presentations especially during their studies. And they frequently used words like recapitulation, applying, or adopting in the same context. Their previous knowledge and their basic understanding of the topic of the simulation game helped them to anticipate and to structure the situation. After the first such indications we also considered g/s itself as a transfer environment in the following interviews. We were more sensitive to such cases and sometimes tried to explicate the descriptions by asking thoughtful questions.

Taking all data together it draws attention to the fact that all respondents described situations during the participation of the game where they applied (theoretical) learnings from other presentations or contexts. This finding is independent of the kind of university they attend or the point of time of the interview. Some examples:

» "It was really nice, that you could actually sort of test, tryout the fundamental business concepts or management concepts that you heard in your lectures, in a business environment without anything actually happening. You get another chance to see the connection to the lectures." (Schwenk, para. 56; translation by the author)
» "Yes, in my case it helped, because I attended a 'Wirtschaftsgymnasium' [high school with a special focus on business management and economics] and wrote my 'Abitur' [German university-entrance exams] with a focus on managerial accounting, and therefore I could, you could say, convert my theoretical knowledge." (Russ, para. 50; translation by author)
» "You really had to convert everything that you covered during your studies. You can't really say everything, because of course it was focused purely on the management-side of things, business management and marketing, economics, so these three areas were bound to be there. […] But in the last simulation game, it really was the case, that everything that you had done before, that it came up and that you could really apply it.

» Just when you thought you didn't know it anymore, you knew that: Wait a second, I learned this at one point. And then you thought about it a little more, until it came back to you: aha, it's this or that. From that point a lot actually came up." (Wind, para. 19; translation by author)

If we interpret these findings the situation in the simulation game could be described as follows: all the interviewees described situations where they took knowledge from previous learning contexts, like lectures or high school, and then transferred it to the context of the simulation game. This knowledge could not just be played back. The participants had to modify the theoretical knowledge so that it could be applied in a compatible way in the game context. For example they had to look for correlations between different subject areas. For some of the interviewees it was necessary at first to reactivate their knowledge or to use their previous knowledge to generate the knowledge needed.

Following these research findings concerning the transfer of learning with g/s it was necessary to change the appreciation and to differentiate two processes of transfer of learning relating to the use of g/s:

» Transfer of learning 1 (LTF 1): Transfer of learnings occurring before the participation into the environment of g/s – in this case the game is appreciated as a transfer context.
» Transfer of learning 2 (LTF 2): "Classical" Transfer of learning – application of knowledge acquired in g/s in a new context outside of the game, (usually) termed after finishing the game.

In addition to the differentiation between these two processes of transfer, the environment of a simulation game can also be understood as a learning and transfer context. This has an impact for design and application of such games.

It is certainly not appropriate to generalize this perspective to all g/s. As mentioned in the description of the research design, only a special type of game was focused on for this research project: games focusing on a general management perspective in companies. It is not the business case as criteria of constraint but the integrative perspective of general management. Complex g/s, which combine different subdomains, are more likely to result in the two distinct processes of transfer of learning in contrast frame games, which focus on single aspects.

Also the integration within a larger learning context seems to be relevant. It is expected that there could be much more power if g/s are integrated in a curriculum as learning and transfer environments. This might be possible, for example, in junior staff programs or university studies. Additionally it appears to be wise to have a look at the timing of g/s, for example using g/s before theoretical studies when students have different capabilities than at the end of their studies.

6 Illustrative Example

To illustrate the relevance and the capability of g/s as transfer environments, an example might be helpful. Comparable to the research project, our hypothetical participant Maria is studying at a university in the fifth semester in business studies. She has attended many lectures since her first year at university, for example she took part in the course "Financing and Accounting". There she heard a lot about balance sheets, profit and loss statements, and ratings. Methodically it was a mixture of slide shares, answering questions in the plenary, and in some cases preparing some content in group work. And at the end she had to write an exam. She also took part in similar courses focusing on production, marketing, logistics and HRM.

According to the curriculum she attended a three-day seminar using a general management simulation game.

In a year Maria finishes her bachelor degrees and starts working in a consulting agency specialized in business process management.

While using the theoretical content in another context (simulation game) it is also one step in the process of abstraction and decontextualization. If we have a look at the analytical classification of transfer contexts by Barnett and Ceci, the difference between the two described contexts may not differ dramatically. There is a difference in the physical, temporal, and functional context. In those three cases the environment of the simulation game is a kind of "step between". It could shorten the transfer distance to reality.

If Maria has problems with applying the theoretical content she has the opportunity and time to work with the other participants to reconstruct and to modify the content for using it in the game. She may ask the facilitator and/or systematically combine theoretical models with the "reality" of the simulation game to evaluate their practical impact. In reference to research on transfer of learning, implementation often fails because of the absence of opportunities to use the knowledge (Baldwin & Ford, 1988, pp. 64; Karg, 2006, p. 183). With simulation games we have an instrument to facilitate the transfer of learning (even once) and to create a didactic "over all" design integrating transfer opportunities close(er) to reality.

7 Conclusions

If you look around you will find a vast number of learning methods. One of those methods is g/s. For sure this special learning method has established legitimacy as illustrated by its frequent and wide spread use. That at least a portion of g/s are effective could be indicated even in the few hints on transfer situations after the participation (see above). Further research results will differentiate this impression (forthcoming in 2014).

When examining the possibilities to facilitate the transfer of learning, the variety of methods is much smaller. Examples might include on-the-job trainings, follow-ups, and coaching (personal or digital). A specialized simulation game could be used in this field. Considering the amount of money spent for educational purposes without knowing how much knowledge will ultimately be transferred and adopted in a real life context, an additional stage preparing transfer into real life by using g/s is definitely relevant.

Even today g/s are used as transfer context, mostly without that being the main objective. This capability of the method could be an area of application in the future. Prior to this occurring a few points need to be addressed, for example:

» We need to find out more about the LTF 1, for example about the beneficial characteristics of g/s as transfer context or the impact of such a LTF 1 on the LTF 2.
» We need to design g/s with a special focus on facilitating the transfer process.
» We need awareness of such a purpose at the selection and the facilitation of games.

Beside such educational aspects this finding gives us advanced possibilities for research on transfer of learning. Although the environment of g/s is still a kind of educational context and differs from reality, we are able to get a lot closer to the process to "observe".

Looking back to the beginning of this article, gaming was described as a communication mode and as a future "mode of understanding". This mode can refer to future scenarios, new content or the impact of the application of already learned content. Especially the multilingual pattern of interaction could play a central role: in the intensive interaction the participant gets offered the possibility to reconstruct things already learned; they can learn from each other and get support by the others; and they can discuss together the strengths and weaknesses of theories and models in practical application.

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5

PERSONAL STORIES AND MEMORIES, ANECDOTES, SPECULATIONS ON THE FUTURE OF GAMING

DUKE, FELDT, AND SIMULATION/GAMES, 1964-1977

Allan Feldt

Abstract

Richard Meier provided my first exposure to simulation games around 1960 and a few years later introduced me to Richard Duke and Metropolis. Duke and I supported each other and our two games, Metropolis and CLUG, over the next ten years. I was invited me to join Duke's development team in 1970 to work on a simulation of Dortmund, Germany and in 1971 I left Cornell for a position with the University of Michigan faculty of Urban and Regional Planning. As a research associate in Duke's Environmental Simulation Laboratory I developed a series of simulation/games on water resource management in urban development for the Sea Grant program ending in 1976. Health issues occurring for both Duke and my wife about that time resulted in our pursuing divergent interests in both gaming and other activities. We still remain close neighbors and friends, however, and it gives me great pleasure to offer a few comments and congratulations on this 40th anniversary of his seminal work.

In the late 1950's the University of Michigan's Professor Richard Meier developed a game, Wildlife, representing competition and adaptation among animals in a scarce resource environment. When free beer was offered to those helping to play-test the game, I and several other grad students volunteered.

I was impressed at the learning experience provided by the game, especially the way it led players to create survival strategies exemplifying dynamic interactive equilibria. Several years later, while running a graduate seminar on urban land use planning at Cornell University, I borrowed concepts from Meier's Wildlife, Milton Bradbury's Square Mile, Pat Crecine's TOMM model of Pittsburgh, and Ira Lowry's mathematical model of metropolitan land use to develop a game replicating land use decisions in a small city. This became CLUG, the Cornell Land Use Game.

When I wrote to Meier describing what we were doing he suggested I visit Ann Arbor to watch runs of two games being demonstrated there: Harold Guetzkow's Internation Game and Richard Duke's Metropolis.

A year later, Cornell's Dean of Architecture, organized a small conference on operational gaming and invited about twenty people (including Guetzkow) concerned with either land use law or gaming. I made sure Duke was invited and he ran an early version of Metropolis for the group with considerable success. Over the next few years Duke and I supported each other by citing each other's work and collaborating on getting small grants from the Ford Foundation. In 1967 I spent several weeks in East Lansing working with Duke and a dozen of his colleagues on an advanced version of Metropolis partially funded by the EPA to include some air pollution issues. While there I ran CLUG for Duke and his associates and they began using that game in some of their classes.

