Computer history and the movement of business simulations

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ABSTRACT
In this paper I explore some aspects of the rise of early business games in the post-war period after the Second World War. For a game to become truth-apt in a scientific sense and able to guide actions in a pragmatic sense it needs coupling to the computer and its technical-mechanical calculatory competence as well as certain types of rationality assigned to it culturally. Regarding this interconnection of games and rationality with the medium computer, three different ways of using computers can be described: First, the idea of the computer functions operationally in administration. With the aid of the computer, many of the corporate management's tasks are to be realized in a more rational and less mistake prone way. Secondly, the computer appears simulatorily in this context, by calculating and presenting complex management operations. Following the idea of the cybernetic control circuit the computer as dream constellation promises understanding and manipulability of complex systemic interdependencies. Third, the constellation of the computer acts as a stochastic and probabilistic tool, as a decision making aid in possible situations and for the consequences of future decisions.

In early business simulations the company, modeled as a game, is examined and evaluated with the aid of the computer. Thus the business game serves as a *metareflection* of processes, decisions, strategies and planning within the company (1). The interconnections of rationality and the mediality of computing machines are complex and run parallelly on several levels, as historically the computer not only changes the functionality of a business operationally as an element of rationalization in order to increase efficiency for example in administrative procedures (scientific management), but at the same time is also used on the level of longterm planning, analysis, decision making as well as in schooling and training (decision making).

Keywords
Business games, Business simulation, Game history, COBOL, Flow-Matic. Top Management Decision Simulation, Serious Games, Computer history

INTRODUCTION
If academics look at the early origins of computer technology and business games, they often tend to follow the popular idea, that 'war is the mother of invention' and technological innovation. Even history scholars often emphasize, that in many ways the early management games were a "direct outgrowth of war games" (Fritzsche 1987, 177).

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In contrast to this thinking I want to explore the idea, that early management games are very much an outgrowth of the non-military and commercial use of computer technology.

COMPUTER HISTORY AND THE MOVEMENT OF BUSINESS SIMULATIONS

One of my starting points during the initial research was an article by Joseph Wolfe "A History of Business Teaching Games in English-Speaking and Post-Socialist Countries: The Origination and Diffusion of a Management Education and Development Technology" (1993) where he described the movement of business games from hand scored to personal computers in terms of four phases. This is shown in the following table, with the addition of a fifth phase by A. J. Faria (2009).

Phase	Period	Developments
I	1955 to 1963	Creation and growth of hand-scored games
II	1962 to 1968	Creation of mainframe business games and growth of commercially published games
III	1966 to 1985	Period of fastest growth of mainframe games and significant growth in business game complexity
IV	1984 to 2000	Growth of PC-based games and development of decision making aides to accompany business games
V	1998 to present	The growth of business game availability on the Internet and run through central servers (e.g., CAPSIM and the CAPSTONE series of business games and INNOVATIVE LEARNING SOLUTIONS and the MARKETPLACE simulations)

Faria et al. (2009) Business Gaming Developments, p. 467

Table 1: Phases in the Development of Business Gaming, table taken from Faria (2009).

Even though the first period from 1955 to 1963 in this phase-model is dedicated exclusively to hand-scored games, we do find some notable business games from the computer-scored type within this time frame.

So to get an idea about the technological basis of early business games, it is useful to look at some of the technological developments of the non-military and *commercial* use of computer technology in the post-war period during the Fifties:

EDSAC	1949	Cambridge University by Maurice Wilkes
BINAC	1949	Eckert's and Mauchly's Electronic Control Co.
Whirlwind I	1949	Digital Computer Laboratory, Massachusetts Institute of Technology, Jay Forrester
SWAC	1950	US Bureau of Standards Western Division, Institute for Numerical Analysis, University of California at Los Angeles, Harry Huskey
UNIVAC	1951	Eckert-Mauchly Computer Corporation, Philadelphia
IAS Computer	1952	Institute for Advanced Study, Princeton University, Julian Bigelow, Arthur Burks, Herman Goldstine, von Neumann, and others
IBM „Def. Calc."	1952	later renamed the „701"
LEO	1951	Lyons Tea Company, England
IBM 650	1953	the first mass-produced electronic computer Shipping started 1954. Over 2000 Systems sold until 1962.

