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Developments in business gaming over the past 40 years

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*This article examines developments in business simulation gaming over the past 40 years. Covered in this article will be a brief history of business games; the changing technology employed in the development and use of business games; changes in why business games are adopted and used; changes in how business games are administered; and the current state of business gaming. Readers interested in developments in other areas of simulation gaming (urban planning, social studies, ecology, economics, geography, health, etc.) are encouraged to look at other articles appearing during the 40th anniversary year of *Simulation & Gaming* and at the many fine articles that appeared in the silver anniversary issue of *Simulation & Gaming* (December, 1995).*

KEYWORDS: Business simulation games; gaming usage; gaming history; hand scored games; mainframe games; PC games; gaming technology; game adoption; debriefing.

As *Simulation & Gaming* celebrates its 40th anniversary, we are also marking the 50th anniversary of the first use of a business simulation game in a university course in North America. Over the 40 year life of *Simulation & Gaming*, the use of business games has grown dramatically as noted by Wolfe (1993), "Once a novel and cutting-edge teaching technology, this method's use has reached the point of relative saturation in various American business course applications" (p. 446). As will be discussed, business gaming usage has grown globally and has a long and varied history. *Simulation & Gaming*, which has been around for much of the history of business game usage, has contributed significantly to current business gaming usage levels, the advancing technology of business games, how business games are administered, and the current nature of business simulation games.

A brief history of business games

Both Wolfe (1993) and Hodgetts (1970) contend that the history of business games can be traced back nearly 5000 years to the development of board games and war games. Wolfe (1993), in particular, presents an extremely interesting history of board

and war games from their beginnings in China in 3000 BC and their development through modern war games. Champion (1995) discusses the computerization of war games in the mid-1950s.

The direct predecessors of the modern business simulation game can be dated back to 1932 in Europe and 1955 in North America. In 1929, Mary Birshstein was a high ranking manager in the Bureau for the Scientific Organization of Work (Leningrad, Russia) when it was merged into the Leningrad Institute of Engineering and Economics. While teaching at the Leningrad Institute, Mary Birshstein got the idea to adapt the concept of war games to the business environment.

Mary Birshstein developed her first business simulation in 1932. This exercise simulated the assembly process at the Ligovo typewriter factory and was used to train managers on how to handle production problems (Gagnon, 1987). From 1932 to 1940, over 40 similar exercises, simulating the production and distribution processes at a number of different types of businesses were developed by Mary and her team in Leningrad. This promising early work at the Leningrad Institute was then interrupted for a number of years by World War II. A very interesting overview of the career of Mary Birshstein, a true pioneer in business gaming development, can be found in Wolfe & Crookall (1993).

In North America, the modern business simulation game dates back to 1955. In that year, RAND Corporation developed a simulation exercise that focused on the U.S. Air Force logistics system. The simulation, called *Monopologs*, required its participants to perform as inventory managers in a simulation of the Air Force supply system in the same fashion as current business simulations place the participants into the roles of business managers (Jackson, 1959).

In 1956, the first widely known business game, *Top Management Decision Simulation*, was developed by the American Management Association for use in management seminars (Hodgetts, 1970). This was followed in 1957 by the development of the *Business Management Game* by Greene and Andlinger for the consulting firm of McKinsey & Company (Andlinger, 1958) and the first known use of a business simulation game in a university course, the *Top Management Decision Game*, in a business policy course at the University of Washington in 1957 (Watson, 1981).

From this point, the number of business simulation games in use grew rapidly. In 1961, it was estimated that more than 100 business games were in existence in the U.S. alone and had been used by over 30,000 business executives and countless students (Kibbee, Craft, & Nanus, 1961). The *Business Games Handbook*, published in 1969 (Graham & Gray) listed nearly 190 business simulation games. *The Guide to Simulation/Games for Education and Training* (Horn & Cleaves, 1980) described 228 business simulation games then in use.