In 1970 the West German Housing Authority funded DATUM in Bad Godesberg to create a simulation game for use in planning and policy making for Dortmund, Germany. DATUM created a design team which included Richard Duke, Allan Feldt and Roy Miller and several US students to work with Hans Hansen and several of his DATUM colleagues on this project. Duke, Miller, and I spent several months in Bad Godesberg during the summers of 1970 and 1971 helping to create the initial structure of this game. We anticipated that, when completed, this would become the first major use of gaming/simulation in real world urban policy making. Unfortunately, the German economy declined sharply during 1971 and the project was dropped after five months of preliminary effort over a two year period.

The most significant by-product of this effort was the first international meeting of simulation-gamers in 1970. Duke and I each invited a number of European gamers we had been corresponding with over the past several years to join us in Bad Godesberg for a few days to discuss the nature of simulation-gaming and to attend a small party. Details of this meeting and the subsequent creation of ISAGA are covered in other documents and require no elaboration here.

In 1971, I accepted an appointment as Associate Professor of Urban and Regional Planning at the University of Michigan with a part time position as Research Associate in the Environmental Simulation Laboratory, recently created by Michigan's School of Natural Resources and headed by Duke. One of the attractions luring me back to Michigan was an IBM 1130 computer Duke had acquired for the exclusive use of the Simulation Lab. I had had limited access to an 1130 at Cornell and hoped that with greater access we might be able to convert CLUG into a computerized game.

At the Environmental Simulation Lab I was asked to assume management of a Sea Grant project to develop a simulation/game representing land use issues in Traverse City, MI. The first version was similar to CLUG with water and sewage issues added. It was called WALRUS (Water and Land Resource Utilization Simulation) and was run successfully about thirty times in Michigan and at several other universities during the next few years. Meanwhile, we were developing a much larger data base and simulation of land use changes in the Traverse City region. By 1975 we had completed WALRUS III which was basically a free standing component of a larger final model still several years from completion. It used fifty-five types of land use within an 84 square miles area covering much of Grand Traverse County, and a few nearby areas. Preliminary tests of the model indicated that it was performing satisfactorily in making short term projections and was already usable as a data storage and retrieval system for the Grand Traverse Regional Planing Commission. Most importantly, many local officials and members of the general population understood what we had accomplished and were eager to begin using this and later more advanced versions as part of their planning process. The Commission had designated $25,000 annually beginning in 1976 towards its use and development in conjunction with the annual grant of $60,000 that the Sea Grant program had been allocating to our effort. This would have allowed us to mount the program as part of their ongoing planning efforts and to continue expanding its scope. Once again we anticipated that this might become a major advance in urban policy making. Unfortunately, the Sea Grant program had been under some pressure to expand its coverage to other parts of Michigan and announced that 1976 funding would be exclusively for work on Saginaw Bay. Our project and most others dealing with Grand Traverse Bay would no longer be funded.

We were all deeply disappointed at this decision. Shifting to Saginaw Bay meant at least three years to just get back to the point we had finally reached in Travese City including gaining the trust and understanding of local planning officials and the public. We searched for alternative sources of funding without success. The most discouraging responses was an NSF representative who told us that they only supported basic research. Since we had shown that the model worked it was now considered to be applied rather than basic research.

As in our German effort, defeat was once again snatched from the jaws of victory, this time after five years of development instead of the five months invested in Germany. At about this same time, Duke developed some severe health problems and the new dean of the School of Natural Resources withdrew his support of the Environmental Simulation Lab. We each picked up the pieces and went our separate ways.

I returned to full-time teaching, using CLUG and a few other games now and then as academic schedules permitted. Local politics and my wife's failing health also consumed much of my time over the next decade. Duke and I each continued developing a number of other games but we never collaborated on any gaming activity beyond this point.

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GAMING: THE FUTURES LANGUAGE – THE EARLY YEARS

Robert B. Cary

Abstract
This is a personal reflection of my experience designing and running games with Prof. Duke. I was also influenced by his book *Gaming: the Futures Language*. This paper assesses the value of these experiences. Also included is a proposal to build a technology platform for designing future policy gaming simulations.

Keywords
gaming simulation, policy games, policy game simulations, future of game simulation, computer policy game simulation, web based gaming simulations, serious games, systems modeling, models, roles, role playing, game design, communication, multilogue, empathy, policy gaming simulation community, design initiatives, collaboration, systems analysis, big-data analysis, human centered design, open source software

1 Section I – SNUS, A Case Study

1.1 The Beginning

On a cold winter day in Ann Arbor in 1975, I was lucky to find myself, a neophyte, as a student in Prof. Duke's class on game design. There were about 10 people sitting around a large table in a small room waiting to learn about the class. We were a mixed lot: graduate and undergraduate students, some from the School of Natural Resources but other disciplines as well. Most of us did not know our fellow classmates. Prof. Duke described his expectations for the class. We were going to build a gaming simulation about the nutrition systems in third-world countries for the Nutrition Policy Planning Division of the United Nations Food and Agriculture Organization. Initially, the product of our efforts was referred to as the FAO Game. Eventually, it became known as the Simulated Nutrition System, or SNUS.

1.2 The Game Specific Problem

In cooperation with the FAO staff Prof. Duke had defined the specifications for the game. The staff were attempting to engage local and national policymakers on the impact of their actions on the nutritional health of their nation's population. According to the FAO's assessment, many of the experts in the financial, industrial, education, health and agriculture ministries in the third world were finding it diff cult to understand the dynamics of the nutrition systems in their respective countries. FAO staff thought it very important to coordinate ministry-level efforts to improve the nutritional status of civilians in third-world environments. The FAO planners noticed that the local experts were often stuck in their own jargon based on their academic training. They hoped that a game could be designed that would break down these barriers and give the experts a greater understanding of the issues impacting their nation's nutrition system.

1.3 The Game Design Process

What ensued over the next five or six months was remarkable. Prof. Duke had total confidence that this group of students, from many different backgrounds, would design and build a successful game. He expected us to deliver a product (the SNUS game) to the client in Europe in mid-July. None of us had any experience in nutrition policy. And, other than Dr. Duke, no one had ever built a game or simulation. Prof. Duke used his new book *Gaming: the Future's Language* to guide the class through the game design process.

During the class, we developed and shared our visions of how the game would be played. Then, we would evaluate each of these ideas against the requirements of the game specifications.

- » Did the game fit the time allowed for playing the game?
- » Did the exercise include all of the necessary roles?
- » Did it include a sufficiently rich model of a country's nutrition system?
- » Could the model be modified while in use?
- » Could it be played in different languages?
- » Was it real enough for players with expertise in finance, health, education, agriculture, and nutrition to accept the dynamics of the game?

These questions were posed and answered using an iterative process until we reached consensus.

1.4 The Model

As work progressed, it became obvious that we needed to develop game-specific symbols to represent the production, distribution, and food consumption within our make-believe nation. It was essential that participants in our simulation be able to evaluate the nutrition status of different population groups. To help understand and build such a model, I turned to a book by H. T. Odom called *Environment, Power and Society.* Instead of using a flow chart of the nutrition system, we designed and built a game board representing the three regional parts of SNUSLAND. The players, during each cycle of play, would manipulate various game-specific symbols representing the economic resource requirements: production, output, distribution, income, government interventions, and food available for each population. When finished, the gaming simulation model was reflected in the game board, the symbols, and the steps of play. These illustrated the complexity of the nutrition system and the interactions of the various roles on the nation's economy and, more importantly, on the nutritional status of its people.

1.5 The Roles

As our ideas crystallized we started to focus on the roles of the players. We knew that we needed to represent many different groups so they would have a voice in the dynamics. The roles of the different ministries and governmental agencies were at the heart of FAO's concerns. These included the Ministers of Agricultural, Education, Health, Finance, Trade, and Public Works. In addition to these government agencies, we added the nutrition planners, farmers, and regional planners. The objective was to include all stakeholders so that their voices were part of the deliberations during the game. (We recognized that some of these conversations in the game might never take place in reality). Having the game players assume roles that were different from their professional positions also helped bring different perspectives to the exercise.

1.6 The Prototype

By the end of the term, we had a draft of the game. We had defined the roles, the steps of play, the symbols, and a schematic of the game board. The date had been set for the game to be played in Rome with the client at FAO. Prof. Duke urged me to take responsibility for put the finishing touches on the Rome prototype. I worked on the calibration of the models that we used in the game. I used the FAO Food Statistics Yearbooks and Texas Instrument SR-51A calculator (personal computers were not available at that early date) to run regression analysis on agricultural production data. I developed estimated production functions. The evaluation of nutritional status was based on the population's share of the food available. These were calculated by the nutritional planners from FAO.

1.7 The Pay Off

M. H. Lörstad of the Nutrition Policy Planning Division of the FAO invited us to play the game in Rome in the summer of 1975. This early trial of SNUS revealed that this was the first time the staff had met to focus on nutrition. Many of the players had never met even though they were in the same government.

SNUS was well received. Contracts were let to refine the game and to start to build multiple game sets. Ultimately, the game was tested by USAID with nutrition planners in the United States, at MIT, and in Nairobi, Kenya. Some additional features were added, and copies were built and delivered to USAID. These were used for training field staff and providing technical support for agriculture economic development. 15 years later, I met a retired USAID technical advisor who used the game extensively to train his regional field staff.

