

# The future of simulation games: Issues and challenges

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## **Abstract**

Issues and challenges for the future development and application of games for production management are discussed, based on the results of a group work session at the closing of the workshop. A general model is used to discuss trends in industry and to identify key elements of designing, operating and validating simulation games. New types of simulation games may contribute to meet these trends. However, it will require that new focal areas be included and new elements be developed. The paper will discuss the direction of this development.

## **Keywords**

**Simulation games, facilitator role, debriefing, modeling, validation**

## 1 INTRODUCTION

In an effort to identify issues and challenges for the future development and application of simulation games in the area of production management, we have prepared a model which identifies some of the key elements of designing, operating and validating simulation games, cf. Figure 1.

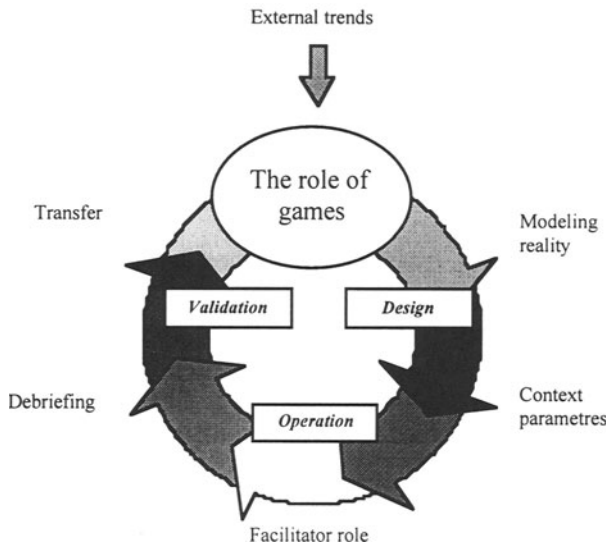


Figure 1. A model of key elements of designing, operating and validating simulation games.

We start by looking at trends in industrial enterprises to identify challenges for future roles of games, e.g. which areas and topics should be addressed, which qualifications are needed, and which learning processes should be emphasized.

Thereafter, we discuss the main elements of designing, operating and validating simulation games, respectively modeling reality and some context parameters for the games, the facilitator role, debriefing, and validation as well as transfer of the learning results.<sup>1</sup>

## 2 TRENDS IN INDUSTRIAL ENTERPRISES AND THE ROLE OF GAMES

We have identified three trends in the conditions for industrial enterprises as well as in the ways universities generate and transfer knowledge, which in particular may affect the development of simulation games.

<sup>1</sup>This chapter has been prepared on the basis of a group discussion held at the end of the workshop. Mari Ventä and Juha-Pekka Mäkelä from Helsinki University of Technology have recorded and summarized the discussion. A draft version of the chapter has been circulated to the participants for comments and suggestions. The authors hope that the chapter captures the essential points of the discussion among the participants.

## **2.1 Globalization**

In the past decade there has been an increased internationalization of trade. This has also led to an increased globalization of product development and formation of global networks of production facilities, enabled through the rapid advancement of telecommunication technology. This development calls for a better understanding of the operation of complex business networks. Could simulation games be developed to address these challenges?

At universities, international networks and cooperation will proliferate, and the concept of the IT-enabled virtual university will become substantiated. Simulation games offer several ways of stimulating learning and training in a global setting.

## **2.2 Integration**

The increased pressure in industry to shorten delivery time and, yet, be able to increase quality and productivity has strengthened the need to integrate the work across disciplines and functions. New organizational forms and working modes have to be introduced and practised. This suggests that the focus of simulation games be directed towards integration of disciplines and functions, and also, as a consequence, address holistic thinking.

Also at universities, integration will be a key issue in the near future. First, students should be trained to meet the challenges of industry, e.g. to address technical and social issues, to integrate various disciplines and functions (e.g. mechanical and electrical engineering design, marketing, production engineering, organizational and economic aspects). Second, there is a growing demand for combining theory and practice at universities.

Could simulation games be used as a vehicle for integration both in industry and universities? For example, could customers be involved in a game to create a better understanding of customer needs; could practitioners play with students to offer opportunities for mutual exchange of ideas and experience; or could a game prepare students to cope with future integrated production systems?