In 1962, a survey of 107 American Assembly of Collegiate Schools of Business member universities reported that business simulation games were in use at 71.1 percent

of the schools surveyed (Dale & Klasson, 1962). Klabbers (1994) reports that the *New York University Business Game* was in wide use in the Netherlands, Israel, Poland and Hungary by the early 1970s. A survey of universities in Eastern Europe in 1980 listed over thirty business simulations in use in 22 separate universities (Assa, 1982). The *German Survey of Management Games* reported that approximately 200 business games (80 hand scored and 120 computer scored) were in use in German speaking countries in 1985 (Rohn, 1986). A 2004 e-mail survey of university business school professors in North America reported that 30.6% of 1,085 survey respondents were current business simulation users while another 17.1% of the respondents were former business game users (Faria & Wellington, 2004).

Types of business games

Early business games were simplistic with respect to the number of decision variables included, the number of participants that could be accommodated, the number of products and markets, and the amount of feedback available to the participants. This was necessary as the models supporting the early business games were uncomplicated and the simulation games were hand scored (Fritzsche & Burns, 2001). As business schools acquired access to mainframe computers, business games migrated to this platform and the complexity of the games increased enormously. Presently, of course, business games are run on personal computers allowing for quick and easy input, easily changeable business environments, and graphical display of results. Interestingly, many of the early hand scored business games did not make the transition to the mainframe era and many mainframe games did not make the transition to the PC era. Instead, many new business simulation games appeared at the start of each new era (Fritzsche & Burns, 2001).

Wolfe (1993) described the movement of business games from hand scored to personal computers in terms of four phases. To Wolfe's (1993) four phases, we've added a fifth.

- Phase I (1955 to 1963): Creation and growth of hand scored games.
- Phase II (1962 to 1968): Creation of mainframe business games and growth of commercially published games.
- Phase III (1966 to 1985): Period of fastest growth of mainframe games and significant growth in business game complexity.
- Phase IV (1984 to 2000): Growth of PC based games and development of decision making aides to accompany business games.
- Phase 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).

Business simulation games can be divided into top management games, functional games or concept simulations (Wolfe, 1993). In top management simulations, participants take on the role of the top executives of a company and are responsible for the operation of the entire organization. A functional simulation game emphasizes one area of business operation such as marketing, production or finance. A concept simulation focuses on one small area of business operation. The concept game might concentrate on traffic management, advertising management, sales management, or personnel as examples. Interestingly, all three types of business games date back to the origins of business gaming in the 1932 to 1956 period.

Gaming organizations

As business games grew in number and usage, organizations supporting the development and use of business games came into existence. ABSEL, the Association for Business Simulation and Experiential Learning, an organization devoted exclusively to business gaming, was formed in 1974. The first ABSEL conference was held in Oklahoma City, Oklahoma in 1974. The first ABSEL meeting included the presentation of 47 papers and an attendance of 101 interested business game users who became the original ABSEL membership. *The Bernie Keys Library*, named after the founder of ABSEL, contains all papers presented at all ABSEL conferences from 1974 through 2009, as well as the *Guide to Business Gaming and Experiential Learning* (Gentry, 1990) and all issues of the *Journal of Experiential Learning*. *The Bernie Keys Library* now contains in excess of 2,100 papers and is available on a CD by contacting ABSEL or online at www.absel.org.

The North American Simulation and Gaming Association (NASAGA) dates back to 1962. Originally founded as the East Coast War Games Council, the original organization was devoted to war games. The name of the organization was changed to the National Gaming Council in 1968 as the emphasis of the organization had shifted toward business and economic gaming. The name was changed again in 1975 to the North American Simulation and Gaming Association and the organization continues to meet under this name today. The 2008 NASAGA conference, held in Indianapolis, Indiana was billed as its 40th anniversary meeting which dates back to the organization becoming the National Gaming Council in 1968.

ISAGA, the International Simulation and Gaming Association, was founded in Birmingham, England in 1969 and held its first conference in Bad Godesburg, Germany in 1970 (Klabbers, 1994). ISAGA is a global organization but is primarily European based. ISAGA covers a range of disciplines in which simulation games are used and business represents only a small part of each ISAGA conference. The 40th annual ISAGA conference will be held in Singapore in 2009.