1.8 The Conrail Game

A couple of years later I became part of the team that built the Conrail Game. A case study of the Conrail game is presented in *Policy Games for Strategic Management* (Duke & Geurts, 2004). Conrail was the client. The problem stemmed from the impending elimination of all U.S. Federal subsidies to Conrail. Congress was more than willing to end the subsidies, but initially they were demanding that Conrail continue to serve all of their constituents needs. Conrail needed the ability to abandon tracks where the revenue for hauling the freight did not even cover the transportation costs let alone the maintenance costs of the tracks.After the game was built, it was played by the staff of the Congressional Office of Budget and Management and then with the Congressional staff members of concerned U. S. House and Senate members. Amendments to the pending legislation were written based on the results of the game, and the bill was passed and signed by the President.

1.9 My Take Away

My undergraduate degree was in Environmental Design and Communications. My capstone project was titled: *Citizen Participation in Land Use Planning.* I had already faced the task of translating the terminology and principles of land use decision making to the landowners and the general public. The goal was to empower local landowners by increasing their understanding of land use issues so that they would be more effective and confident in engaging a county's update of their land use plan. I also was very familiar with C. P. Snow's *The Two Cultures,* whose thesis stated that we have one culture, that is fluent in the languages of thermodynamics, biology, metrics engineering and technology. We also have a culture rooted in interpersonal relationships, art, and literature. Snow argued that these cultures were growing apart.

Snow was suggesting that the tools used by each of these cultures were fundamentally different and the way that they processed information and perceived the world were just as different. He was arguing that this was a flaw in the British educational system, and I thought that the same was true for the United States. When I came to the University of Michigan I was looking for skills to help bridge this gap. After my experience with gaming simulation, I realized that I had found a major tool that could help.

I already had a design background. However the design process and disciplined approach described in *Gaming: The Future's Language* was more precise and more focused on communication. In many respects the process that Prof. Duke defined for building game simulations was a precursor for what David Kelly of IDEO calls *Human Centered Design.*

I was a believer after our class actually built a very successful game by following the game design steps straight from *Gaming: The Future's Language.* When it comes to policy gaming simulation, I think the most important concepts are the discipline of the design process, the use of transparent models that lead to understanding the issues, the inclusion of the voices of all the stakeholders, and creating opportunities for the players to engage each other to find a shared understanding of the problem and to interact with each other as they play the game.

2 Section II – Game Design Process

2.1 Game Design Process

Game design, as spelled out in *Gaming: The Future's Language* and as experienced in the design of SNUS and the Conrail game, is an iterative process. The game's overarching goal is to achieve results outlined in the game specifications and the concept report. The discipline of following the process insures clarity of the specifications that lead to a comprehensive concept report as a precursor to the game itself.

The game design team's task is to consider the problem being addressed and research where necessary to define the width and breadth of the problem. Concurrently, all of the stakeholders and influencers affecting the problem need to be identified. Both of these tasks take time and need to be repeatedly tested before completing the concept report. If the concept report is to inspire confidence it must reflect a nuanced understanding of the many aspects of the problem. This process will often require reframing the original game specifications. As the game's design continues and the team becomes more comfortable with the game's design requirements, the staff needs to create opportunities for the players to examine and test their understanding of the game's model.

2.2 Models

The goal is to design a model that the staff and the players agree that is an accurate abstraction of their collective perception of reality. The model must be presented at an appropriate level of understanding; reflecting the complexity of the real-world problem yet easy to understand. When this is achieved during the play of the game, it is called the *suspension of disbelief*. This acceptance is critical. It means that the players have reached agreement as to their understanding of the problem. This is rarely achieved in the broader world. Most importantly, it allows the players to focus their attention to creating alternative solutions that can be tested and evaluated through the iterative play of the game.

2.3 Roles

The game designers must give a high priority to insuring that the roles in the game represent all of the stakeholders and influencers. The process of dove-tailing a carefully abstracted model of the problem with a representative set of the actors helps to create a dynamic environment. This creates an experience in which players with different perspectives enter into discussions regarding the real-world issues. In my view, this is where, during the game run, unexpected and highly productive conversations take place. The game designers job is to create the basic game environment; once underway, the staff must stand back and let the exchange happen.

Empathy is not a word often discussed in policy game simulations, but it is important to give it consideration. Policy game-simulations provide a unique opportunity to configure artificial roles that almost never happen in reality. The staff can ask one or more players to take the role (and therefore the *voice*) of an under-represented stakeholder; this can give important new perspective(s) to the conversations during the game. The ability to *live* the role helps the players step into a different set of shoes, again providing interesting conversations and new points of view.

2.4 Multilogue

When individuals are playing a game like SNUS or the Conrail Game, an observer can expect to hear a loud buzz of conversation among the players. It happens when they have played for a while and then, all of a sudden they feel comfortable and the buzz starts. Someone challenges a move or wants to explain a different view of what would be happening if it were *real.* And then the game is on. The staff should not stop or impede these impromptu sessions! The intensity of these conversations focuses on the player's shared understanding of the problems they are facing in the game.

This is what Prof. Duke calls *'Multilogue';* achieving this is one of the prime objectives of any game. You want the players to be engaged and to achieve a vigorous give and take. They are seeking to develop a shared understanding of the alternatives available and to gain insight into the kinds of actions/options that can lead to solutions. Note: the design team is not providing the solutions; their role is to create an experience wherein the players develop their own solutions.

3 Section III - The future of policy gaming/simulations

What Now?

Gaming simulation is a very powerful tool that can be used to address the complex and urgent challenges that we share as a people living on this planet. The urgency has increased over the past 40 years as the world has gotten smaller and more tightly interconnected. Differences in wealth, beliefs, cultures, and habitat tend to create conflict. If we can find ways bridge those differences, all of us will benefit.

I remain convinced that gaming/simulation, as set forth in *Gaming: The Future's Language,* is potentially one of the best tools we have. In 1976, I was a student looking for a type of game/simulation where real stakeholders were working with real data to confirm their common understanding of a problem. My focus then pivoted to creating alternative scenarios that could be tested by playing the game. This process is as you might expect in *a war game* used by the military to craft different strategies. At that time, the value of policy gaming simulations for testing and evaluation policy were limited due to a lack of data and computer-assisted gaming technology.

I hope to see policy games of the future being used as an integral part of all major policy deliberations. No doubt those of us who are dedicated to the discipline will need to demonstrate their value to policy makers. I suspect one of the reasons that policy games are not used more often is that they models are too abstract. Policy makers want to use real data to better measure the results. I believe we need to forge a marriage between the best of policy gaming and those who use computer technology. l advocate building a gaming platform which focuses on designing policy games that leverage the latest technology working with real data.

A critical task inherent in the new gaming platform is to include interactions between the players – their actions and reactions during the play of the game. This is not a trivial task. I can also imagine a platform where the policy game is played as a hybrid, computer-assisted, game played on an interactive wall or table display (see my 'Proposal to Move Forward' in the appendix)

4 Conclusion

The essence of *Gaming: the Futures Language* presents a very powerful communications tool. It describes a design process used to develop a policy game that encourages policy-makers to cooperate in finding a shared understanding of a complex problem. These tools set the stage for creative policies that can be examined and evaluated based on the policy-makers shared vision of the problem. The goal for a policy game-simulation is to empower real-world players to see the potential consequences of their actions. They must be able to evaluate alternative policies and solutions, just as you would in a war game. These new, hybrid gaming simulations will prove of great value in the next forty years.

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Appendix - A Proposal to Move Forward

There should be a concerted effort to appeal to potential collaborators in many fields: computer simulation, graphic design, journalism, web developers, programmers, big data analysts, systems designers, simulation experts, human centered designers, public policy specialists and global business organizations. Such collaboration should seek an open source, online gaming simulation platform that could be used by everyone to design and configure gaming simulations. The design specifications would include the following:

Systems Modeling Module

» Highly variable online system modeling capabilities
» Connect to real data
» Can be easily configured
» Graphic model display configurations
» Can be modified on the fly
» Has a rich set of display options
» Records *decisions* taken during game play for later analysis
» All changes to be archived.

Online Communications and Negotiating Module

- Where players see and comment on communications
- Where decisions are recorded for review
- Includes surveys requests for proposals
- Responses are reflected back to the players
- Data analysis tools for interpreting the data
- Responses and comments are mapped, geographically player, role etc
- Enables virtual town hall meetings in real-time with moderators.

Player-based Online Communications Module

- Players can have space to collaborate as determined by them
- Online video conferencing
- Referencing of documents, video, pictures and slide shows
- Communications are visible to players

Newsroom Dashboard Module

- The Home Page for each game
- Game events are posted
- Players can post their own stories and Videos
- Has a reference Library
- Provides training for new players
- Feedback component to alert staff

Sharing Module

- Individuals could see the content but not play the game
- This could be valuable for after-game analysis.
- Sharing the game to prospective clients
- Examples of differently configured games

Configuration Module - Learning

- Learn how to configure each module
- Learn how to connect them together
- Learn best practices
- Share with one another
- Describe their dreams of new features

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GAMING: THE FUTURE'S CHALLENGE

Pieter van der Hijden

1 The games, the book and the impact

In 1974, Richard D. Duke published his "Gaming; the Future's Language" (Duke, 1974). He was professor in Urban planning at the University of Michigan (UM) in Ann Arbor at that time. The games he developed with colleagues and students were meant for communicating, training, research and policy development. These games were mainly board games and tabletop games. To process human decisions and to compute some outputs, the game facilitators, their assistants or even participants in a dedicate role, used calculators. Computers, i.e. time sharing systems with terminals, were not used for gaming that early on.