## **2.3 Change management**

Increasingly industrial enterprises will be met by a quest to be able to change their operation with great speed and precision. Change will be the norm. In some instances an incremental improvement effort is sufficient to cope with external challenges. But in other situations a more radical re-engineering is warranted, e.g. a shift in the basic production management principles. Increasingly, we believe that there will be a need to train students to engage in innovative engineering design efforts.

In addition, in many countries there is a wide-spread appreciation of the need to involve employees not only in the daily operation, but also in development activities. This will require that employees be actively involved early in the change process to create increased awareness of the need to change. Employees should be

empowered to take initiatives in the intricate mutual interplay of actors and systems which will characterize the modern industrial organization.

Simulation games have already demonstrated a capability to help create a common understanding of present processes, which is the critical starting point of any change project. The globalization and integration trends constitute challenges for the development of simulation games that efficiently support the creative experimentation and innovation of future production systems.

## **2.4 Challenges for the role of games**

The indicated trends of industrial enterprises point to new roles which simulation games may play. New opportunities are:

- Games to illustrate international networks of vendors, production facilities and customers
- Games to train in holistic thinking
- Games to create an interaction of disciplines and functions, and industrialists and students, and to stimulate integration
- Games to stimulate creative thinking
- Games to illustrate future production systems
- Games to empower employees to take initiative in the complex setting of industrial enterprises

The general objectives of a game include learning, creating a good cooperative attitude, sharing tacit knowledge, understanding and developing patterns of organizational behaviour, changing personal behaviour, enhancing creativity, and enabling communication. To fulfill these objectives and to become a useful development methods, games have however to be carefully designed and facilitated.

## **3 MODELING REALITY**

A key issue of modeling is the capturing of complex phenomena in such a way that it can be communicated to others. If the model is too detailed and complex, very few will take the time and effort needed to understand the model. On the other hand, if the model is very simple and general, it does not reflect the nature of reality.

The same argument holds for simulation games. Experience shows that a game does not need to give a perfect picture of reality. The challenge is to select an appropriate focus for the game, and extract and model the essential properties of reality which are sufficiently rich to reflect reality for participants. Apparently it is more important that players experience a familiarity with the simulation environment and context than that the game is a true replica of reality.

With a view to the subsequent transfer of game results to reality, it is important that industrialist players can identify their own professional situation (company, department, market ...) in the game, or that students accept that the game portrays

a realistic industrial situation. Several contextual factors influence the design of a game and offer opportunities as well as constraints.

### **3.1 Time and cost**

In the past decade there has been a pressure to reduce the time necessary to run a game. Previously, a game run in an enterprise would typically last for two or three days, whereas the time limit for a game today more likely is one full day. At universities, the time slots available for lectures and exercises are often difficult to change.

Cost constraints are also imposed, especially at universities, not only with respect to the acquisition of a game, but also the manpower needed for running the game.

### **3.2 Technology**

Modern technology, in particular information technology, offers great possibilities for playing simulation games in new ways; for example telecommunication networks, virtual reality and graphical presentations of data.

However, there is a risk of shifting focus away from the game itself when advanced technology is used. On the one hand, technology may be instrumental in visualizing the game model and its dynamics. But, on the other hand, there is a risk that technology may hide some aspects of the model that previously were made visible in the manual games; e.g. the face-to-face discussion between players, or the concrete experience from physically doing things in the game, which are essential for the externalization of tacit knowledge.

Using simulation games to demonstrate the operation of an international network organization represents a major challenge to simulate activities that the players cannot see with participants they do not know. Is telepresence sufficiently interactive, emotional and close? Such issues need to be addressed.

### **3.3 Participants**

The motivation and attitude of the participants is of course important for the success of a simulation game. Some games use PC software or standard production management systems applications, which require prior knowledge of participants in order to enable them to concentrate on the game. However, many games have no pre-requisites with respect to prior knowledge, which will allow the game to be run with different categories of employees from top managers to workers on the shop floor. This may be more frequent in the future, as a means to stimulate the vertical communication and learning in industrial organizations.

Often employees are not challenged to be creative in their job and consequently may be reluctant to engage in such an activity in a game. However, simulation games provide a setting with a mixture of fun and sincerity in which it is safe to make experiments without losing face. The need to stimulate creative and innovative behaviour mentioned above may be included in most games, in enterprises as well as in universities.