Other simulation and gaming organizations that devote part of their programs each year to business simulation games include SAGSET (The Society for the Advancement of Games and Simulations in Education and Training) founded in 1969 and

JASAG (The Japanese Association for Simulation and Gaming) founded in 1989. Additional organizations that are associated with ISAGA, and often meet along with ISAGA, include SAGANET (The Simulation and Gaming Association of the Netherlands), SAGSAGA (Swiss, Austrian and German Simulation and Gaming Association), OzSAGA (Australian Simulation and Gaming Association), and SSAGSg (Society of Simulation and Gaming of Singapore).

Adding to the number of simulation organizations, the European Conference of Games Based Learning (ECGBL) was formed in Scotland in 2007 and held its first meeting in Paisley, Scotland at which 33 papers were presented. Only one session at the first ECGBL conference was devoted to business gaming. The second ECGBL Conference was held in Barcelona, Spain in October, 2008. Finally, the two newest simulation organizations to appear, both formed in 2008, are the Indian Simulation and Gaming Association (INDSAGA) and the Thai Association for Simulation and Gaming (ThaiSim).

The changing technology of business games

The first technological advance in business games was the transition from the hand scored games of the 1930's to 1950's to mainframe computer based games in the late 1950's. The *Top Management Decision Simulation*, developed by the American Management Association, and the *Top Management Game*, developed by Schreiber, were both available in mainframe versions by 1957. While the transition to mainframe games allowed for the development of more complex games, the more important issue is whether technological improvements resulted in business games that are better teaching and learning tools. Wolfe (1994) stated that "business gaming has progressed far more in a hardware technological sense than it has progressed either as a teaching method or as a field of research" (p. 276). Fritzsche & Burns (2001) and Adobor & Daneshfar (2006), however, argue that technological advancements in business games have contributed to improving the teaching and learning aspects of current business games.

Non-computerized business games were burdensome to use as they required hand scoring which was time consuming and subject to error and limited the games in terms of complexity of decisions and amount of feedback. Most hand scored business games allowed for only a small number of competing participants, one or two products to be sold in only one or two markets, and very simple decision inputs. As mainframe computer based games grew in the 1960's, the complexity of the games grew. Mainframe games allowed for greater numbers of competing companies, more products being sold in more markets, more and more complex decision inputs, and greater and more detailed amounts of feedback to the participants. According to Fritzsche & Burns (2001), the 1970s could be designated as the height of mainframe computer games. While mainframe business games represented a major improvement over hand scored games, the technology was still cumbersome. Participant decisions were typically submitted on paper to the game administrator who then typed the decisions onto key punch cards for entry into the mainframe computer. Errors in reading student writing and

simple data entry errors created problems as the results from incorrectly entered decisions did not correctly reflect the participants' performance.

The next significant technology advancement in business games occurred with the movement to the personal computer in 1984 when IBM launched its first model and with the introduction of the Windows operating system in 1985 which offered enhanced graphical user interface (GUI). With this jump in technology, many new business game authors were able to develop simulation games as personal computers were more accessible, less expensive, and more user-friendly than mainframe computers. While a number of mainframe business games were converted to PC versions, many new business games were developed over the 1985 to 2000 period. For business game users, the significantly improved GUI made it much easier to install and administer business games. Further, as students could now enter their own decisions and submit them on a disk, a source of potential error was eliminated. Due to these advances, there was a significant growth in business gaming usage after 1985 (Faria & Wellington, 2004).

A seminal event in business gaming was the invention of the world-wide-web by Timothy Burnes Lee in 1991. The world-wide-web allows text, images, and media to be carried over the Internet. Given the heavy usage of the Internet by academics and business, many business games were converted to allow for web access. Prior to 2003, however, most web-based simulations were not yet fully online which caused some technical problems (Schmidt, 2003). Specifically, with these simulations, data needed to be downloaded to local computers and then uploaded to the server program. This resulted in security problems that persist with a number of business games today. The most recent generation of web-based business simulations, however, are completely run through central servers with administrator selected parameters and participant decisions entered to the server, results retrieved directly from the server and all data files stored on the central server.