The UM gamers were a unique combination of experts in urban planning, gifted in the visualization of complex issues and interested in communicating with many stakeholders. They were able to link up with teachers keen on clarifying educational environments (Moore & Anderson, 1969). Their work together formed the base of research from which "Gaming: the Future's Language" emerged. The book explained the concept of their type of gaming to a wider audience and generously described the development process of games in full detail.

The book was rather unique when it was first published. It introduced gaming to policy makers, human resource professionals, policy developers and social scientists. Early adopters travelled to Ann Arbor to drink from the source directly. Games for communicating, games for training, games for policy development were used more and more in all social economic sectors, up into the boardrooms and, ultimately, all over the world. The gaming/simulation tools are accepted for their added value and have found their place in the spectra of tools for communication, learning and training, and for complex multi-actor decision-making.

And of course the book was not the only one. New publications were coming from the initiators in the USA and even more from the early adopters who translated the "future's language" in their own languages or wrote their own.

2 The cycles, the clockwork and the issues

"Gaming, the Future's Language" states that game making starts with an analysis of the complexity of the real world problem to be communicated, trained or explored via the game. The complexity is reduced to what is essential for the game and documented / visualised as the conceptual map. This map then forms the starting point for the building of the game in terms of game board, rules and roles and game paraphernalia. The game board acts as the "memory" of the game. It displays the actual game status at any moment during the game play.

At the start of the game play, the game board is loaded with its initial state. The playing process itself consists of a so-called macro cycle and a series of micro cycles. The macro cycle is in fact a sequence of major steps that the game play passes through from start to finish, e.g. 1. Briefing (including role allocation), 2. Game kernel (the substantive content), 3. Debriefing (incl. role de-allocation). The game kernel consists of a micro cycle (a sequence of smaller steps) that will be repeated various times. For instance, in the HEX game (Duke, 1975), the micro cycle will be repeated 3-5 times. Each cycle passes the same steps-of-play: a. events, b. production, c. taxes, d. trading, e. regional requests and f. end-of-cycle.

Progress over time is reflected in a variety of roles assigned to participants who, guided by the predefined cycles, played their moves and change the state of the game (board). In fact the whole game was a well-defined and clever engineered clockwork. Unexpected events were possible, but predefined or at least selected and/or defined by the facilitator during the session, not emerging from the game nor defined by participants/roles themselves.

The approach was efficient, manageable, predictable and more. However, there were some issues that troubled:

» One was the division of labour between game developers and game participants. The game developers built real world knowledge into the game, while the game participants often were the real world experts.
» Another issue was the clockwork character of games. It is perfect to keep the facilitator in control of the process. It is less perfect as a model of a simulated micro-world. Or maybe you can say, the world does not work that way anymore.
» And a third issue was the complexity of the games produced. It was questioned whether simpler games could result in higher learning outcomes.

Various authors have illustrated how they deal with such issues:

» Thiagi (Thiagarajan, 2003) is a strong advocate of frame games. In fact such a game is a communication mechanism loaded with a case description. In many situations that is enough to fulfil the game's mission. Most of the domain specific content comes from the participants.

- Bjork and Holopainen (2004) used their broad experience with developing and using games, both board games and video games, to describe a growing set of what they call game design patterns. Games with a "clockwork" character now are part of a larger family of object-oriented games.
- Schell (2008) describes about 100 different points of view for analysing, designing and assessing games. His focus is creating the required user experience.

3 The times, the tools and the challenges

The video entertainment games came up and led to an industry larger than the movie business so far. Game development has been split-up in many different disciplines. Numerous universities and other institutes for higher education offer all types of training programs and courses in gaming. When the market for entertainment games saturated, commercial game publishers identified "serious games" as their newest niche market, and entered the field of games for communicating, training, research and policy development (Bergeron, 2006)

Recent developments in computers and technology (big data, data visualization, etc.) might challenge the application of policy games and related tools. However, the bottom line is that responsible policy makers and managers will not leave important decisions to the computer alone. So there will always be a "market" for collaborative multi-actor policy development in complex situations with sub-optimal information. The point is this: policy games alone will no longer fulfil this demand. For example, think about mindmapping; think about all kinds of visualization techniques; think about the immense popularity of video as learning tool; think about all kinds of combinations in modern didactic approaches for social constructivistic learning (computer supported or not).

Gaming is very powerful as it has the potential to create spatial structures (e.g. roles distributed in a room) that develop over time (the game process). However, there are now many more tools and systems that are supporting these spatial structures, the time dimension or both. These are tools for communicating, training and policy exploring as well as methods and tools for collaborative design and development. Although "serious games" usually steal the show today, the type of gaming as pioneered by Duke could withstand the test of time. It is effective and stable. In a well-filled toolkit containing decision rooms, game storms, social design, ex ante policy analysis, etc. gaming is widely accepted as one of the tools you can apply.

IMHO, a trend for the coming 25 years will be the growing interconnectedness of people on a global level combined with the diminishing loyalty to well established structures. Even a modern phenomenon like Facebook has no idea whether it is still young people's favourite next year. A plethora of new communication, learning, training, research and policy-making needs will come-up which are just as many challenges for gaming. For gaming professionals, the future's challenge is to be part!

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GAMING, THE LANGUAGE TO SHAPE A SUSTAINABLE FUTURE A JOURNEY FROM 1974 TO 2054

Markus Ulrich

"But no matter how deep the shadows may be, how sharp the conflicts, how tense the mistrust reflected in what is said and done in our world today […], we are not permitted to forget that we have too much in common, too great a sharing of interests and too much that we might lose together, for ourselves and for succeeding generations, ever to weaken in our efforts to surmount the difficulties and not to turn the simple human values, which are our common heritage, into the firm foundation on which we may unite our strength and live together in peace." Dag Hammarskjöld, United Nations Day, 24. October 1960, (Hammarskjöld, 1975, pp. 225)

"I foresee games that tackle global-scale problems like climate change and poverty. In short, I foresee games that augment our most essential human capabilities – to be happy, resilient, creative – and empower us to change the world in meaningful ways. Indeed, as you'll see in the pages ahead, such games are already coming into existence."
Jane McGonigal, Reality is Broken, (2011, p. 14).

1 The voyage ahead

Forty years ago, Richard Duke embraced the nature of simulation and gaming (s/g) in his pioneering book *Gaming: The Future's Language*. He introduced the concept of *multilogue,* the coordinated multiple dialogues focused towards one goal that take place among participants in a simulation game. He described the increasing complexity of the world, and the necessity for adequate tools to deal with it. And he lucidly carved the concept of Gestalt-communication, a key asset of s/g.

Dick Duke did not write up nice wish lists; rather, he laid the groundwork for a new discipline. He developed a systematic game design method that enables developers to create tools that achieve their promise (Duke & Geurts, 2004). The method proceeds systematically through a sequence of steps.

As one of the first steps, developers answer the question "Why for heaven's sake do we need this game? What's the problem?". Clear specifications follow, then a comprehensive systems analysis. Next comes, the elaboration of a *schematic,* i.e. a lucid visual representation, a cognitive map of the system to be displayed by the game.

Thereafter, the designers enter the swamps of the so-called *System components/gaming elements matrix.* In meticulous labor, designers have to split up the system and rearrange all its components along the categories of the gaming elements. Those who did not sink into the swamp will assemble the elements of the game, define its format, and elaborate the first prototypes and the final game.

The method is sometimes hard to follow. Clients challenge designers with their preferred formats. Budgets ask for quick results. Whenever a designer has a chance to follow the method, the chances are high it will generate a unique simulation game that is more than a nice "training tool". Gaming tools that result from this process are able to convey a gestalt of the issue at stake. I have experienced the emergence of such a Gestalt, and it is always a wonder. The method does not *actively define* the format of the final simulation game until the final stages of the process. The method is more like an instruction for a farmer on how to cultivate a rich potato field. When the harvesting season comes, you dig out the tasty potato, the final simulation game.

Do not dig out the potatoes too early. I remember a day back in 1996, sitting in the game design class of Dick Duke in Ann Arbor. We were at an early stage of the development of our VCM-game (Value Centered Management game, for the University of Michigan). Dick entered the room and heard us talking about possible formats. Then – I was really startled – he instantly forbade us any further thoughts about the format until we would reach the corresponding design step. I do not recall the exact words, but his decided rigor remained vivid in my memories.

Who is the author of Gaming: The Future's Language and the inventor of the most valuable game design method known to me? I always experienced him as a brilliant and thoughtful advocate for proper design and use of s/g. I knew him at an encouraging facilitator of his games with a clear, alert mind, with a never-ending curiosity for what goes on in the minds of the participants. He was also a facilitator with a big heart. Always remember this when running one of his simulation games like HEX or SLOGAN. They do not work when being operated like a Swiss clock.