Table 2: Computers of the post-war period. Some notable machines in an era of transition.

Technological development

While in the U.S. the UNIVAC, built 1951, is generally considered the first computer to be available commercially, one of the first computers developed especially for commercial use was the LEO, Lyons Electronic Office. It was manufactured in England. The president of Lyons Tea Co. had the computer modeled after the EDSAC of the Cambridge University. It was built to solve the problem of daily scheduling production and delivery of cakes to the Lyons tea shops.

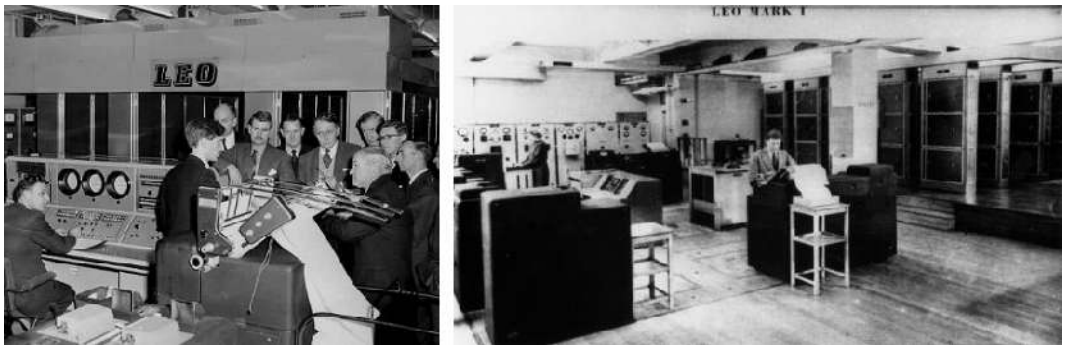

Figure 1: LEO (1951): Build to solve the problem of daily scheduling production and delivery of cakes to the Lyons tea shops.

After the success of the first LEO, Lyons went into business manufacturing computers to meet the growing need for data processing systems.

The first really *mass-produced* stored-program electronic computer was probably the IBM 650. Announced in 1953, and first shipment in 1954, an IBM-slogan described it as the "workhorse of modern industry".

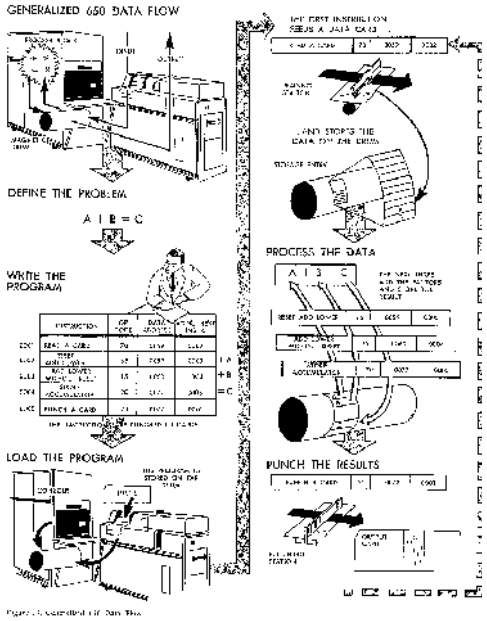

Figure 2: IBM 650 Data Flow, excerpt from the official IBM 650 Data Processing System Bulletin.

By the mid of 1956, there already were more than 200 machines installed and operating, and over 2000 systems were produced until its final manufacture in 1962. Among the early costumers of the 650 were the foremost industrial corporations. For example Esso Standard Oil, General Electric, Allied Chemical, Boeing Airline and so on.

All these machines belong to the 'First Generation' of computers, which means they are not using transistors but vacuum tubes. Most of them used punch cards for programming (2).