Emerging technologies

New technologies are currently emerging that offer a paradigm shift in the way business simulations are being modeled. Intelligent software agents, called avatars or virtual characters, are now being embodied in simulation games. Intelligent software agents are an outgrowth of research in the field of artificial intelligence. As stated by Summers (2004), "Virtual characters can interact with each other and their environment producing new states, information and events. Under these conditions, learners must query the simulation to keep abreast of where it is in the evolutionary process" (p. 223). The virtual characters (avatars) not only provide information but may impact the environment and direction of the simulation. The avatar may take the form of an animated character, representing a human player, thus creating an emotional engagement for the game participant (particularly since some avatars can show emotion).

Given the capabilities offered by artificial intelligence and 'agent-based' simulation games (games that use avatars), the potential exists to capture the pedagogical

benefits embodied within video games with the recent development of 'pervasive learning games.' Pervasive learning games build on the framework provided by commercial video games and the pedagogical design and practice as developed over the years for educational simulation games (Thomas, 2006). Pervasive games use multiple media platforms such as mobile phones, PDAs, computers, faxes, television and newspapers to deliver real-time game content. As described by Thomas (2006), pervasive games offer the advantages of being continuous (they are available 24 hours a day offering dynamically changing conditions); the game has no set state but is always in a state of flux; the game emphasis is on the journey rather than the end outcome; and the games can be played anywhere, at any time, using PDAs and java-enabled mobile phones.

Virtual reality technologies and 'Serious Games' are also on the horizon. A study by Vogel, et al. (2006) utilized three-dimensional images with movement on the computer screen in an educational simulation. The study showed that using a virtual reality program can be a significant aid in helping to understand complex ideas. 'Serious Games' attempt to capture and combine the engaging components of video games and educational games. Bringing the massive size, resource and technology of the video games industry to the development of business, educational, health and public policy games could offer explosive business gaming growth potential (Yilmaz, Oren, & Aghaee, 2006).

A framework to assess technological change

The impact of 40 years of technological changes on the use and effectiveness of business games will be measured across seven key dimensions. These dimensions are realism, accessibility, compatibility, flexibility and scale, simplicity of use, decision support systems, and communication.

Realism

In a study by Adobor & Daneshfar (2006), realism was defined as the extent to which game users perceive the simulation to be reflective of life situations. Adobor & Daneshfar (2006) demonstrated that there is a positive relationship between realism and the degree of learning from the simulation. The authors conclude that a simulation that is viewed as either too trivial or too complex reduces its' pedagogical effectiveness as the participants find it difficult to see the linkages between the game and reality.

Fritzsche & Burns (2001) noted that the shift of business games to personal computers with a Windows operating system led to more sophisticated games with increased numbers of products, markets, decision variables and vastly increased feedback as one would find in real companies. Martin & McEvoy (2003) also demonstrated how the development of computer technology and the rapid improvements in the versatility of programming languages has increased the realism of business games. Summers (2004)

showed that new technologies have allowed computer-based behavioral simulations to embody decision trees and agents, represented by avatars. Player avatars could take on the role of the company CEO, an executive or salesperson from a supplier firm, a union leader, or any other role relevant to the simulation exercise. Yilmaz, et al. (2006) stated that “Artificial intelligence and intelligent agents are sources of synergy for simulation and computer-based games. They support a striking realism of the physical environment and provide unique opportunities for learning” (p. 339).

The realism, and presumably learning value, of business games will continue to grow. An excellent example of a widely used pervasive business simulation is *Industryplayer* published by Tycoon Systems. The simulation is described on its website as follows: “In real time, you compete against hundreds of players from around the globe for profits and market share. You experience real competition within a simulation with real market forces. Your objective is to achieve market leadership. Your success depends entirely on your business skills and your competitive strategy” (www.industryplayer.com).

Accessibility

The Internet and world-wide-web have revolutionized the use of business simulations in at least two critical ways according to Dasgupta & Garson (1999): (1) by providing easy access to a wide variety of simulation games; and (2) by providing availability to worldwide, mass audiences, including remote participation by players. Prior to the Internet and world-wide-web, accessibility to business games and participation in the games was more cumbersome as business games were often restricted to one computer at one location. Participation over wider geographic areas created problems with decision submission and the return of results, with snail mail, e-mail or fax often used.