I have developed (since 1997) many games in my own company. My professional background includes biology, environmental sciences, mathematical modeling and simulation of ecological and technical systems, focusing increasingly on sustainability. This article is fueled by my experience as a game designer and facilitator, as a sustainability lecturer, and as a human being living in the early 21st century.

Challenges like climate change, deforestation, endangered biodiversity (etc., see for instance UNEP, 2012; IPPC, 2014) continue to interest me. I dream of a lifestyle that respects nature and genuine human needs. I dream of a way of life that can be generalized to all inhabitants of the planet living today and in the future, very much in the sense of the Kantian imperative.

To achieve this life style is a Herculean task, it is described comprehensively by Jackson (2011, Chapter 11). His 12-point-agenda for sustainable development is full of entries that call for s/g. Just to name three of them: resource and emission caps and reduction targets, fiscal reform for sustainability and dismantling the culture of consumerism.

Today's technology allows the linkage in real-time of many groups distributed about the planet. This provides a golden opportunity to develop ongoing parallel simulation games. Lately, McGonigal (2011) described this potential of modern technology, embedded in computer games, "to save the world".

All these ingredients nourished my article. As a practitioner I have tried to depict a journey we might take, as gaming community, to use the wonders of games. Recent developments in the gaming industry in combination with the opportunities that result from the World Wide Web permit our discipline to address boldly the challenges that lay ahead. Let's listen to what Duke said in his hallmark book about complexity (1974).

2 Complexity, couch potatoes and hand axes that still prevail

"The situation just described results from a dramatic and fundamental change in societal structure over the past century; the change is permanent, irreversible, and more profound than any encountered before by mankind." (Duke, 1974, p. 6). Since these days, the complexity of the planetary society has again increased in quantitative and qualitative measures.

The world population has almost doubled, from 4 billions to roughly 7.5 billions. World Exports have increased by a factor of about 30 (in U.S. Dollars, current prices), (WTO, 2014). The most profound ***qualitative*** change since 1973 has most probably been the invention of the Internet with currently 4.3 billion active users (including a share of almost 40% of mobile users with smartphones and other handheld devices) (Facts Hunt, 2014). For the first time in history, a real-time connection between any two and more persons living on this planet became possible.

There is an increasing dependency on these highly complex systems, with countless actors and system states. These systems, while most often function reliably, can exhibit entirely unpredictable behaviors. Financial market domino effects, sponta neous mass manifestations of people out of "nowhere", or shut downs of power grids tell the story. On top of this increasing complexity, planetary limits pop up as another complicating issue.

The increasing resource and energy use is on collision course with available capacities. The world community has started to deal with these problems, on all levels from individual up to global levels. Unfortunately, most of these efforts are still undertaken in the same mode as we eat up a bowl of chips while watching TV. We mostly deal with these problems in a simple linear, static mode. This is the moment to introduce the couch potato model, or in short, the CPM. As any model, it is simple and false, but helpful.

The couch potato model has four system elements:

» 1 The couch potato, lying on the couch watching TV.
» 2 The bowl of chips in front of him/her on the club table.
» 3 The desire to have a long relaxed TV-evening (best case: endless evening)
» 4 The provision of chips in the kitchen.

As a simplification, we neglect any nasty partners, children or phone calls, as well as the beer next to the bowl of chips (as mentioned, the model is wrong).

We are ready to address the essential characteristics of the CPM system:

» 1 The couch potato enjoys the chips.
» 2 The chips in the bowl seem to be available endlessly.
» 3 The bottom of the bowl becomes visible, destroying the illusion of endless availability. The couch potato slows down the pick speed.
» 4 As yet more of the bottom of the bowl becomes visible, the couch potato adapts his/her pick speed by linear extrapolation to meet the remaining time of the movie.
» 5 Shortly after the chips are over, not the movie. The coach potato gets another pack of chips in the kitchen (and proceeds to #1).

These five characteristics describe the CPM. In general, it works pretty well. It also works pretty well for real-life problems. The construction of wastewater treatment plants, for instance, works in this way, as we can easily show:

» 1 People are happy. Wastewaters are purified in the newly built treatment plant.
» 2 Even the problem with polluted lakes seems to be resolved. Lakes and rivers recover.
» 3 New scientific findings show that residues of medication and contraceptive pills, excreted by humans pass all treatment plants, and enter lakes and rivers. They act as hormones and change, for instance, the sex of fish and other animals.
» 4 Some first measures are being taken in the hospitals and in treatment plants. The problem persists.
» 5 New filters are being installed in all wastewater treatment plants. Return to #1.

The story could be continued, with the installation of filters of waste utilization plants, the construction of new roads to eliminate traffic jams, the replacement of depleted oil-wells, the generation of economic growth, etc.

We deal with all these problems in a simple linear, static mode. And it has worked pretty well, so far. So, what's the problem? The challenges of sustainable development cannot be met with the CPM approach. Let me illustrate this with some examples:

» The size of the chips bowl is not clear. Half empty is not evident, for instance.
» Sometimes, a magic invisible eater joins the couch potato, eating at a pace that can nor directly be seen nor be influenced.
» The coach potato, looking for more chips in the kitchen, may find the provisions gone.
» The chips – all of a sudden – turn out to be an essential food for life.
» The movie may last much longer than expected.

Many problems related to sustainable development do not have the CPM system characteristics. They do not evolve in a linear and static mode. They have a dynamic interaction with many known or yet unknown factors, and these interactions may cause new dynamics of their very own. There are time delays. And, there are irreversible effects. This might turn a cozy TV evening into a rather challenging thing.

Two examples illustrate the limits of the CPM in the real world:

The size of the chips bowl is not clear – use of natural resources: The population of cod fish in the Atlantic northwest collapsed in 1992, ending a fishery tradition that had lasted for centuries. The minimum population for a sustainable regeneration was unknown. The fisheries did not take timely action before the collapse.

Invisible eater – climate change: Increasing temperatures as a consequence of Global warming leads to increasing temperatures in Siberia. The frozen tundra soils start to melt. Microorganisms awake to life and start to degrade the organic matter buried in the soil, releasing huge quantities of greenhouse gases into the atmosphere.

Unfortunately, the CPM describes the standard mode of human behavior since quite a bit some time. Some 700'000 years ago, our early relatives Homo erectus manufactured elaborated hand axes with a perfect symmetry, very much different from earlier, rather crude models. According to pre-historians, their production required considerable brain capacity. A clear mental representation of the final product before its production was required. We must assume, therefore, that Homo erectus had the capacity for a formal representation of abstract objects in their brains (Kuckenburg, 2004, p. 75).

Since 700'000 years the CPM has been valid, and humans have been able to make plans based on an abstract notion of future facts. Simply spoken: humans could imagine a given situation before its actual appearance. They were capable of abstract manipulation of options and alternatives.

They could plan an endeavor ahead; mentally carving a hand-axe out of a stone before actually doing it. It has to do with the wonders of imagination. It may indeed have been the take off point of all human culture.

The wonders have reached their limitations. Whenever a future development is to be shaped, we still plan as our ancestors Homo erectus did 700’000 years ago. We imagine (plan, calculate, evaluate) a possible future development. Next, we evaluate the alternatives in a static mode of extrapolation (either by some statistical analysis or by a political power struggle). Next, we implement one of the alternatives, stuck in the present, without any dynamic connection to future developments. There is virtually nothing like “dynamic simulation of future developments and feedback to present decisions”, or as Stephan Marks (2012, p. 25) puts it: “Unsere heutige Gesellschaft ist fähig, fast alles zu implementieren, aber fast nichts sich vorzustellen.” (“Our today’s society is capable to implement almost everything, and to imagine almost nothing.”)

Indeed, findings of cognitive science show considerable deficiencies of Homo sapiens, illustrated by just one example: assessment of generalized behavior. Driving cars or clearing forests are harmless activities if done by few. Done by all, their consequences may be fatal. Homo sapiens is not built to deal with such risks. Are some crutches in sight?

S/g has the potential to boost our capacity for imagination and to develop imagination to entirely new dimensions. Five strengths of the method seem to be particularly relevant for their success:

» Abstraction – condensation to the essential
» Access to time (fast motion, slow motion, time machines)
» Safe experimentation
» Interrelated, distant and side effects can be shown (System thinking)
» Gestalt-communication – to convey the whole, the Gestalt of an issue to be explored

The newest technological developments add further strengths:

» Participants can be connected across any spatial distance.
» On-going simulation games can be linked in real-time to reality.
» Current decisions can in real-time be extrapolated to future states.
» The own (infinitesimal, but relevant) contribution of a single individual to the whole can be turned into a tangible experience.

We are no longer limited to creating a “magic circle” that lets participants experience the Gestalt of a problem. The new dynamic permits the magic circle to be broken up and enter into the daily life of the participants. McGonigal (2011) has shown how this can be done in the context of MMOs (massively multiplayer online games). Large audiences can participate, complex systems can be experienced and their own contribution to future developments can be experienced and made beneficial for today’s decisions.

