



universität
wien

DIPLOMARBEIT

Titel der Diplomarbeit

„Management Games:
A powerful tool to teach competence and knowledge?“

Verfasserin

Barbara Panosch

Angestrebter akademischer Grad

Magistra der Sozial- und Wirtschaftswissenschaften
(Mag. rer. soc. oec.)

Wien, im November 2008

Studienkennzahl lt. Studienblatt:
Studienrichtung lt. Studienblatt:
Betreuer/Betreuerin:

157
Internationale Betriebswirtschaft
Univ.-Prof. Dr. Marion Rauner

Eidesstattliche Erklärung

Ich erkläre hiermit an Eides Statt, dass ich die vorliegende Arbeit selbstständig und ohne Benutzung anderer als der angegebenen Hilfsmittel angefertigt habe.

Die aus fremden Quellen direkt oder indirekt übernommenen Gedanken sind als solche kenntlich gemacht.

Die Arbeit wurde bisher in gleicher oder ähnlicher Form keiner anderen Prüfungsbehörde vorgelegt und auch noch nicht veröffentlicht.

Wien, im November 2008

Unterschrift

(Barbara Panosch)

Danksagung

Da mit dieser Diplomarbeit das Ende meines Studiums erreicht ist, möchte ich mich bei einigen Personen die mich während meiner Studienzeit unterstützt und begleitet haben auf das herzlichste bedanken.

Als erstes möchte ich meiner Betreuerin ao. Univ. Prof. Dr. Marion Rauner für ihre volle Unterstützung und Hilfe bei der Erstellung dieser Arbeit ein Dankeschön aussprechen.

Ein weiterer Dank geht an Mag. Markus Kraus für das Lesen dieser Arbeit und für seine Unterstützung.

Ein Dank an meine Freunde Claudia, Carina, Elisabeth, Tamara, Kathi W., Kathi B., Robert und Andi, ohne die das Leben auf der Uni nie so viel Spaß gemacht hätte.

Mein größter Dank gilt jedoch meiner Familie - an Jakob, der in jeder stressigen Situationen in all den Jahren mit seiner liebevollen Art stets mein Ruhepol war und an meine Eltern ohne deren Unterstützung der Traum vom Studium nie möglich gewesen wäre.

TABLE OF CONTENT

I. TABLES	IV
II. TABLE OF FIGURES	VII
III. LIST OF ABBREVIATIONS	VIII
1. AIM AND PROBLEM DEFINITION	1
2. INTRODUCTION	3
2.1 The demand for management games	3
2.2 Simulations and games in general	4
2.3 Types of games	5
2.4 Process structure of management games	9
2.5 Configuration of management games	10
2.6 Purposes of games	11
2.7 Literature review	12
2.7.1 Simulation and gaming associations	12
2.7.2 Journal review	14
2.7.3 Basic literature on management games	15
3. THE DEVELOPMENT OF MANAGEMENT GAMES	18
3.1 The ancestry of business games	18
3.2 Modern management games	20
3.3 Four main management games in modern history	25
3.3.1 The Top Management Decision Simulation	25
3.3.2 The Business Management Game	25

3.3.3 The Top Management Decision Game _____	26
3.3.4 The Carnegie Tech Management Game _____	26
3.4 The emerging trend of Internet-based management games _____	27
3.4.1 Characteristics of Internet-mediated games _____	30
3.4.2 Advantages of Internet-mediated management games _____	31
3.4.3 Literature Review _____	32
4. EXPERIENTIAL LEARNING _____	35
4.1 The importance of learning _____	35
4.2 Learning through management games _____	39
4.3 Debriefing management games _____	40
4.4 Advantages of games _____	42
4.5 Literature review _____	44
5. METHODOLOGY FOR CLASSIFYING MANAGEMENT GAMES _____	49
5.1 Literature _____	49
5.2 Taxonomy of management games _____	50
6. THE APPLICATION AREA OF MANAGEMENT GAMES _____	54
6.1 A paper study on management games _____	55
6.1.1 General classification attributes _____	56
6.1.2 Application area of management games _____	58
6.1.3 Target Groups _____	60
6.1.4 Decisions in management games _____	61
6.1.5 Media of communication _____	63
6.1.6 Evaluation of management games _____	63
6.2 Online management games _____	65
6.2.1 General classification attributes _____	66
6.2.2 Application area of online management games _____	68

6.2.3 Target groups	69
6.2.4 Decisions in management games	69
6.2.5 Media of communication	70
6.3 Companies offering business game solutions	71
6.3.1 General classification attributes	71
6.3.2 Application area of business game solutions	72
7. MANAGEMENT GAMES IN HEALTH CARE	74
7.1 Education in health care	74
7.2 Literature review	77
7.3 The development of simulation and games in health care	80
7.4 A paper study on management games in health care	82
7.4.1 General classification attributes	83
7.4.2 Application area of management games	85
7.4.3 Target Groups	86
7.4.4 Decisions in management games	87
7.4.5 Media of communication	89
7.4.6 Evaluation of management games	90
8. SUMMARY	94
9. LIST OF LITERATURE	98
10. ANNEX	110

I. Tables

Table 1: Benefits of e-learning over traditional classroom methods	3
Table 2: Classification for games and simulations	5
Table 3: Simulation and gaming associations	14
Table 4: Journal search	15
Table 5: Selective overview papers about management games	16
Table 6a: Management games around 1961	22
Table 6b: Management games around 1961	23
Table 6c: Management games around 1961	24
Table 7: Popular management games in 1977	24
Table 8: The development of the Internet	28
Table 9: Supply and demand factors of learning over the Internet	31
Table 10: Overview papers on management games and the Internet	32
Table 11: Relationships in experiential learning	37
Table 12: Aspects and attributes of learning	40
Table 13: Advantages of management games	43
Table 14a: Effectiveness of Games	44
Table 14b: Effectiveness of Games	45
Table 15: Used databases	49
Table 16: Overview on used keywords	49
Table 17: Used journals for classification	50
Table 18: General classification attributes for management games	51
Table 19: Application areas of management games	51
Table 20: Target groups of management games	52
Table 21: Decisions in management games	52
Table 22: Media of communication of management games	53
Table 23: Evaluation of management games	53
Table 24: Simulation and game usage in % at the AACSB member schools	54
Table 25: Management games disciplines	54
Table 26: List of management games studied	55
Table 27: General model of management games studied	56
Table 28: Complexity of management games	56
Table 29: Interactivity of management games	56

Table 30: Structure of participants	56
Table 31: Management game analysis	57
Table 32: Availability of management games	57
Table 33: Time aspect in management games	58
Table 34: Application area of management games studied	58
Table 35: Target groups of management games	60
Table 36: Decisions in general management games	61
Table 37: Decisions in functional management games	62
Table 38: Media of communication in management games studied	63
Table 39: Evaluation of management games	63
Table 40: Different evaluation methods of management games studied	64
Table 41: Online played management games	66
Table 42: General classification attributes	66
Table 43: Application area of management games	68
Table 44: Target groups	69
Table 45: Decisions in management games	69
Table 46: Measurements of success of management games	70
Table 47: Media of communication	70
Table 48: Illustrative overview about companies offering business game solutions	71
Table 49: General classification attributes	71
Table 50: Application Area	72
Table 51: Other offered solutions	73
Table 52: Different simulation techniques in education	76
Table 53: Different simulation tools in medical education	76
Table 54: Overview of different medical education types	77
Table 55a: Simulation and games in health care	77
Table 55b: Simulation and games in health care	78
Table 56: Early management games in health care	80
Table 57: Illustrative health care games around 1980	81
Table 58: Games studied in health care	82
Table 59: General model of studied games	83
Table 60: Complexity of management games	83
Table 61: Interactivity of management games	83
Table 62: Time horizon of management games	83

Table 63: Participants in management games _____	84
Table 64: Management game analysis _____	84
Table 65: Availability of management games _____	84
Table 66: Application area of management games studied _____	85
Table 67: Target groups of management games _____	86
Table 68: Decisions in general management games _____	87
Table 69: Decisions in functional management games _____	88
Table 70: Media of communication in management games studied _____	89
Table 71: Evaluation of management games _____	90
Table 72: Different evaluation methods of management games _____	91

II. Table of figures

Figure 1: Classification for business games	7
Figure 2: Different simulation models and elements of management games	8
Figure 3: Action and reaction relationship	9
Figure 4: Different simulation types referring to their level of formalization	9
Figure 5: Configuration of management games	10
Figure 6: The history of management games	21
Figure 7: Internet users from 1997 to 2003	28
Figure 8: Time - Distance - Matrix	29
Figure 9: Learning, according to Kolb	36
Figure 10: Learning after Argyris	37
Figure 11: Experiential learning cycle	38
Figure 12: Taxonomy for classifying management games	50

III. List of Abbreviations

ABSEL	Association for Business Simulation and Experiential Learning
ACRM	Anesthesia Crisis Resource Management
A&HCI	Arts and Humanities Citation Index
AMA	American Management Association
BG	Board Game
C	Computer
DiGRA	Digital Games Research Association
EZB	Elektronische Zeitschriftenbibliothek
FM	Functional Management
HPS	Human Patient Simulator
ISAGA	International Simulation and Gaming Association
LM	Low Management
M	Manual
MARS	Marketing Simulation
MEDLINE	U.S. National Library of Medicine
MM	Middle Management
NASAGA	North American Simulation and Gaming Association
RAND	Research and Development Corporation
R&D	Research and Development
SA	Self Administrated
SAGSAGA	Swiss Austrian German Simulation and Gaming Association
SAGSET	The Society for the Advancement of Games and Simulations in Education and Training
SCI	Science Citation Index
SSCI	Social Science Citation Index
SMS	Strategic Management Simulation
TM	Top Management
WWW	World Wide Web

1. AIM AND PROBLEM DEFINITION

This diploma thesis will discuss if management games are as an important and powerful tool for teaching competence and knowledge. Hence, the following research questions were created to confirm the statement above:

- Do management games have a long history or are they just a current phenomena and are there any trends which can be observed that could lead to the assumption that management games are important in management education?
- What are the advantages of that learning method in comparison to traditional ones?
- Is it possible to create a taxonomy for classifying management games to compare them on a standardized level?
- Are management games already established and accepted in the healthcare sector for teaching competence and knowledge?

The introduction discusses the increasing demand for management games, the differences between simulations and games, different types of games, their process structures and configurations as well as a literature overview about management games. Another focus will follow the history and development of management games, from their earliest uses to modern management games, and, finally, the emerging trend of playing management games over the Internet.

Since playing management games are a part of experiential learning, attention will be given to learning in general, learning through management games, debriefing after games, advantages of management games and a literature review, discussing the effectiveness of the games.

A special focus will be given to the health-care sector, including a literature review on management games in that area and the development of games in that sector.

A taxonomy is created and will classify and study management games from different sectors referring to different attributes.

Finally a summary concludes the most important facts and research questions.

1. ZIEL UND PROBLEMFORMULIERUNG

Die vorliegende Diplomarbeit geht der Frage nach, ob Planspiele ein wichtiges Medium in der Management Ausbildung sind, um Kompetenz und Wissen zu erlernen und zu vermitteln. Um dieser übergeordneten Frage nachzugehen wurden folgende Überlegungen aufgestellt:

- Haben Planspiele schon eine lange Geschichte oder sind sie ein aktuelles Phänomen? Lassen sich in der Literatur irgendwelche Trends erkennen aufgrund derer bestätigt werden kann dass Planspiele auch in Zukunft eine Rolle spielen werden?
- Lässt sich eine Taxonomie kreieren um Planspiele nach verschiedenen Gesichtspunkten zu klassifizieren?
- Sind Planspiele im Gesundheitswesenbereich vorhanden und als wichtiges Medium in der Ausbildung von Personal etabliert?

Einleitend wird erklärt dass aufgrund von verschiedenen Faktoren eine Nachfrage nach Planspielen existiert. Des weiteren werden Simulationen von Spielen unterschieden und die verschiedenen Typen von Spielen erörtert. Prozessstruktur und Konfiguration von Planspielen werden ebenfalls festgehalten. Auch der Grund warum Planspiele überhaupt gespielt werden wird erklärt und abschließen ein Literaturüberblick über Planspiele gegeben. Des Weiteren wird der Entwicklungsprozess von Planspielen erörtert. Angefangen von den Vorfahren welche bis in das Jahr 3000 v.Chr. zurück gehen, über moderne Planspiele seit den 50er Jahren und schließlich der Trend das Planspiele heutzutage häufig über das Internet gespielt werden.

Da Planspiele das experimentelle Lernen betreffen soll auch diesem Gebiet ein Kapitel gewidmet werden. Lernen durch Planspiele, das Evaluieren von Planspielen als auch deren Vorteile werden beschrieben. Ein Literaturüberblick betreffend der Effektivität von Planspielen rundet dieses Kapitel ab. Des Weiteren wurde eine Taxonomie zu Klassifizierung von Planspielen entworfen und nach den ausgewählten Merkmalen klassifiziert.

Eine Zusammenfassung der wichtigsten Punkte und Erkenntnisse sowie die Beantwortung der oben angeführten Forschungsfragen, runden diese Diplomarbeit ab.

2. INTRODUCTION

Management games are an essential tool in management education. The use of modern business games began around 1950 and the appearance of e-learning and the Internet increased the potential of this tool, which the following table 1 clarifies (Summers 2004).

Table 1: Benefits of e-learning over traditional classroom methods

Benefit	Percentage
Available anytime and anywhere	80%
Cost saving	65%
Allows learning in own pace	57%
Just in time learning is possible	52%

Source: “2001 E-Learning User Survey” in Summers (2004, p. 217)

2.1 The demand for management games

Growth in the business-simulation industry is indisputable and several trends confirm it. Business practices, such as new information technologies, strategic alliances, globalization and the Internet, led to an increase in training managers in competence and knowledge. New technologies such as computers and the Internet opened the possibility of learning anytime, anywhere and at the participant’s pace. Furthermore, these technologies lowered prices of simulation-based training, because learning in classrooms and seminars became no longer necessary (Summers 2004).

Summers (2004) also mentions three basic advantages of these technologies:

- **Specific knowledge:** Participants of business simulations can be trained in topics they need and companies have the opportunity to coordinate training with their strategies. Furthermore, companies can receive customized business solutions with specific initiatives.
- **Learning on demand:** Because games and simulations can be played anywhere, it becomes possible to learn on demand. Furthermore, every person learns at their own speed, and playing management games on computers removes this obstacle. In addition, these training methods can be integrated into regular work, which would not be possible using classical learning methods such as seminars.

- Cost: Learning with new technology is less costly than classical learning methods. There are no travel costs or absences from work to attend seminars. Feedback can be provided through the computer, meaning no expert is required. Furthermore, software updates of customized solutions are often inexpensive.

2.2 Simulations and games in general

It is common for “simulations” and “management games” to be considered synonymous. It is true that the core model of a management game can be defined as a simulation model, but this is only a small part of what is called a management game (Watson and Blackstone 1981).

One definition for the term “game” comes from Dempsey et al. (2002), and says *“a game is a set of activities involving one or more players. It has goals, constraints, payoffs, and consequences. A game is rule-guided and artificial in some respects. Finally, a game involves some aspects of competition, even if that competition is with oneself”* (Dempsey et al. 2002, p.159).

One definition given by Dill et al. (1961) says that *“A business (management) game is a contrived situation which imbeds players in a simulated business environment, where they must make management-type decisions from time-to-time, and their choices at one time generally affect the conditions under which the subsequent decisions must be made”* (Watson and Blackstone 1981, p. 484).

Shim (1978) made a distinction between simulation models and management games, which says, *“The distinction between a simulation and a game is a subtle one. Both are mathematical models, but they differ in purpose and mode of use. Simulation models are designed to simulate a system and to generate a series of statistical results regarding system operations. Games are also a form of simulation, except that in games human beings play a significant part. In games, human beings make decisions at various stages and games are distinguished by a sense of play. Major goals of game play are to improve decision-making skills and to facilitate an understanding of the game environment simulated by participation of the players”* (Watson and Blackstone, 1981, p. 484).

Elington et al. (1982) wrote that a game has to include some kind of competition and must have rules and guidelines. They classified games and simulations like mentioned in table 2 (Klabbers 2003):

Table 2: Classification for games and simulations

Pure Types	Hybrids
Pure games	Simulation games
Pure simulations	Simulated case studies
Pure case studies	Game used as case studies
	Simulation games used as case studies

Source: Klabbers (2003, p. 60)

Summarizing, it should be noted that the distinction between games and simulations is often blurred. After all, simulations and games have an underlying model, with constraints on participants' actions. In a game, winning or losing characteristics are added and participants have to reach some kind of goal and often they have to do so with limited resources (Leemkuil et al. 2003).

2.3 Types of games

One of the earlier classifications of games came from Eilon (1963), who distinguished between the following characteristics of games:

- Total enterprise or functional enterprise
- Non-interacting or interacting
- Non-computer or computer

A more detailed classification of management games follows:

General management games versus functional management games: In general management games, the players' decisions refer to strategic decisions such as research-and-development expenditures, promotion strategies or establishing prices. Functional management games refer to decisions for special activities of a single functional area, with the goal to improve the players' knowledge and skills in that specific area (in a logistic game only logistic decisions are required, for example). General management games often refer to top-management

decisions whereas functional management games handle middle-management decisions (Watson and Blackstone 1981).

Specific industry games: These kind of games are often developed by companies to train their employees in skills of their specific industry and can include top-management decisions and middle-management decisions (Watson and Blackstone 1981).

Simple versus complex games: Games vary in their complexity, meaning that some games include only several decisions and other games includes hundreds of decisions. It should be noted that simple games with fewer decisions are better for learning (Watson and Blackstone 1981).

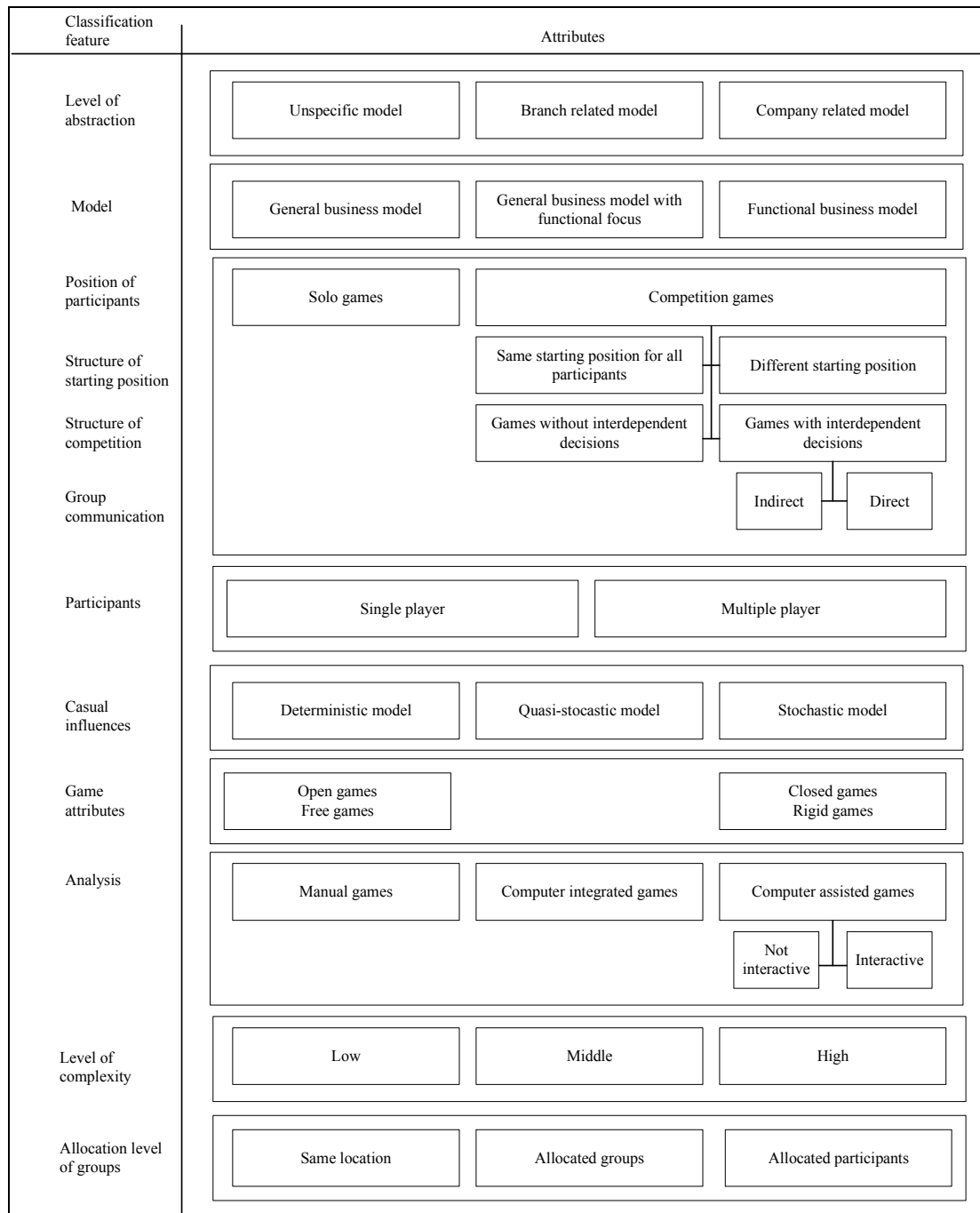
Interactive versus non-interactive games: In interactive games, decisions made by players affect the outcome of other players (if several companies compete in the same market, for example). In non-interactive games, decisions made by the participants do not affect the decisions of other players and no direct competition exists (Carls and Koeder 1988).

Deterministic versus probabilistic games: Most games are deterministic ones and include decisions in which the outcomes are determined only by the decisions themselves and not by chance elements. Sometimes games are probabilistic, meaning that features such as strikes or material shortages are included (Watson and Blackstone 1981).

Computer versus manually scored games: The decision if a game should be computer-based or a manual one depends on the game's goals. Costs for developing the game, the software and computers should be considered (Watson and Blackstone 1981).

Also, Kern (2003) provides a classification for business games that can be seen in figure 1:

Figure 1: Classification for business games

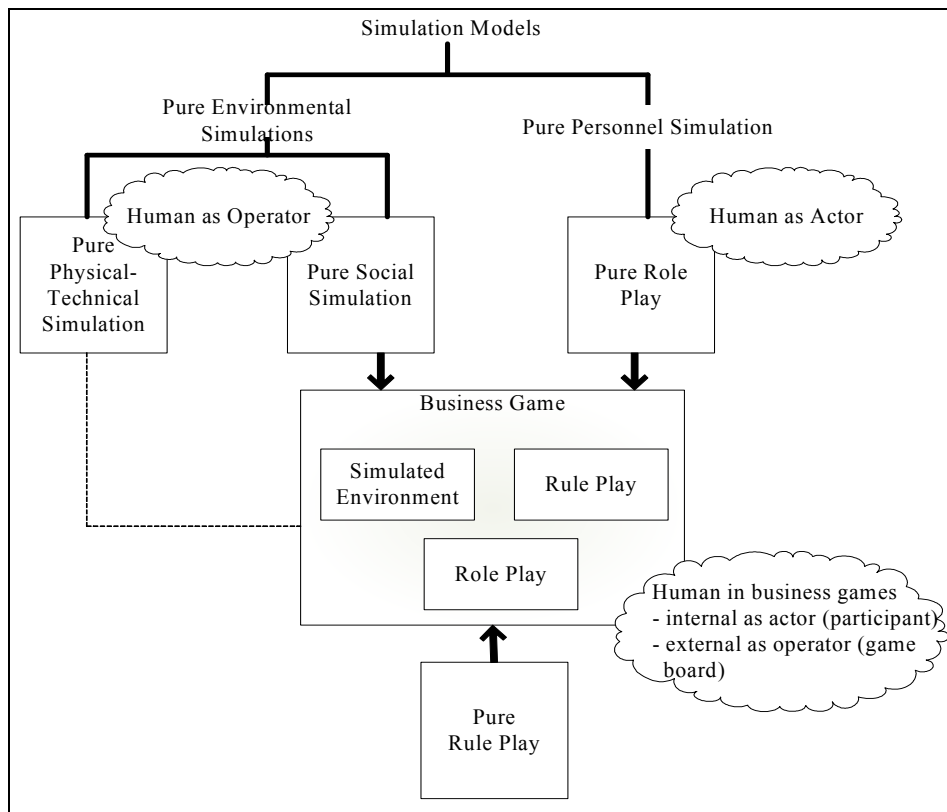


Source: Kern (2003, p. 84); translated

In general, Kern sees management games as a specific activity in which many participants play different roles, situations and scenarios in a virtual, but realistic environment. Referring to this definition, it can be said that management games consist of three elements: social environmental simulation, role-playing and rule-playing, which can be seen in figure 2 (Kern 2003).

Instead of the three elements, in practice often only two components are considered, namely *game* (instead of role-playing and rule-playing) and *model*. These two components are also known as simulation game, meaning a rule-based game, which simulates reality within a model (Kern 2003).

Figure 2: Different simulation models and elements of management games



Source: Kern (2003, p. 75); translated

Nevertheless, the model above builds the base of the environmental simulation, includes all relevant factors that are needed for the virtual environment and can be seen as the game background. The game describes the dynamic component. Referring to Elgood, a game can be described by the following four characteristics (Kern 2003):

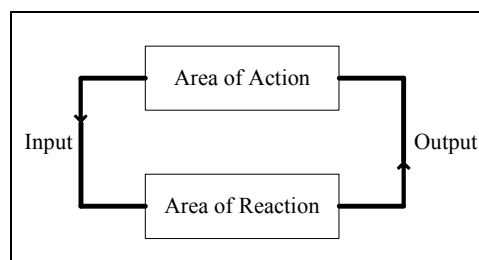
- Well-defined rules
- Stepwise development
- Possibility to benchmark activities
- Instrumental base for enforcement

2.4 Process structure of management games

The game model itself can be divided into an area of action and an area of reaction. The action area refers to the decisions made by the players in the context of their role in the game (as the head of the accounting department, for example). The reaction area consists of a simulation, including, for example, the labour-market situation, the competitive position or manufacturing program and reaction to the decisions made by the participants. Through an analysis sheet, participants receive feedback about their decisions and results, which is a main characteristic of business games (Kern 2003).

In general, as it was mentioned above, a business game consists of an area of action (human activities and actions) and one of reaction (environmental model) (Kern 2003).

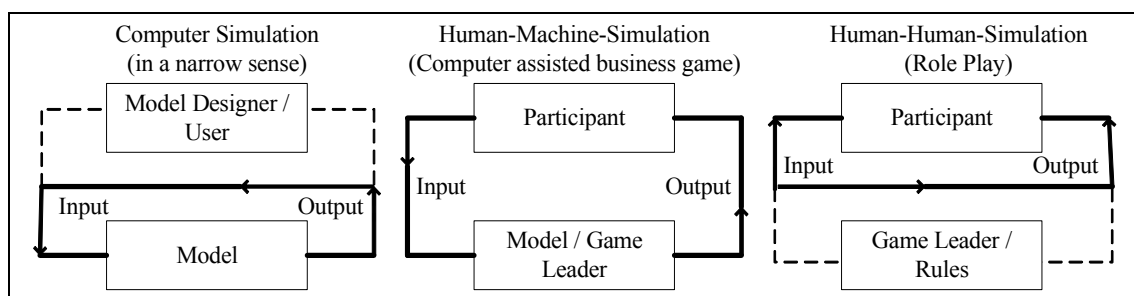
Figure 3: Action and reaction relationship



Source: Kern (2003, p. 77); translated

Böhret and Wordelmann (1997) distinguish between three types of simulations referring to their level of formalization, meaning how far human behaviour is an element of the simulation. Referring to the figure 4, note that the level of formalization can be measured with the complexity of action and reaction area. The higher the comprehensiveness and complexity of reaction in comparison to the action, the higher simulation model's level of formalization (Kern 2003).