More recent developments in the technology of business games allows for ‘learner-controlled learning.’ As explained by Summers (2004), the new technologies can deliver simulation games to any computer with a web-browser and the business games can be played individually or as part of a team. This capability allows for asynchronous learning. Participants can work through the simulation when they wish and at their own pace. The development of simulations with access via portable mobile devices further enhances the accessibility of games (Thomas, 2006).

Compatibility

From the time that business games moved from hand-scored to mainframe and then to PC based, the compatibility of different machines, software programs, and operating systems were major concerns. As technology changed, problems with respect to the compatibility of old versus new technologies occurred. Thorelli (2001) discussed a typical situation with the conversion of a mainframe game to personal computer: “A

great challenge in the technology environment relates to PC operating systems. Beginning with Windows95, Microsoft's DOS prompt was woefully inadequate to be compatible with DOS programs of any complexity. The mix of languages embodying the master program aggravated the problem" (p. 497).

Typical problems with PC based games during the 1990s were further discussed by Darbandi (2000). "Like all games that have moved into a Windows95 environment, computers freeze and error messages still halt the game from time to time. Six sources can cause error messages and frozen computers: student errors, administrator errors, designer errors, programmer errors, errors caused by the Windows95 operating system, and errors caused by the hardware being used. Thanks to the flexibility of Visual Basic, the designers/programmers can eliminate the middle two sources of errors" (p. 292).

More recent developments in object-oriented programs and software libraries make it easier and less costly to develop and upgrade simulation programs. This includes the design and customization of specific modules that can be added to a business simulation game at the user's direction (Summers, 2004).

Flexibility and scale

Barton (1974a) talked about the importance of flexibility in business simulations thirty-five years ago. According to Barton (1974a), the two most important components of flexibility were the ability of the instructor to change the parameters of the game and the ability of the instructor to add or delete modules or components of the simulation. With this flexibility, the instructor could achieve different learning objectives with the use of the same simulation game. An early pioneer in this effort, Barton developed a business simulation called *IMAGINIT* (Barton, 1974b) that allowed for easy modification of the parameters of the game to change the nature of the industry, raw materials requirements and market characteristics. Other early simulations such as *COMPETE* (Faria, Johnstone & Nulsen, 1974) allowed for variable numbers of participants in addition to the flexibility to change the parameters of the competition; or the ability to shift the simulation from solo play to team play and to vary the level of difficulty of play (Thavikulwat, 1988).

Fritzsche & Burns (2001) note that the shift to the personal computer and Windows operating system with GUI greatly enhanced the growth of programmable business game environments. Importantly, personal computer based games became not only more flexible than their mainframe counterparts, but the scale of the game could be controlled allowing for the same business game to be played at the introductory course level by eliminating products, markets and decision variables all the way to the graduate level by adding products, markets and decision variables.

Further advances to the flexibility and scale of business simulations have come about over the past few years. Object-oriented designs and software libraries allow game developers to customize simulations to fit each user's requirements (Summers, 2004).

The use of intelligent agents has given business game users the ability to tailor simulations to the level of the participants' abilities. In addition, intelligent agents can serve as imbedded 'game instructors' that provide advice to the participants as needed.

Flexibility in terms of scale has advanced significantly owing, in large part, to the world-wide-web. Today, there are business games with virtually no limits on the number of participants. Thomas (2006) discusses 'supergaming' which refers to large collaborative play made possible through digital network technologies. Supergaming has the potential to connect game participants from around the world both as competitors and as team members.

Simplicity of use

Simplicity of use refers to how easy the simulation is to use. Ease of use would include: (1) ease of understanding how to play the game; (2) ease of understanding the results returned; and (3) ease of determining what is needed to improve performance. Adobor & Daneshfar (2006) demonstrated that ease of use by the participants positively affected learning in the simulation. A survey of business simulation game users by Faria & Wellington (2004) also showed that game users are concerned with the ease of implementing and introducing business games to their students.