We may further develop these ideas towards a framework for new simulation games for a sustainable world. How do we make s/g fruitful for the next 40 years, and tackle some of the major problems of our times? To learn about this, proceed to chapter 3.

3 The future of the future's language

3.1 A bold agenda

We have learned about the challenges that lay ahead in respect to achieving a sustainable world. We have gathered experience in developing and running effective simulation games. And, technologies are available to run simulation games word wide, to directly link them to everyday decisions, in real time. We are ready to head for the next 40 years.

Let me set up an agenda for the future of s/g. Let's, for this sake, assume I had just won the record Euro Millions Lottery Jackpot of June 2011, EUR 190m, after taxes EUR 150m. This amount is available for our agenda: making a significant contribution to overcoming the gap between the world today and a future sustainable world. What can the wonders of s/g, including all advances of the recent past and the future, contribute to overcome this vast gap?

Our agenda will distinguish three different lines. First, we need new types of simulation games to cope with the challenge of a sustainable development. Second, we need better concepts to scale them up like MMO's (massively multiplayer online games) that are played by millions of people. Third, we have to innovate to embed them into real life so that they achieve maximum effectiveness. A summary a first project line, together with a gross budget, is given in Table 1.

Project List	**Special characteristics**	**First project (tentative)**	**Budget**
3.2 Embracing time with simulation games			EUR 67m
3.2.1 Time slider simulation games	Time slider simulation games provide a time machine effect, and allow users to quickly travel back and forth in time	Climate change time slider simulation game 2000-2100 for 3 selected countries.	EUR 25m
3.2.2 4D-immersion simulation games	4D-immersion simulation games provide full immersion in three-dimensional representations of urban or rural landscapes.	4D-Switzerland simulator, addressing different scenarios for urban and regional planning	EUR 38m

3.2.3 Reversed gaming	In reversed gaming, time runs backwards. Starting at a given, desired point in the future, simulation games run backwards to the present.	Eating out 2054 – Wonders happen	EUR 4m
3.3 Embracing large audiences with simulation games			EUR 55m
3.3.1 Thin slice simulation games	Simulation games split up in asynchronous micro slices of 15-45 seconds, played on smartphones bring the power of simulations to the participants.	Mindful – a simulation game for a sustainable world, played in the midst of daily hustle & bustle	EUR 12m
3.3.2 Skin Simulators	Skin simulators overcome differences in personal attitudes, values, and cultural differences. Skin simulators approach diverse participants in their own language and value system.	Ecological footprint skin simulator	EUR 5m
3.3.3 Policy transformers	*Policy transformer simulation games* allow different groups of participants to creatively explore their preferred solution for the challenges presented in the game. In the background, possible win-win effects or points of conflict are automatically analyzed.	European renewable energy policy transformer simulation game	EUR 38m
3.4 Generate real impacts with simulation games			EUR 28m
3.4.1 Individual behavior extrapolation simulators	Individual behavior extrapolation simulators extrapolate, and link tiny contributions of individuals towards sustainability in a game like environment.	Wikiflicki – the ultimate repair machine	EUR 4m
3.4.2 Global Village simulation games	Global Village simulation games link real world projects with computer games. Typically they include four components: (1) participants; (2) real projects; (3) social networks and (4) simulation games.	Global Village	EUR 2m
3.4.3 MMO policy simulation games	MMO policy simulation games support sound policy making using facts, models, and simulation games. They anticipate consequences of suggested solutions and help to find jointly good solutions.	Swiss energy-tax MMO simulation game	EUR 22m

Table 1 Future simulation games, and first projects funded with EUR 150m of the Euro Millions Lottery Jackpot.

3.2 Embracing time with simulation games

Global problems related to sustainable development, including climate change, cover a vast time span of centuries or millenniums. Current projections hardly ever go beyond 2100. In the political and economical world, time spans often shrink to years or less. Simulation games are by their nature suited to convey the full time Gestalt of such developments. Three specific concepts will be elaborated in the following chapters.

3.2.1 Time slider simulation games

Traditional simulation games comprise time spans of days up to years. A typical business simulation covers a time span of 3 to 10 years. The simulation game STRATAGEM by Meadows, Biesiot, Benders, Berger & Louwes (2000) covers 50 years in 10 cycles of 5 years each. In the simulation game triCO2lor about climate and energy (trico2lor, 2014) the participant groups represent generations, parents, children, grand children and so forth. While the groups take independent decisions, they are linked via the atmospheric CO2-concentration, and by means of intergenerational conferences. In this way, the game may encompass a time span of about 100 years.

Today, a vast amount of data is available on the state of the world and on many future trends. These data sets would allow developing entirely new types of simulation games that would let participants travel through time, according to the following specifications:

- Special characteristic: time machine effect. Time slider simulation games allow users to quickly travel back and forth in time, and to interactively evaluate the effects of different policy decisions.
- Number of players: 1 to millions
- Playing time: 1 minute (video demonstrations) to asynchronous play over weeks (apps on mobile phones)
- Validity:
  _ Scenario technique with adequate indication of the probability of the results
  _ No false pretenses of precision in case sufficient data is not available
- First project (Table 1): The “Climate change time slider simulation game 2000-2200” lets users experience and interact with state of the art scientific findings, and scenarios on climate change in three selected countries (Switzerland, U.S.A., and the Maldive Islands).

3.2.2 4D-immersion simulation games

Most simulation games rely for user feedback on traditional means, such as data tables, graphs, or the self-experience of the participants during the simulation game. This is wimpy in the light of the visualization power of today’s computer games.

These permit players to act in their self-designed landscapes and buildings (virtual environments) available today with 3D-cubes or 3D-glasses. Underpinned with adequate computer simulation models, these technologies would allow a group of participants to dynamically interact in full immersion with all the consequences of their decisions in an ongoing simulation game.

This leads us to the specifications for the 4D-immersion simulation games:

» Special characteristic: Full immersion in photo realistic three-dimensional representations of urban or rural landscapes.
» Type of simulation: computer based
» Number of players: 1 to millions
» Target audience: politicians, regional authorities, experts, students and the general public.
» First project (Table 1): The "4D-Switzerland simulator" lets users interactively design different scenarios for urban and regional planning, including different options for public and private transportation. It makes the subtle transformation of agricultural land to settlements and roads tangible in a sensual way. Architects, urban planners and politicians shape optimal long-term policies using the 4D-Switzerland simulator.

3.2.3 Reversed gaming

In reversed gaming, time runs backwards. Starting at a given point in the future, simulation games run backwards to the present. The starting point typically represents a desired future state that can be defined by the developers, the facilitators, or even the participants. Round by round, participants take decisions that aim at reaching the *present* state.

In these simulations neither the starting nor the endpoint are the cores of learning. It is the process. Traditionally, participants start from a given (present) state, and take decisions to cope with challenges and to reach a favorable future state. In reversed gaming, the challenge is a paradox one. All the problems we face today are resolved. The participants then need to find good reasons to turn the time backwards and to undo all favorable innovations.

Reversed gaming is promising:

» Participants get acquainted with a desired future state and learn how to overcome barriers.
» Reversed gaming has the funny potential of so called "paradox interventions": "What can you do to become a really bad team?" "How can you manage to go back to a dumb past."
» The present state is being questioned; minds open up fostering creative thinking about future developments.

» Format: role-play simulations, optionally with computer support.
» First project (Table 1): Eating out 2054 – Wonders happen. The simulation game starts in the future (2054). The focus is "eating out in restaurants". All problems related to global sustainable nutrition, including ending hunger, are resolved. No more food perishes, no XXL-portions are stuffing eaters to death. And hunger has been ended worldwide. Starting from this wonderful future state participants are challenged to undo, step by step, favorable technological and behavioral innovations, to reach the archaic present state of running a restaurant and eating out. The challenge is to come back as efficiently as possible to the greasy world of juicy Schnitzel-Pommes frites.

3.3 Embracing large audiences with simulation games

Traditional simulation games reach few people. The New Commons Game (Powers, 1992), addressing sustainable management of renewable resources, is the game I have used most. Nevertheless, I have reached only a few thousand participants. In general, the reach of traditional simulation games is desperately low. The new benchmark is the online computer games with 3 billion hours spent weekly and 18 million people constantly playing around the globe (McGonigal, 2011, p. 6). We need to embed simulation games in the life of millions of people in culture, society, and business in order to achieve a real impact. The next three chapters illustrate the journey ahead.

3.3.1 Thin slice simulation games

Time is scarce. Increasingly I am being asked whether I could run my simulation games, originally tailored for an entire day, to half a day or maybe in two hours? Even better would be to run it on a smartphone in 30 second slices while participants are waiting in a line, sitting in the bus or in a traffic jam.

Let's embed simulation games into the daily life of people and bring games to the smartphones that all carry. The message is to be conveyed in increasingly engaging slices. The design of such games requires a clear understanding of how to involve people in short games, and bring them to real learning through it. Much expertise is available in the field of gamification and of smartphone apps. And still more has to be explored in order to achieve lasting results and to meet the specifications of the slice simulation games:

» Special characteristic: simulation games split up in asynchronous micro slices.
» Type of simulation: Internet based, using mobile devices (smartphones, etc.)
» Number of players: 1 to billions
» Playing time: One slice: 15-45 seconds. Total duration: 15 minutes to ongoing

» First project (Table 1): “Mindful – a simulation game for a sustainable world, to be played in the midst of daily hustle and bustle”. Participants enter their personal perceptions (positive and negative) regarding selected aspects of sustainability into their smartphones (e.g. nutrition, littering, resource use, shopping). They regularly get quests, form distant squads and share successes. Jointly they reach up to epic scale. A quest may be: “Reduce your resource consumption by one unit within the next hour”, or “Undo littering by one unit and achieve a total of 12 units together with your squad”.