Figure 4: Different simulation types referring to their level of formalization



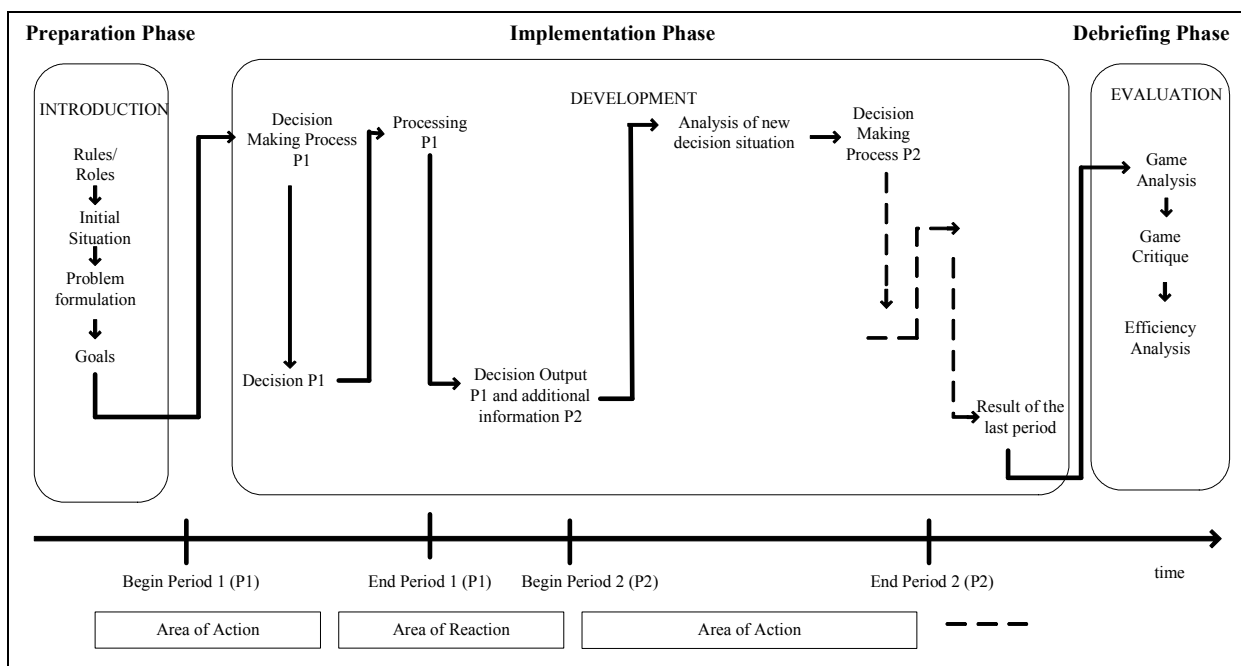
Source: Kern (2003, p. 78); translated

Computer simulations have the highest level of formalization meaning that area of reaction is clearly more complex than area of action and sometimes area of actions become dispensable. Human activities are limited to data input. In role-playing (human-human-simulation), the level of formalization is low. No complex mathematical model exists and area of reaction consists just out of different rules which are controlled by the game leader. Between these two simulation types is the computer-assisted business game (human-machine-simulation). Area of action refers to the decisions made by the participants and are of reactions include the environmental model and the possibility of interventions made by the game leader (Kern 2003).

2.5 Configuration of management games

Figure 5 shows the configuration of management games in general.

Figure 5: Configuration of management games



Source: Kern (2002, p. 80); translated

During the preparation phase, participants are introduced to the game and its rules. Roles are set and the game's starting position and its problems are discussed. Finally, strategic and operational goals are set. During the implementation phase, actions and reactions are run through several times. In period 1, participants make their decisions based on the information they received in the beginning. Action alternatives are analysed and players make their

choices. After making all relevant decisions, the reaction, or output, can be calculated. The results become the bases for the next period's decisions. After the final decision period, the whole business game is evaluated. The evaluation process promotes learning, helps identify unexpected situations and makes connections between decisions more transparent (Kern 2003).

2.6 Purposes of games

Why are games played? What are the purposes for playing games? Here are the main reasons provided by Watson and Blackstone (1981) for why games are played:

- Teaching
- Operational gaming
- Evaluating personnel
- Research about group and human behaviour

Most games are played to make teaching more effective and are used in university courses and in companies. Games provide an incredible learning opportunity that will be explained in detail in a later chapter. Operational gaming helps to find optimal strategies and solutions that can be transferred into the real world. Participants experiment with alternative decisions in a realistic simulation. Another purpose for games is to evaluate personnel, whether to find areas of weakness or to promote improvements or advancements in organizations. For researching group and human behaviour in games, participants can be placed into teams with different communication flows, organizational structures or leadership styles. Observations include behavioural variables such as motivation, performance or satisfaction (Watson and Blackstone 1981).

Carls and Koeder (1988) state that management game reasons are:

- Emergency situations
- Practice situations
- Training situations

During emergency situations, difficult decisions with complex consequences are made in a playful way, with the aim to identify undesired effects in advance and to adjust or to revise these decisions. Practice and training situations often occur in companies to prepare the employees for ambitious decision problems. Goals are set to develop the personality of the players, to motivate for experimentation, to develop skills and methods and, of course, to transform theory into practice. Purposes in all three situations are to develop personality and different techniques, to convert theory into practice and to as animation to experimentation (Carls and Koeder 1988).

Faria and Wellington (2004) showed the most important reasons why management games were first adopted and include:

- Provide decision-making experience
- Allow for theory application
- Integrate different functional areas
- Require teamwork
- Require more involvement
- Are interactive exercises

2.7 Literature review

The following chapter provides an overview about associations that focus on simulation and games, journals and basic literature about management games.

2.7.1 Simulation and gaming associations

Because games are an important tool in management, special organizations, international and national ones, were developed over time.

The International Simulation and Gaming Association (ISAGA) is an organization for practitioners and scientists that develops and uses simulations, games and similar methodologies such as role-playing, computerized simulations, virtual reality or experiential learning. The main goals of the International Simulation and Gaming Association are:

- To develop gaming and simulation methodologies
- To strengthen the use of games and simulations in management education
- To bring together specialists from around the world to talk about this topic at conferences and to exchange information (International Simulation and Gaming Association 2008)

The Association for Business Simulation and Experiential Learning (ABSEL) was first organized in 1974. Its main purpose is to convey the use of experiential techniques such as simulations and games in management education. Yearly conferences help to exchange information about different experiential topics (Association for Business Simulation and Experiential Learning 2008).

The Digital Games Research Association (DiGRA) is a non-profit organization that concentrates on the study of digital games and is also a network for people who are connected to the topic. Furthermore, the Digital Game Research Association offers online resources, including a digital library, and organizes an annual conference (Digital Games Research Association 2008).

The Society for the Advancement of Games and Simulations in Education and Training (SAGSET) is an important association for teachers, trainers, educational institutions and training providers. SAGSET is dedicated to the quality and effectiveness of learning through role-playing, games and simulations (The Society for the Advancement of Games and Simulations in Education and Training 2008).

The Swiss Austrian German Simulation And Gaming Association (SAGSAGA) was founded in 2001. Experts from these three countries try to enhance experiential teaching methods (Swiss Austrian German Simulation And Gaming Association 2008).

Table 3 summarizes the mentioned simulation and gaming associations with their Internet addresses.

Table 3: Simulation and gaming associations

Name	Abbreviation	Internet Address
International Simulation and Gaming Association	ISAGA	http://www.isaga.info/
Association for Business Simulation and Experiential Learning	ABSEL	http://www.absel.org/
Digital Games Research Association	DiGRA	http://www.digra.org/
The Society for the Advancement of Games and Simulations in Education and Training	SAGSET	http://www.simulations.co.uk/sagset/sagset2.htm
North American Simulation and Gaming Association	NASAGA	http://www.nasaga.org/
Swiss Austrian German Simulation And Gaming Association	SAGSAGA	http://sagsaga.org/

Source: Own illustration

2.7.2 Journal review

Specific journals that focus on games, gaming, management and games, education as well as Internet games exist which can be seen in table 4. Most important journals are “Computers and Education”, “Management Science”, “The Journal of Management Development” and “Simulation and Gaming”. The following list mentions the keywords with which journals were searched in EZB, SCI, SSCI, A&HCI, JSTOR, PROQUEST and SCIENCE DIRECT:

- Gam*
- Game
- Gaming
- Learning management
- Learning
- Management
- Educational learn*

Table 4: Journal search

Journals	
Academy of Management Journal Academy of Management Review Computers & Education Computers Education Central European Journal of Operations Research Decision Sciences Journal of Innovative Education Developments In Business Simulation & Experiential Exercises Educause Quarterly E-Learning and Education Experimental Economics Games and Culture Game Developer Games and Economic Behaviour Game Research Game Studies: The International Journal of Computer Game Research Gaming Research & Review Journal	Interactive Learning Environments International Game Theory Review International Journal of Computer Games Technology International Journal of Intelligent Games and Simulation International Journal of Game Theory Internet and Higher Education Internet Gaming International Journal of Computer Assisted Learning Journal of Economic Education Journal of Information Technology Education Journal of Management Education Learning and Behaviour Learning & Teaching in Higher Education Management Learning Management Science Operations Research Project Management Journal Simulation and Gaming The Journal of Gambling Business and Economics The Journal of Management Development The Journal of Operational Research Society Training

Source: Own illustration

2.7.3 Basic literature on management games

Management game literature can be found nearly in every journal listed above. There are some authors who have specialized on that topic and are often mentioned in literature:

- John V. Dempsey is the head of the Department of Professional Studies at the University of South Alabama in the United States. Many of his publications refer to simulations, games and educational learning (Dempsey et al. 2002).
- Anthony J. Faria is a professor at the University of Windsor in Canada and is the head of the marketing department. He is a member of ABSEL and published inter alia “Compete”, a management game that focuses on marketing (Faria and Wellington 2004).

- Bernard Keys was ABSEL's founder and its first president. He is a professor at Georgia Southern College in the United States (Knotts and Keys 1997).
- Jan H.G. Klabbers comes from the Netherlands and works at the University of Bergen. His research interests are also simulations and gaming. Klabbers is a former president and general secretary of ISAGA (Klabbers 2001).
- Ulysses S. Knotts is a specialist in decision science and strategic management and works at the University of Southern Georgia in the United States (Knotts and Keys 1997).
- William J. Wellington is a professor at the University of Windsor in Canada. He has published several books and papers and is specialized in market research and simulation gaming (Faria and Wellington 2004).

The following table gives an overview about older and newer papers that discuss management games in general:

Table 5: Selective overview papers about management games

Author	Title	Year
Dipietro et al.	Towards a Framework for Understanding Electronic Educational Gaming, <i>Journal of Educational Multimedia and Hypomedia</i> , Vol. 16, No. 3, p. 225-248	2007
Eilon	Management Games, <i>OR</i> , Vol. 14, No. 2, p. 137-149	1963
Faria	Business Simulation Games: Current Usage Levels – An Update, <i>Simulation & Gaming</i> , Vol. 29, No. 3, p. 295-308	1998
Faria	The Changing Nature of Business Simulation/Gaming Research: A Brief History, <i>Simulation & Gaming</i> , Vol. 32, No. 1, p. 97-110	2001
Faria and Wellington	A Survey of Simulation Game Users, Former-Users, and Never-Users, <i>Simulation & Gaming</i> , Vol. 35, No. 2, p. 178-207	2004
Feinstein et al.	Charting the experiential territory: Clarifying the experiential territory – Clarifying definitions and uses of computer simulation, games, and role play, <i>The Journal of Management Development</i> , Vol. 21, No. 9/10, p. 732-744	2002
Ganguli and Punnoose	Management Games: An Effective Pedagogic Tool, <i>The ICFAI Journal of Higher Education</i> , Vol. 2, No. 4, p. 75-82	2007
Keys J.	Strategic Management Games: A Review, <i>Simulation & Gaming</i> , Vol. 28, No. 4, p. 395-422	1997
Klabbers J.	The merging field of simulation & gaming: Meanings of a retrospect, <i>Simulation & Gaming</i> , Vol. 32, No. 4, p. 471-480	2001
Lane D.	On a Resurgence of Management Simulations and Games, <i>The Journal of the Operational Research Society</i> , Vol. 46, No. 3, p. 297-314	1995
Summers G.	Today's business simulation industry, <i>Simulation & Gaming</i> , Vol. 35, No. 2, p. 208-241	2004

Source: Own illustration

The paper written by Dipietro et al. (2002) aims to advance the understanding about management games and therefore provide a framework. Eilon (1963) documents the history of management games, provides a classification of games and gives an overview about games' purposes and characteristics. Faria (1998) recognizes the increase of management games in the last 40 years. After summarizing history, he determines the usage of management games by making a study with more than 1500 questionnaires. Faria (2001) reviews the development of management games and game research and mentions several authors who also focus that topic. The effectiveness of management games and what management games teach are just two topics of his article. Furthermore, he reviews the ABSEL conferences of the last 25 years.

Faria and Wellington (2004) give an overview about management games in general, summarize previous findings on the use of management games and, finally, describe a study of the current usage of management games. The authors provide a comparison of users, never-users and former-users of management games. Feinstein et al. (2002) classify games, role-playing and simulations and their training and educational outcomes. Ganguli and Punnoose (2007) record the increasing use of management games by trainers, educators and business executives. After mentioning the history, the authors refer to playing methods, classifications, advantages and the effects of learning from management games. Finally, they summarize different authors and their findings about business games. Keys (1997) describes the usage of management games and presents a study of seven strategic management games and concludes that playing games has become an important strategic tool.

Klabbers (2003) refers to a taxonomy to classify games and discusses the effects of learning. Lane (1995) defines management games and management simulations. Furthermore, the author refers to the ancestry of management games and defines why games and simulations are useful in education. Finally, he summarizes pitfalls and advances of games. Summers (2004) describes new technologies that occurred in the field of management games. Furthermore, he describes trends that affect supply and demand of management games.

3. THE DEVELOPMENT OF MANAGEMENT GAMES

3.1 The ancestry of business games

While searching for the ancestry of business games, literature proves that their origins are unclear. However, it is assumed that chess is the direct ancestor of business games and to this day is one of the most popular war games (Cohen and Rhenman 1961). Early examples of war games are “Wei-Hai”, which was first played in China around 3000 B.C. and “Chaturanga”, which came from India around 1000 B.C. Both were played for diversion purposes. With the game of Weikman in 1644, war chess of Helwig in 1780 and the game of Vinturini in 1798, war games became more complex and serious (Lane 1995).

Weikman’s game was called “The Kings’ Game” and included 60 pieces (30 on each side including a chaplain, officers, a king, sentries, couriers, heralds and infantry soldiers) and 14 different movements. Helwig, a writer of the Brunswick court scribe, made further innovations in the area of war games. He built a table with 1666 mobile squares. The squares had different colours and therefore had different meanings, for example blue for lakes and rivers, red for mountains or green for marshes. Furthermore, Helwig included political borders and artificial obstacles such as shelters and trenches. To conquer a series of opponents’ fortifications, was the aim of the game (Matute 1970). Vinturini’s “New Kriegsspiel” was the first game that used actual maps to replace the older game boards. On this map, (it was separated into 3600 squares) pieces were moved like troops (Cohen and Rhenman 1961).

Around 1800, Napoleon attained a lot of military victories through his strategic movements and placements of troops at the right moment. He was one of the first who outlined a “situation map” with pins and different colours. With use of this map, he planned new movements and positions of his own troops and those of the enemy (Matute 1970).

In 1811, Baron von Reisswitz, the Prussian minister of war, had the idea of a game in which tactical moves could be made on a terrain board with movable pieces and with rules based on military regulations. A referee was responsible for maintaining order and to control all movements. Time was an important element of the game as it is in real military operations, and after every session, two-minute pauses took place so participants could consider

movements made by the rival. After the game, an analysis of all manoeuvres, movements and losses was carried out in order to learn for the next game (Matute 1970).

Around 1824, von Reisswitz's son created some rules that were published under the title "*Instructions for the Representation of Military Manoeuvres With War Games*" (Matute 1970, p.52) and the general of the army said that he would recommend these guidelines to be used in the army for training purposes. Because of the great success of this game, it became rapidly known in Europe, Japan and in the United States. It can be said that Reisswitz enhanced Vinturini's ideas in combination with Napoleon's concepts (Matute 1970).

Because of the demand for more realistic and playable games, over the years the development of war games split into two new directions, namely "Free Kriegsspiel" and "Rigid Kriegsspiel" (Cohen and Rhenman 1961). The "free version" was characterized through an adjudicator, who evaluated circumstances, decisions and instructions and decided who had won the game. With "Rigid Kriegsspiel", mathematics eliminated human referees, which led to the problem that only those variables that could be quantified were included in the game (Geilhardt und Mühlbradt 1995). Random effects were included with the use of dice. Detailed charts, calculations and tables were used to simulate troop movements or effects of fires (Cohen and Rhenman 1961).

An important agent of "free war games" was Julius von Verdy du Vernois, who broke the rigid rules and included a kind of "reality" and published his book "War Game" in 1877. In foreign countries, the ideas of Verdy du Vernois displaced the rigid ones made by Reisswitz. Verdy du Vernois criticised the use of dice because of their inadequacy of replacing unforeseeable factors that have an impact on winning or losing games (Matute 1970).

Livermoore in 1879 made a significant innovation to games by keeping each side in separate rooms. The game leader was the only one who knew the complete range of activities. Another of Livermoore's ideas was the introduction of a timetable, which helped the game leader umpire the game and was a kind of predecessor of today's computer (Matute 1970).

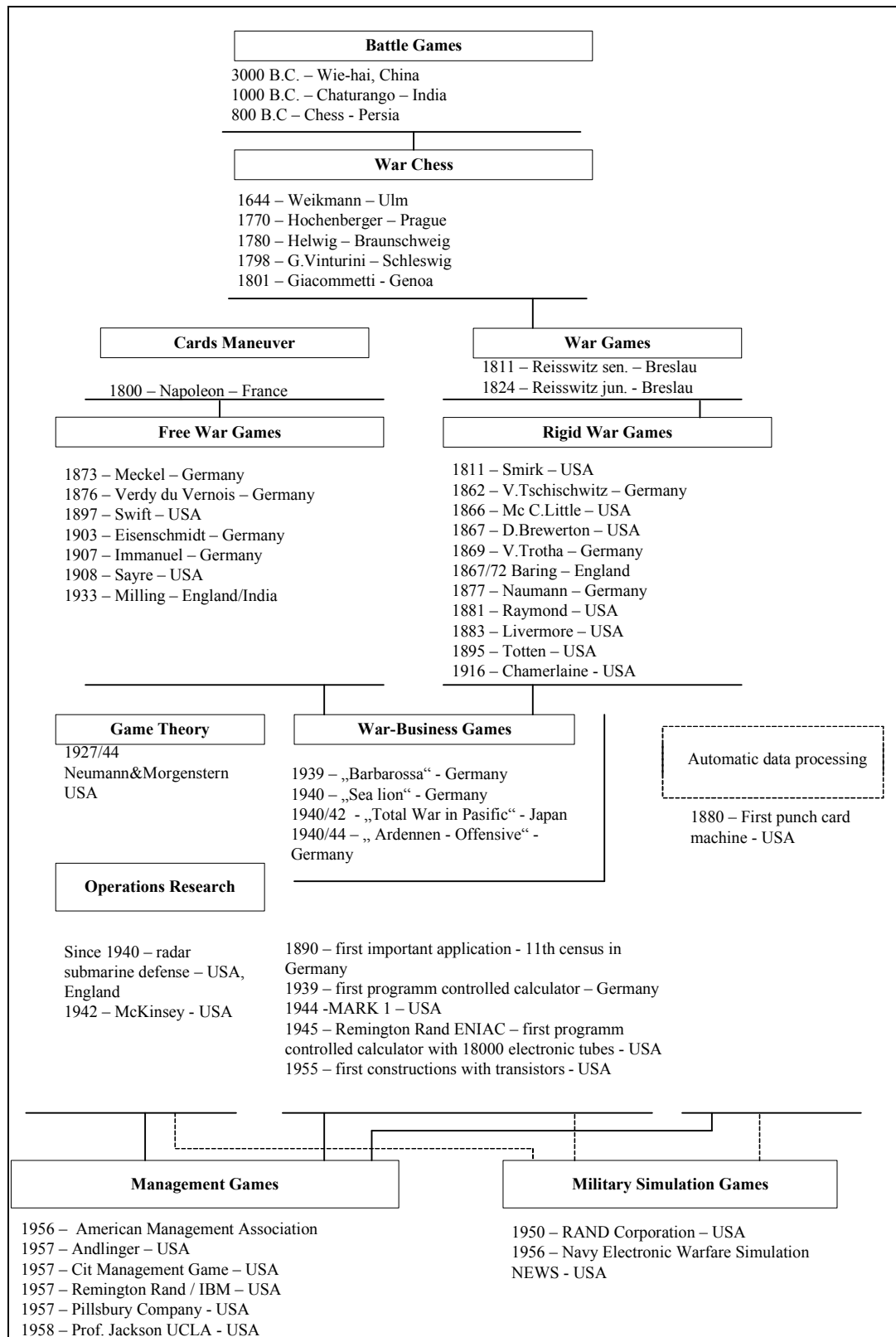
3.2 Modern management games

Game theory, automatic data processing and operations research led to modern business games. Even though the history of simulation games goes back to 3000 B.C., modern business games are only 60 years old. In 1955, the Rand Corporation developed a military-oriented business game focused on the U.S. Air Force logistics system. It was called “Monopologs”, and Jackson (1959) stated that *“MONOPOLOGS required its participants to perform as inventory managers in a simulation of the Air Force supply system in much the same fashion as current business simulations place the participants in the roles of company managers”* (Faria and Wellington, 2004, p.179). In this game, a supply depot with five air force bases was simulated and the players had to make monthly decisions on repair of parts, procurement of new parts and distribution of parts among the different bases (Meier et al. 1969).

In 1956, the American Management Association (AMA) developed the first widely known business game, which was called “Top Management Decision Simulation”. Although the game grew out of military war games, the development of the “Top Management Decision Simulation” was also dependent upon new improvements in operations research and computing machines. Two other famous management games developed around 1955, namely the “Top Management Decision Game” by Schreiber, which was used for teaching effects at the University of Washington and based on the AMA game, and the “Business Management Game” by Andlinger 1958, which was developed for McKinsey & Company. Because the Andlinger game included a manual scoring feature, it was used for first gaming experiences in companies (Faria and Wellington 2004).

The complete history of management games is shown in figure 6:

Figure 6: The history of management games



Source: Rohn in Geilhardt and Mühlbradt (1995, p.66); translated

Since then, the number of management games has grown rapidly. Early users of business simulation games were Westinghouse, Caterpillar, General Electric, IBM, Proctor & Gamble, Sun Oil and Boeing (Faria and Nulsen 1996). The following tables 6a, 6b and 6c show a directory by Kibbee et al. (1961) about management games during that period.

Table 6a: Management games around 1961

Name	Company	Target Group					Adminis- tration		
		TM	MM	LM	BG	FM	C	M	SA
Property and liability Insurance Game	Allstate Insurance Company		X					X	
Decision Making Simulation	American Management Association	X					X		
General Management Simulation	American Management Association	X	X				X		
Physical Distribution Simulation	American Management Association		X	X			X		
Materials Management Simulation	American Management Association and Remington Rand					X	X		
Market Simulator	American Radiator & Standard Sanitary Corp.					X	X		
Management	The Avalon Hill Company				X				X
Financial Management Game	American Telephone & Telegraph					X		X	
Operation Interlock	Boeing Airplane Company	X							
Operation Federal Reserve	Boeing Airplane Company					X		X	
Management Game	Carnegie Institute of Tech.						X		
Organization Oriented Game	Case Institute							X	
Sesame	C-E-I-R, Incorporated	X	X	X			X		
Executive Action Simulation	Clarkson College	X	X	X				X	
Tire Simulation	Dayco Corporation	X	X					X	
Business Strategy Simulation	General Electric Company	X	X	X				X	
Dispatch-O	General Electric Company								X
Inventrol	General Electric Company							X	
Planning Simulation Exercise	General Electric Company						X		
Simuload	General Electric Company					X		X	
Uniflo	General Electric Company					X			X
Manufacturing Executive Game	General Motors Institute		X					X	
Trading Post	Stanley Halpern				X			X	
Prospectville	Handy & Harman							X	
Gusher	Harvard Business School				X			X	
Ascot	Imperial Oil Limited	X	X	X			X		
Management Decision Making Laboratory	International Business Machines Corporation	X					X		
Production Manpower Decision Making	International Business Machines Corporation					X	X		
Retail Industry Management Game	International Business Machines Corporation						X		
Management Decision Simulation	Indiana University	X						X	

Source: Kibbee et al. (1961)

TM (Top Management), MM (Middle Management), LM (Low Management), BG (Board Game), FM (Functional Management), C (Computer), M (Manual), SA (Self Administrated) / Missing crosses – no information available

Table 6b: Management games around 1961

Name	Company	Target Group					Adminis- tration		
		TM	MM	LM	BG	FM	C	M	SA
Executive Decision Game	Indiana University	X					X		
Supermarket Decision Simulation	The Kroger Company	X						X	
Top Management Decision Simulation	Lockheed Aircraft Corp.	X					X		
Business Management Game	McKinsey & Company	X						X	
Bank Management Game	McKinsey & Company						X		
Section Supervisors Game	Metropolitan Life Insurance Company							X	
Investment Game	Michigan State University	X						X	
Business Policy Game	Michigan State University	X	X	X				X	
Inter-Nation Simulation	Northwestern University							X	
General Business Management Simulation	Ohio University	X						X	
Research and Development Game	Operations Research, Incorporated	X	X				X		
Management Decision Exercise	The Pillsbury Company	X	X	X			X		
Sales Management Simulation	The Pillsbury Company	X					X		
Sobig Stock Market Game	Princeton University					X			X
Production Scheduling Exercise	Proctor & Gamble Co.							X	
Computer Sales Game	Radio Corporation of America	X						X	
Marketing Decisions Simulation	Radio Corporation of America	X						X	
Baselogs	The Rand Corporation					X			X
Monopologs	The Rand Corporation					X			X
Marketing Management Simulation	Remington Rand UNIVAC	X	X				X		
Manufacturing Management Simulation	Remington Rand UNIVAC	X	X				X		
Rohr Business Game	Rohr Aircraft Corporation	X	X	X				X	
Wildcat	Republic Game Company				X				
Exercise in Business Management	Shell Mex House	X	X	X				X	
Marketing Game	Sloan School of Industrial Management		X					X	
Steps	System Development Corp.							X	
General Management Simulation	Tokyo Center for Economic Research	X						X	
Airline Operating Game	Trans-Canada Airlines							X	
Mangement decision Game	Travelers Insurance Company	X					X		
Logsim-W	U.S. Army Logistics Management Center					X			X
Task Manufacturing Corp.	UCLA						X		
UCLA Executive Games	UCLA	X	X	X			X		
Business Game I	University of Chicago	X						X	
Petroleum Economy Simulation	University of Oklahoma	X					X		
Television Game	Université d'Aix-Marseille	X	X	X			X		

Source: Kibbee et al. (1961)

TM (Top Management), MM (Middle Management), LM (Low Management), BG (Board Game), FM (Functional Management), C (Computer), M (Manual), SA (Self Administrated) / Missing crosses – no information available

Table 6c: Management games around 1961

Name	Company	Target Group					Adminis- tration		
		TM	MM	LM	BG	FM	C	M	SA
Management Decision Simulation	University of Oregon	X							X
WEG	University of Oregon	X					X		
Smart	University of Pennsylvania					X	X		
Top Management Decision Game	University of Washington	X	X	X			X	X	
Automobile Dealer Simulation	Wayne State University	X						X	
Plant Scheduling and Warehouse Distribution	Westinghouse Electric Corp.					X	X		
Production Simulator	Westinghouse Electric Corp.					X		X	
Business Simulator	Westinghouse Electric Corp.	X						X	

Source: Kibbee et al. (1961)

TM (Top Management), MM (Middle Management), LM (Low Management), BG (Board Game), FM (Functional Management), C (Computer), M (Manual), SA (Self Administrated) / Missing crosses – no information available

Summarizing the table above, it should be noted that out of 72 management games, 34 games are manual ones (47%) , 30 games are computer games (42%) and eight games are self-scored (11%). Leading companies are the American Management Association, General Electric and Westinghouse as well as different universities.