## 4 FACILITATING AND DEBRIEFING SIMULATION GAMES

### 4.1 Facilitator role

The important role of the game facilitator has perhaps not been sufficiently stressed in the past. It is very much different from the traditional role of a teacher or lecturer, because the facilitator must be sensitive to the behavioural processes during the game and let the participants live the situations of the game like in reality. The facilitator should also be capable of intervening when needed, e.g. to stop the game for a time-out. During debriefings important incidents should be discussed and reflected upon, and theoretical knowledge should be presented when appropriate to enlighten the discussion. Facilitating requires special talents that should be consciously developed and trained.

At universities the role of teachers is likely to change in the future from that of a lecturer to the role of a coach, as students will become more involved in project work and self-driven learning activities. We see a general trend at universities away from focusing exclusively on theoretical knowledge towards also including application aspects, and even training proficiencies in coping with industrial issues - individually and collectively.

This shift of teachers' role is conducive to letting more teachers be trained as facilitators. In general there is a need to put increased emphasis on training of teachers to be proficient in the role of a coach or a facilitator.

Concerning games in enterprises, the question whether to use an external or an internal facilitator has been discussed at length. However, there is general agreement that it is important that the facilitator and the game fit together.

As already pointed out, there is a need to develop games which support creative thinking. However, this puts pressure on the facilitator. For example, in cases where the game includes process improvement aspects, the facilitator should know the game well enough to guide the participants in their experimentations for new process designs. If the actual game is not capable of accommodating innovative solutions in a certain area, the facilitator should direct the participants in other directions, and maybe save the original ideas to be discussed in debriefings. Participants may become quite disappointed, if the game cannot allow them to include their creative ideas, especially if the game facilitator has encouraged creativity.

### 4.2 Debriefing

Ordinarily, the periods during which the game is run are considered the most essential and consequently should take up most of the time. An alternative view states that the running of the game merely is a necessary step to provide a common experience for the debriefing period. In any case, the debriefing is essential for achieving the objectives of the game.

Some of the elements of debriefing include:

- Analysis of incidents of the game session, including exchange of information to create a commonly shared understanding of what went on
- Reflection on the meaning of the incidents to contribute to a collective learning process
- Transfer to own situation, e.g. by comparing the incidents in the game with those of the participants' daily work
- Development of new solutions, either an improvement on the basis of the current system, or an innovative solution.

If the game is run at different geographical locations, special means should be adopted to ensure a collective learning process during the debriefing sessions, e.g. interactive video, and joint exercises for analysis and improvements.

## 5 VALIDATION AND TRANSFER

The methodology of design and operation of simulation games has a weak point, namely validation. The game model itself as well as the results of the game compared to the formulated objectives need to be validated. Also the transfer of the experience gained and the learning taken place to the reality of the participants have to be followed up and researched.

At universities we need better methods for assessing under which circumstances a simulation game may lead to more effective and efficient learning processes compared with lectures, case studies and projects, and which combinations should be recommended.

Especially in the field of simulation games for production management, the systematic validation of the games run is often neglected. As a consequence, evaluation methods are not well developed, and will require a great effort with respect to data collection and analysis. Development of new types of games for international production networks and for stimulating creativity will make it even more difficult to define appropriate measures of success. Further research is needed in this area.

The simulation game itself may not change anything. Only when the results are transferred to the situations of the participants, a change in attitude, knowledge and behaviour may take place. Several elements affect this transfer, e.g. the way in which the role and objectives of the game are defined, the game model and its realization, as well as the debriefings.

## 6 CONCLUSION

Industrial enterprises face the trends of increased globalization and integration across disciplines and functions. A more effective and predictable change management is needed which requires creative thinking, and continuous organizational learning.

Simulation games may contribute to meet these challenges both in industry and at universities. However, it will require that new focal areas be included in the simulations, such as international network organizations and new technology. New challenges must be coped with when designing, operating and validating games so that they meet the requirements for efficient learning and creativity. For example, we have pointed out that new ways of running the simulations and carrying out the debriefings in a geographically dispersed group of participants will call for the application of new telecommunication means.

We hope that a continuing development effort from researchers, designers as well as users of the games results in new innovative simulation games and methods to enhance experimental learning and innovation in production management.

## 7 REFERENCES

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