The shift to personal computers provided a major advancement in the ease of use of business simulation games (Fritzsche & Burns, 2001). Starkey & Blake (2001) further state that "Improvements in the user-friendliness of computer systems have had a dramatic effect on the use of computer-assisted simulations in education. Computers are now seen as tools to be utilized across the entire range of disciplines, and universities have made a priority of integrating information technology into curricula outside of the hard sciences, giving rise to the growing field of instructional technology" (p. 541). Pillutla (2003) adds that "The student can now concentrate on the content and learning in the gaming exercise without getting too diverted by the mechanics of playing the game" (p. 112).

More recent developments will have an even greater impact on the simplicity of use of business simulation games. Summers (2004) notes that "...new technologies have allowed for advanced computer-user interfaces employing video game-quality graphics, natural language processing, and voice recognition technology. These capabilities and qualities include online feedback and coaching, advanced interfaces, learning on demand, and the ability to teach specific knowledge" (p. 208). Just emerging are the use of intelligent agents in business simulation games that can serve as what is being referred to as 'help wizards.' The help wizard agent can answer questions directly posed by the game participant and demonstrate how different aspects of the simulation exercise work.

Decision support

From the mid-1960s through the 1970s, decision support took the form of enhancing the simulation game with non-computer based supplemental materials. Nulsen & Faria (1977) discussed some widely used business game support enhancements including video-taped commercials, product and brand manager reports, marketing plans, news releases that the game participants had to respond to, and similar non-computerized activities. Nulsen & Faria (1977) further reported that the use of these game support materials resulted in more favorable participant responses to the enjoyment and learning from the simulation competition.

The development of the electronic calculator in 1975 represented a significant milestone for the further enhancement of learning through the use of business games. As noted by Ellington (1994), “I do not think it is generally appreciated just what an impact the advent of the electronic calculator had on educational simulation/gaming....It is possible for game designers to build lengthy and demanding calculations into their exercises without worrying about whether the participants will be able to cope with them” (p. 203).

Suggs (1980) reported on the use of a computerized student and instructor module package at Temple University to assist both participants and instructors to enhance the use of business games. The student module allowed participants to enter their proposed decisions into a program to ascertain expected results if their forecasts of the economy, market and competition were correct. The student module provided forecasts of profits, cash flow, inventories, accounts receivable, interest charges, payables, and equity. The administrator module provided a compact listing of student team decisions, performance results and relevant statistical analyses for ease of interpreting and evaluating participant performance.

The development and use of the personal computer was the next milestone in the use of decision support materials with business games (Fritzsche & Burns, 2001). The highly powerful micro-computer was developed in the early 1980s and offered inexpensive and powerful data analysis programs well suited for use with business simulation games. Most decision support programs were oriented around a spreadsheet program that offered templates to help participants evaluate the financial and operating implications of their decisions by providing ‘what-if’ analysis. These types of decision support programs were quickly incorporated directly into the simulation game software by many game authors.

By the early 1990s, more sophisticated Internet and web-based decision support programs had been developed. An excellent early example was the web-based Boston Consulting Group (BCG) package developed by Palia, DeRyck & Mak (2002). The BCG package allowed participants to perform static, comparative static and dynamic analyses of their own and their competitors’ product portfolios. The BCG web-based package allowed game participants to check for internal balance in their product portfolios, look for trends, evaluate competitor market positions, consider factors not captured in the portfolio analysis, and develop target portfolios.

Artificial intelligence represents the latest development in decision support programs. Uretsky (1995) explains, "Expert systems and artificial intelligence are commonplace....These techniques are frequently embedded in the computer programs so that users are not even aware that they are using them. The expert systems introduce several important simulation/gaming capabilities. They help participants analyze data and learn from simulated events. They dramatically modify the simulation to reflect changing situations or needs. They help the administrator learn about the activities taking place, thus improving both quality or the debriefing and his or her own administrative skills" (p. 222). Artificial intelligence technologies have made it possible to develop sophisticated computer-generated feedback and coaching with business games, including supplemental knowledge-based learning materials such as tutorials, reference materials, exercises, and multimedia application tools (Summers, 2004).