In 1977, the 20 most popular management games were (Watson and Blackstone 1981):

Table 7: Popular management games in 1977

Game	Area of Application	Publisher
Executive Game	Top Management	Richard D.Irwin, Inc.
Business Management Lab	Marketing and management	Business Publications, Inc.
Finansim	Financial Management	International Textbook Co.
Marketing in Action	Marketing and management	Richard D.Irwin, Inc.
Tempomatic IV	Management	Houghton Mifflin Co.
The Management Game	Management	The Macmillan Co.
Marksim	Top management	Intext Educational Publishers
Intop	International management	The Free Press
GPSS	Simulation language	Wiley/Hamilton and others
Purdue Supermarket Game	Management	Educational Methods, Inc.
Compete	Marketing and management	Business Publications, Inc.
Imaginit	Management	Active Learning Co.
Stanford Bank Management	Finance	Robicheck Publishing
Starting a Small Business	Starting a small business	Not known
Integrated Simulation	Management, finance and marketing	Southwestern Publishing Co.
Marketing Strategy	Marketing	Didactic Systems, Inc.
AMA General Management Business	Top Management	American Management Association
Computer Augmented Accounting	Accounting	Southwestern Publishing Co.
SimQ	Management	Brain Schott, Georgia State Univ.
Sales Management	Sales Management	General Learning Press

Source: Watson and Blackstone (1981, p.487)

3.3 Four main management games in modern history

The games devised by Schreiber, Andlinger, the American Management Association, and the Carnegie Institute of Technology are the most mentioned ones in literature (Meier et al. (1969), Kibbee et al. (1961), Feinstein et al. (2002), Cohen and Rhenman (1961), Summers (2004), Faria and Nulson (1996), Faria (1998), Faria and Wellington (2004)) so a special interest should be given to these games.

3.3.1 The Top Management Decision Simulation

In the AMA game, teams of players made business decisions and represented officers of firms. Each team (company) produced one product that they have to sell in a competitive common market. The game was played over 20 to 40 periods and six different decisions had to be made in each period, including selling price, investments for marketing activities, research-and-development investments, selection of a rate of production, decisions about plant capacity and finally, the possibility of buying information about competitors. The financial profit was treated through current cash flows and this cash was the money that was available for the next period. After each period, all decisions from all teams were fed into an IBM 650 and the computer determined the results of all the interactions (Cohen and Rhenman 1961).

3.3.2 The Business Management Game

The “Business Management Game” of McKinsey & Company was developed by G.R. Andlinger and around 1960 was one of the most famous management games (Watson and Blackstone 1981).

The “Business Management Game” dealt with capital goods whereas the “Top Management Decision Simulation” deals with consumer goods. The advancement of Andlinger’s game was to include the time lag between making a decision and the result. Key elements of the company to be run were market, advertising, marketing, production, research and development, competition and finance. The game was played by two or three teams and each team was divided into three or four people (it was also possible to play the game with only

one person per team). Basic tools of the Business Management Game were random-number tables, the decision forum and the board game (Andlinger 1958).

3.3.3 The Top Management Decision Game

This game was played at the University of Washington in graduate courses and seminars. The game was designed for three to six teams, where each team represented a company that competes with others. The market focused on consumer goods, in which each firm produces only one semi-luxury product. Each team began with the same financial position and after decision were made, they received some feedback through reports, including an income statement, a balance sheet, an economic news letter and market-research reports (Meier et al. 1969).

During Phase A, eight decisions had to be made, namely marketing expenditures, selling price, research-and-development expenditures, purchase of raw material, production quantity, plant expansion and market-research expenditures. To keep players away from bankruptcy, constraints on expenditures were set. During Phase B, borrowing money was allowed and expenditure constraints no longer existed. During Phase C, new variables occurred, namely the possibility to buy or sell stock of other companies, buying or selling treasury stock, declaring stock and cash dividends and issuing new capital stock. Phase D included an interesting decision on equipment replacement in which players because had to decide whether to replace or to repair deteriorating equipment (Meier et al. 1969).

Finally, all decision inputs and performance measurements for each period for each team were plotted by a computer to illustrate the performance of each team (Meier et al. 1969).

3.3.4 The Carnegie Tech Management Game

This game was developed to demonstrate how to run a company more realistically than other management games. Players had to coordinate overtime policies, maintenance, hiring policies, purchase of raw materials and other variables that influenced output. Between 100 and 300 decisions were made every “month” and players got feedback about their own performances and about their relations to suppliers, competitors and customers (Cohen and Rhenman 1961).

The Carnegie game was played with three teams and each team worked in four regional markets with up to three products at one time. Each group had a factory where all products were manufactured and a warehouse in each region. Raw materials had to be ordered from suppliers three months in advance. The players also had to schedule production, meaning that they had to decide about hiring, firing, overtime or plant capacity. Finished products were sent to warehouses and could be switched between each of those (Cohen and Rhenman 1961).

Investing into product research led to a generation of new products. Market-research information could be bought and informed the players about competitors and their prices, their advertising and distribution methods (Cohen and Rhenman 1961).

Finally, decisions were fed into an IBM computer, which analysed the performance of the players (Cohen and Rhenman 1961).

3.4 The emerging trend of Internet-based management games

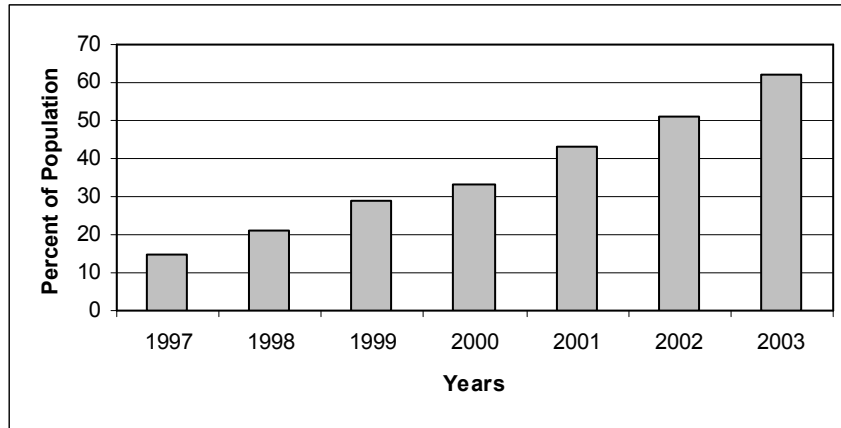
Summarizing the development of management games, it should be noted that a three-generational typology of management games exists. The first generation was mainframe-based and management simulations were difficult to interface. The second generation of management games followed the introduction and the development of the desktop microcomputer. With this innovation, games were possible to be stored on floppy disks and could be installed on each individual microcomputer. Early forms of the second-generation games had students making decisions on a piece of paper and had the professor inputting the decisions into the microcomputer. Decisions in the second generation were DOS-based and evolved over time to Windows-based software. The third generation emerged with the development and the widespread use of the Internet (Cook and Cook 2005).

Dasgupta (2001) stated that *“The Internet and web-based technologies have added a new dimension to the world of gaming... Since a crucial component of every simulation and game is the technological environment where it is run, the advent of new technology is changing the world of gaming in ways not seen in the past”* (Martin 2003, p. 23).

Online learning has developed into an accepted and popular learning method in comparison to face-to-face education (Connolly et al. 2007). As it can be seen in following graph, the

percentage of people using the Internet has grown from 14% in 1997 to 62% in 2003 (Gold 2001):

Figure 7: Internet users from 1997 to 2003



Source: Gold (2001, p. 76)

The Internet is hard to define, but Forsyth (1998) sees it as a library access facility and an electronic mail system, Conner-Sax and Krol (1999) define it as a the largest computer network in the world and Levine et al. (1996) describe it as a network of networks (Martin 2003). The fact is the Internet has revolutionized methods of commerce and communications and allows computer networks all over the world to interconnect (Martin 2003).

Table 8 summarizes the different stages of the development of the Internet (Roberts 2006):

Table 8: The development of the Internet

Stage	Year	Characteristic
1. Research and Academic Focus	1980 – 1991	<ul style="list-style-type: none"> First great era with the focus on R&D Debate about which protocol to use (TCP/IP)
2. Early Public Internet	1992 – 1997	<ul style="list-style-type: none"> Academic world expands the range of the Internet
3. International Public Internet	1998 – 2006	<ul style="list-style-type: none"> Internet is available for everyone Criticism of the Internet occurs
4. Challenges for the Future Internet	2006 - ?	<ul style="list-style-type: none"> Internet becomes a worldwide, maturing, universal network Internet begins to mirror human society

Source: Roberts (2006)

The development of the Internet and the World Wide Web led to new applications for education, policy development and business. Inventions such as e-mail were a helpful tool to allow people in different places to communicate with each other. The World Wide Web

includes also sound, images and video, therefore the media richness of the “www” offers a lot of features of a face-to-face interaction (Asakawa and Gilbert 2003).

Fundamental capabilities of the Internet are (Martin 2003):

- Interaction and communication across distances and time
- Access to multimedia information

Interaction and communication across distances is possible and made relatively quickly because of the global presence of computers, high-bandwidth and high-speed connections. Thus, collaborative work can be completed within a suitable time. Unfortunately, time, and global time zone differences in particular, are difficult to conquer. A study from Saunders and Powell documented that even a two-hour time-zone difference is difficult to handle. Time barriers can be defeated by compressing simulated time, using real time or through a simulation of travel through time (Martin 2003).

A shared virtual learning space is offered through the Internet. The following figure 8 describes the time-distance-matrix in which groups of people (in all sectors) can use computer-based games or simulations more than being restricted to same-time or same-place events (Martin 2003):

Figure 8: Time - Distance – Matrix

Different place	Teleconference	International project management
	Real meeting	Shift work management
Same time		Different time

Source: Martin (2003, p. 26)

The Internet allocates an open gateway for the entrance into a game or a simulation and offers an opportunity for players from all over the world to participate. Participants from different parts of the world can share the simulation/game and do not have to be at the same campus or

classroom. Participants from different cultural backgrounds from all over the world can interact in groups and learn about the subject as well as learning other skills, about other cultures and social relationships (Martin 2003).

The Internet's other fundamental capability, the "access to multimedia information," refers to the fact that once connected to the Internet, participants are able to access almost all information. This is a valuable and powerful resource for a game or a simulation (Martin 2003).

3.4.1 Characteristics of Internet-mediated games

Objectives of Internet-mediated games are improving communication and negotiation, perspectives, experiential learning, training and the development of strategy-making (Asakawa and Gilbert 2003).

Role-playing is another characteristic of Internet-mediated games because participants assume different roles or identities during the game. The Internet also allows players to remain anonymous, which increases the participants' experiences and learning (Asakawa and Gilbert 2003).

Synchronicity includes an asynchronous manner or a synchronous one and describes different methods of communication. An asynchronous game means that participants in different locations and different time schedules can play with each other in the same way that many educational games are played in different classes, different schools and even different countries. On the other hand, synchronous games include person-to-person components (e.g. video-conferencing) and interactive dialogue features (e.g. chat rooms). Most Internet-mediated games have synchronous and asynchronous features because they try to reflect actual methods of communication (Asakawa and Gilbert 2003).

Game facilitation includes information and advice sources if technical problems occur. For most games, facilitation is provided offline and online and is an important tool for the players' success (Asakawa and Gilbert 2003).

Interactive communication tools include teleconferencing, e-mail, video-conferencing and chat rooms and are important features that enhance Internet-mediated games (Asakawa and Gilbert 2003).

3.4.2 Advantages of Internet-mediated management games

E-learning's main advantages are saving time and money. Those advantages include reduced travel costs and/or travel time, reduced costs for seminar rooms, payments for trainers and so on. The high costs for the infrastructure required should be noted, however (Kern 2003).

The advantage of time independence does not always occur during management games because several people often have to cooperate (or have to compete). The possibility of "learning whenever I want" is limited because business games often use a fixed time schedule to tell participants when decisions must be made. Within groups, participants often have to arrange convenient meeting times to make their cooperative decisions. However, business games create the possibility for flexibility when compared to face-to-face games (Kern 2003). Younger generations in particular like this flexibility because they are often frustrated by technologies that tie them to a fixed place or time (Connolly and Stansfield 2006).

Learning over the Internet occurred because of the powerful supply-and-demand factors (Gold 2001).

Table 9: Supply and demand factors of learning over the Internet

Demand Factors	Supply Factors
<ul style="list-style-type: none"> ▪ Cost-effective ▪ Flexible access ▪ E-biz, e-chatting and e-mailing become normal forms in the field of communication ▪ Barriers of distance for a globally distributed workforce get eliminated ▪ Demand for just-in-time training ▪ Permits different learning styles of individuals ▪ Allows alternative pedagogies 	<ul style="list-style-type: none"> ▪ Growth of Internet ▪ Computers become standard in households ▪ B-to-C and B-to-B applications growth ▪ Increase of bandwidth ▪ Improvement of delivery platforms ▪ Improvement of interactivity and media-rich content ▪ Technology standardization reduces compatibility problems

Source: Gold (2001, p. 77)

3.4.3 Literature Review

Table 10 provides an overview of authors who have studied the Internet, management games and advantages of these trends:

Table 10: Overview papers on management games and the Internet

Author	Title	Year
Arbaugh	Learning to learn online: A study of perceptual changes between multiple online course experiences, <i>Internet and Higher Education</i> , Vol. 7, No. 3, p. 169-182	2004
Asakawa and Gilbert	Synthesizing experiences: Lessons to be learned from Internet-mediated simulation games; <i>Simulation & Gaming</i> , Vol. 34, No. 1, p. 10-22	2003
Bates	Teaching, Learning, and the Impact of Multimedia Technologies, <i>Educause Review</i> , Vol. 35, No. 5, p. 39-43	2000
Brown	Growing up Digital: How the Web Changes Work, Education, and the Ways People Learn, <i>Change</i> , March/April, p. 11-20	2000
Chan and Welebir	Strategies for e-education; <i>Industrial and Commercial Training</i> , Vol. 35, No. 4/5, p. 196-202	2003
Connolly and Stansfield	Using Games-Based eLearning Technologies in Overcoming Difficulties in Teaching Information Systems; <i>Journal of Information Technology Education</i> , Vol. 5, No. 5, p. 459-476	2006
Connolly et al.	A quasi-experimental study of three online learning courses in computing; <i>Computers & Education</i> , Vol. 49, No. 2, p. 345-359	2007
Dasgupta and Garson	Guest Editorial: Internet Simulation/Gaming, <i>Simulation & Gaming</i> , Vol. 30, No. 1, p. 20-22	1999
Gold	E-Learning: The next wave of experiential learning, <i>Developments in Business Simulation and Experiential Learning</i> , Vol. 28, p. 76-79	2001
Gunasekaran et al.	E-learning: research and applications, <i>Industrial and Commercial Training</i> , Vol. 34, No. 2, p. 44-53	2002
Martin	Adding value to simulation/games through Internet mediation: The medium and the message, <i>Simulation & Gaming</i> , Vol. 34, No. 1, p. 23-38	2003
Prensky	Digital Game Based Learning, <i>ACM Computers in Entertainment</i> , Vol. 1, No.1	2003
Roberts	Lessons for the Future Internet: Learning from the Past, <i>Educause Review</i> , Vol. 41, No. 4, p. 17-24	2006
Schweizer	E-Learning in Business, <i>Journal of Management Education</i> , Vol. 28, No. 6, p. 674-692	2004
Song and Lee	Key factors of heuristic evaluation for game design: Towards massively multi-player online role-playing game; <i>International Journal of Human-Computer Studies</i> , Vol. 65, No. 5, p. 709-723	2007
Stansfield et al.	Enhancing Student Performance in Online Learning and Traditional Face-to-Face Class Delivery; <i>Journal of Information Technology Education</i> , Vol. 3, No. 3, p. 173-188	2004
Smith-Stoner and Willer	"Innovative Use of the Internet and Intranets to Provide Education by Adding Games"; <i>CIN Computers, Informatics, Nursing</i> , Vol. 23, No. 5, p. 237-241	2005

Source: Own illustration

Arbaugh (2004) identifies the asynchronous aspect of the Internet as its main advantage and focuses on students' satisfaction with the Internet when taking online courses.

Asakawa and Gilbert (2003) characterize Internet-mediated games that business, policy and educational games have in common. Because of the improvement of features such as video-conferencing and language translators, these features will become more powerful in the future. For the success of Internet-mediated business, policy and educational issues, management games should be planned carefully.

Bates (2000) mentions that through the Internet, isolated teachers and students can still meet for discussions and that Internet helps link people together. The author also states a balance between distance and face-to-face teaching must be found due to new technologies.

Brown (2000) summarizes fundamental characteristics of the World Wide Web and recognizes the emerging trend of learning through the Internet.

Chan and Welebir (2003) notice that the Internet's 24-hour-accessibility makes it a popular and powerful medium. Also, demand for online education has increased over the years and opened the door for a new market in the education industry.

Connolly and Stansfield (2006) identify the three generations of e-learning and develop a new model of distance education. They provide an overview about what game-based e-learning is and why it is needed. One reason is that the younger generation is bored of technologies that bind them to a specific location and prefer portability. In 2004 and 2007, the authors made a study to compare an online-format course to face-to-face learning and concluded that online students performed better than the face-to-face students (Connolly and Stansfield 2007, Stansfield et al. 2004).

Dasgupta and Garson (1999) state that games and simulations will be affected by the development of the Internet. Advantages of playing games over the web are, for example, the lack of geographical boundaries and the possibility of creating networks.

Gold (2001) mentions that the e-learning market is growing quickly, and that e-learning is more than just online learning or distance learning. The Internet has become one of the most powerful mediums for communication, information and to facilitate commerce. Furthermore, Gold summarizes the supply-and-demand factors for e-learning.

Gunasekaran et al. (2002) notice the appearance of digital technologies and the potential of learning over the Internet. The authors identify the most important learning areas on the Internet, which are arts, business, engineering, science, medicine, agriculture and law.

In Martin (2003), capabilities of the World Wide Web, such as the easy access to information and the global working network, are mentioned. Martin describes how these advantages can be used in the field of management games and simulations.

Roberts (2006) mentions the advantages of the Internet and explains its development. Furthermore, he writes about higher education and its relationship to the Internet.

Song and Lee (2007) state that computer games are one of the fastest-growing industries in the field of entertainment and therefore study different role-playing online games.

Schweizer (2004) describes the Internet as a tool that opens new opportunities for business. Furthermore, she provides a historical background of e-learning and summarizes the different characteristics of learning over the Internet. Schweitzer also notices that the e-learning boom will continue in the future because of the interest in just-in-time delivery, quality and cost-effectiveness. Also, Smith-Stoner and Willer (2005) recommend learning online.

4. EXPERIENTIAL LEARNING

Several authors in literature describe experiential learning activities with the following statement of Confucius:

I hear and I forgot
I see and I remember
I do and I understand.

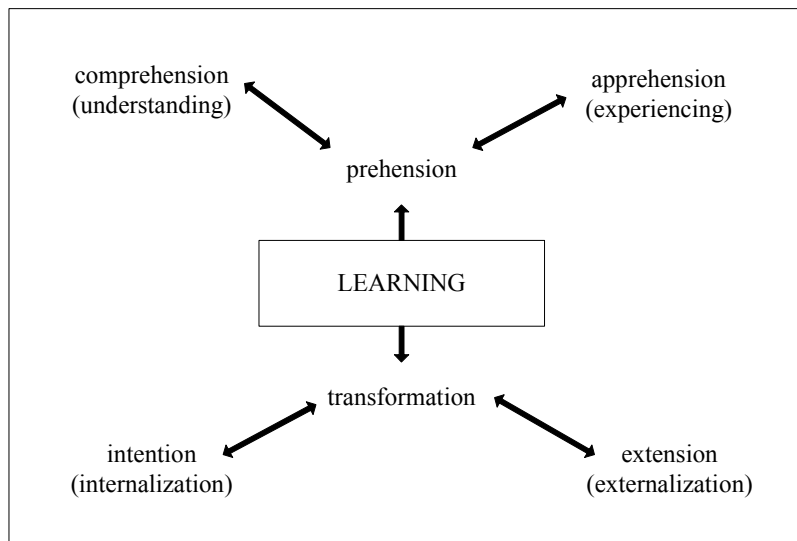
(Confucius, in Feinstein et al. 2002, p. 733)

The statement argues that learning is more than just seeing or hearing. Doing is an important component for effective and successful learning (Feinstein et al. 2002).

4.1 The importance of learning

Children learn by exploring, by touching things, taking and moving them. They prove the adage that says “learning by doing.” In school, children learn by sitting down quietly without playing and they are not allowed to whisper. This purely cognitive process was removed by pedagogies like Peters, Steiner or Montessori, who developed alternative learning approaches. At first, such approaches were used only in primary education, but later, educators came to the conclusion that traditional learning approaches are also restrictive and limited for adult learners. One famous educator in literature who saw the traditional learning process in a critical way was David Kolb with his experiential learning theory. He says “*learning is a process of a combination of grasping experience and transforming it*” (Dieleman and Huisinigh 2006, p. 838). The important part in experiential learning is that not only grasping or prehension (meaning understanding the phenomena and observing it) is included, moreover it also has its focus on testing the phenomena studied or applying it to achieve a desired result (called transformation) (Dieleman and Huisinigh 2006).

Figure 9: Learning, according to Kolb



Source: Dieleman (2006, p. 838)

As it can be seen in figure 9, prehension (grasping) can be divided into comprehension and apprehension. Experiences made through comprehension refer to symbolic representation and conceptual interpretation. They need the right side of the brain, are rational, analytical and are the kind of teaching offered at universities or schools. On the other hand, experiences through apprehension refer to learning by touching, smelling, feeling, hearing and tasting, meaning all lateral processes that refer to the brain's left side (Dieleman and Huisingsh 2006).

But for David Kolb, learning is more than the distinction between apprehension and comprehension. He says learning refers also to a transformative process in which he distinguishes between extension and intention. Transforming through intention refers to internal reflection and touches the recreates and emotions and transforms images people have from itself, vis-a-vis the phenomena which is studied (Dieleman and Huisingsh 2006). On the other hand, externalization refers to the "*active manipulation of the external world*" (Dieleman and Huisingsh 2006, p.838).

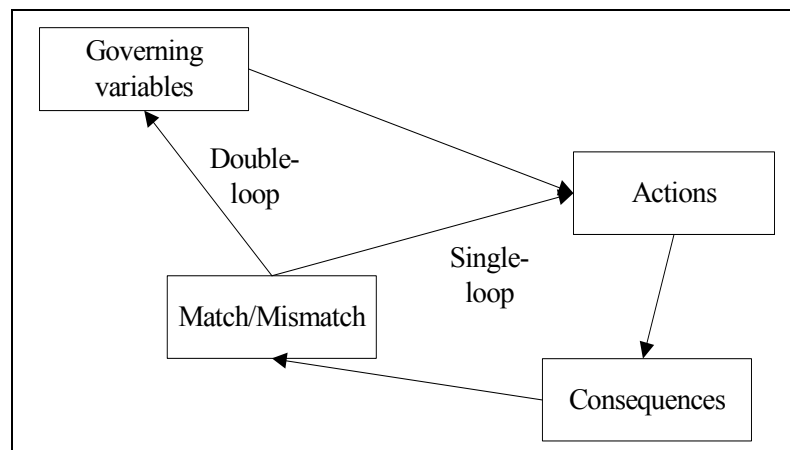
Kolb also differs between four different types of knowledge (Dieleman and Huisingsh 2006):

- Assimilative knowledge: which helps to understand things and to adapt them to existing situations and contexts
- Accommodative knowledge: which helps to understand things and to adapt them to new situations and contexts

- Divergent knowledge: which helps to handle changes in given contexts and situations
- Convergent knowledge: which helps to change contexts and situations

These four types of knowledge are comparable with Argyris' single-and-double-loop learning shown in figure 10:

Figure 10: Learning after Argyris



Source: Lane (1995, p. 611)

Single-loop learning has the goal to improve known activities within a given context. Double-loop learning is used to change the context of the activities and is a type learning to make effective changes (Dieleman and Huisingh 2006).

Kolb's process of experiential learning is a four-stage-cycle and is described in the following table.

Table 11: Relationships in experiential learning

Learning process	Type of knowledge	Change process
Apprehension/intention	Assimilative	Adapt to existing contexts
Comprehension/intension	Accommodative	Adapt to different contexts
Comprehension/extension	Convergent	Change within contexts
Apprehension/extension	Divergent	Changes contexts

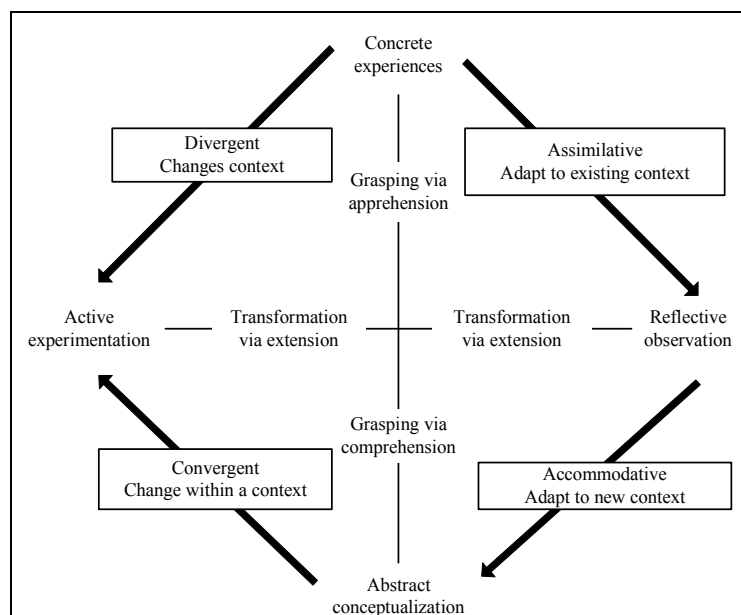
Source: Dieleman and Huisingh (2006, p. 838)

Kolb says that people must go through the four different phases in the experiential learning process (Dieleman and Huisingsh 2006):

- Concrete experience: This phase concentrates on experiences made through apprehension. Mostly the experiential learning process starts with the concrete-experience phase and refers to the section of understanding.
- Reflective observation: This phase concentrates on accommodative knowledge. The learning process in this phase is stimulated by how people react to specific questions or specific solutions. This phase can be seen as the single-loop-process and deals with tools, practices and techniques currently used.
- Abstract conceptualization: This phase has its focus on comprehension through conceptual interpretation, symbolic representations and analyses. It underlies the importance of reaching understanding from information. In this phase, skills for converting the information into knowledge are developed but within a given context.
- Active experimentation: This phase is the ultimate phase of transformation and has the aim to put the acquired knowledge into practice through implementing changes to manipulate the outside world.