These technological developments can be understood as part of an important *historical transition* from the exclusive and mostly military use of big computing power to commercial use and new business tasks within the post-war period. While the LEO represents one important milestone in this transition, the IBM 650 can be seen as the first climax of this development.

Programming Languages (1955-1958)

Closely entangled with this new use of computing power for commercial applications is the development of high-level programming languages like FLOW-MATIC or COBOL. According to common Computer History the first high-level programming language development was begun by John Backus and his team at IBM in 1954 with FORTRAN. This programming language was especially suited to numeric computation and scientific computing. Its fist implementation was in 1957. But already two years before that, FLOW-MATIC was introduced.

FLOW-MATIC, originally known as B-0 (Business Language version 0), is possibly the very first English-like data processing language. It was invented and specified by Grace Hopper, one of the key figures in the history of modern programming languages. Her work on FLOW-MATIC started in 1955 for the UNIVAC I, and the language was generally available and being used commercially since 1958. Later it became a model for COBOL, the first widely standardized programming languages: COBOL. COBOL is an acronym for COmmon Business-Oriented Language, defining its primary domain in business, finance, and administrative systems for companies and governments (3).

These milestones of modern programming languages seem to be worth mentioning because they show how technological infrastructure was changed according to business and commercial needs in the post-war period.

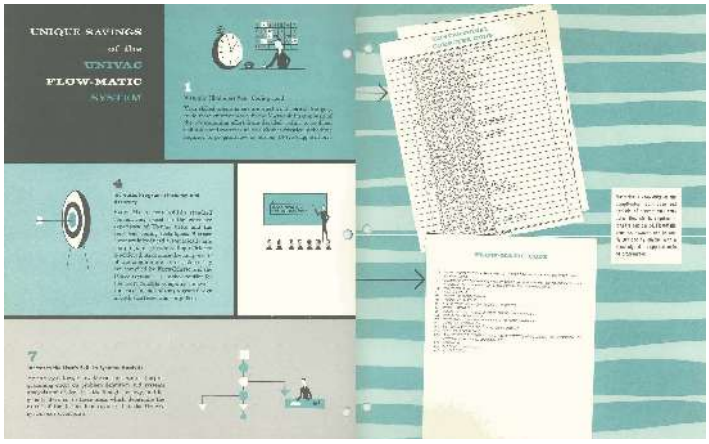

Figure 3: FLOW-MATIC brochure by Remington Rand Univac, advertising the language for business tasks.

EARLY HISTORY OF BUSINESS GAMES (1956-1963)

Prototypes of computer-aided business games

The first computer-scored business simulation, as it is generally agreed, was the TOP MANAGEMENT DECISION SIMULATION created by the AMA, the American Management Association in 1955. As far as we know, the first game was undertaken 1956.

The game used the IBM 650, the "workhorse of the industry", just two years after it was released on the market. This machine provided 60 words of magnetic core memory. Other computer games followed the AMA Management Decision Simulation within the next three years: For example The UCLA Executive Game No2, 1958, the IBM Management Decision-Making Laboratory and other games by Westinghouse Electric Corporation, Pillsbury Mills, or by the Carnegie Institute of Technology.

The target audience of the AMA game were management executives of the very industries, that were also among the customers of the IBM Computer. It was exclusively available only to participants in executive decision-making programs held at the AMA Academy. For the participants of this game this could have been experienced as being part of a 'computer revolution'.

The Game provides an environment in which teams of players, representing the officers of firms, make business decisions. The original game consists of five teams of three to five persons each. The teams must decide the strategy for their product. Their companies produce a single product which they sell in competition with each other in a common market.

The basic decision period in the game represents the quarter of a year. At the AMA seminars the game generally simulated five to ten years of company operation, or twenty to forty quarters.

With the AMA game there are six types of decisions each team must take:

- to chose a selling price for their product
- to decide how much they spent for marketing and how much for development
- whether to purchase marketing research information
- to change plant capacity
- and to select a rate of production.

After all firms make their decisions for a quarter, these are collected by the game administrator and then key-punched and fed into an IMB 650. The computers result at the end of each quarter then shows where each corporation and team ranks in the industry.