3.3.2 Skin simulators

Imagine a family of simulation games that allow participants to explore issues like stopping climate change or ending ***hunger within their very own personal mode*** of addressing such issues? Can this be done? Yes, using the concept of ***Skin simulators.*** Skin simulators overcome differences in personal attitudes, values, and cultural differences. Skin simulators approach diverse participants in their own language and value system. They operate like Saint Paul 2000 years ago, who said in 1 Cor 9, 19-23: “While working with the Jews, I live like a Jew… when working with the Gentiles, I live like a Gentile, outside the Jewish Law.”

In this way, skin simulators stop throwing participants into vast argumentations about how to achieve a prosperous future. They operate similar to the famous exercise “Parallel Thinking” of de Bono (2001, chapter 8) that turns argumentative blockades into fruitful exchange. While different participants with diverse values design each *their* future, with *their* deep wishes and *their* aspirations, the skin simulator aligns the diverse contributions of all the participants along a deeper joint goal underlying the simulation game, and gives appropriate feedback. In this way the simulation games supports participants in overcoming real or apparent barriers separating them in their search of a better future.

The design of such simulation games requires a thorough analysis of the nature of the problem to be addressed. Usually, while developing a simulation game, developers specify a “basic referent system”, i.e. the client’s or designer’s values that form the underlying base for the development of the game, or, in other words, the perspective employed to address the topic of the game (Duke & Geurts, 2004).

When developing a skin simulator, the specification of one basic referent system is not sufficient. *Various* basic referent systems of major target groups have to be taken on board for the development of such a simulation game. The core of the problem as well as its various manifestations, and their mutual inter-relations have to be analyzed. In the final simulation game underlying routines would identify win-win-situations and match deep concerns of one group to those of other groups in order to carve out underlying connections.

All who have ever developed a simulation game will notice this is a major task. Nevertheless, it can be addressed, step by step. The following example illustrates the approach.

The ecological footprint reflects the resource intensity of the life style of an individual or a nation. The footprint expands with increasing resource and energy consumption and it may come to exceed the available bio capacity. In a typical footprint calculator, e.g. available on Global Footprint Network (2014), participants answer a questionnaire about their life style. At the end, they get a message such as "If everybody lived like you, we would need 4 planets Earth. Bah!" along with a series of suggestions on how to reduce the footprint. For some people this is helpful and they start reflecting on their lifestyle. Others just do not like to be told what is "good" and "bad", and turn away.

The "Ecological Footprint *Skin* Simulator" approaches the problem differently. It digs deeper. First it evaluates the personal values of its participants: "What are your personal ingredients for a good and prospering life? What counts in your life?" Second, the participant evaluates the impact of his or her lifestyle in a questionnaire that speaks his or her language. Third, the skin simulator offers support to explore the personal impact and its reduction, within the frame of the value system of the actual participant. In short, it talks to the participants in their language, and builds bridges to other participants across the boundaries of separating value systems. In this way it generates maximum impact.

3.3.3 Policy transformers

While skin simulators address the individual level, *policy transformers* aim at fostering constructive policies in the large scale. They address a widespread problem. Political parties and interest groups tend to focus on a single preferred solution and risk getting stuck in their positions. Alternatives are not considered, solutions block each other and the underlying problem to be resolved gets out of sight.

Policy transformer simulation games address these problems. They allow one group of participants to creatively explore their preferred solution in the dynamic simulation game. In the background, possible win-win effects and points of conflict with solutions developed by other groups are automatically analyzed. In this way, policy transformer simulation games support the elaboration of fruitful solutions, combining the strategies developed by different participants.

The model underlying such simulations contains a comprehensive and lucid description of the problem, either by text, pictures and/or in mathematical terms. In this way they support the transformation of the solutions presented by different groups into each other, thus helping to carve solutions accepted by all.

The specifications are:

» Special characteristic: *Policy transformers* overcome (political) blockades expressed with arguments like: "We acknowledge the problem, but your solution is inadequate."
» Type of simulation: Computer supported role play simulation games
» Number of players: 1 to 300
» Playing time: 1 - 3 days
» First project (Table 1): "European renewable energy policy transformer simulation game". In Europe there are many powerful initiatives for renewable energies underway. However, instead of jointly working on forward-looking solutions, initiatives get stuck in political blockades. The *European renewable energy policy transformer* simulation game lets groups with differing priorities explore their strategies for strengthening renewable energies. It fosters effective solutions by systematic cross-evaluations and win-win-analyses.

3.4 Generate real impact with simulation games

The tools described in chapters 3.2 and 3.3 generate real solution options for real problems. This is the moment for the next innovation: Simulation games that make real impacts: simulation games that are connected to real institutions, real policies, and real human beings.

3.4.1 Individual behavior extrapolation simulators

Humans strive for "better hope of success", "stronger social connectivity", or "epic scale" (McGonigal, 2011). In real life such ambitions may be hard to fulfill. McGonigal explains the success of computer games by their ability to fix such shortcomings of reality. New types of simulation games could profit from these findings. Such *Individual behavior extrapolation simulators* might be designed along the following scheme:
Starting point: Individual behavior → this behavior is being analyzed, extrapolated and evaluated → the simulator lists options for alternative behavior, and… → …transforms them into quests: can you do better (in respect to the requirements of a sustainable development)? → if the quests are met, the resulting improvement is scaled up, to entire companies, communities, countries, and the entire world, and fed back to the participant in an attractive way → evaluation, learning takes place → learning communities evolve.

First project (Table 1): "Wikiflicki – the ultimate repair machine" (flicken (German) = to repair). Highly developed countries have forgotten how to repair inkjet printers, shavers and mixers. Instead, perfectly functioning appliances are trashed and replaced by new equipment.

With Wikiflicki, a consumer with a broken device becomes a participant in a huge simulation game. Whenever a participant enters a problem in the database, Wikiflicki identifies options for repair in its vast database. (On a second game level, talented users feed the Wikiflicki database with their repair advices. Hence, the users of Wikiflicki manage its content, very much like in Wikipedia.) A quest for repair is given out. Successful repairs are recorded and scaled up. The pile of non-trashed shavers and other appliance pops up. Companies not supporting Wikiflicki start to deal with sustainability image problems.

3.4.2 Global Village simulation games

Global Village simulation games have one specific characteristic: they link real world projects with computer games. Typically they include four components: (1) participants; (2) real projects; (3) social networks and (4) simulation games.

Real sustainability projects, designed and implemented by the participants, are added to a multiplayer-online computer game that is based on a comprehensive simulation of selected aspects of the real world. Every real project incorporated in the game further enriches its options, and also advances the status of its creator.

Specifications:

» Special characteristic: tight link between real world projects and simulation game.
» Time covered: 5-100 years
» Type of simulation: internet based distributed simulation game
» Number of players: 1 to thousands
» Playing time: weeks to months
» Validity: Appropriate quality measures ensure the validity of the real world projects incorporated to the simulation game by participants.
» First project (Table 1): Global Village for teenagers. The participants inhabit, together with their avatars a virtual world. They determine by their decisions the development of the game world. Quests are to be solved individually or in teams. Certain tasks are linked to real sustainability projects, realized by the teenager participants. As new real projects are incorporated into the virtual level, the simulation game gets richer, and the participants more involved. The underlying computer simulation model (i.e. a simplified world model) – controlled by the actions of the players – calculates in the background, the development of the virtual world and the relevant interconnections. While the game goes on, the avatars evolve. Each player can at any time see the contribution of his avatar to the welfare of the world. Social bonds arise. New projects and ideas spread from the virtual back to the real world. A real impact extrapolator serves as a motivator for strong learning communities.

3.4.3 MMO policy simulation games

Why do elevators stop smoothly at floor 34? Why do modern air fighters not fly from the sky? They are operated by means of a built-in computer simulation models. These models extrapolate the current path (i.e. simulate future system behavior) and automatically derive necessary adjustments (fine control of the elevator motor, adjustments of rudders). In politics, on the contrary, alternatives are still developed in the "Homo erectus-mode". Every party imagines its preferred solution. The blocks form, the disputes start. We imagine, but we do not put the pieces together as a whole. No simulation game examines and extrapolates planned policy changes.

Time is ripe for massive multiplayer online policy simulation games. MMO policy simulation games anticipate the consequences of suggested solutions and help to find jointly good solutions for urgent problems. The concept has potential applications in a wide scale in policy making and institutional change.

Specifications:

» Special characteristic: sound policymaking using facts, models, and simulation games.
» Time covered: 4-50 years
» Type of simulation: internet based distributed simulation game, with integrated face-to-face simulation game sessions
» Number of players: 1 to millions
» Playing time: 1 day to 6 months
» Validity:

  _ By nature, such simulations can never claim to provide precise projections of future developments. They can, however, combine all existing data, and the decisions of the participations in a dynamic simulation model.