Graphically, the experiential learning cycle of Kolb looks like this (Dieleman and Huisingsh 2006):

Figure 11: Experiential learning cycle



Source: Dieleman and Huisingsh (2006, p. 839)

4.2 Learning through management games

Graf (1992) mentions four different implications of business games, namely educational-training implications, cognitive implications, emotional implications and instrumental implications:

- General educational (training) implications include the desire to win the business game and to be as successful as possible compared to other participants of the game and compared to the participant's own aims and expectations. Another educational implication of games is to learn as much as possible.
- Cognitive implications refer to increased know-how, meaning to learn the basics about business economics (for example, the production of a company, cost accounting, finance and human-resource management).
- Affective/emotional implications can be also called the “development of their own management style and management behaviour.” Questions such as “how do I improve my cooperative skills of the planning-and-decision team,” and “which management skills must I improve to organize, to delegate, to plan and to coordinate as effective as possible” and “how much social power is important to lead successfully” refer to affective/emotional implications.
- Instrumental implications refer to working techniques and different methods of leadership. Participants of games should learn about how goals for the company/department/institutions are developed, how business policy and strategic plans are formulated, how budget/production plans/investment plans are made and also about debriefing results.

Kern (2003) summarizes the most important goals of management games:

- Understanding for economic inter-relations
- Development of decision-making ability in complex situations
- Formulation and enforcement of goals, developments and implementation of strategies
- Soft skills in intercultural team work

- Cross-linked thinking
- Enhancement of business economic know-how
- Enhancement of achievement motivation
- Efficient use of innovation and communication technologies

Referring to Ganguli and Punnoose (2007), it should be mentioned that management games help to improve innovation skills, survey-research skills, problem-solving capabilities, meeting-management skills, group-working skills and negotiation skills.

As gaming can be seen as a part of learning, the following table shows games' most important attributes by Oblinger (Wall and Ahmed 2008):

Table 12: Aspects and attributes of learning

Aspect	Attribute
Social	Often games are part of social environments and can involve large distributed communities
Research	When a new player starts to play a game, he has to recall prior learning immediately and has to decide about which information is needed and transfer it to that new situation
Problem Solving	If the player knows which information or techniques are needed to apply in situations, greater success and therefore better problem-solving is possible
Transfer	Recognize connections between real life and game aspects and use them in unique situations is one great advantage of game-playing
Experiential	Players of games engage multiple senses. Each action is followed by a reaction and feedback is swift. Users can test their hypotheses and learn from results.

Source: Wall and Ahmed (2008, p. 1387)

4.3 Debriefing management games

Through debriefing, learning objectives are discussed and made clear, which should help to think about what was learned during the management game. Debriefing is the final phase of a management game and is the phase where the behaviours of the participants are examined and evaluated and when relations between simulation and real life are explored (Peters and Vissers 2004). One game developer and trainer said *“playing a game without debriefing is like playing a soccer game without scoring goals”* (Dieleman and Huisinigh 2006, p. 846).

Depending on the game's purpose, debriefing is different. If a game is played for training and educational purposes, debriefing sessions help participants connect the skills and knowledge developed in the management game and transfer them into real-life situations. In a management game with an exploratory purpose, the debriefing facilitator cannot expect that

the participant knows how to proceed. Therefore, it is important to assist them to make conclusions that can be used in real-life situations. Furthermore, in an exploratory management game, debriefing often takes place between rounds when participants focus on decisions and the consequences of those decisions. In a final debriefing, participants evaluate the different solutions themselves. When games are played for research purposes, debriefing helps inform participants about hypotheses and research questions. But intermediate debriefing sessions should not be used because discussion between rounds may influence the participants' behaviour (Peters and Vissers 2004).

Questions in a debriefing phase after a management game could be (Dieleman and Huisinigh 2006):

- While playing the game, what did I learn about my values, my behaviour, myself, my thoughts or my eagerness to win?
- What did I learn about the behaviour of other participants?
- Were there new elements I did not know?
- How can I use the game for my future or my work?

To gain knowledge from the debriefing phase, some kind of structure should be used. Kritz and Nöbauer (2005) classify the debriefing process into six different questions:

- How did you feel? (Participants describe emotions and feelings after playing the game)
- What happened? (Participants reflect thoughts, observations and perceptions)
- What did you learn? (Meaning to identify the most important findings and conclusions of those findings)
- How are the game and reality connected? (Includes importance of the played game for the workplace)
- What if...? (Discussion about hypothetical situations)
- What are the next steps? (Meaning to identify clear, realistic and measurable goals for the future)

Different debriefing methods exist. Debriefing can take place with or without a moderator and can be supported by video. Furthermore, games can be debriefed using questionnaires or with a group discussion (Kritz and Nöbauer 2005).

4.4 Advantages of games

Faria and Dickinson (1994) mention the following advantages of business games:

- Participants learn about different areas of management. From goal-setting to developing a strategy and, furthermore, tactical decision-making.
- Different analytical techniques can be used.
- Participants learn to work with others.
- Business games are active training methods (not passive ones like other training methods).
- Participants can gain experience in a simulated world by making wrong decisions that are not punished like in a real-world setting.
- Time-compression is possible, so activities that take years in real life can be simulated in a single day.
- Immediate feedback.
- Simulations and games combine excitement with a learning experience.
- Through games, participants have the possibility to gain a more global view about their daily businesses.

Other advantages mentioned by Graf (1992) are:

- In business games, decisions can be repeated and different alternatives can be tried.
- A modular configuration helps the participants to get along with the complexity of games.
- Business games are multidimensional, meaning participants do not only develop their intellect, they also have to use their social and emotional behaviour.

Dieleman and Huisingh (2006) mention that playing games creates shared experiences, which are important because they can help to define shared problems and also create shared solutions. Often participants come from different social positions, cultural, experiential and

academic backgrounds with different values, needs and attitudes. This helps to create shared experiences that can help increase understanding. Furthermore, playing games enhances team-building. Because games are played in a virtual world, it is possible to engage people who in real life do not prefer to be a team players. Another advantage of playing in groups is that a kind of sporting ambition occurs (like in soccer), meaning that the group tries to win and wants to make the most of their opportunities. Lastly, the games provide fun (Dieleman and Huisingsh 2006).

Ganguli and Punnoose (2007) describe other advantages such as the development of a management-oriented view and insights into topics like tradeoffs, teamwork and time-management. Management games do not refer only to short-term advantages but also to long-term advantages such as motivation for self-education.

A study of Faria and Wellington (2004) provide an overview about perceived advantages and conclusions of/about games for students and teachers. Findings are summarized in table 13:

Table 13: Advantages of management games

Students	Teachers
<ol style="list-style-type: none"> 1. Provide experiential learning 2. Combine different functional areas 3. Allow theory application 4. Consequences of decisions can be seen 5. Require teamwork 6. Require more involvement 7. Games are interactive and dynamic exercises 8. Games are realistic exercises 9. Expose competition 10. Games are fun 	<ol style="list-style-type: none"> 1. Games are interactive and dynamic exercises 2. Allow theory application 3. Games motivate and interest students 4. Measure understanding and comprehension 5. Combine different functional areas 6. Add variety to courses 7. Games are easy to administer 8. Games are fun 9. Games require instructor involvement 10. Games are a lot of work

Source: Faria and Wellington (2004, p. 186)

Lane (1995) summarizes some pitfalls coming from literature that might occur when playing management games. Unless the game's designer is clear about the learning effects and goals, these goals do not become clear to others. It is also mentioned that sometimes games and simulations get over-used and other teaching methods are neglected. Another disadvantage perhaps, is that the games have too many elements, giving students an "overload" because of the multiplicity of elements like decision-making, random events, computer skills, role-playing, negotiation skills or system thinking. Lane also argues that players often do not get enough briefing with the aim of working out problems for themselves. Also, the debriefing is

an important learning experience for participants and, unfortunately, is often neglected in practice.

4.5 Literature review

It is indisputable and well-documented in literature that playing management games has a great effect on learning (Faria 2001). Table 14a and 14b are a selection of authors who deal with the effectiveness of games.

Table 14a: Effectiveness of Games

Author	Titel	Year
Adobor and Daneshfar	Management Simulations: Determining their effectiveness, <i>The Journal of Management Development</i> , Vol. 25, No. 2, p. 151-169	2006
Ammar and Wright	Experiential learning activities in Operations Management, <i>International Transactions in Operational Research</i> , Vol. 6, No. 2, p. 183-197	1999
Brenenstuhl	An experiential study of performance in a basic management course, <i>Simulation Games and Experiential Learning in Action</i> , Vol. 2, p. 83-91	1975
Catalanello and Brenenstuhl	An assessment of the effect of experiential, simulation and discussion pedagogies used in laboratory sections of an introductory management course, <i>New Horizons in Simulation Games and Experiential Learning</i> , Vol. 4, p. 51-58	1977
Certo	Experiential training methodology, traditional training methodology, and perceived opportunity to satisfy needs. <i>Simulation Games and Experiential Learning in Action</i> , Vol. 2, p. 31-37	1975
Dieleman and Huisinigh	Games by which to learn and teach about sustainable development: exploring the relevance of games and experiential learning for sustainability, <i>Journal of Cleaner Production</i> , Vol. 14, No. 9-11, p. 837-847	2006
De Freitas and Oliver	How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?, <i>Computers & Education</i> , Vol. 46, Issue. 3, p. 249-264	2006
Egenfeldt Nielson	Review of the research on educational usage of games, Version 0.5 http://www.itu.dk/people/sen/public.htm , [Date of Access 6.5.2008]	2003
Faria	The Changing Nature of Business Simulation / Gaming Research: A Brief History, <i>Simulation & Gaming</i> , Vol. 32, No. 1, p. 97-110	2001
Faria and Wellington	Validating business gaming: Business game conformity with PIMS findings, <i>Simulation & Gaming</i> , Vol. 36, No. 2, p. 259-273	2005
Fritzsche	The lecture vs. the game, <i>Simulations, Games and Experiential Learning techniques</i> , Vol. 4, p. 41-46	1974
Fry, Kidron and Schriesheim	The effectiveness of experiential methods in training and education, <i>Simulation Games and Experiential Learning in Action</i> , Vol. 2, p. 365-373	1975
Greenlaw and Wyman	The teaching effectiveness of games in collegiate business courses, <i>Simulation & Games: An international Journal</i> , Vol. 4, No. 2, p. 259-294	1973

Source: Own illustration

Table 14b: Effectiveness of Games

Author	Titel	Year
Hsu	Role-event gaming simulation in management education: A conceptual framework and review, <i>Simulation & Games: An International Journal</i> , Vol. 4, No.1, p. 409-438	1989
Jennings	Strategic management: an evaluation of the use of three learning methods; <i>The Journal of Management Development</i> , Vol. 21, No. 9/10, p. 655-665	2002
Kayes et al.	Experiential learning in teams; <i>Simulation & Gaming</i> ; Vol. 36, No. 3, p. 330-354	2005
Kenworthy and Wong	Developing Managerial Effectiveness: Assessing and Comparing the Impact of development Programmes using a Management Simulation or a Management Game, <i>Developments in Business Simulations and Experiential Learning</i> , Vol. 32, No.	2005
Kritz	Creating effective learning environments and learning organizations through gaming simulation design, <i>Simulation & Gaming</i> , Vol. 34, No. 4, p. 495-511	2003
Mancuso	A comparison of lecture-case study and lecture-computer simulation teaching methodologies in teaching minority students basic marketing, <i>Simulation Games and Experiential Learning in Action</i> , Vol. 3, p. 339-346	1975
Miles et al.	Student perceptions of skill acquisition through cases and a general management simulation, <i>Simulation & Games : An International Journal</i> , Vol. 17, Nr.1, p. 7-24	1986
Raia	A study of the educational value of management games, <i>Journal of Business</i> , Vol. 39, No. 3, p. 339-352	1966
Roberts and Fields	Using student opinions in evaluating results with a business game, <i>Simulation Games and Experiential Learning in Action</i> , Vol. 2, p. 92-99	1975
Robertson and Howells	Computer game design: opportunities for successful learning, <i>Computers & Education</i> , Vol. 50, No. 2, p. 559-578	2008
Sampson and Sotiriou	Student perceptions: Simulations and the corporate policy course. <i>New Horizons in Simulation Games and Experiential Learning</i> , Vol. 4, p. 110-117	1977
Washbush&Gosen	An exploration of game derived learning in total enterprise simulations, <i>Simulation & Gaming: An Interdisciplinary Journal</i> , Vol. 32, Issue 3, p. 281-296	2001
Wideman et al.	Unpacking the potential of educational gaming : A new tool for gaming research, <i>Simulation & Gaming</i> , Vol. 38, No. 1, p. 10-30	2007
Wolfe and Byrne	A comparison of perceived learning in three pedagogically different sections of a required business policy course. <i>Computer Simulation and Learning Theory</i> , Vol. 3, p. 474-482	1976
Wolfe	The teaching effectiveness of games in collegiate business courses: A 1973-1983 update, <i>Simulation & Games: An international Journal</i> , Vol. 16, No. 2, p. 251-288	1985
Wolfe	The effectiveness of business games in strategic management course work. <i>Simulation & Gaming: An interdisciplinary Journal</i> , Vol. 28, No. 4, p. 360-376	1997

Source: Own illustration

Adobor and Daneshfar (2006) created a study that used data from 49 teams who had to manage a company in global athletics. The outcome proved that playing games affects learning in a positive way. Participants noted in a positive way the ease of the simulation and how the simulation reflected in real-world-situations.

Ammar and Wright (1999) summarized eight different games that were played in classes (some manual and some on computer) and concluded that playing such games produces a real benefit for the students and helps them to improve the understanding of operation and production management. Because of the games, the interest in production and operation management increased.

De Freitas and Oliver (2006) presented a four-dimensional framework for evaluating games and simulations and tested it in two case studies.

Dieleman and Huisinigh (2006) also documented that playing games is an important tool in experiential learning theory. Egenfeldt-Nielsen (2003) reviewed the educational use of simulations and games and mentioned other authors who have written on the topic.

Early research in this area was made by Greenlay and Wyman (1973), Raia (1966) and Fritzsche (1974). Fritzsche observed exams and their scores in a lecture-centred business course section and a game-centred section and concluded that scores of the game-centred section exceeded the scores made in the lecture-centred section (Faria 2001).

Other authors who wrote about the effectiveness of games were “*Brenenstuhl, 1975; Catalanello & Brenenstuhl, 1977, Certo, 1975; Fry, Kidron, & Schriesheim, 1975, Mancuso, 1975; Roberts & Fields, 1975; Sampson & Sotiriou, 1977; Scott, 1977; Wolfe & Byrne, 1976*” (Faria 2001, p. 101). Summarizing these nine papers, it can be said that in seven of these nine studies, students had higher scores in simulation sections than in traditional sections. Another outcome was that students of simulation sections thought that they learned more than students of traditional sections (Faria 2001).

Keys (1976) reviewed about 13 studies between 1962 and 1975 to observe the effectiveness of simulation and games. The result was that game sections produced better results in nine of the 13 studies. Wolfe (1985) reviewed 39 studies and concluded that in 19 cases simulation sections showed better results than traditional ones, in 10 cases traditional sections showed better results than simulation sections, and in 10 studies no differences could be reported. Miles et al. (1986) observed 16 studies and his findings were that in 10 cases simulation courses were better and in four cases traditional courses were better (no difference could be observed in two cases) (Faria 2001).

Also, Greenlaw and Wyman (1973), Wolfe (1985) and Hsu (1989) concluded that management games are a powerful way to learn managerial skills (Faria 2001).

Thirty years of research in the field of management games' effectiveness were summarized by Wolfe (1997). He concluded that *"Ample evidence has been presented authenticating the effectiveness of computer-based general management games as vehicle for teaching strategic management. In every study cited, the particular business gaming application produced significant knowledge-level increases. When the business game method was pitted against the case approach, the game approach was superior to cases in producing knowledge gains"* (Faria 2001, p. 102).

Faria and Wellington (2005) made a study with data from more than 700 simulation competing companies and concluded that business games are fantastic teaching tools.

Referring to skill-based learning outcomes, Gopher, Weil and Bareket (1994) documented that military trainees with computer simulation training made better test flights than those with standard training. The effectiveness of learning on declarative knowledge is documented by White (1984), who demonstrated that students playing computer games answered more questions than students who did not play the game. Whitehall and McDonald (1993) observed procedural knowledge and concluded that playing a game is more effective for procedural knowledge than receiving standard practices. Referring to strategic knowledge, Wood and Stewart (1987) found that using computer games for improving practical skills increased the potential in critical thinking (Garris et al. 2002).

Jennings (2002) studied three different learning methods (case method, business simulation and workplace-based projects) and concluded through questionnaires that the dominant method in effective learning is the business simulation.

Kayes et al. (2005) highlighted the advantages of learning in teams and their effectiveness. Kenworthy and Wong (2005) launched a study and found differences exist between learning management simulations and games versus case studies. Playing games and simulations increased players enjoyment and were useful to transfer knowledge to the workplace.

Also, Kritz (2003) mentioned positive effects of learning through games and stated that not only did playing games increase social and personal skills, but also increased methodical competencies and knowledge.

Robertson and Howells (2008) documented a classroom study with game-playing experiences and concluded that participants were highly enthusiastic and motivated. Furthermore, players were able to connect different situations and their results. The authors also mentioned that a mediation by a facilitator or a teacher is necessary for playing a game effectively.

Washbush and Gosen (2001) documented that learning with simulations and games leads to an increase of 10% on post- and pre-learning assessments (Wideman et al. 2007).

5. METHODOLOGY FOR CLASSIFYING MANAGEMENT GAMES

In this chapter, the databases, keywords and selected journals used for chapters 6 and 7 are mentioned. Furthermore, a taxonomy for classifying management games is presented.

5.1 Literature

The following table 15 shows the databases used for the general application area of management games and for management games in health care.

Table 15: Used databases

Databases	General Application Area	Health Care
Pro Quest	X	X
Science Direct	X	X
Blackwell Synergy	X	X
Medline		X
Google Scholar	X	X
JStor	X	X
SSCI/SCI/A&HCI	X	X

Source: Own illustration

Keywords used in the databases above, are mentioned in table 16. For an easier further research in the topic of management games, keywords should be alluded.

Table 16: Overview on used keywords

Keywords	General Application Area	Health Care
Application area of games	X	X
Business Game	X	
Educational games	X	X
Effectiveness of games	X	X
Gaming	X	X
Gam*	X	X
Game effectiveness	X	X
Games	X	X
Games in healthcare		X
Games in health care		X
Health care and games		X
Healthcare and games		X
Learning and games	X	X
Learning through games	X	X
Management games	X	X
Management games in health care		X
Management games in healthcare		X
Simulations and Games	X	X
Simulation games	X	X

Source: Own illustration

Finally, the following journals, listed in table 17, were selected for the classification of management games in chapters 6 and 7.

Table 17: Used journals for classification

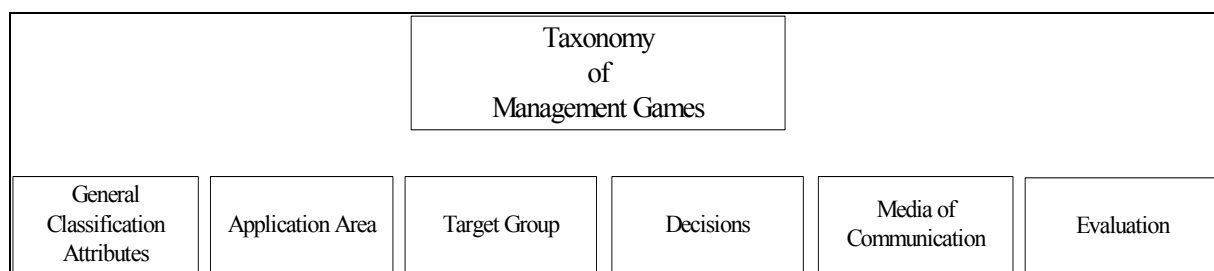
General Application Area	Health Care
<ul style="list-style-type: none"> ▪ Academy of Marketing Science ▪ Central European Journal of Operations Research ▪ Computer & Education ▪ Decision Sciences Journal of Innovative Education ▪ Decision Support System ▪ International Transactions in Operational Research. ▪ Journal of Economic Education ▪ Journal of Legal Studies Education ▪ Journal of Economic Education ▪ Production and Operations Management ▪ Project Management Journal ▪ Systems Research and Behavioural Science ▪ Simulation and Gaming ▪ The Journal of Management Development ▪ Review of Business ▪ Zeitschrift für Planung 	<ul style="list-style-type: none"> ▪ American Journal of Pharmaceutical Education ▪ Developments in Business Simulation & Experiential Exercises ▪ European Journal of Operational Research ▪ Education for Health ▪ Health Care Management Science ▪ Healthcare Financial Management ▪ INFORMS Transactions on Education ▪ Journal of Interactive Learning Research ▪ Journal of Nursing Management ▪ Journal of the Society for Health Systems ▪ Medical Education ▪ Medical Teacher ▪ Nurse Education Today ▪ The American Journal of Surgery ▪ Tropical Doctor ▪ Simulation and Gaming

Source: Own illustration

5.2 Taxonomy of management games

The following figure summarizes classification attributes and created the taxonomy for classifying management games. These attributes refer to general classification attributes, application area, target group, decisions, media of communication and evaluation.

Figure 12: Taxonomy for classifying management games



Source: Own illustration

As mentioned in chapter 2.3, different types of management games exist. Therefore, a basic classification like the following listed in table 18 should help to provide an overview about the elementary characteristics. It should explain if the management game is a general or a functional one; how complex the game is; if competition exists and how the structure of competition is; if the game is played by a group or a single person; if the game is manual or computer-assisted; if the game is played online, offline or on the Internet; and if the game is played only for one period or for more periods.

Table 18: General classification attributes for management games

General Classification Attributes	Specification
General model	<ul style="list-style-type: none"> ▪ General business game ▪ Functional business game
Game's complexity	<ul style="list-style-type: none"> ▪ Simple ▪ Complex
Interactivity	<ul style="list-style-type: none"> ▪ Interactive ▪ Not interactive
Participants	<ul style="list-style-type: none"> ▪ Single-player ▪ Multiple-player
Game analysis	<ul style="list-style-type: none"> ▪ Manual ▪ Computer-based
Availability	<ul style="list-style-type: none"> ▪ Internet ▪ Online ▪ Offline
Time	<ul style="list-style-type: none"> ▪ Single-period ▪ More than one period

Source: own illustration (according to Watson and Blackstone 1981)

Another distinctive feature is the application area of management games. Most games are played for strategic purposes, but for functional management games, the most common fields are marketing, logistic and finance (Faria and Wellington 2004). For health-care issues, functional games are certainly played in other fields, which the following table 19 explains:

Table 19: Application areas of management games

General Application Area	Health Care
<ul style="list-style-type: none"> ▪ Strategic/General Management ▪ Marketing ▪ Logistics ▪ Finance ▪ Others 	<ul style="list-style-type: none"> ▪ Strategic/General Management ▪ Department Management ▪ Disease Management ▪ Pharmacy ▪ Nursing ▪ Others

Source: Own illustration

Target groups for the general application area of management games and for health-care issues are also not identical, like table 20 shows. Target groups top-management, middle-management, low-management and students are idem for both classifications in chapter 6 and 7. Another target group for the general application area are management trainees and for health care games doctors and nurses.

Table 20: Target groups of management games

General Application Area	Health Care
<ul style="list-style-type: none"> ▪ Top Management ▪ Middle Management ▪ Low Management ▪ Management Trainees ▪ Students 	<ul style="list-style-type: none"> ▪ Top Management ▪ Middle Management ▪ Low Management ▪ Doctors ▪ Nurses ▪ Students

Source: Own illustration

Depending on the area of application, participants of games have to make different decisions. Games focusing on health-care issues include similar decisions to ones made in general management games. Table 21 provides an overview of the different decisions included in the taxonomy. General application area decisions include strategic management, finance, human resources, logistic and marketing. Decisions in health care games refer furthermore to medical equipment, emergency, diseases and patients.

Table 21: Decisions in management games

General Application Area	Health Care
<ul style="list-style-type: none"> ▪ Strategic Management ▪ Finance ▪ Human Resource ▪ Logistic ▪ Marketing ▪ Others 	<ul style="list-style-type: none"> ▪ Strategic Management ▪ Finance ▪ Human Resource ▪ Medical equipment ▪ Education ▪ Emergency ▪ Patient ▪ Disease ▪ Others

Source: Own illustration

Media of communication can vary from game to game. So taxonomy should also include communication methods like Internet browser, computer, cards dices or paper and pencil. The following table 22 is identical for chapters 6 and 7:

Table 22: Media of communication of management games

Media of communication
<ul style="list-style-type: none"> ▪ Internet Browser ▪ Computer ▪ Cards ▪ Dice ▪ Paper and pencil

Source: Own illustration

As mentioned in chapter 4, a game is known as an experiential learning cycle and therefore should also be categorized by its learning process. The simplest process is single-stage, meaning only the experience itself. Tossing a coin would be an example for such a game because the results' anticipation depends on the experience alone. On the other hand, in a two-stage-model, reflections follow experience. Simple quiz games (question – evaluated answer – next question) can be categorized as two-stage-model games. Refined quiz games are often three-stage-model games because after the experience and also after the followed reflection, a tactic to deal with the next cycle is devised. Finally quiz games including experience, reflection, abstraction of issue and planning for the next step are called four-stage-models and follow the Kolb's idea explained in chapter 4 (Bochennek 2007).

Taxonomy therefore includes a table to distinguish between papers evaluated and not evaluated and a table with different evaluation methods like evaluation through questionnaire, interview, debriefing, statistics and pre- or post-test.

Table 23: Evaluation of management games

Evaluation	Evaluation Methods
<ul style="list-style-type: none"> ▪ No ▪ Yes ▪ Further research implications 	<ul style="list-style-type: none"> ▪ Questionnaire ▪ Interview ▪ Debriefing session ▪ Statistics ▪ Pre-test ▪ Post-test ▪ Others

Source: Own illustration

6. THE APPLICATION AREA OF MANAGEMENT GAMES

The applications of management games are widespread and used in nearly every business discipline today, as the following table 24 shows (Faria and Wellington 2004):

Table 24: Simulation and game usage in % at the AACSB member schools

Business Discipline	Faria (1987)	Faria (1998)
Strategic management/ Business policy	52.9%	65.7%
Marketing	51.0%	62.7%
Finance	24.8%	39.0%
Management	17.8%	44.5%
Accounting	8.9%	15.7%
Other business	16.8%	18.6%

Source: Faria and Wellington (2004, p. 180)

Findings come from the “*American Association of Collegiate Schools of Business Member Schools*” (Faria and Wellington 2004, p. 180) and show clearly the importance of management games in strategic management, marketing and traditional management (Faria and Wellington 2004). In 2004, the authors showed nearly the same results, namely that most management games are played in the areas of management, marketing and strategy (Faria and Wellington 2004) like table 25 mentions.

Table 25: Management games disciplines

Discipline	Percentage
Management	23.3%
Marketing	20.4%
Strategy/Policy	9.7%
Management Science	17.8%
Finance	7.8%
Accounting	12.3%
Others (mainly economics)	8.7%

Source: Faria and Wellington (2004, p. 183)

Skills that should be trained in business simulations and games include entrepreneurial skills, inventory management, personnel administration, leadership, hiring and firing, data analysis and research skills, collective bargaining, basic economic concepts, interpersonal skills and communication skills (Faria 2001).

6.1 A paper study on management games

In this chapter, 36 management games were studied and analysed to the mentioned characteristics in chapter 5.2. Table 26 in this chapter gives an overview about the authors, the published year and names of the described management games.