The AMA example – using the computer as a tool for wishful realism

According to Kalman Cohen and Eric Rhenman (1961), who wrote about the game in the early 1960s, the underlying mathematical model itself is comparatively simple and the amount of information to be processed is relatively slight. The necessary calculations for a single quarter of play, Rhenman and Cohen estimated, could have been performed on desk calculators in about 45 minutes.

If this is true, then why did they use a computer at all? Even if one considers, that a computer is slightly faster than a desk calculator – is this worth to use an IBM 650? Even though this machine was comparatively cheap, it has to be considered that at the time its price was probably about half a million dollars.

Realism, Complexity, Drama

If one takes into account the general situation of the computer within this post-war period, it seems obvious, that the computer is much more than just a tool to perform fast calculations. This is especially true in the context of business simulations, where computers start to play an important role for the appearance and production of realism. And not only due to the possible calculation of complexity and dynamic economic processes, but because the computer "adds considerably to the drama [sic!] of game play" (Cohen & Rhenman 1961, 134).

The importance of drama, especially the role playing aspect, can be illustrated by a quote from the original AMA report from 1957: The authors describe their approach with the Top Management Decision Simulation and explain it as follows:

"Why shouldn't a vice president, say, in charge of advertising have a chance to play the role of company president for fun and for practice? Why not a business 'war game', in which teams of executives would make basic decisions of the kind that face every top management – and would see the results immediately? From these questions grew AMA's TOP MANAGEMENT DECISION SIMULATION." (Ricciardi et al. 1957, as quoted in Cohen & Rhenman, 135).

Management games include elements of role-playing that are as important as the - often only rudimentary - simulation of actual economic situations. Within this framework, the computer is one actor in a drama. We can ask: What role is the computer playing? And one part of the answer could be, that the computer acts like a deus ex machina, or that it is god-like or the representation of 'objectivity, because it is in an transcendental position of judgment.

In other words: The credibility of the results is often an important property for which game designers strive. If a computer is used, even if it only calculates the scores and was programed with a very simple mathematical model, a "feeling of realism is gained through the 'objectivity' of the machine [itself]" (Cohen & Rhenman, 154).

CONCLUSIONS

This brief survey on the rise of early business games points to three provisionally conclusions:

1. Following the historical development of computer technology, it seems far too linear if business games are understood as a "direct outgrowth of war games". Rather there are some references that point to the conclusion, that the early movement of management games developed in very close relation to the civil and commercial use of computing technology.
2. The early years of business games between 1956 and 1963 are not only dominated by hand-score games. From the very beginning of the movement there are computers involved and are part of the attractiveness of these games.
3. The role and function of the computer in early business games can not be reduced to mere number crushing or the use of a simulation device. Its function to

produce realism and give credibility to the game is tied to a cultural image of the machine and the electronic computer. Therefore it can guarantee the illusion of objectivity and validity of the outcome of a game. That the players do not know in detail, what algorithms are calculated within the machine is not a failure or an accident, but must be seen as a condition for the production of 'realism' and 'credibility'.

Further research could try to reconstruct some early games and to play them again. By 'experiencing' these games it should be possible to gather more knowledge about the actual proportions between role-playing, discussion and computer-aided 'simulation' in early management games. Other aspects may be relevant to describe the dramatic role and the ludic function as well as aspects of rationality and objectivity, that are discursively linked to the computer within these game settings and their arrangements.

ENDNOTES

1 This paper is part of a research project concerning the development of business simulation in germany 1950-1970, initiated by Rolf F. Nohr, HBK Braunschweig. For more information cf. http://www.strategiespielen.de

2 And it was not until 1960, that the first commercial computer with a monitor and keyboard input was introduced by DEC, the PDP-1. It was sold for 120.000$$. About 50 Units were built of this machine. It's large scope intrigued early hackers at MIT, who wrote the first computerized video game, SpaceWar!, for it.

3 The Committee on Data Systems Languages (Codasyl) is formed in 1959 to create Cobol (Common Business Oriented Language).

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