  _ The reliability of any results is to be checked by systematic sensitivity analyses, thus identifying the probability ranges of the generated results.

» First project (Table 1): Swiss energy-tax MMO policy simulation game. Swiss citizens will soon vote on a political initiative that demands to replace the value-added-tax (VAT) by an energy-tax. The supporters expect a reduction of energy consumption, as well as a reward for individuals and companies who use energy efficiently. The Swiss energy-tax MMO policy simulation game replaces the traditional pro-con-campaigns and discussions that take place usually in the months prior to such a referendum. Citizens run the simulation, test the arguments, explore scenarios, and weigh the benefits and risks of a change. They compare future developments employing either the traditional VAT or the new energy tax. And finally, citizens will base their vote on more than vague imagination. They will decide based on a sound evaluation of the Gestalt of two alternatives.

4 Conclusions

We have seen many new types of simulation games that might help contribute significantly to build a sustainable world. The prototype projects might be funded by a Jackpot of EUR 250m. The chance to win the Jackpot is tiny. Having depicted the bold outline, maybe it becomes clearer where to start with small, realistic first steps. Richard Duke set out for a courageous journey in his book, 40 years ago. The complexity of the world has continued to grow. The challenges lying ahead still ask for multilogue and Gestalt communication.

I hope to have contributed with this article some direction and inspiration on how to proceed. The task ahead has many levers for committed people to use. When completed, the task would definitely put the CPM (you remember, couch potato model) upside down. By a slight modification of its third characteristic: Instead of "3. The bottom of the bowl becomes visible, destroying the illusion of endless availability. The couch potato ***slows down the pick speed.***" it would then read: "The bottom of the bowl becomes visible, destroying the illusion of endless availability. The couch potato ***adapts the pick speed to his needs and limits, and to the availability of chips in the kitchen.***" Sounds simple. Sounds like a task for a generation.

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LOOKING BACK FORTY YEARS – MEMORIES OF ISAGA

Dmitry Kavtaradze

Editor's Note: In this article, Dmitry has captured important lessons he has gained from attendance at many ISAGA conferences. He presents a few of these memories and recalls the individuals who were central figures at specific conferences. Over time, most of the participants have become colleagues and good friends. Dmitry sends his thanks and has requested "old friends attending ISAGA 2014 to give dozens of hugs for old times sake". In short, Dmitry has created a 'Poem for ISAGA'

Games are one of the oldest meaningful human activities. We are not born as "gamenauts". Rather, one must follow the game trail. One needs to place some sticks along the way to be sure that you are really on the right track. When sticks are in the proper place, you need to be thankful to leave some of your humanity there.

In Table 1 '"What ISAGA members and their milieu shared with me" I have identified specific lessons learned at various ISAGA conferences and named people who remain central in my mind. Those who are named in this chart were instrumental in placing 'sticks along the way'. My apologies go to many others who I can no longer recall.

Table 1 Chronic "What ISAGA members and their milieu shared with me"

Year	ISAGA members	Lessons from ISAGA
Sofia 1973	Dennis Meadows, Cathy Greenblat, John Gagnon, Norio Baba	Mode of game delivering as interaction and dynamic activity: "Commons Game". My game "Developing Without Destruction" was recognized. "Climate change" game is possible and coming. The scale of games is huge and may be endless.
Weimar 1989	Moorhead Kennedy, Martha Keys	Deep personal mastering level first, game design possible latter: "Hostage Crises", "Death of the Decedent"; complex societal problem possible to present by instruction booklet, PC is not necessary. Terrorism is a tool of the poor (now it has changed).

Durham 1990	Dennis Meadows, Cathy Greenblat, John Gagnon, Diana Shannon, Christina Rolley, Dick Duke, Frederick Goodman	Modeling possibilities are potentially endless. "Petals and Roses" is enough to be used as ABC introduction to gaming. Shifting from observation (film, case) to causal diagram and SD model is a good mode of understanding. The result of the game appears clearly at the very end ("FishBanks Ltd.", "Pomp and Circumstances"). Debriefing shifts you from how to act, how to win, how to understand what really you were doing. Time is resource that could be represented in the game as "time-ticket". Body contact is important for coherent behavior. Hands and body are speaking not less efficient than your tongue. The urban milieu is a great field for modeling.
Kyoto 1993	Kioshi Arai	Voting is a subject of modeling. Architects use simple wooden pieces to plan town.
Ann Arbor 1994	Dick Duke, Frederick Goodman	Desktop computer models might have bad character, prototypes need to be done at home. Even university student note on the wall on ISAGA conference might give you ideas for a game design.
Valencia 1995	Pier Corbeil, Amparo Garcia	Animal's behavior is easy to model even in big class (Babuin Papio). Human ethnic behavior is inside of almost all of us and easily could be demonstrated as not rationale controlled ("Rose and Blue").
Riga 1996	Dick Duke	ISAGA DWD project appears; collect several S&G designed by participants for shareware.
Tilburg 1997	Jac Geurts, Cisca Jolsdersma	Complex systems need extra time for run-in. Games train us to support each other.
St. Petersburg 1998	Markus Ulrich	Cooking PC and board game for education in sustainable development.
Sydney 1999	Elyssebeth Leigh	Even extra event – Olympic Games, needs simulation games in preparation. Case of terrorist attack at National Olympic Committee "Crisis Center" successfully modeled combining different instruments, milieu: video, real artist, radio, phone communication, staff conversation. In such simulation usual boundaries of perception "it is not real" disappears. Trainees might design games good for publishing. Simulation of conflict possible to demonstrate an easy way ("Reasonable Force"), "Fire in Australia"
Tartu 2000	George Simmons	Human population unconscious sense could be demonstrated "here and now". ISAGA participants, students and authors of the games from International University (Moscow) are capable trainers in local authority schools (Elena Smirnova, Vladimir Sidorenko, Serge Kavtaradze).
Munich 2004	Willy Kriz	Simulation that you meet at the city festival ("How to feel as very old person") is good for education at university.
St. Petersburg 2007	Yuli Porkhovnik	Technical disaster is important issue to be modeled ("Fire on the Ship", Dutch game).
Nijmegen 2010	Vincent Peters	Support in complicated simulation game is a two-way road.

Spokane 2010	Teach couple, Elizabeth Tipton	Small pieces need to be different and make participants concentrated on the actions within a game. 'Things' keep you busy and you act with certainty. Students are "addicted to repeat mistakes" several times (up to 7) even after corrections (medical faculty center and police training center). First stage school person (Teach grandson) with family experience in gaming and supported by home consultations is capable to design board game.
Warsaw 2012	Marcin Wardaszko, Jagoda Gandziarowska	Simple tools keep you close to the reality in immersing in the game milieu: "Living with garbage" game and "Flood disaster"
Stockholm 2013		Understanding market system by repeating activity, moving goods, changing markets etc. understanding is result of activity, not formal knowledge of the rules (Japan team game).

In addition to those mentioned above, I must acknowledge the classes taught by ISAGA veterans. They provided a chance to learn important lessons. This helped me understand the art and craft of game design: insight, fantasy, headaches and postponed success.

A few paradoxes I have observed at various ISAGA conferences:

» Designer who are physically disabled are able to create fruitful games.
» Individuals spontaneously invent "frame-games".
» Deliver games to the local community and faculty will get involved.
» Understanding through games is faster than traditional learning.
» Simulation games are "endless" until humans interact productively.

Rules learned from ISAGA (and from Cathy Greenblat, Dennis Meadows, Dick Duke and all those who gave without taking back.) Here are some of the discoveries:

» Games can be produced by working on your own at the kitchen table.
» As you need can-opener for food you need a game-opener to foster participation.
» Gaming is the mode of thinking through doing: the game is the tool for thinking.
» Gaming design keeps the 'family' united as they capture ideas.
» Supporting tools are graphics, drawings, paper, color, simple 3-D constructions
» Do not push newcomers in gaming, but allow them to help.
» A short game is always better (Mark Twain: "Young cub is better than old paradise bird").
» Test the game ten times (Dick Duke - 12 times), one time-publish.
» Listen first, speak second.
» Involve newcomers by acting in the game, not by explaining and explaining.

» Keep all working copies as long as possible: sometimes they start to speak to you.
» Game is the first human invention, second is art.
» Believe by helping.
» Smile.
» Be ironic.
» Don't afraid to be stupid.

Wishes for ISAGA:

» Stay as an international professional association.
» Encourage ISAGA inspired games for the annual conference including open publishing and distribution.
» Value and keep accessible only the best of these games.
» Continue the Summer and Winter game design schools.

After years of practice and many ISAGA conferences it has became possible to design up to 15 educational simulation games; also to produce an educational kit with a set of 20 games "The Green Bag"(2004). An additional accomplishment has been the ability of the studios participants to write and publish a book that covers part of the philosophy and practice of game design process "The Games Studio: Craft and Art" (2013).

The most brilliant result was meeting super bright participants and educators who became my dear friends. All, really all, are united by ISAGA that started 45 years ago.

Thank you Richard Duke!

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