Table 26: List of management games studied

Author	Year	Management Game
[1] Ammar and Wright	1999	The Distribution Game
[2] Ammar and Wright	1999	The Beer Game
[3] Anderson and Morrice	2000	Mortgage Service Game
[4] Backus and Amlin	2005	Utilities 21
[5] Barlas and Özevin	2004	Stock Management Game*
[6] Barrese et al.	2003	*
[7] Bekebrede et al.	2005	Sim Maas
[8] Bird	2002	Amy Chen v. East Asia Import Company
[9] Brozlik and Zapalska	2002	The Portfolio Game
[10] Chakravorty and Franza	2005	Simulation Game from the AGI Goldratt Institute*
[11] Chapman and Martin	1995	Crac - Metal Box Business Game
[12] Cook and Cook	2005	Mars SMS - Sales Management Simulation
[13] Cook and Cook	2005	Mars MMS- Marketing Management Simulation
[14] Devine et al.	2004	Tinsel Town
[15] Ebner and Holzinger	2007	Internal Force Master
[16] Faria and Dickinson	1994	The Sales Management Simulation Game
[17] Hansmann et al.	2005	Simulme
[18] Heidenberger et al.	2001	Merlin
[19] Hofer and Ladner	2006	Sinto
[20] Hoogeweegen et al.	2006	The Business Networking Game
[21] Jacobs	2000	The Beer Distribution Game
[22] Keys et al.	1994	The Multinational Management Game
[23] Kuit et al.	2005	The Infrastratego Game
[24] Lainema and Nurmi	2006	Realgame
[25] Leemkuil et al.	2003	KM Quest
[26] Lengwiler	2004	The Monetary Policy Simulation Game
[27] Nair	2003	Manutex
[28] Navarro et al.	2004	SimSe
[29] Paich and Sterman	1993	B&B Enterprises*
[30] Parker and Swatman	1999	Trees
[31] Sanderson et al.	1997	Cybertronics Interactive Simulation Game
[32] Santos	2002	The Financial System Simulator
[33] Shapiro	2003	The Marketplace Game
[34] Vanhoucke et al.	2005	The Project Scheduling Game
[35] Wall and Ahmed	2008	Merit
[36] Woltjer	2005	Steer the Economy

Source: Own illustration (*referring to the name of the game, email correspondence with author)

This alphabetical order of games will be also used in the following tables to describe characteristics.

6.1.1 General classification attributes

Table 27: General model of management games studied

General Model	[4] [6] [7] [8] [10] [11] [14] [17] [18] [20] [22] [23] [24] [25] [27] [35] [36]	[1] [2] [3] [5] [9] [12] [13] [15] [16] [19] [21] [26] [28] [29] [30] [31] [32] [33] [34]
General Business Game	X	
Functional Business Game		X

Source: Own illustration

Table 27 shows that 17 of the 36 studied games are general management games and have the aim to teach strategic management in different fields of business. In summary, 19 of the 36 studied games are functional management games, meaning they are related to a specific area of a company.

Table 28: Complexity of management games

Game's complexity	[8] [9] [14] [28]	[1] [2] [3] [4] [5] [6] [7] [10] [11] [12] [13] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [29] [30] [31] [32] [33] [34] [35] [36]
Simple	X	
Complex		X

Source: Own illustration

Most of the studied management games show a complex structure except the games from Bird (2002) [8], Brozlik and Zapalska (2002) [9], Devine et al. (2004) [14] and Navarro et al. (2004) [28]. These games are configured in a simple manner using cards, pencils and paper. Complex systems, interdependencies and computers do not play a role in these games.

Table 29: Interactivity of management games

Interactivity	[1] [2] [3] [5] [4] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36]
Interactive	X
Non Interactive	

Source: Own illustration

Interactivity is a typical characteristic of games. As it can be seen in table 29, all studied management games are interactive.

Table 30: Structure of participants

Participants	[15]	[1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36]
Single Player	X	
Multiple Players		X

Source: Own illustration

The game by Ebner and Holzinger (2007) [15] is also the only single-player game of the 36 management games studied.

Table 31: Management game analysis

Game Analysis	[8] [9] [14] [28]	[1] [2] [3] [4] [5] [6] [7] [10] [11] [12] [13] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [29] [30] [31] [32] [33] [34] [35] [36]
Manual	X	
Computer based		X

Source: Own illustration

The analysis of the selected games show, that only the games by Bird (2002) [8], Brozlik and Zapalska (2002) [9], Devine et al. (2004) [14] and Navarro et al. (2004) [28] are manual games. In these games, manual features are used for communication and will be described in chapter 6.1.5. Finally, as it can be seen in the table above, 32 of the games studied are computer-based games.

Table 32: Availability of management games

Availability	[12] [13] [15] [17] [18] [21] [25] [30] [32] [33]	[2] [3] [4] [6] [7] [10] [11] [12] [13] [14] [15] [17] [18] [19] [20] [21] [22] [23] [24] [25] [27] [29] [30] [31] [32] [33] [34] [35] [36]	[1] [5] [8] [9] [14] [16] [26] [28]
Internet	X		
Online		X	
Offline			X

Source: Own illustration

Nearly one-third of the 36 games studied are played over the Internet. Most of the games are played online, meaning that the computers used are linked to a network. Just eight games are played offline, meaning that they are played without networking or are played manually. Cook and Cook (2005) [12,13] host their games over the Internet so students can make their decisions directly on the World Wide Web. Ebner and Holzinger (2007) [15] use the Internet in their game so they can register players on a high-score list when they score enough points in the game. Hansmann et al. (2005) [17] host the game over the Internet to connect participants from different classes. The game by Heidenberger et al. (2001) [18] and Santos (2002) [32] also use the potential of the web and host their games over the Internet. The game by Jacobs (2000) [21] is an expansion of Ammar and Wright (1999) [1,2] and allows participants to play the Ammar and Wright (1999) [1,2] game over the Internet so students from different classrooms can use web browsers to play. The game described in Leemkuil et al. (2003) [25] is also played over the Internet because its participants are mostly managers

who have tight schedules or are with companies from remote areas. Also, Parker and Swatman (1999) [30] have recognized the Internet as a powerful tool to play management games and made their game Internet-compatible. The main reason for the Internet compatibility of Shapiro (2003) [33] is to play the game against students from other universities.

The games by Ammar and Wright (1999) [1,2], Barlas and Özevin (2004) [5], Faria and Dickinson (1994) [16] and Lengwiler (2004) [26] are played on computer but offline. These games use the computer mainly to analyse decisions and to calculate results like cash, quantities or other different outputs.

Table 33: Time aspect in management games

Time	[9]	[1] [2] [3] [4] [5] [6] [7] [8] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36]
Single Period	X	
Multiple Periods		X

Source: Own illustration

The game by Brozlik and Zapalska (2002) [9] is the only game of the 36 games studied that is played just for one period.

6.1.2 Application area of management games

Table 34: Application area of management games studied

Application Area	[4] [6] [7] [8] [10] [11] [14] [17] [18] [20] [22] [23] [24] [25] [27] [35] [36]	[13] [19] [29] [33]	[1] [2] [3] [21] [30]	[5] [9] [26] [32]	[12] [15] [16] [28] [31] [34]
Strategic/General Management	X				
Marketing		X			
Logistics			X		
Finance				X	
Others					X

Source: Own illustration

The game by Backus and Amlin (2005) [4] is situated in the deregulated-electricity market and participants get used to the dynamics of deregulation. Barrese et al. (2003) [6] developed a game in which players run a fictional insurance company and Bekebrede et al. (2005) [7] developed a game to teach infrastructure. The game by Bird (2002) [8], is situated in the field of law, where participants have to represent lawyers and have to manage a court case.

Chapman and Martin (1995) [11] established a general management game situated in the manufacturing sector in which participants sell goods. Devine et al. (2004) [14] developed a game in which participants manage a movie studio. The game developed by Heidenberger et al. (2001) [18] focuses on strategic decisions mainly in the R&D sector. Hoogeweegen et al. (2006) [20] established a game in which mass customization creates dynamic networks. The game launched by Keys et al. (1994) [22] is situated in the microcomputer industry and Kuit et al. (2003) [23] focuses a game on the electricity market. In the game by Lainema and Nurmi (2006) [24], participants play competing manufacturing firms. Also the game of Nair (2003) [27] includes all important features of a general management game. Wall and Ahmed (2008) [35] developed a game of fictional construction firms, in which teams operate as boards of directors. Woltjer (2005) [36] wants to focus on different macroeconomic decisions with his game and aims to show how these decisions influence real wages, unemployment, investment or inflation.

Cook and Cook (2005) [13], Hofer and Ladner (2006) [19], Paich and Sterman (1993) [29] and Shapiro (2003) [33] have functional games that are based in marketing. In the game of Cook and Cook (2005) [13], participants play a marketing manager who is responsible for the strategic direction of the company's marketing mix. Participants of Hofer and Ladner's game (2006) [19] have to position new brands with one of the following strategies, namely imitation or niche policy. Paich and Sterman (1993) [29] devised a game in which players realize the dynamics of new products on a market, and participants must manage a product from its launch until its maturity. Shapiro (2003) [33] also developed a game in which players use modern marketing tools for decision-making.

The games by Ammar and Wright (1999) [1,2], Anderson and Morrice (2000) [3], Jacobs (2000) [21] and Parker and Swatman (1999) [30] are related to logistics and supply-chain management. Ammar and Wright (1999) [1] devised a game based on inventory management. "The Distribution Game" includes a supplier, three retailers, a warehouse and. In "The Beer Game" [2] players learn about distribution including a retailer, a distributor, a factory and a warehouse. Anderson and Morrice (2000) [3] and Jacobs (2000) [21] focus on supply chains. Supply chains are simulated in Parker and Swatman (1999) [30] as well. The game features an e-bank, freight forwarders and a warehouse. Participants must to purchase inputs, manufacture goods and sell the products.

Barlas and Özevin (2004) [5], Brozlika and Zapalska (2002) [9], Lengwiler (2004) [26] and Santos (2002) [32] specialize in games related to finance. Barlas and Özevin (2004) [5] developed a stock-management game with the goal of “*keeping the inventory level as low as possible while avoiding any backorders*”(Barlas and Özevin 2004, p. 440). In Brozlika and Zapalska (2002) [9], different portfolio formations are simulated and must be managed. In Lengwiler (2004) [26], participants play central bank governors and their stock decisions affect the economy. Santos (2002) [32] focuses on monetary policy and its international consequences.

Cook and Cook (2005) [12] as well as Faria and Dickenson (1994) [16] have games situated in sales management. Ebner and Holzinger (2007) [15] concentrate on civil engineering and Navarro et al. (2004) [28] simulate a software engineering process. The game by Sanderson et al. (1997) [31] simulates a product development process and Vanhoucke et al. (2005) [34] focuses on decisions of project management.

6.1.3 Target Groups

Table 35: Target groups of management games

Target Group	[4] [14] [16] [20] [23] [24] [25] [27] [34]	[4] [14] [16] [20] [23] [24] [34]	[4] [14] [16] [20] [23] [24]	[14] [16] [20] [23] [24] [29] [31] [34]	[1] [2] [3] [6] [8] [9] [10] [11] [12] [13] [14] [15] [17] [18] [19] [20] [21] [23] [24] [25] [26] [28] [29] [30] [31] [32] [33] [35] [36]
Top Management	X				
Middle Management		X			
Low Management			X		
Management Trainees				X	
Students					X

Source: Own illustration

The games studied refer to different target groups. Nine of the studied games are played by top managers, seven by middle managers and seven by low-level managers. Eight management games can be used by management trainees and more than two-thirds of the games are played by students. The games of Backus and Amlin (2005) [4], Devine et al. (2004) [14], Faria and Dickinson (1994) [16], Hoogeweegen et al. (2006) [20], Kuit et al. (2005) [23] and Lainema and Nurmi (2006) [24] can be played by top-, middle- and low-level

managers. Management games of Devine et al. (2004) [14], Hoogeweegen et al. (2006) [20], Kuit et al. (2005) [23] and Lainema and Nurmi (2006) [24] are ideal for all target groups.

6.1.4 Decisions in management games

For a better overview, decisions in management games are divided into a table for general management games and functional ones.

Table 36: Decisions in general management games

Decisions	[4]	[6]	[7]	[8]	[10]	[11]	[14]	[17]	[18]	[20]	[22]	[23]	[24]	[25]	[27]	[35]	[36]
Strategic Management	X		X			X	X		X	X	X		X	X	X	X	
R&D	X					X	X		X		X			X			
Finance	X	X	X		X	X			X	X	X		X	X	X	X	X
Human Resources					X						X				X	X	X
Logistic					X								X				
Marketing					X	X	X		X	X	X		X	X		X	
Others	X		X	X		X	X	X	X	X			X	X	X	X	X

Source: Own illustration

Basically, decisions in general management games focus on more than one area of a company. Decisions in Backus and Amlin (2005) [4] include power-plant building activities, mergers and acquisitions, making contracts, price decisions, advertising, paying stock dividends and cancellation of contracts. Although Barrese et al. (2003) [6] describes a general management game, decisions are made only in the financial area because the game simulates an insurance company. Decisions focus on insurance operations and investments. In Bekebrede et al. (2005) [7] participants are playing the role of different department directors, including general directors, financial directors, commercial directors and operational directors and make decisions depending on their department. Decisions in Bird (2002) [8], refer to law decisions, brief-writing, oral argument skills and negotiations. Chakravorty and Franza (2005) [10], as well as Chapman and Martin (1995) [11], are typical general management games with marketing, operations, finance and human-resource decisions. Because the game by Devine et al. (2004) [14] simulates a movie studio, decisions refer to marketing, script evaluation, industry research and talent appraisal. Heidenberger et al. (2001) [18] includes mainly R&D decisions but include also pricing, marketing investments and scheduled quantities. Participants of Keys et al. (1994) [22] must make tactical decisions, turn inventory into cash, reduce employee turnover, increase productivity, R&D, sales and advertising. Lainema and

Nurmi's (2006) game [24] is based in manufacturing and includes decisions about funding, deliveries, production, financial reporting, sales and marketing. Leemkuil et al. (2003) [25], Nair (2003) [27] and Wall and Ahmed (2008) [35] have typical general management games that include decisions from nearly every functional area of a company. Woltjer (2005) [36] includes macroeconomic decisions to see how decisions influence real wages, unemployment investment or inflation.

Table 37: Decisions in functional management games

Decisions	[1]	[2]	[3]	[5] [9] [26] [32]	[12]	[13] [33]	[15]	[16]	[19]	[21]	[28]	[29]	[30]	[31]	[34]
Strategic Management														X	
R&D															
Finance		X		X				X	X	X		X	X	X	
Human Resources								X							
Logistic	X	X						X		X					
Marketing						X			X			X	X	X	
Others	X	X	X		X		X	X			X		X	X	X

Source: Own illustration

Ammar and Wright (1999) [1,2] include cost, lead times and demand distribution decisions. Also, the game by Jacobs (2000) [21], which is also based in logistics, focuses on typical decisions like cost-minimization (holding costs and backordering costs) or selling debt to meet financial requirements. Parker and Swatman (1999) [30] let their players set prices, communicate with suppliers and customers, predict customers' demands and compete with other companies.

Marketing decisions in Cook and Cook (2005) [13] include target-marketing, market-segmentation, product-positioning and marketing mix. In Paich and Sterman (1993) [29], participants have to manage a product from launch until maturity and therefore must set prices or make capacity decisions. In Shapiro (2003) [33] no detailed information about what kind of marketing decisions are given.

In the game by Barlas and Özevin (2004) [5], financial decisions include mainly order decisions, but participants of Brozlik and Zapalska (2002) [9] have to make different decisions to manage their portfolios. Lengwiler (2004) [26] includes stock and interest-rate decisions and Santos (2002) [32] concentrates on decisions referring to non-borrowed reserves, discount rates, reserve ratios and currencies-to-deposit ratios.

In Cook and Cook (2005) [12], participants decide about different sale activities and also in Faria and Dickinson (1994) [16] sales decisions dominate (for example, basic organizational structure decisions, geographic allocation and size of allocation including hiring and firing personnel or the number of salesman for each district). Vanhoucke et al. (2005) [34] focuses on different project-management decisions such as planning, scheduling, realization and control.

6.1.5 Media of communication

Table 38: Media of communication in management games studied

Media of communication	[12] [13] [15] [17] [18] [21] [25] [30] [32] [33]	[1] [3] [4] [5] [6] [7] [10] [11] [16] [19] [20] [22] [23] [24] [26] [27] [29] [31] [34] [35] [36]	[2] [28]	[8] [14]	[9]
Internet Browser	X				
Computer	X	X			
Cards			X		
Dice					X
Paper and pencil				X	X

Source: Own illustration

As it can be seen in table 38 above, 31 out of 36 management games use the computer as their media of communication, including ten management games that can be played over the Internet. Just five games use other forms of communication like cards, dice, paper and pencils.

Ammar and Wright (1999) [2] as well as Navarro et al. (2004) [28] use cards as their main media of communication. In Bird (2002) [8] and Devine et al. (2004) [14], participants just need paper and pencil to make their decisions. Required material in Brozlik and Zapalska (2002) [9] are only paper, pencil and dice.

6.1.6 Evaluation of management games

Table 39: Evaluation of management games

Evaluation	[1] [2] [5] [6] [7] [9] [11] [16] [19] [21] [26] [33] [34] [36]	[3] [4] [8] [10] [12] [13] [14] [15] [17] [18] [20] [22] [23] [24] [25] [27] [28] [29] [30] [31] [32] [35]	[3] [4] [5] [12] [13] [18] [20] [25] [28] [30] [31] [34] [35]
No	X		
Yes		X	
Future game and research implications			X

Source: Own illustration

Nearly two-thirds of all games are evaluated and show mainly positive learning effects. One-third of the evaluated papers also give future implications and suggestions for their described games.

Table 40: Different evaluation methods of management games studied

Evaluation Methods	[12] [13] [20] [28] [32] [35]	[4] [8] [10] [27] [30] [34]	[3] [29]	[14] [22]	[15] [31]	[24] [25]
Questionnaire	X			X	X	X
Interview						X
Debriefing Session		X		X		
Pre Test					X	
Post Test					X	
Others			X			

Source: Own illustration

Cook and Cook (2005) [12,13], Hoogeweegen et al. (2006) [20], Navarro et al. (2004) [28], Santos (2002) [32] as well as Wall and Ahmed (2008) [35] use questionnaires for evaluating their management games. Backus and Amlin (2005) [4], Bird (2002) [8], Chakravorty and Franza (2005) [10], Nair (2003) [27], Parker and Swatman (1999) [30] and Vanhoucke et al. (2005) [34] all evaluated through debriefing sessions after playing the game. Anderson and Morrice (2000) [3] as well as Paich and Sterman (1993) [29] use statistical methods to evaluate their games. Devine et al. (2004) [14] and Keys et al. (1994) [22] combine questionnaires with debriefing sessions. Ebner and Holzinger (2007) [15] and Sanderson et al. (1997) [31] use questionnaires but also pre- and post-testing for evaluation. Lainema and Nurmi (2006) [24] as well as Leemkuil et al. (2003) [25] hold questionnaires and interviews. Heidenberger et al. (2006) [18] and Kuit et al. (2005) [23] evaluate their games but do not give descriptive information about how evaluations are made.

There are also general results that refer to the effectiveness of the games studied. Participants in Barrese et al. (2003) [6] argued that playing the game helped to learn more about different strategic decisions. In Bird (2002) [8], playing the game advanced negotiation styles and helped to find the right solutions for their law cases. Chakravorty and Franza (2005) [10] analysed that playing their management game advanced students' cross-functional thinking. Participants of Cook and Cook (2005) [12,13] showed positive educational experience because the game helped to develop specific skills. Devine et al. (2004) [14] as well as Ebner and Holzinger (2007) [15] observed that playing their management games showed a high fun factor. But results in Ebner and Holzinger (2007) [15] showed no learning differences between "playing students" and "traditional learning students". Hansmann et al. (2005) [17]

and Heidenberger et al. (2001) [18] also observed mainly positive results and positive learning effects. Participants of the game by Keys et al. (1994) [22] noticed that they learned a lot about strategic thinking and teamwork within intercultural groups. Another advantage of management games occurred in Lainema and Nurmi (2006) [24], namely that games create team spirit. In Navarro et al. (2004) [28] participants appreciated that different strategies were possible to play the game. Also, Parker and Swatman (1999) [30] and Sanderson et al. (1997) [31] observed that playing management games increased the value of learning. Santos (2002) [32] cited the advantage of playing games over the Internet because it worked easier. Wall and Ahmed (2008) [35] found that games helped players understand different management problems better and furthermore, games helped to develop problem-solving and analytical techniques.

One-third of the studied management games provide further research implications. Anderson and Morrice (2000) [3] suggested a feedback session for their game to learn more from the results and, furthermore, an Internet version of their game will be developed. Backus and Amlin (2005) [4] noticed that their future work includes to teach participants of the game how they can implement their learned skills in their real-life work. Cook and Cook (2005) [12,13] will try in the near future to make their games more realistic to generalize their observed results. Heidenberger et al. (2001) [18] argued that future features for their game could be playing in more than one market or company fusions. Navarro et al. (2004) [28] and Sanderson et al. (1997) [31] want to develop Internet versions of their games in the near future so that people from all over the world can participate. Wall and Ahmed (2008) [35] think that laptops for better working and learning should be available for participants in the future.

6.2 Online management games

As mentioned in chapter 3.4, online games have a unique characteristic. The following tables classify an illustrative selection of management games that can be played over Internet. The mentioned online games are the only big ones found during research. In these management games, players can register directly over the Internet to participate the game.

Table 41: Online played management games

Number	Company	Online game	Internet Address
[37]	Bayer	Bayer International Management Simulation	www.bims.ag
[38]	Detecon	Mobile Award 2	www.mobile-award.de/
[39]	L' Oreal	E-Strat Challenge	www.e-strat.loreal.com
[40]	The European School of Management and Technology	Marga	www.esmt.org/eng/executive-education/marga-business-simulations/
[41]	Dr. Cook	Mars	http://www.shootformars.com/

Source: Own illustration

6.2.1 General classification attributes

Table 42: General classification attributes

General Model		[37]	[38]	[39]	[40]	[41]
Model	General business game	X	X	X	X	
	Functional business game					X
Games' complexity	Simple					
	Complex	X	X	X	X	X
Interactivity	Interactive	X	X	X	X	X
	Non-interactive					
Participants	Single player					
	Multiple players	X	X	X	X	X
Game Analysis	Manual					
	Computer-based	X	X	X	X	X
Availability	Internet	X	X	X	X	X
	Online	X	X	X	X	X
	Offline					
Time	Single-period					
	Multiple periods	X	X	X	X	X

Source: Own illustration

Table 42 shows the general model of the illustrative management games. The games by Bayer [37], Detecon [38], L'Oreal [39], The European School of Management and Technology [40] are general business games whereas the game by Dr. Cook [41] is a functional one.

The “Bayer International Management Simulation” [37] is one of the first Internet-based management games that is available in German as well as in English. The challenge is to run a medium-sized manufacturing company (Bayer Business Service 2008).

“Mobile Award 2” [38] is the biggest online-played management game in Germany and is divided into three challenges. In the first challenge, participants have to run a bad margin

telecommunication service provider with the goal to strengthen its Internet and landline segments. For the second challenge, the participants' company has grown and has its focus on new telecommunications technologies. Complexity of the game increases and more decisions have to be made by the participants than in the beginning. The final round is a challenge between the best participants of the two other challenges and it is played in a two-day event (Detecon Consulting 2008).

In the "E-Strat Challenge" [39] five companies compete in the cosmetic branch with the goal to market different cosmetics brands. In comparison to the other games, in the "E-Strat Challenge" [39], every team leads the same company but in different simulated worlds against other simulated competitors. After the fifth round, only the 300 best teams are selected for semi-finals, where they have to make a business plan. In the end, 16 teams go to Paris to compete in a final round against each other, meaning that they present L'Oreal their company with the goal that the jury would buy it. The two winners are chosen by the jury (StratX 2008).

"Marga" [40] can be played in two different versions, either "Marga Service" or "Marga Industry" and is also a general management game. The game is divided into four different challenges - training round, main round, quarter-finals and semifinals. A last competition takes place at Schloss Gracht, where only the eight best teams are invited (MARGA Business Simulation GmbH 2008).

"Mars" [41] is a functional management game and offered in two different versions, the "Sales Management Solution" and the "Marketing Management Solution". In the first one, participants play a district sales manager and are responsible for five other sales staff in their district. The offered products are electronic video games. In the second kind of simulation, participants play the role of a marketing manager and are responsible the company's strategic marketing direction (Cook and Cook 2008).

All five games mentioned above are complex and interactive games, which are typical characteristics for management games, especially ones played online. All five games are multiple-player games. In the "Bayer International Management Simulation" [37], participants can register individually as well as in a team. Individuals are then allocated to an adequate team (Bayer Business Services 2008). In "Mobile Award 2" [38] individual

participants are not allowed. Every team member can overrule the others, meaning the decision saved last is the valid one (Detecon Consulting 2008). In the "E-Strat Challenge" [39], participants have to form a team of three students for the challenge (StratX 2008). "Marga" [40] is also played in teams, but team members are mobile, so virtual teams can exist (MARGA Business Simulation GmbH 2008).

Over a period of five months, the Bayer game [37] simulates seven fiscal years and expected effort is five hours per week (Bayer Solution Services 2008). The first challenge of "Mobile Award 2" [38] is designed for five years and expected effort for a week is one to three hours, depending on previous knowledge (Detecon Consulting 2008). In the L'Oreal game [39], six decisions have to be made and three fiscal years are simulated (StratX 2008). In the training rounds of "Marga" [40], a necessary time of five hours should be calculated and three hours in the final round (MARGA Business Simulation GmbH 2008). In "Mars" [41], three years are simulated and each decision represents a business quarter (Cook and Cook 2008).

6.2.2 Application area of online management games

Table 43: Application area of management games

Application Area	[37]	[38]	[39]	[40]	[41]
Strategic Management	X	X	X	X	
Marketing					X
Operations					
Logistics					
Human Resource					
Accounting					
Finance					
Distribution					
Others					X

Source: Own illustration

As mentioned earlier, "Bayer International Management Simulation" [37], "Mobile Award 2" [38], "E-Strat Challenge" [39] and "Marga" [40] are general management games whereas "Mars" [41] focuses on marketing and sales.

6.2.3 Target groups

Table 44: Target groups

Target Group	[37]	[38]	[39]	[40]	[41]
Top Management	X				
Middle Management	X				
Low Management	X				
Management Trainees		X	X	X	
Students		X	X		X

Source: Own illustration

The “Bayer International Management Simulation“ [37] focuses mainly on managers whereas “Mobile Award 2“ [38] and “Mars” [41] focuses on participants from universities and colleges (Bayer Solution Services 2008, Detecon Consulting 2008, Cook and Cook 2008). The L’Oreal game [39] is open to MBA and undergraduate students (StratX 2008). “Marga“ [40] is played by staff with high potential and management trainees (MARGA Business Simulation GmbH 2008).

6.2.4 Decisions in management games

Table 45: Decisions in management games

Decisions	[37]	[38]	[39]	[40]	[41]
Strategic Management	X	X	X	X	
R&D	X	X	X	X	
Financial	X	X	X	X	
Human Resources	X	X	X	X	
Marketing	X	X	X	X	X
Others		X	X	X	X

Source: Own illustration

A typical characteristic of general management games is that decisions are made in nearly every area. For the “E-Strat Challenge” [39], it should be noted that Internet-based decisions (e.g. operations and design of websites) are included and main decisions refer to marketing (e.g. marketing-mix decisions, developing new products, decisions about distribution channels of products) (StratX 2008). As Mars [41] is a functional business game, decisions are either marketing-guided or sales-guided (Cook and Cook 2008).

Table 46: Measurements of success of management games

Measurement of success	[37]	[38]	[39]	[40]	[41]
Greatest company value				X	
Share Price Index			X		
Success Value /Balance Scorecard		X			
Business Performance	X				
Market position	X				

Source: Own illustration

Every game of the five illustrated vary in the measurement of success. In the “Bayer International Management Simulation“ [37], each team is evaluated by its business performance and its market position. The five best teams are invited to Leverkusen, Germany, to play a one-week final round of the management game (Bayer Solution Services 2008). In “Mobile Award 2“ [38], measurements for success are a balance scorecard, including economic factors (e.g. financial performance or cash flows) but also “soft” factors (e.g. consumer satisfaction or staff competency) (Detecon Consulting 2008). In “E-Strat Challenge“ [39], success is measured over the Share Price Index, which is influenced by factors such as growth, profitability, market share or ethical indices. Results are measured against cyber-competitors but also against human teams (StratX 2008). In “Marga“ [40], only the companies with the greatest company value survive (MARGA Business Simulation GmbH 2008). Measurements of success are not determined in “Mars“ [41].

6.2.5 Media of communication

Table 47: Media of communication

Media of Communication	[37]	[38]	[39]	[40]	[41]
Internet browser	X	X	X	X	X
Computer	X	X	X	X	X
Cards					
Dice					
Paper and pencil					

Source: Own illustration

All five games use an Internet browser and a computer as their media of communication to play the games.

6.3 Companies offering business game solutions

Because of the increasing potential and the rapid development of management games, companies specialize on offering business game solutions. The following tables show seven companies found during literature research and give an illustrative overview about their range of products and characteristics of their solutions:

Table 48: Illustrative overview about companies offering business game solutions

Number	Company	Solution	Internet Address
[42]	Tata Interactive Systems	Topsim	www.topsim.com
[43]	Softclick IT	Sell the robot	www.sell-the-robot.de/
[44]	University of Dortmund	Dolores	http://dolores.mb.uni-dortmund.de/
[45]	Innovative Learning Solutions	Market Place Simulation	http://marketplace-simulation.com/
[46]	ConPlus	Business Plus	http://www.conplus.ch/
[47]	Logic Systems	Bo Cash	www.bo-cash.de

Source: Own illustration

6.3.1 General classification attributes

Table 49: General classification attributes

General attributes		[42]	[43]	[44]	[45]	[46]	[47]
Model	General Business Game	X			X	X	X
	Functional Business Game	X	X	X	X	X	
Games' complexity	Simple						
	Complex	X	X	X	X	X	X
Interactivity	Interactive	X	X	X	X	X	X
	Non-interactive						
Participants	Single player						
	Multiple players	X	X	X	X	X	X
Game Analysis	Manual						
	Computer based	X	X	X	X	X	X
Availability source	Internet	X	X		X		X
	Online	X	X	X	X	X	X
	Offline						
Time	Single Period						
	More periods	X	X	X	X	X	X

Source: Own illustration

As mentioned before, Tata Interactive Systems [42], Innovative Learning Solutions [45] and ConPlus [46] offer general business games as well as functional ones. Softclick IT [43] and the University of Dortmund [44] offer functional ones and Logic Systems [47] only a general one. All games show a complex structure and are interactive games. All games are

multiplayer games and are all computer-based and include more than one period. The games by Tata Interactive Systems [42], Softclick IT [43], Innovative Learning Solutions [45] and Logic Systems [47] are also Internet-based.

6.3.2 Application area of business game solutions

Table 50: Application Area

Application Area	[42]	[43]	[44]	[45]	[46]	[47]
General Management Game Solutions	X			X	X	X
Marketing	X	X		X		
Operations						
Logistics	X		X	X		
Human Resources	X					
Accounting / Finance	X				X	
Distribution						
Others	X			X	X	

Source: Own Illustration

Topsim [42] offers 20 different business-game solutions. Eight general management game solutions try to sensitize for economic behaviour and for economic decisions. Topic-specific management games focus on the training of specific skills. For example, the main aim of “Topsim Marketing“ is the positioning of products and the right use of communication and distribution channels. “Topsim Change Management“ focuses on human-resource decisions such as organizational culture and the change of environmental decisions. In “Topsim Logistics”, participants try to optimize in-house, outbound and inbound logistics. Furthermore, Topsim offers games that focus on banking, tourism, the insurance industry, public management, service management and trade (Tata Interactive Systems 2008).

Softclick IT [43] offers a functional business game with the focus on business-to-business marketing. The aim of “Sell the Robot” is to sell as many robots as possible but under financial constraints (Softclick IT 2008).

“Dolores” [44] is a management game developed at the University of Dortmund and situated in the field of logistics (University of Dortmund 2008).

Innovative Learning Solutions [45] offer management games for different business courses and companies in 35 countries all over the world. Simulations include marketing-specific games (Introduction to Marketing, Strategic Marketing, Advanced Marketing) and general

management games (Strategic Management, Business Management, Venture Strategy) (Innovative Learning Solutions 2008).

ConPlus [46] was formed in 1994 and in 1998, the company began to develop management games. The most successful is “Business Plus”, which focuses on production, service and commerce or a combination of these (ConPlus 2008).

“Bo Cash” [47] is developed by Logic Systems, a company specialized since 1993 on offering business game solutions. Today, “Bo Cash” is one of the best management games in Europe. Decisions that must be made involve areas of production, sales, finance and marketing (Logic Systems 2008).

Table 51: Other offered solutions

Others		[42]	[43]	[44]	[45]	[46]	[47]
Seminars	Yes	X	X	X		X	X
	No				X		
Demo-Versions	Yes		X	X	X		X
	No	X				X	
Customized Solutions	Yes					X	X
	No	X	X	X	X		

Source: Own illustration

Furthermore, Tata Interactive Systems [42] offers seminars to play the different management games but do not provide demo versions or customized solutions (Tata Interactive Systems 2008).

ConPlus [46] offers no rigid solutions, products, markets and services but they can be defined by the course instructor. In Business Plus, participants do not play a fictional company, it allows participants to play the customers’ company to make the game as realistic as possible. This is realized through parameterization. Also, seminars offered by the company are customized, which increase learning effects (ConPlus 2008).

Logic Systems [47] offers different versions their game, namely a starter version for education and training and a professional version for managers. For seminars, customers can define main targets and Logic Systems provides a tailored business game (Logic Systems 2008).

7. MANAGEMENT GAMES IN HEALTH CARE

7.1 Education in health care

The slogan “learning by doing” becomes less acceptable when high-risk care is needed. Restrictions in medical education led to seeking alternative teaching methods to gain experience and to learn medical knowledge. Medical educators are confronted with budgetary constraints and societal pressure to raise safety of medical care and medical education. In recent decades, different types of medical education were used (Vozenilek et al. 2004).

Skills that are demanded for physicians are (Lane et al. 2001):

- Patient-centred skills: skills related to direct care of patients, technical, interpersonal and communication skills
- Process-centred skills: skills including teamwork, information-management and patient-advocacy skills; they allow physicians to work successfully in their environment
- Environment-centred skills: skills needed for the success in the culture of medicine such as administration, leadership and business skills

For medical education and training, the use of live patients is necessary, but on the other hand medical professionals have to ensure the well-being and safety of their patients. Simulation-based learning is an optimal tool to develop knowledge, attitudes and skills of medical professionals with a minimized risk (Ziv et al. 2003).

The following statement comes from Barach (2001) and mentions the importance of medical simulation. *“Medical simulation [is gaining] interest from multiple corners. Research, evidence-based outcomes, medical education, performance assessment ethics, business, all are pushing at the doors to learn more about this “new” field and its potential impact in health care. There is a great need to educate health-care practitioners to the variety of tools, techniques, theory, and history of simulation.”* (Crookall and Zhou 2001, p. 142)

Different simulation techniques allow physicians, managers, students and many others to improve these skills and to train them in a risk-free environment (Lane et al. 2001).

Vozenilek et al. (2004) mention three different types of medical education namely:

- Web-based education
- Virtual reality
- High-fidelity human patient simulation

Referring to web-based education, it should be noted that faster Internet access and improved computing capabilities led to a change in traditional teaching. The paper by Vozenilek et al. (2004), which includes agreed statements upon the members of the “*Educational Technology Section of the 2004 AEM Consensus Conference for Informatics and Technology in Emergency Department Health Care*” (Vozenilek et al. 2004, p. 1149), concluded that emergency physicians should promote basic computer literacy and access to computer-based training, medical education materials through the Internet and other education methods to ensure medical training and education .

Virtual reality can be described as a kind of advanced computer-human interaction. It permits humans to interact with computers in a simulated environment of our physical world. A consensus recommendation in the paper mentions that physicians should become more involved in virtual-reality development (Vozenilek et al. 2004).

High-fidelity human patient simulation means full-body automated mannequins with the aim to provide realistic, tactile, auditory and visual stimuli. The authors mention that emergency medicine programs should use these mannequins to teach and evaluate competencies among trainees (Vozenilek et al. 2004).

Streufert et al. make another classification on simulation technologies in health care. They distinguish between games, microworlds, role-playing and in-basket techniques. Streufert et al. mention that the disadvantage of games is that players often don't take them seriously. On the other hand, microworlds are computerized, complex, dynamic game programs in which the participant gets consumable resources and makes decisions. After the decision, a software calculates the outcome, and then participants make decisions again. The details of the software are not known by the participant but the software should clarify the questions about what challenge the medical participants should practice and how they handle this challenge (Streufert et al. 2001).

Lane et al. (2001) describe three different simulation techniques that are used to educate medical personnel and summarized in table 52:

Table 52: Different simulation techniques in education

Simulation type	Characteristics
Simulation patient encounters	<ul style="list-style-type: none"> ▪ Role-playing ▪ Simulated or standardized patients
Screen-based simulations	<ul style="list-style-type: none"> ▪ Computer-based clinical simulations ▪ Video-based simulations
Realistic interactive simulators	<ul style="list-style-type: none"> ▪ Early simulators ▪ Task-specific simulators

Source: Lane et al. (2001)

Ziv et al. (2003) provide an overview about different simulation tools in medical education.

Table 53: Different simulation tools in medical education

Tool	Description
Low-tech simulators	Mannequins or models to practice simple manoeuvres
Simulated / standardized patients	Role-playing to train communication or physical skills
Screen-based computer simulators	Decision-making and problem-based learning
Complex task trainers	High-fidelity tools are integrated with computers
Realistic patient simulator	Full-length and computer-driven mannequins

Source: Ziv et al. (2003, p. 784)

Bradely (2006) distinguishes between four different types of medical education systems. Part-task trainers include a body part and are used to train psychomotor or procedural skills such as ophthalmoscopy, catheterisation or venepuncture. Computer-based systems are often supported by CD-ROMs and often these systems are a combination of virtual reality and haptic systems. Simulated patients are popular in medical education and are often embedded in role-playing. Integrated simulators combine mannequins and computer controls and can be manipulated to study different situations and their outcomes.

Christensen et al. (2001) differentiate between four types of simulators that are available in medical education. Macrosimulators include a physical component, for example a mannequin, whereas microsimulators are pure computer-based simulators. Depending on the topics' complexity, micro- and macrosimulators can be divided into simple or complex.

Table 54: Overview of different medical education types

Author	Year	Medical education types
Bradley	2006	<ul style="list-style-type: none"> ▪ Part task trainers ▪ Computer-based systems ▪ Simulated patients and environments ▪ Integrated simulators
Christensen et al.	2001	<ul style="list-style-type: none"> ▪ Simple macrosimulators ▪ Complex macrosimulators ▪ Simple microsimulators ▪ Complex microsimulators
Lane et al.	2001	<ul style="list-style-type: none"> ▪ Simulated patient ▪ Screen-based ▪ Realistic interactive simulators
Streufert et al.	2001	<ul style="list-style-type: none"> ▪ Games ▪ Microworlds ▪ Role-playing ▪ In-basket techniques
Vozenilek et al.	2004	<ul style="list-style-type: none"> ▪ Web based education ▪ Virtual reality ▪ High-fidelity human patient simulation
Ziv et al.	2003	<ul style="list-style-type: none"> ▪ Low-tech simulators ▪ Simulated/standardized patients ▪ Screen-based computer simulators ▪ Complex task trainers ▪ Realistic patient simulators

Source: Own illustration

As it can be seen in table 54, many different types of simulations exist and all of them can be used in the health-care sector, whether the focus is on training, patient care or assessment of the physician's performance (Streufert et al. 2001).

7.2 Literature review

In the last years, many authors wrote about why simulations and management games enjoy an increasing importance in the health-care sector. The following tables 55a and 55b provide an illustrative overview about important papers referring to this topic:

Table 55a: Simulation and games in health care

Author	Title and Journal	Year
Akl et al.	Educational games for health professionals (Review); <i>Cochrane Database of Systematic Reviews</i> , Issue 1, Art. No.: CD006411. DOI: 10.1002/14651858.CD006411.pub2	2008
Barach et al.	Healthcare Assessment and Performance: Using Simulation, <i>Simulation Gaming</i> , Vol. 32, No. 2, p. 147-155	2001
Beaubien and Baker	The use of simulation for training teamwork skills in health care: how low can you go? <i>Quality and Safety in Health Care</i> , Vol. 13, p. 51-56	2004
Bond et al.	The Use of Simulation in Emergency Medicine : A Research Agenda, <i>Society of Academic Emergency Medicine</i> , Vol. 14, No. 4, p. 353-363	2007

Source: Own illustration

Table 55b: Simulation and games in health care

Author	Title and Journal	Year
Bradley	The history of simulation in medical education and possible future directions; <i>Medical Education</i> ; Vol. 40, Issue 3, p. 254-262	2006
Christensen et al.	Microsimulators in medical education : an overview, <i>Simulation & Gaming</i> , Vol. 32 , No. 2, p. 250-262	2001
Crookall and Zhou	Medical and Healthcare Simulation: Symposium Overview <i>Simulation Gaming</i> , Vol. 32, No. 2, p. 142-146	2001
Donaldson	Safe high quality care: investing in tomorrow's leader, <i>Qual. Health Care</i> , Vol. 10, p. 8-12	2001
Gaba	The future vision of simulation in health care, <i>Quality and Safety in Health Care</i> , Vol. 13, p. 2-10	2004
Good	Patient simulation for training basic and advanced clinical skills, <i>Medical Education</i> , Vol. 37, Issue 1, p. 14-21	2003
Greenblat	The design and redesign of gaming simulations on health care issues, <i>Simulation and Gaming</i> , Vol. 32, No. 3, p. 315-330	2001
Kneebone	Simulation in surgical training: educational issues and practical training, <i>Medical Education</i> , Vol. 37, Issue 3, p. 267-277	2003
Kurkovksy	Simulation Technologies for Health Sciences Curriculum, <i>Simulation</i> , Vol.82, No. 11, p. 785-794	2006
Lane et al.	Simulation in medical education: A review, <i>Simulation & Gaming</i> , Vol. 32, No. 3, p. 297-314	2001
Pauli	Using games to demonstrate competency, <i>Journal of Nurses in Staff Development</i> , Vol. 21, No. 6, p. 272-276	2005
Reznek et al.	Virtual Reality and Simulation: Training the Future Emergency Physicians, <i>Academic Emergency Medicine</i> , Vol. 9, Issue 1, p. 78-87	2002
Satish et al.	Strategic management simulations is a novel way to measure resident competencies, <i>The American Journal of Surgery</i> , Vol. 181, Issue 6, p.557-561	2001
Satish and Barach	Assessing and improving medical competency: Using strategic management simulations, <i>Simulation & Gaming</i> , Vol. 32, No.2, p. 156-163	2001
Satish and Streufert	Value of a cognitive simulation in medicine: towards optimizing decision making performance of healthcare personnel, <i>Quality and Safety in Health Care</i> , Vol. 11, p. 163-167	2002
Shapiro et al.	Simulation based teamwork training for emergency department staff: does it improve clinical team performance when added to an existing didactic teamwork curriculum?, <i>Quality and Safety in Health Care</i> , Vol. 13, p. 417-421	2004
Streufert et al.	Improving Medical Care: The Use of Simulation Technology, <i>Simulation Gaming</i> , Vol. 32, No. 2, p. 164-174	2001
Wildman and Reeves	The value of simulations in the management education of nurses: students' perceptions, <i>Journal of Nursing Management</i> , Vol. 5, Issue 4, p. 207-215	1997
Ziv et al.	Simulation-Based Medical Education: An Ethical Imperative, <i>Academic Medicine</i> , Vol. 78, No. 8, p. 783-788	2003

Source: Own illustration

Akl et al. (2008) mention the potential of educational games in health to improve skills, attitudes and knowledge. Barach et al. (2001) notice that because care for patients and education for caregivers is costly in personnel as well as in time, simulation is crucial in the field of health care. Training in complex situations and correct actions are possible in a risk-free environment. Beaubien and Baker (2004) published a number of principles that should

help to maximize the effectiveness when used as training tool. Bond et al. (2007) state that simulations revolutionize education in health care and also mention the advantage of having the possibility to practice skills and to reflect upon performance. They also note that debriefing is an essential part of simulations. Bradley (2006) observes the history of medical simulations and mentions three movements that led to the development in health care. In the future, the field of medical education will continue to grow.

Christensen et al. (2001) notice that in medicine, interactive, problem-based learning grows and that is a shift away from didactic frontal learning and that this interactive problem-based learning reduces human errors. The authors also mention the importance of debriefing, which ensures the quality of education. Crookall and Zhou's (2001) symposium refers to different authors who are connected to this topic. Donaldson (2001) mentions, among other subjects, important facts and qualities a clinical manager should have. Gaba (2004) states that for improving patient care and patient safety, the use of simulations has grown in the last five years. In his paper, Gaba (2004) provides 11 dimensions of simulations in health care to show the diversity of applications. Good (2003) mentions the use of patient simulators in training and education of health-care professionals. They are not only used to teach basic skills, they also play a unique role in learning advanced clinical skills. Greenblat (2001) provides a historic overview about games he developed with colleges from 1974 to 1991.

Kneebone (2003) describes recent technological developments in simulations in surgical training. A classification into computer-based, model-based and hybrid simulators is used. Furthermore, learning, assessment and evaluation is discussed. Lane et al. (2001) mention different types of technologies in the education of health care and describe standardized patients, videotape, computer simulations, mannequin simulations and role-playing. Pauli (2005) refers to the importance of competency in education and the use of games to test and review staff knowledge, to promote group interaction and to engage students. The paper from Reznick et al. (2002) provides an overview about the development of simulations in health care, including the history of Anesthesia Crisis Resource Management (ACRM) and virtual reality. Satish et al. (2001) refers to the "Strategic Management Simulation" (SMS), which is a tool to train people in leadership and professional positions. Skills needed in surgery include flexibility, team-building, factual knowledge, crisis management and critical thinking and should be trained via the SMS. Also in the paper by Satish and Barach (2001) the "Strategic Management Simulation" and its applications are explained. Satish and Streufert (2002)

discuss the applications of the SMS to train health professionals. Shapiro et al. (2004) mention the importance of teamwork training, because nearly half of medical errors are because of team-coordination problems. The authors conclude that team training in health care should be integrated into didactic curricula and that teamwork training is especially important in emergency medicine.

Streufert et al. (2001) make an overview about different types of simulation technologies in health care. They mention that simulation technologies are important educational methods in which patients are never put at risk. The authors also explain the different applications of these technologies that all improve patient care. Wildman and Reeves (1997) specialize in simulation and games in nurse education. Ziv et al. (2003) make an overview of different types of technologies and, furthermore, specialize on an ethical view of simulation-based medical education.

7.3 The development of simulation and games in health care

While games were used in other fields for centuries, the use of games in medical education began only during the 1970s (Bochennek et al. 2007). Computer games can be seen as an extension of simulations and are an important tool in medical education (Breslin et al. 2007). They have the potential to decrease medical errors and management failures, and by adopting games and simulations as a training, standard health systems will become more accountable (Ziv et al. 2003).

The following table 56 gives an overview about early games in health care:

Table 56: Early management games in health care

Title	Designer	Year	Target Group
The Hemophilia Planning Games	Gagnon and Greenblat	1974 - 1975	Policy makers and medical personnel working in the field of hemophilia care
Blood Money	Greenblat and Gagnon	1976	General public, policy makers, nurses, physicians
Pomp and Circumstance	Greenblat, Rosen and Gagnon	1979	Adolescents (13-17 years old)
Capjefos: The Village Development Game	Greenblat, Langley, Ngwa, Mangesho, MacBailey and Luyumba	1985 – 1990	Practitioners of development, village management, health, rural economics
The Encounters Family of Simulations	Greenblat, Shannon and Gagnon	1988 – 1991	Policy makers, health care professionals,

Source: Greenblat (2001, p. 317)

“The Hemophilia Planning Games” focused on hemophilia care and on problems with hemophilia. “Blood Money” was related to general and hemophiliac issues. Educators and participants of “Blood Money” were enthusiastic about the game, but when medical and social changes occurred in the 1980s, “Blood Money” became limited. The goals of the board game “Pomp and Circumstance” were to demonstrate benefits and costs of contraception as well as making participants think about contraceptives in general. After the game, decisions made in the simulation and real-life decisions were discussed. “Capjefos” was designed to train health practitioners on Third World issues, namely village life and rural development. In the game, the players assumed roles as development agents or villagers and each participant had goals, constraints and activities. The “Encounter” Games focused on the increasing threat of AIDS. Although the epidemic was in its early stage when the game was developed, designers realized the global threat and developed the “Encounter” family for prevention. Different role-playing simulations of “Encounter” were developed with different target groups and topics (Greenblat 2001).

Another early management game in the health-care sector was “The Hospital Game”, which was developed by Jack Meredith in 1977. Also, Sulver et al. (1983) dealt with management games in health care (Knotts et al. 1989). Also, gaming as teaching strategy in nursing has played an important role in education since the early 1980s (Royse and Newton, 2007). More illustrative health-care games developed in the 1980s are shown in table 57:

Table 57: Illustrative health care games around 1980

Author	Title/Journal	Year
Johnson	Game simulates hospital operations, <i>Modern Healthcare</i> , Vol. 10n No.11, p. 100	1980
Feldstein	The strategic planning game: a computer game for health-care administrators, <i>Journal of Health Administration Education</i> , Vol. 4, No.1, p. 67-75	1986
Suver et al.	State of the art in health care management simulation games, <i>Journal of Health Administration Education</i> , Vol. 1, N0.2, p. 137-150	1983
Mahachek	Computer simulation: supporting management decisions, <i>Softw. Healthc.</i> , Vol. 3, No.2, p. 97-104	1985
Knotts et al.	SCORE: a model for evaluating participant performance in the hospital simulator (HOSPSIM) game, <i>Journal of Health Administration Education</i> , Vol. 3, No. 2, p. 233-239	1985
Feldman	The organization game, <i>Nurse Management</i> , Vol. 16, No.9, p. 47-49	1985
Starkweather DB	Teaching with a computer-based game, <i>Journal of Health Administration Education</i> , Vol. 2, No. 2, p. 135-145	1984
Smith DB	Using quality of care outcomes in health administration simulation games, <i>Journal of Health Administration Education</i> , Vol. 6, No. 1, p. 109-117	1988

Source: Medline

Benefits of simulation-based learning are already mentioned in chapter 4. Because of the safe environment, students can fail and learn from their mistakes in a way that would be not possible in a clinical setting. Another important fact is that skills can be trained within their own departments and with their own colleges. Often, different professionals (e.g. pharmacists, technicians, physicians and nurses) have to work together and therefore being a good team player is crucial (Good 2003).

7.4 A paper study on management games in health care

The following chapter gives an overview about different selected games and simulation games in healthcare. In summary 27 management games were studied and analysed referring to taxonomy in chapter 5.2.

Table 58 mentions the authors, publication date and the name of the game:

Table 58: Games studied in health care

	Author	Year	Name of the game
[48]	Cromwell et al.	1998	Dragon
[49]	Da Rosa et al.	2006	*
[50]	Evans et al.	2005	Geriatric Medication Game
[51]	Flessa	2001	Moshi
[52]	Fukuchi et al.	2000	Oncology Game
[53]	Gaba et al.	2001	ACRM
[54]	Hans and Nieberg	2007	Operating Room Manager Game
[55]	Harfner and Prockl	1995	Arktis
[56]	Kennedy et al.	2004	The Age Game
[57]	Knotts et al.	1982	HOSPSIM
[58]	Knotts et al.	1989	CHESS
[59]	Mann et al.	2002	The Breast Game
[60]	Meterissian et al.	2007	Who wants to be a surgeon?
[61]	Meyer	1996	Klima
[62]	Nehring et al.	2001	HPS
[63]	Pauli	2005	*
[64]	Persky et al.	2007	PK-Poker
[65]	Rauner et al.	2008	COREmain hospital
[66]	Roche et al.	2004	Who Wants to Be a Med Chem Millionaire?
[67]	Schwandt	1998	Klima Forte
[68]	Schwarz	1992	Asteriks
[69]	Seybert and Barton	2007	Sim-Man
[70]	Steinman and Blastos	2002	Biobattles*
[71]	Uhles et al.	2008	*
[72]	Warnke	2001	Prima Klinik
[73]	Westbrook and Braithwaite	2001	The Health Care Game
[74]	Wildman and Reeves	1996	*

Source: Own illustration (* referring to the name of the game, e-mail correspondence with author)

7.4.1 General classification attributes

Table 59: General model of studied games

General Model	[48] [51] [57] [58] [61] [65] [67] [68] [72] [73]	[49] [50] [52] [53] [54] [55] [56] [59] [60] [62] [63] [64] [66] [69] [70] [71] [74]
General Management Game	X	
Functional Management Game		X

Source: Own illustration

Table 59 shows that 10 out of 27 management games are general management games and 17 games have a functional background.

Table 60: Complexity of management games

Game's complexity	[49] [50] [52] [56] [60] [63] [64] [66] [70] [71] [74]	[48] [51] [53] [54] [55] [57] [58] [59] [61] [62] [65] [67] [68] [69] [72] [73]
Simple	X	
Complex		X

Source: Own illustration

Eleven of the studied games are identified as games with simple complexity whereas 16 games are complex ones.

Table 61: Interactivity of management games

Interactivity	[48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [26] [74]	
Interactive	X	
Non-interactive		

Source: Own illustration

Table 62: Time horizon of management games

Time	[48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [26] [74]	
Single-period		
Multiple periods	X	

Source: Own illustration

Table 63: Participants in management games

Participants		[48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [26] [74]
Single-player		
Multiple-player		X

Source: Own illustration

As it can be seen in the tables above, all games studied are interactive, played for more than one period and are multi-player games.

Table 64: Management game analysis

Game Analysis	[49] [50] [52] [56] [60] [62] [63] [64] [66] [69] [70] [71] [74]	[48] [51] [53] [54] [55] [57] [58] [59] [61] [65] [67] [68] [72] [73]
Manual	X	
Computer-based		X

Source: Own illustration

Table 64 shows conspicuously that nearly 50% of the games are manual games and 50% are computer-based games.

Table 65: Availability of management games

Availability	[54] [65] [73]	[48] [51] [54] [55] [57] [58] [59] [61] [65] [67] [68] [72] [73]	[49] [50] [52] [53] [56] [60] [61] [62] [63] [64] [66] [69] [70] [71] [74]
Internet	X		
Online		X	
Offline			X

Source: Own illustration

Just Hans and Nieberg (2007) [54], Rauner et al. (2008) [65] and Westbrook and Braithwaite (2001) [73] published games that can be also played over the Internet. This leads to the assumption that management games in health care over the Internet are rare and that a huge need of catching up exists.

7.4.2 Application area of management games

Table 66: Application area of management games studied

Application Area	[48] [51] [57] [58] [61] [65] [67] [68] [72] [73]	[54] [55]	[49] [52] [59] [60] [69] [70]	[63] [74]	[50] [56] [64] [66]	[53] [62] [71]
Strategic Management	X					
Department Management		X				
Disease Management			X			
Pharmacy					X	
Nursing				X		
Others						X

Source: Own illustration

Games of Meyer (1995) [61], Schwandt (1998) [67], Schwarz (1992) [68] and Warnke (2001) [72] are general management games developed at the University of Erlangen-Nürnberg at the department for business economics and operations research and focus on managing a whole hospital and their different departments. The game by Cromwell et al. (1998) [48] was first played in Australia with the goal not to exceed the hospital's budget and keep a high quality of service for patients. Flessa (2001) [51] describes a culture-tailored general management game for hospital managers in Africa in which a typical African disease such as cholera can be simulated. With their game, Knotts et al. (1982) [57] developed a training method for hospital administration and adopted it in 1989 [58] to the Canadian health system. Rauner et al. (2008) [65] published a general management game that simulates the competition of six hospitals with the possibility of changing reimbursement systems. Westbrook and Braithwaite (2001) [73] fit their game to the Australian health system and participants of the game must solve different hypothetical, but realistic, situations within the health-care system.

Functional management games are located in different application areas as shown in table 66 above. Because 70% of the admissions are created by surgical interventions, Hans and Nieberg (2007) [54] developed a game situated in the management of an operating-room department. Harfner and Prockl (1995) [55] designed a game for managing problems in the hospital pharmacy field. Its main aim is to supply medications in an optimal way.

Da Rosa et al. (2006) [49] developed a card game with different clinical cases around viral hepatitis. In Fukuchi et al. (2000) [52] participants must manage patients with different types of cancer, similar to Mann et al. (2002) [59] where players of that game must care for patients with different breast problems. Meterissian et al. (2007) [60] published a game for surgical

staff and Seybert and Barton (2007) [69] concentrate on cardiovascular diseases. Steiman and Blastos (2002) [70] developed a game for teaching general medicine problems.

Pauli (2005) [63] as well as Wildman and Reeves (1996) [74] created games for nursing education. Whereas Pauli (2005) [63] developed a game with the goal to educate participants, Wildman and Reeves (1996) [74] concentrated on the management of a ward by a head nurse.

Evans et al. (2005) [50] and Kennedy et al. (2004) [56] describe games used in pharmaceutical education with the aim to increase the awareness for difficulties that can occur when working with geriatric patients. But whereas Evans et al. (2005) [50] concentrate on the handling on social, psychological, financial and physical problems in combination with the medication for geriatric patients, Kennedy et al. (2004) [56] includes geriatric topics such as decreased hearing, diets or depressions. The game by Persky et al. (2007) [64] was developed to help participants to learn more about pharmacokinetics and the effects of medications on the human body. In Roche et al. (2004) [66] players learn to understand chemical principles in pharmacy better. Gaba et al. (2001) [53] and Nehring et al. (2001) [62] developed mannequin-based simulations used for educational training. The main aim of Gaba et al. (2001) [53] is to train participants to work in teams while Nehring et al. (2001) [62] focus on nursing education with a human-patient simulator. The game by Uhles et al. (2008) [71] simulates different financial events that might occur in health-care organizations.

7.4.3 Target Groups

Table 67: Target groups of management games

Target Group	[48] [51] [54] [55] [57] [58] [61] [65] [67] [68] [71] [72]	[51] [54] [55] [57] [58] [61] [65] [67] [68] [71] [72]	[51] [54] [57] [58]	[48] [51] [53] [58] [60] [69]	[62] [63] [69] [74]	[48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74]
Top Management	X					
Middle Management		X				
Low Management			X			
Doctors				X		
Nurses					X	
Students						X

Source: Own illustration

Table 67 shows by whom health-care games can be played. Twelve of the 27 games studied can be played by top-management personnel and eleven can be played by middle management. Just four games are playable for low management. Six games can be played by doctors and four by nurses. All the games save for one can be played by students.

7.4.4 Decisions in management games

Table 68: Decisions in general management games

Decisions	[48]	[51]	[57]	[58]	[61]	[65]	[67]	[68]	[72]	[73]
Management	X	X	X	X	X	X	X	X		
Financial	X	X	X	X	X	X	X	X		X
Human resources	X	X	X	X	X	X	X	X	X	
Medical equipment	X	X	X	X		X	X	X	X	
Educational			X	X			X	X		
Emergency	X	X				X	X	X		
Patient	X	X				X	X	X	X	X
Others		X	X	X	X	X				X

Source: Own illustration

In Cromwell et al. (1998) [48], participants of the game must handle obstetrics, orthopaedics, cardiac surgery and cardiology. Other participants' responsibilities include patient care in theatres, emergency departments, pharmacy, radiology and pathology. Players get financial reports and are not allowed to exceed the budget. In Flessa (2001) [51], players must fix management styles and goal systems. Four goals must be taken from a list, which may include high occupancy, high quality of services, low fees for patients or high profit. Another decision of Flessa (2001) refers to the prevention of AIDS and investments for prevention. Participants can also decide if they want to have a central pharmacy or not. Knotts et al. (1982) [57] and (1989) [58] include decisions about medical staff, nursing hours, bed capacity, expenditures for education and housekeeping. Each quarter, players receive different information about their performance. In Meyer (1995) [61], participants begin by setting their strategic goals. Further decisions include capacity utilization, operating expenses, budget-planning, manpower-planning and investment-planning. In Rauner et al. (2008) [65] virtual hospitals host four departments — surgery, radiology, nursing and management. Players make financial and personnel decisions. Others refer to machines, admission and patient-scheduling. In Schwandt (1998) [67], participants define the strategy decisions for the game like whether the hospital is a general or a specific one. Other decisions are hiring, firing and education of employees. Financial decisions include the purchase of medical equipment. Also in Schwarz (1992) [68], participants must define three strategic goals in the beginning (e.g. satisfaction of

staff and patients, quality of treatment, length of stay). Departments are surgery, laboratory and radiology. Decisions include financial ones, admission of patients, hiring and firing or shifting patients to different departments. Warnke (2001) [72] created a game with three departments — care, radiology and operation. Each department must make ward-specific decisions including allocation of medical equipment, and staff. Theoretically, a separate game could be played for each department but also one with interdependencies. Westbrook and Braithwaite (2001) [73] developed a game in which health decisions involving different problems of family members must be done. Participants must decide which service is needed, what choices the patient has and how much the treatment will cost.

Table 69: Decisions in functional management games

Decisions	[49]	[50]	[52]	[53]	[54]	[55]	[56]	[59]	[60]	[62]	[63]	[64]	[66]	[69]	[70]	[71]	[73]	[74]
Management					X	X												
Financial		X			X	X							X			X	X	
Human Resources					X	X				X								X
Medical Equipment		X	X	X	X	X		X		X							X	
Educational																		
Patient	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Emergency				X	X	X				X								X
Disease	X	X	X				X	X	X			X	X	X	X		X	X

Source: Own illustration

Decisions in Da Rosa et al. (2006) [49] involve patients and disease decisions around viral hepatitis. In Evans et al. (2005) [50] participants decide about finances, medical equipment, patients and their diseases and disabilities. In Fukuchi et al. (2000) [52] players must decide the optimal treatment for the three different types of cancers from three departments — surgical oncology, radiation oncology and medical oncology. Patients must be managed correctly. Gaba et al. (2001) [53] trains specific technical skills like intensive care, labour, cardiac, general surgery or orthopaedics as well as general management skills such as teamwork, resource-management, leadership or decision-making. Participants rotate in the simulation and play primary anaesthesiologist, first-responder, scrub technician or observer. Participants of Hans and Nieberg (2007) [54] must make strategic and tactical decisions like the arrangement and the number of operating rooms in use, the number of out-patients or in-patients. Participants of the game must schedule patients to operating rooms and must decide when the next patient has to be brought to the operating room. Participants of Harfner and

Prockl (1995) [55] must decide about the medication distribution, the supplies of hospital medications, and the replacement, production and storage of medications. Furthermore, players must manage which medications should come on the market and which should not. Other decisions deal with staff and investments of the pharmacy department. Kennedy et al. (2004) [56] includes mainly disease decisions about different geriatric topics. Decisions in Mann et al. (2002) [59] focus on decisions about treatment of breast diseases and conditions. Players must diagnose four patients with different conditions (invasive carcinoma, fibroadenoma, simple cyst, axillary mass) and have to send patients for ultrasound or mammography tests and must manage different office procedures. Nehring et al. (2001) [62] describe a human-patient simulator that can create different patient scenarios and consequences. The simulation includes monitors for heart rate, cardiac, EKG, wedge pressure, blood pressure or heart attacks, for example. In Persky et al. (2007) [64] players must make different pharmacokinetic decisions regarding medication doses, hepatic clearance or basic. In Steinman and Blastos (2002) [70], players must deal with questions about different organs like lungs, blood, liver and intestines. In Uhles et al. (2008) [71] participants must decide about different financial aspects like payroll or admissions. Players have to determine gross revenue, taxes, create income statements and calculate net revenues. Wildman and Reeves (1996) [74] concentrate on nursing education, and therefore, players have to act as a head nurse and decide about the coordination of patients, allocation of staff, daily routine plans (e.g. breaks, coffee, lunch), emergency cases, death of staff or sickness.

7.4.5 Media of communication

Table 70: Media of communication in management games studied

Media of communication	[54] [65] [73]	[48] [51] [54] [55] [57] [58] [59] [61] [65] [66] [67] [68] [72] [73]	[49] [50] [70] [74]	[52]	[53] [62] [69]	[60]	[56] [63] [64]	[71]
Internet browser	X							
Computer		X			X			
Game board				X			X	X
Paper and pencil						X		
Cards			X	X			X	
Dice							X	X
Others					X			

Source: Own illustration

Half of the games studied use a computer as their basic media of communication, but just three can be played over the Internet. Games by Da Rosa et al. (2006) [49], Evans et al.

(2005) [50], Steinman and Blastos (2002) [70] and Wildman and Reeves (1996) [74] use cards as their basic media of communication. Fukuchi et al. (2000) [52] include cards with questions about oncology and dice to decide which question is next. Gaba et al. (2001) [53], Nehring et al. (2001) [62] and Seybert and Barton (2007) [69] are simulation games that use computers and a patient simulator as main media. In Meterissian et al. (2007) [60], players must answer specific questions using paper and pencil. In Kennedy et al. (2004) [56] players use a game board, scenario cards and dice to answer questions. Also, Pauli (2005) [63] and Persky et al. (2007) [64] use the same media of communication to play their games. In Uhles et al. (2008) [71] participants use dice and move on a game board, where each square applies to different activities.

7.4.6 Evaluation of management games

Table 71: Evaluation of management games

Evaluation	[51] [55] [57] [58] [61] [62] [65] [67] [68] [72]	[48] [49] [50] [52] [53] [54] [56] [59] [60] [63] [64] [66] [69] [70] [71] [73] [74]	[49] [53] [54] [56] [59] [62] [65] [70] [71] [73]
No	X		
Yes		X	
Future implications			X

Source: Own illustration

Harfner and Prockl (1995) [55], Meyer (1995) [61], Schwandt (1998) [67], Schwarz (1992) [68] and Warnke (2001) [72] do not provide an evaluation for their games. Therefore, it should be noted that literature fundamentals were game manuals, and games were just described but not evaluated. Knotts et al. (1982) [56], Knotts et al. (1989) [57] and Flessa (2001) [51] also do not discuss the effectiveness of their games. The game by Rauner et al. (2008) [65] is brand new and no playing-experience data exist. Nehring et al. (2001) [62] do not evaluate their papers but refer to other authors who had positive experiences with that kind of teaching. 17 out of the 27 health-care games studied are evaluated and 10 papers give further implications for their games.

Table 72: Different evaluation methods of management games

Evaluation methods	[49] [50] [52] [70] [71] [73]	[56] [60] [64] [66] [69]	[53]	[54]	[59]	[74]	[48] [63]
Questionnaire	X	X	X		X	X	
Interview			X				
Debriefing session							
Statistics					X		
Pre-test	X				X		
Post-test	X				X		
Others				X		X	
No information							X

Source: Own illustration

Da Rosa et al. (2006) [49], Evans et al. (2005) [50], Fukuchi et al. (2000) [52], Steinman and Blastos (2002) [70], Uhles et al. (2008) [71] and Westbrook and Braithwaite (2001) [73] evaluate their games using questionnaires as well as pre- and post-testing. Questionnaires usually included topics about learning with games and feelings during the game, whereas pre- and post-tests evaluated the specific knowledge of the game. Da Rosa et al. (2006) [49] concluded that the game was interesting and helped students to understand the topic more easily. Furthermore, the game improved participants' knowledge. Da Rosa et al. (2006) [49] also observed that players were polite to each other, open-minded and listened carefully what the others said. Participants in Evans et al. (2005) [50] had to evaluate the emotions they felt during their game. The evaluation's outcome discovered the most intensive emotion was frustration and helplessness. But the result of the post-test showed that the game helped participants to care for geriatric patients. Fukuchi et al. (2000) [52] results showed that participants had greater appreciation and knowledge for and about cancer management after playing the game. Also, the game by Steinman and Blastos (2002) [70] showed that players thought they knew more about the topic after playing the game than they did before. Furthermore, the game was enjoyable and understandable. Feedback for Uhles et al. (2008) [71] was positive, as participants noted the brilliance of learning by doing, the helpfulness of facilitators and that the game advanced knowledge about financial topics in health care. In Westbrook and Braithwaite (2001) [73] questionnaire, pre- and post-testing showed students had a better knowledge of the Australian health system, insurance and medical care than before playing the game. Furthermore, the interest in the health-care system was also greater after playing the game than before.

Kennedy et al. (2004) [56], Meterissian et al. (2007) [60], Persky et al. (2007) [64], Roche et al. (2004) [66] and Seybert and Barton (2007) [69] evaluated their games using questionnaires. Participants of Kennedy et al. (2004) [56] noted that the game was easy to

play and helped them to learn more about specific subjects. In Meterissian et al. (2007) [60], junior players found the game more interesting than senior players. Seniors said that it was stressful because they had to reveal their solutions to an audit. But in general, both groups liked playing the game. Persky et al. (2007) [64] evaluated through rigid and open-ended questions. Players found the game was a good alternative to classical education. The game was fun and the players enjoyed the interactive mode to talk with others. A disadvantage, however, was how the system awarded points for winning and losing. Questionnaires in Roche et al. (2004) [66] found participants felt that the game helped to deepen their knowledge as pharmacy professionals. Playing in groups was helpful for the participants. Also, in Seybert and Barton (2007) [69], learning through games found positive feedback.

In Gaba et al. (2001) [53], evaluation of ACRM showed positive results, and participants said that they received better behavioural and technical handling with ACRM. In Hans and Nieberg (2007) [54], participants did not only reflect upon their own decisions, but also decisions from the other groups. Playing the game in 2005 and 2006 showed that players liked that kind of learning method. Mann et al. (2002) [59] was evaluated through questionnaires, statistics and pre- and post-testing. Results showed that more correct answers were given after playing the game than before. Furthermore, players found the game enjoyable and said it increased their knowledge about breast diseases. In Wildman and Reeves (1996) [74], participants were observed and were given a questionnaire. The outcome found that the game was valuable, realistic, fun and a good way to learn skills and teamwork. But participants also felt that there was not enough time for discussion.

Cromwell et al. (1998) [48] and Pauli (2005) [63] provided no information about how games were evaluated but both concluded that playing the game was fun and was seen as a good alternative teaching method.

Some of the authors also provided future research and implications for their games. Da Rosa et al. (2006) [49] indicated that playing games with smaller groups would be better for their game in the future. They also want to develop a CD-ROM version so that students can play at home. Gaba et al. (2001) [53] discussed the extension of ACRM to other health-care domains such as intensive care, delivery room or radiology. Hans and Nieberg (2007) [54] want to include the possibility of making agreements with health insurers in their game and want to decrease planning horizons. Kennedy et al. (2004) [56] want to develop more scenario cards,

more discussions about experiences, an instruction manual and the adoption of a control group for their game. Mann et al. (2002) [59] want to play the game “*between groups of medical students trained in a traditional preclinical medical curriculum versus those trained in a problem-based learning curriculum*” (Mann et al. 2002,p. 308). Nehring et al. (2001) [62] want more modules in the Human Patient Simulator (HPS) to train more nursing clinical events. Rauner et al. (2008) [65] discussed game applications that would test key concepts of hospital management. Furthermore, they thought the game should be studied with different or mixed player groups. Another extension of the game could include a transport system or a laboratory. Future work by Steinman and Blastos (2002) [70] will be an evaluation of the duration of knowledge learned during the game and a comparison to other learning formats. Uhles et al. (2008) [71] want to make their game transferable to other health-care organizations. Westbrook and Braithwaite (2001) [73] want to play their game more often to see if results continue.

8. SUMMARY

Main goal of the present diploma thesis was to discuss if management games are an important and powerful tool in management education to teach competence and knowledge.

Management games show different characteristics. They can be general or functional, simple or complex, interactive or non-interactive, deterministic or probabilistic and played over the computer or manually scored (Watson and Blackstone 1981)

Management games are played for several reasons. Most games are played for teaching effects because they provide incredible opportunities for learning. Optimal strategies can be found in operational gaming and transferred into the real world. Another purpose of games is to evaluate personnel and to research group and human behaviour (Watson and Blackstone 1981).

First research issue referred to the question if management games have a historical background or if they are a current phenomena. Searching for the history of business games, literature shows that chess is the direct ancestor of business games (3000 B.C.). Early examples of so-called “war games” occurred around 1000 B.C. and were played for diversion purposes (Lane 1995). Through game theory, automatic data processing and operations research, modern management games began around 1950. The first one was “Monopologs”, a military-oriented business game and was developed by the United States Air Force. Business management games began being used around 1956, with the most important being the “Top Management Decision Simulation“, the “Top Management Decision Game“ and the “Business Management Game” (Faria and Wellington 2004).

Furthermore the diploma thesis should identify trends which lead to the assumption that this management education method will be an important one in future too and is not a current phenomena. Literature showed an emerging trend in playing management games over the internet. Whereas the first generation of management games were mainframe-based, the second generation grew popular with the introduction and the development of desktop microcomputers. The third generation emerged with the development and the widespread use of the Internet (Cook and Cook 2005). Because of the interaction and communication across

distances and time as well as the access to multimedia information, the Internet is an attractive tool for playing management games (Martin 2003)

Another core question of that thesis was to identify advantages that make this kind of learning method unique in comparison to others and therefore an important tool in management education. Literature showed that most important goals of playing them are to enhance economic know-how, to train soft skills in intercultural team work, to develop of decision-making ability in complex situations and to increase cross-linked thinking (Kern 2003). Through management games, participants learn to make decisions in different areas of management in a simulated world, where wrong decisions are not punished like in a real-world setting. Management games also help to obtain a more global view of the daily business of managers (Faria and Dickinson 1994).

In addition, a taxonomy for classifying management games was developed in this diploma thesis, including general classification attributes, application areas, target groups, decisions, media of communication and evaluation. 36 management games in different business disciplines and 27 management games in health care were studied and classified.

Classification and analysis show, among other things, that half of the 36 management games studied were general ones and nearly every game is played on the computer. One-third can be played over the Internet. Main application areas of functional games are marketing, finance and logistics.

Last research question referred to management games in health care sector. Literature showed indeed an emerging trend of management games in that sector but it can also be concluded that games are not as established as in marketing, finance or logistics. Studying 27 health care games, it can be observed that 10 out of 27 games are general management games. Functional ones refer to department management, disease management, pharmacy and nursing. Half of the studied games are computer-based but just three can be played over the Internet.

This diploma thesis shows that management games are played in nearly every area. Future research in management games should expand the possibilities of playing management games over the Internet so that people from all over the world can exchange knowledge and experience.

ZUSAMMENFASSUNG

Übergeordnetes Ziel dieser Diplomarbeit war es, der Frage nachzugehen ob Planspiele ein wichtiges Medium in der Management Ausbildung sind um Kompetenz und Wissen zu erlernen und zu vermitteln.

Planspiele weisen unterschiedliche Charakteristiker auf. Sie können entweder ein gesamtes Unternehmen oder einen Teilbereich betreffen, können simpel oder komplex sein, interaktiv oder nicht interaktiv und können entweder manuell oder über den Computer gespielt werden. (Watson and Blackstone 1981)

Planspiele werden in verschiedenen Bereichen und aus verschiedenen Gründen gespielt. Zum Großteil aus Lehrzwecken, da mit der Planspielmethode enorme Lerneffekte erzielt werden können. Andere Gründe können Personalevaluierung oder Forschung von menschlichen Verhalten und Gruppenverhalten sein (Watson and Blackstone 1981).

Die erste Forschungsfrage sollte klären ob Planspiele schon eine lange Geschichte haben oder ein aktuelles Phänomen darstellen. Die Literatur zeigte, dass als direkter Vorfahre von Planspielen gilt Schach und geht bis 3000 v.Chr. zurück. Erste Versionen von „Kriegsschach“ gab es 1000 v.Chr. (Lane 1995). Spieltheorie, automatische Datenverarbeitung und Operations Research verhalfen Planspielen in den 50er Jahre zum Durchbruch. Das erste Planspiel der Moderne wurde von der US Air Force 1959 entwickelt und hieß „Monopologs“. Für den Planspieleinsatz im Wirtschaftsbereich erwähnt die Literatur als erste Spiele die „Top Management Decision Simulation“, das „Top Management Decision Game“ und das „Business Management Game“ (Faria und Wellington 2004).

Auch konnte der Trend, Planspiele über das Internet zu spielen, identifiziert werden. Durch das Medium Internet wurden Planspiele als Lernmethode noch beliebter (Cook and Cook 2005). Vorteile wie Kommunikation unabhängig von Raum und Zeit und der Zugang zu multimedialer Information machte Planspiele noch attraktiver.

Des Weiteren sollte der Frage nachgegangen werden welche Vorteile die Planspielmethode gegenüber klassischen Lernmethoden hat in der Vermittlung von Kompetenz und Wissen. Die Literatur zeigte, dass durch das Spielen von Planspielen unter anderem wirtschaftliches

Know-How, vernetztes Denken, Entscheidungsfindung in komplexen Situationen aber auch Fähigkeiten im Umgang mit Menschen gestärkt und gefördert werden können. Durch das Spielen in einer simulierten Welt haben Fehlentscheidungen keine Auswirkungen wie in der realen Welt. (Faria and Dickinson 1994)

Des Weiteren wurde in der vorliegende Diplomarbeit eine Klassifizierung von Planspielen mit den Attributen „Generelle Merkmale“, „Anwendungsbereich“, „Zielgruppe“, „Entscheidungen“, „Kommunikationsmittel“ und „Evaluierung“ kreiert. Insgesamt wurden 64 Spiele klassifiziert von denen 27 den Gesundheitswesensbereich betreffen.

Die Klassifizierung und Analyse der allgemeinen Planspiele hat gezeigt, dass die Hälfte der 36 Spiele im „Generellen Planspielbereich“ anzutreffen sind. Fast jedes Planspiel nutzt den Computer als Hauptkommunikationsmittel und ein Drittel der Spiele enthält die Fähigkeit über das Internet gespielt zu werden. Hauptanwendungsfelder der funktionalen Planspiele sind die Bereiche Marketing, der Finanz und Logistik.

Die letzte Forschungsfrage ging der Etablierung von Planspielen im Gesundheitswesen nach. Die Literatur zeigte, dass Planspiele im Gesundheitswesen zwar vorhanden sind, jedoch nicht so etabliert sind wie in Marketing, Finanz oder Logistik. Die Analyse der Planspiele im Gesundheitswesen hat gezeigt dass nur 10 der 27 Spiele generelle Planspiele sind. Die Mehrheit der Spiele weisen einen funktionellen Charakter auf und beinhalten das Management von einzelnen Stationen, das Managen von Krankheiten, Pharmazie und den Pflegebereich. Jedoch wurde nur drei der untersuchten Planspiele auch über das Internet gespielt welches verdeutlicht, dass hier die Wichtigkeit dieses Mediums noch nicht so bekannt ist wie in den klassischen Anwendungsbereichen.

In dieser Arbeit hat sich gezeigt dass es sehr viele Planspiele gibt und in vielen Bereichen der Wirtschaft, aber auch im Gesundheitswesen, Anwendung finden. Das Medium Internet sollte für Planspiele in jeglichem Bereich als Hauptkommunikationsmittel eingesetzt werden da es den Teilnehmern die Möglichkeit bietet mit Menschen aus der ganzen Welt Erfahrung und Wissen auszutauschen.

9. LIST OF LITERATURE

Literature for the taxonomy

- [1] Ammar S. and Wright R., Experiential learning activities in Operations Management, *International Transactions in Operational Research*, Vol. 6, 1999, p. 183-197
- [2] Ammar S. and Wright R., Experiential learning activities in Operations Management, *International Transactions in Operational Research*, Vol. 6, 1999, p. 183-197
- [3] Anderson E. and Morrice D., A Simulation Game for Teaching Service-Oriented Supply Chain Management: Does Information Sharing Help Managers With Service Capacity Decisions?, *Production and Operations Management*, Vol. 9, No. 1, 2000, p. 40-55
- [4] Backus G. and Amlin J., "Using gaming simulation to understand deregulation dynamics", *Simulation & Gaming*, Vol. 36, No. 1, 2005, p. 45-57
- [5] Barlas Y. and Özevin M., Analysis of Stock Management Gaming Experiments and Alternative Ordering Formulations, *System Research and Behavioural Science*, Vol. 21, No. 4, p. 439-470
- [6] Barrese J., Scordis N., Schelhorn C., Teaching Introductory Concepts of Insurance Company Management: A Simulation Game, *Review of Business*, Vol. 24, No. 1, 2003, p. 43-48
- [7] Bekebrede G., Mayer I., Van Houten S., Chin R., Verbraeck A., How serious are serious games? Some lessons from Infra-Games, *Proceedings of DiGRA Conference: Changing Views – Worlds in Play*, 2005
- [8] Bird R., A Business Law Simulation Game: Amy Chen v. East Asia Import Company, *Journal of Legal Studies Education*, Vol. 20, No. 1, 2002, p. 89-116
- [9] Brozik D. and Zapalska A., The PORTFOLIO GAME: Decision making in a dynamic environment, *Simulation & Gaming*, Vol. 33, No. 2, 2002, p. 242-255
- [10] Chakravorty S. and Franza R., Enhancing Cross-Functional Decision Making: A Simulation Approach, *Decision Sciences Journal of Innovative Education*, Vol. 3, No. 2, 2005, p. 331-337
- [11] Chapman G. and Martin F., Computerized Business Games in Engineering Education, *Computers Education*, Vol. 25, No 1 / 2, 1995, p. 67-73
- [12] Cook K. and Cook R., The pedagogy and efficacy of using internet-based marketing simulations: The MARS simulations (MARS) experience, *Refereed Research Journal of the ooi Academy, Transactions on CIS/DS/MIS/IT*, Vol. 5, No. 1, 2005
- [13] Cook K. and Cook R., The pedagogy and efficacy of using internet-based marketing simulations: The MARS simulations (MARS) experience, *Refereed Research Journal of the ooi Academy, Transactions on CIS/DS/MIS/IT*, Vol. 5, No. 1, 2005

- [14] Devine D., Habig J., Martin K., Bott J., Grayson A., TINSEL TOWN: A top management simulation involving distributed expertise, *Simulation & Gaming*, Vol. 35, No. 1, 2004, p. 94-134
- [15] Ebner M. and Holzinger A., Successful implementation of user-centred game based learning in higher education: An example from civil engineering, *Computers & Education*, Vol. 49, Issue 3, 2007, p. 873-890
- [16] Faria A. and Dickinson J., Simulation Gaming for Sales Management Training, *The Journal of Management Development*, Vol. 13, No. 1, 1994, p. 47-59
- [17] Hansmann R., Scholz R., Francke C., Weymann M., Enhancing environmental awareness: Ecological and economic effects of food consumption, *Simulation & Gaming*, Vol. 36, No. 3, 2005, p. 364-382
- [18] Heidenberger K., Ristl W., Summer C., Planung von Forschungs- und Entwicklungsinvestitionen im Unternehmensspiel, *Zeitschrift für Planung*, Vol. 12, 2001, p. 125-140
- [19] Hofer V. and Ladner K., Positioning of new brands in an experiment, *Central European Journal of Operations Research*, Vol. 14, No. 4, 2006, p. 435-454
- [20] Hoogeweegen M., Van Liere D., Vervest P., Hagdorn L., Lepper I., Strategizing for mass customization by playing the business networking game, *Decision Support Systems*, Vol. 42, Issue 3, 2006, p. 1402-1412
- [21] Jacobs R., Playing the Beer Distribution Game over the internet, *Production and Operations Management*, Vol. 9, No. 1, 2000, p. 31-39
- [22] Keys J.B., Wells R.A., Edge A.G., The Multinational Management Game: A Simuworld, *The Journal of Management Development*, Vol. 13, No. 8, 1994, p. 26-37
- [23] Kuit M., Mayer I., De Jong M., The INFRASTRATEGO game: An evaluation of strategic behaviour and regulatory regimes in a liberalizing electricity market, *Simulation & Gaming*, Vol. 36, No. 1, 2005, p. 58-74
- [24] Lainema T. and Nurmi S., Applying an authentic, dynamic learning environment in real world business, *Computers & Education*, Vol. 47, Issue 1, 2006, p. 94-115
- [25] Leemkuil H., De Jong T., De Hoog R., Christoph N., KM QUEST: A collaborative Internet-based simulation game, *Simulation & Gaming*, Vol. 34, No. 1, 2003, p. 89-111
- [26] Lengwiler Y., A Monetary Policy Simulation Game, *Journal of Economic Education*, Vol. 35, No. 2, 2004, p. 175-183
- [27] Nair K., Middle Managers Score Fewer Goals and Make more Fouls: Findings from a Computerized Top Management Simulation, *Simulation & Gaming*, Vol. 34, No. 3, 2003, p. 387-408

- [28] Navarro E., Baker A., Van der Hoek A., *Teaching Software Engineering Using Simulation Games*, <http://www.ics.uci.edu/~emilyo/papers/ICSIE2004.pdf> , [Date of Access 12.10.2008] ,2004
- [29] Paich M. and Sterman J., Boom, Bust, and Failures to Learn in Experimental Markets, *Management Science*, Vol. 39, No. 12, 1993, p. 1439-1458
- [30] Parker C. and Swatman M., An Internet-Mediated Business Simulation: Developing and Using TRECS, *Simulation & Gaming*, Vol. 30, No. 1, 1999, p. 51-69
- [31] Sanderson A., Millard D., Jennings W., Krawczyk T., Slattey D., Sanderson S. *Cybertronics: Interactive Simulation Game for Design and Manufacturing Education*, <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=00632758> [Date of Access 12.10.2008], 1997
- [32] Santos J., Development and implementing an Internet-based financial system simulation game, *Journal of Economic Education*, Vol. 33, No. 1, 2002, p. 31-40
- [33] Shapiro S., The Marketplace Game, *Journal of the Academy of Marketing Science*, Vol. 31, No. 1, 2003, p. 92-95
- [34] Vanhoucke M., Vereecke A., Gemmel P., The Project Scheduling Game (PSG): Simulating Time/Cost Trade-Offs in Projects, *Project Management Journal*, Vol. 36, No. 1, 2005, p. 51-59
- [35] Wall J. and Ahmed V., Use of a simulation game in delivering blended lifelong learning in the construction industry – opportunities and Challenges, *Computers & Education*, Vol. 50, No. 4, 2008, p. 1383-1393
- [36] Woltjer G., Decisions and Macroeconomics: Development and Implementation of a Simulation Game, *Journal of Economic Education*, Vol. 36, No. 2, 2005, p. 139-144
- [37] Bayer Business Services, *BIMS online – Bayer International Management Simulation*, https://www.bayer-fortbildung.de/medien/bims/downloads/bimsonline_eng_gesamt_2009_web.pdf, [Date of Access 29.06.2008]
- [38] Detecon Consulting, *Mobile Award – Erläuterung zum Planspiel 2008*, http://www.mobile-award.de/downloads/ma08_faq_erlaeuterungen_zum_planspiel.pdf , [Date of Access 29.06.2008]
- [39] StratX, *The L'Oréal Estrat – Participant Pre-Reading Manual*, http://www.e-strat.loreal.com/_int/_en/download/EStrat_Team_Manual_Academic_A4.pdf?, [Date of Access 09.10.2008]
- [40] MARGA Business Simulation GmbH, *MARGA – The General Management Business Simulation*, http://www.esmt.org/fm/290/MargaFolder_Herbst2008%20Faxantwort_engl.pdf, [Date of Access 09.10.2008]

- [41] Cook and Cook, *The Pedagogy and Efficacy of Using internet-based marketing simulations: The Mars Simulations (Mars) Experience*, <http://www.shootformars.com/articles/OOI2005.pdf>, [Date of Access 09.10.2008]
- [42] Tata Interactive Systems, www.topsim.com, [Date of Access 09.09.2008]
- [43] Softclick IT, www.sell-the-robot.de/, [Date of Access 07.08.2008]
- [44] University of Dortmund, <http://dolores.mb.uni-dortmund.de/>, [Date of Access 09.09.2008]
- [45] Innovative Learning Solutions, <http://marketplace-simulation.com>, [Date of Access 09.09.2008]
- [46] ConPlus, <http://www.conplus.ch/>, [Date of Access 08.09.2008]
- [47] Logic Systems, www.bo-cash.de, [Date of Access 09.09.2008]
- [48] Cromwell D., Priddis D., Hindle D., Using simulation to educate hospital staff about casemix, *Health Care Management Science*, Vol. 1, 1998, p. 87-93
- [49] Da Rosa A., De Lima Moreno F., Mezzomo K., Scroferneker M., Viral Hepatitis: An Alternative Teaching Method, *Education for Health*, Vol. 19, No. 1, 2006, p. 14-21
- [50] Evans S., Lombardo M., Belgeri M., Fontane P., The “Geriatric Medication Game” in Pharmacy Education, *American Journal of Pharmaceutical Education*, Vol. 69, No. 3, 2005, Article 46
- [51] Flessa S., MOSHI: A culture-tailored management game for African hospital managers, *Trop.Doct.*, Vol. 31, No. 3, 2001, p. 144-146
- [52] Fukuchi S., Offutt L., Sacks J., Mann B., Teaching a Multidisciplinary Approach to Cancer Treatment during Surgical Clerkship via an Interactive Board Game, *The American Journal of Surgery*, Vol. 179, 2000, p. 337-340
- [53] Gaba D., Howard S., Fish K., Smith B., Sowb Y., Simulation-based training in anesthesia crisis resource management (ACRM): A decade of experience, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 175-193
- [54] Hans E. and Nieberg T., Operating Room Manager Game, *INFORMS Transactions on Education*, Vol. 8, No. 1, 2007, p. 25-36
- [55] Harfner A. and Prockl P., *Spielanleitung für das logistische Planspiel ARKTIS (Arzneimittelversorgung im Krankenhaus)*, Forschungsgruppe Medizinökonomie am Lehrstuhl für Betriebswirtschaftslehre und Operations Research der Universität Erlangen-Nürnberg, Arbeitsbericht Nr. 95-3, 1995
- [56] Kennedy D., Fanning K., Thornton P., The Age Game: An Interactive Tool to Supplement Course Material in a Geriatrics Elective, *American Journal of Pharmaceutical Education*, Vol. 68, No. 5, 2004, Article 115

- [57] Knotts U., Parrish L., Harrison J., A Hospital Simulator (HOSPSIM) A report of the model and results expected from field testing, *Developments in Business Simulation & Experiential Exercises*, Vol. 9, 1982, p. 33-37
- [58] Knotts U., Parrish L., Caro D., The Canadian Hospital Executive Simulation System (CHESS), *Developments in Business Simulation & Experiential Exercises*, Vol. 16, 1989, p. 5-9
- [59] Mann B., Eidelson B., Fukuchi S., Nissmann S., Robertson S., Jardines L., The development of an interactive game-based tool for learning surgical management algorithms via computer, *The American Journal of Surgery*, Vol. 183, No. 3, 2002, p. 305-308
- [60] Meterissian S., Liberman M., McLeod P., Games as teaching tools in a surgical residency, *Medical Teacher*, Vol. 29, No. 9, 2007, p. e258-e260
- [61] Meyer M., *Spielanleitung für das Planspiel KLIMA (Klinikmanagement)*, Forschungsgruppe Medizinökonomie am Lehrstuhl für Betriebswirtschaftslehre und Operations Research der Universität Erlangen-Nürnberg Arbeitsbericht Nr. 95-1, 1995
- [62] Nehring W., Ellis W., Lashley F., Human Patient Simulators in Nursing Education: An Overview, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 194-204
- [63] Pauli P., Using games to demonstrate competency, *J. Nurses Staff Dev.*, Vol. 21, No. 6, 2005, p. 272-276
- [64] Persky A., Stegall-Zanation J., Dupuis R., Students Perceptions of the Incorporation of Games into Classroom Instruction for Basic and Clinical Pharmacokinetics, *American Journal of Pharmaceutical Education*, Vol. 71, No. 2, 2007, Article 21
- [65] Rauner M., Kraus M., Schwarz S., Competition under different reimbursement systems: The concept of an internet-based hospital management game, *European Journal of Operational Research*, Vol. 185, No. 3, 2008, p. 948-963
- [66] Roche V., Alsharif N., Ogunbadeniya A., Reinforcing the Relevance of Chemistry to the Practice of Pharmacy Through the “Who Wants to Be a Med Chem Millionaire?” Learning Game, *American Journal of Pharmaceutical Education*, Vol. 68, No. 5, 2004, Article 116
- [67] Schwandt M., *Entwicklung eines Planspiels zum Klinikmanagement mit Fallpauschalen-orientierter Finanzierung: KLIMA^{FORTE}*, Forschungsgruppe Medizinökonomie am Lehrstuhl für Betriebswirtschaftslehre und Operations Research der Universität Erlangen-Nürnberg, Arbeitsbericht Nr. 98-3, 1998
- [68] Schwarz S., Asteriks – A Management Game for Hospitals, *Journal of the Society for Health Systems*, Vol. 3, No. 3, 1992, p. 5-14
- [69] Seybert A. and Barton C., Simulation-Based Learning to Teach Blood Pressure Assessment to Doctor of Pharmacy Students, *American Journal of Pharmaceutical Education*, Vol. 71, No. 3, 2007, Article 48
- [70] Steinman R. and Blastos M., A trading-card game teaching about host defence, *Medical Education*, Vol. 36, Issue 12, 2002, p. 1201-1208

[71] Uhles N., Weimer-Elder B., Lee J., Simulation game provides financial management training, *Healthcare Financial Management*, Vol. 62, No. 1, 2008, p.82-88

[72] Warnke S., *Entwicklung eines Systems computergestützter Planspiele zum Prozessmanagement im Krankenhaus*, Forschungsgruppe Medizinökonomie am Lehrstuhl für Betriebswirtschaftslehre und Operations Research der Universität Erlangen-Nürnberg, Arbeitsbericht Nr. 01-1, 2001

[73] Westbrook J. and Braithwaite J., The Health Care Game: An Evaluation of a Heuristic, Web-Based Simulation, *Journal of Interactive Learning Research*, Vol. 12, No.1, 2001, p. 89-104

[74] Wildman S. and Reeves M., The utilization and evaluation of a simulation game in pre-registration nurse education, *Nurse Education Today*, Vol. 16, Issue 5, 1996, p. 334-339

Other Literature

Adobor H. and Daneshafr A., Management Simulations: Determining their effectiveness, *The Journal of Management Development*, Vol. 25, No. 2, 2006, 151-169

Akl E., Sackett K., Pretorius R., Erdley S., Bhoopathi P., Mustafa R., Schünemann H., Educational games for health professionals (Review), *Cochrane Database of Systematic Reviews*, Vol.1, 2008, Art. No.: CD006411. DOI: 10.1002/14651858.CD006411.pub2.

Ammar S. and Wright R., Experiential learning activities in Operations Management, *International Transactions in Operational Research*, Vol. 6, Issue 2, 1999, p.183-197

Andlinger G., Business Games – Play one!, *Harvard Business Review*, 1958, p. 115-125

Arbaugh J., Learning to learn online: A study of perceptual changes between multiple online course experiences, *Internet and Higher Education*, Vol. 7, No. 3, 2004, p. 169-182

Asakawa T. and Gilbert N., Synthesizing experience: Lessons to be learned from Internet-mediated simulation games, *Simulation & Gaming*, Vol. 34, No. 1, 2003, p. 10-22

Barach P., Satish U., Streufert S., Healthcare Assessment and Performance : Using Simulation, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 147-155

Bates T., Teaching, Learning, and the Impact of Multimedia Technologies, *Educause Review*, Vol. 35, No. 5, 2000, p. 39-43

Beaubien J. and Baker D., The use of simulation for training teamwork skills in health care: how low can you go?, *Quality and Safety in Health Care*, Vol. 13, No.1, 2004, p. 51-56

Bochennek K., Wittekindt B., Zimmermann S., Klingebiel T., More than mere games: a review of card and board games for medical education, *Medical Teacher*, Vol. 29, No. 9, 2007, p.941-948

Bond W., Lammers R., Spillane L., Smith-Coggins R., Fernandez R., Reznick M., Vozenilek J., Gordon J., The Use of Simulation in Emergency Medicine: A Research Agenda, *Academic Emergency Medicine*, Vol. 14, No. 4, 2007, p.353-363

Bradely P., The history of simulation in medical education and possible future directions, *Medical Education*, Vol. 40, Issue 3, 2006, p. 254-262

Breslin P., McGowan C., Pecheux B., Sudol R., Serious Gaming, *Health Management Technology*, Vol. 28, No. 10, 2007, p. 14-17

Brown J., Growing up Digital: How the Web Changes Work, Education, and the Ways People Learn, *Change*, 2000, p. 11-20

Chan P. and Welebir B., Strategies for e-education, *Industrial and Commercial Training*, Vol. 35, No. 4/5, 2003, p. 196-202

Christensen U., Heffernan D., Barach P., Microsimulators in medical education : An overview, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 250-262

Cohen K. and Rhenman E., The Role of Management Games in Education and Research, *Management Science*, Vol. 7, No. 2, 1961, p. 131-166

Connolly T. and Stansfield M., Using Games-Based eLearning Technologies in Overcoming Difficulties in Teaching Information Systems, *Journal of Information Technology Education*, Vol. 5, 2006, p. 459-476

Connolly T., MacArthur E., Stansfield M., McLellan E., A quasi-experimental study of three online learning courses in computing, *Computers & Education*, Vol. 49, No. 2, 2007, p. 345-359

Crookall D. and Zhou M., Medical and healthcare simulation: Symposium overview, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 142-146

Dasgupta S. and Garson G., Guest Editorial: Internet Simulation/Gaming, *Simulation & Gaming*, Vol. 30, No. 1, 1999, p. 20-22

De Freitas S. and Oliver M., How can exploratory learning with games and simulations within the curriculum be most effectively evaluated?, *Computers & Education*, Vol. 46, Issue 3, 2006, p. 249 – 264

Dempsey J., Haynes L., Lucassen B., Casey M., Forty simple computer games and what they could mean to educators, *Simulation & Gaming*, Vol. 33, No. 2, 2002, p. 157-168

Dieleman H. and Huisingh D., Games by which to learn and teach about sustainable development: exploring the relevance of games and experiential learning for sustainability, *Journal of Cleaner Production*, Vol. 14, No. 9-11, 2006, p. 837 – 847

- Dipietro M., Ferdig R., Boyer J., Black E., Towards a Framework for Understanding Electronic Educational Gaming, *Journal of Educational Multimedia and Hypomedia*, Vol.16, No.3, 2007, p. 225-248
- Donaldson L., Safe high quality health care: investing in tomorrow's leaders, *Quality and Safety in Health Care*, Vol. 10, 2001, p. 8-12
- Eilon S., Management Games, *Operational Research*, Vol.14, No. 2, p.137-149
- Egenfeldt- Nielson S., *Review of the research on educational usage of games*, <http://www.itu.dk/people/sen/public.htm>, [Date of Access 6.5.2008]
- Faria A. and Dickinson J., Simulation gaming for sales management training, *The Journal of Management Development*, Vol. 13, No. 1, 1994, p. 47-59
- Faria A. and Nulsen R., Business Simulation Games: Current Usage Levels – A Ten Year Update, *Developments In Business Simulation & Experiential Exercises*, Vol. 23, 1996, p. 22-28
- Faria A., Business Simulation Games: Current Usage Levels – An Update, *Simulation & Gaming*, Vol. 29, No. 3, 1998, p. 295-308
- Faria A., The Changing Nature of Business Simulation/Gaming Research: A Brief History, *Simulation & Gaming*, Vol. 32, No. 1, 2001, p. 97-110
- Faria A. and Wellington W., A Survey of Simulation Game Users, Former-Users, and Never Users, *Simulation & Gaming*, 2004, Vol. 35, No. 2, p. 178-207
- Faria A. and Wellington W., Validating business gaming: Business game conformity with PIMS findings, *Simulation & Gaming*, Vol. 36, No. 2, 2005, p.259-273
- Feinstein A., Mann S., Corsun D., Charting the experiential territory: Clarifying the experiential territory – Clarifying definitions and uses of computer simulation, games, and role play, *The Journal of Management Development*, Vol. 21, No. 9/10, 2002, p. 732-744
- Gaba D., The future vision of simulation in health care, *Quality and Safety in Health Care*, Vol. 13, 2004, p. 2-10
- Ganguli S. and Punnoose E., Management Games: An Effective Pedagogic Tool, *The ICFAI Journal of Higher Education*, Vol. 2, No. 4, 2007, p. 75-82
- Garris R., Ahlers R., Driskell J., Games, Motivation, and Learning: A Research and Practice Model, *Simulation & Gaming*, Vol. 33, No. 4, 2002, p. 441-467
- Geilhardt T. and Mühlbradt T., *Planspiele im Personal- und Organisationsmanagement*, Göttingen: Hogrefe-Verlag für Psychologie, 1995
- Gold S., E-Learning: The next wave of experiential learning, *Developments in Business Simulation and Experiential Learning*, Vol. 28, 2001, p.76-79

Good M., Patient simulation for training basic and advanced clinical skills, *Medical Education*, Vol. 37, Issue 1, 2003, p. 14-21

Graf J., *Planspiele – simulierte Realitäten für den Chef von morgen*; Gabal Verlag, Speyer, 1992

Greenblat C., The Design and Redesign of Gaming Simulations on Health Care Issues, *Simulation & Gaming*, Vol. 32, No. 3, 2001, p. 315-330

Gunasekaran A., McNeil R., Shaul D., E-learning: Research and applications, *Industrial and Commercial Training*, Vol. 34, No. 2, 2002, p. 44-53

Jennings D., Strategic management: an evaluation of the use of three learning methods; *The Journal of Management Development*, Vol. 21, No. 9/10, 2002, p. 655-665

Kayes A., Kayes D., Kolb D., Experiential learning in teams, *Simulation & Gaming*, Vol. 36, No. 3, 2005, p. 330-354

Kenworthy J. and Wong A., Developing Managerial Effectiveness: Assessing and Comparing the Impact of development Programmes using a Management Simulation or a Management Game, *Developments in Business Simulations and Experiential Learning*, Vol. 32, 2005, p. 164-175

Kern M., *Planspiele im Internet: netzbasierte Lernarrangements zur Vermittlung betriebswirtschaftlicher Kompetenz*, 1st Edition, Wiesbaden, Dt. Univ.-Verl., 2003

Keys J., Strategic Management Games: A Review, *Simulation & Gaming*, Vol. 28, No. 4, 1997, p. 395-422

Kibbee J., Craft C., Nanus B., *Management Games – a new technique for executive development*, Publisher Reinhold, New York, 1961

Klabbers J., The Emerging Field of Simulation and Gaming: Meanings of a Retrospect, *Simulation & Gaming*, Vol. 32, No. 4, 2001, p. 471-480

Kneebone R., Simulation in surgical training: educational issues and practical implications, *Medical Education*, Vol. 37, Issue 3, 2003, p. 267-277

Knotts U., Parrish L., Caro D., The Canadian Hospital Executive Simulation System (Chess), *Developments in Business Simulation & Experiential Exercises*, Vol. 16, 1989, p. 5-9

Kritz W., Creating effective learning environments and learning organizations through gaming simulation design, *Simulation & Gaming*, Vol. 34, No. 4, 2003, p. 495-511

Kritz W. and Nöbauer B., *Debriefing von Planspielen*, Fachbeitrag in Blötz U., „Planspiele in der beruflichen Bildung“, Bundesinstitut für Berufsbildung, 2005

Kurkovsky A., Simulation Technologies for Health Sciences Curriculum, *Simulation*, Vol. 82, No. 11, 2006, p. 785-794

- Lane D., On a Resurgence of Management Simulations and Games, *The Journal of the Operational Research Society*, Vol. 46, No. 5, 1995, p. 604-625
- Lane J., Slavin S., Ziv A., Simulation in medical education: A review, *Simulation & Gaming*, Vol. 32, No. 3, 2001, p. 297-314
- Leemkuil H., De Jong T., De Hoog R., Chistoph N., KM QUEST: A collaborative Internet-based simulation game, *Simulation & Gaming*, Vol. 34, No.1, 2003, p. 89-111
- Matute E., Birth and Evolution of War Games, *Military Review*, Vol. 50, 1970, p. 49-56
- Martin A., Adding value to simulation/games through Internet mediation: The medium and the message, *Simulation & Gaming*, Vol. 34, No. 1, 2003, p. 23-38
- Pauli P., Using games to demonstrate competency; *Journal of Nurses in Staff Development*, Vol. 21, No. 6, 2005, p. 272-276
- Peters V. and Vissers G., A Simple Classification Model for Debriefing Simulation Games, *Simulation & Gaming*, Vol. 35, No. 1, 2004, p. 70-84
- Prensky M., Digital Game-Based Learning, *ACM Computers in Entertainment*, Vol. 1, No. 1, 2003, Book 02
- Roberts M., Lessons for the Future Internet: Learning from the Past, *Educause Review*, Vol. 41, No. 4, 2006, p.17-24
- Robertson J. and Howells C., Computer game design: opportunities for successful learning, *Computers & Education*, Vol. 50, Issue 2, 2008, p. 559-578
- Reznek M., Harter P., Krummel T., Virtual Reality and Simulation: Training the Future Emergency Physicians, *Academic Emergency Medicine*, Vol.9 ; 2002, p. 78-87
- Satish U. and Barach P., Assessing and improving medical competency: Using strategic management simulations, *Simulation & Gaming*, Vol. 32, No. 2; 2001, p.156-163
- Satish U., Streufert S., Marshall R., Smith J., Powers S., Gorman P., Krummel T., Strategic management simulations is a novel way to measure resident competencies, *The American Journal of Surgery*, Vol. 181, 2001, p.557-561
- Satish U. and Streufert S., Value of a cognitive simulation in medicine: towards optimizing decision making performance of healthcare personnel, *Quality and Safety in Health Care*, Vol. 11, 2002, p.163-167
- Schweizer H., E-Learning in Business, *Journal of Management Education*, Vol. 28, No. 6, 2004, p. 674-692
- Shapiro J., Morey J., Small S., Langford V., Kaylor C., Jagminas L., Suner S., Salisbury M., Simon R., Jay G., Simulation based teamwork training for emergency department staff: does it improve clinical team performance when added to an existing didactic teamwork curriculum?, *Quality and Safety in Health Care*, Vol. 13, 2004, p. 417 – 421

Song S. and Lee J., Key factors of heuristic evaluation for game design: Towards massively multi-player online role-playing game; *International Journal of Human-Computer Studies* , Vol. 65, No. 5, 2007, p. 709-723

Smith-Stoner M. and Willer A., Innovative Use of the Internet and Intranets to Provide Education by Adding Games, *CIN Computers, Informatics, Nursing* , Vol. 23, No. 5, 2005, p. 237-241

Stansfield M., McLellan E., Connolly T., Enhancing Student Performance in Online Learning and Traditional Face-to-Face Class Delivery; *Journal of Information Technology Education*, Vol. 3, 2004, p. 173-188

Streufert S., Satish U., Barach P., Improving medical care: The use of simulation technology, *Simulation & Gaming*, Vol. 32, No. 2, 2001, p. 164-174

Summers G., Today's business simulation industry, *Simulation & Gaming*, Vol. 35, No. 2, 2004, p. 208-241

Vozenilek J., Huff J., Reznick M., Gordon J., See One, Do One, Teach One: Advanced Technology in Medical Education, *Academic Emergency Medicine*, Vol. 11, No. 11, 2004, p. 1149-1154

Wall J. and Ahmed V., Use of a simulation game in delivering blended lifelong learning in the construction industry – Opportunities and Challenges, *Computers & Education*, Vol. 50, No. 4, 2008, p. 1383 - 1393

Watson H. and Blackstone J., *Computer Simulation*, 2nd edition, John Wiley&Sons, NY, 1981

Wideman H., Owston R., Brown C., Kushniruk A., Ho F., Pitts K., Unpackaging the potential of educational gaming: A new tool for gaming research, *Simulation & Gaming*, Vol. 38, No. 1, 2007, p. 10-30

Wildman S. and Reeves M., The value of simulations in the management education of nurses: students' perceptions; *Journal of Nursing Management*, Vol. 5, Issue 4, 1997, p. 207-215

Ziv A., Wolpe P., Small S., Glick S., Simulation-Based Medical Education: An Ethical Imperative, *Academic Medicine*, Vol. 78, No. 8, 2003, p. 783-788

Internet Sources

ABSEL – Association for Business Simulation and Experiential Learning, <http://www.abssel.org/>, [Date of Access 10.08.2008]

Carls C. and Koeder K., *Aktives Lernen durch Planspieleinsatz*, 1988, <http://www.sowi-online.de/methoden/dokumente/carlskoeder.htm>, [Date of Access 3.10.2008]

Cook K. and Cook R., The pedagogy and efficacy of using internet-based marketing simulations: the MARS simulations (MARS) experience, *Refereed Research Journal of the ooi Academy, Transactions on CIS/DS/MIS/IT*, Vol. 5, No. 1, 2005 (Presented at Faculty

Student International Conference on Research & Teaching Spring 2005)
<http://www.shootformars.com/articles/OOI2005.pdf> [Date of Access 09.10.2008]

DiGRA – Digital Games Research Association,
http://www.digra.org/digrainfo/document_view [Date of Access, 10.08.2008]

ISAGA – International Simulation and Gaming Association,
<http://www.isaga.info/mod/wiki/view.php?id=70&page=About+ISAGA> [Date of Access 10.08.2008]

Klabbers J., *The Gaming Landscape: A Taxonomy for Classifying Games and Simulations*, 2003, Utrecht University and Digital Games Research Association (DiGRA)
<http://www.digra.org/dl/db/05163.55012.pdf>, [Date of Access 3.10.2008]

SAGSET – The Society for Advancement of Games and Simulations in Educational Training,
<http://www.simulations.co.uk/sagset/sagset2.htm>, [Date of Access 10.08.2008]

SAGSAGA – Swiss Austrian German Simulation and Gaming Association,
<http://www.sagsaga.org/>, [Date of Access 10.08.2008]

10. ANNEX

Curriculum Vitae

Barbara Panosch

barbara.panosch@gmx.at

Persönliches:	<ul style="list-style-type: none">☛ Geboren am 19.08.1981 in Mödling☛ Österreichische Staatsbürgerschaft
Ausbildung	<ul style="list-style-type: none">☛ 2002 - 2008: Studium der „Internationalen Betriebswirtschaft“ mit Spezialisierung in „Innovations- und Technologiemanagement“ und „Internationales Management“☛ 1995 – 2000: Höhere Lehranstalt für wirtschaftliche Berufe Perlasgasse 10, Biedermannsdorf☛ 1991 – 1995: Bundesgymnasium Untere Bachgasse 8, Mödling
Sprachen:	<ul style="list-style-type: none">☛ Englisch, fließend☛ Italienisch, verständigungsfähig
Berufe:	<ul style="list-style-type: none">☛ 2007 - 2008 geringfügige Angestellte der Merkur Zentrale, Wr. Neudorf☛ 2003 – 2007: geringfügige Angestellte der Billa AG, Gießhübl☛ 2001 – 2002: Bankangestellte der Bank Austria☛ 1998: Praktikum Hotel „Löffle“ in Kärnten