Communication

Most participants in business simulation competitions are assigned to teams and forty years of gaming research has shown that team functioning affects performance. Studies by Croson (1999), Kramer (1999), Noy, et al. (2006) and Dasgupta & Garson (1999) have reported that enhanced team communication improves team performance. The Internet and advancing information and communication technology (including e-mail, live chats, telecommunications, teleconferencing, videoconferencing using webcams and social networks) allow team members to communicate more easily and enhance team performance and individual participant learning. Videoconferencing typically involves a small camera that is connected directly to a PC. This is a powerful communication tool that has become cost effective owing to advances in technology and allows for easy face-to-face communication. Computer-mediated communication helps group members to generate more alternatives with more equal participation. The Internet is an excellent vehicle for users from diverse cultural backgrounds to communicate and participate effectively. As shown by Adobor & Daneshfar (2006), the greater the exchange of ideas among team members, the greater the learning from the simulation.

Martin (2003) reports that "...communication over distance is made possible and relatively fast by a pervasive global presence of computers and high-speed, high-bandwidth communication links. This enables the potential for collaborative work to be undertaken within a feasible time scale. Because time and distance are fundamental dimensional constraints of human physical existence, this contribution is extremely significant" (p. 25). The importance of pervasive simulation games, as explained by Thomas (2006), is not the pervasive technologies that they offer but the social interactions that they allow among the participants. Plymale (2005) reports that pervasive games offer improved capabilities for communication, coordination, collaboration, and knowledge exchange by removing time and space constraints. The growing power of the Internet and web-based simulations has made these developments possible.

Why and how business games are used

The review of the technological changes in business simulation games over the past 40 years as presented in the previous section has shown that there have been many enhancements to business simulations with regard to their functioning across the dimensions of realism, accessibility, compatibility, flexibility and scale, simplicity of use, decision support systems, and communication. This leads to the next important question with regard to business game changes over the past 40 years and that is the pedagogical impact of these technological changes on both why business games are used and how business games are used.

In order to assess the changing nature of why and how business simulation games are, and have been, used over the years, a review of all articles published in *Simulation & Gaming* going back to the first issue was undertaken. From the first issue of *Simulation & Gaming* (March 1970) through the September 2008 issue, a total of 1,115 full articles have been published in *Simulation & Gaming* and 304 of the articles have covered some aspect of business simulation game education and learning. This represents 27.3% of all articles published in *Simulation & Gaming*.

Why business games are used

A review of the topics covered in the business education and learning articles of *Simulation & Gaming* identified nine central themes as to why educators use business simulation games. These nine themes, in order of their frequency of mention in articles published in each decade and in total across the four decades, are presented in Table 1. The major themes identified include: using games for the experience they bring to the participants, instructing participants on strategy, teaching decision making, accomplishing course learning outcomes and objectives, promoting teamwork, motivating students, applying theory in a practical fashion, involving students (active learning) and integrating ideas.

A review of the 304 business simulation education and learning articles shows that the five topics of **experience** gained through business games, the **strategy** aspects of business games, the **decision-making** experience gained through business games, the **learning outcomes** provided by business games, and the **teamwork** experience provided through business games were the most often discussed topics. Each of these topics was covered in over 25 percent of the business education and learning articles that have been published in *Simulation & Gaming* (many articles covered multiple learning topics).

Interestingly, in each decade of reviewed articles (see Table 1), the same five topic areas listed in the previous paragraph emerged as the top five article topic areas for that time period. If we assume that the articles appearing each decade in *Simulation & Gaming* on the educational and learning aspects of business games represents the reasons why business game users were using games, the why of business game usage has remained remarkably the same over the past 40 years.

While the same five topic areas emerged as the most discussed business education and learning articles each decade, the order of the major educational and learning topics did change each decade as shown in Table 2.

TABLE 1: Why Business Games Are Used

	Decade		Decade		Decade		Decade		40 Years	
	1970s	% of Total	1980s	% of Total	1990s	% of Total	2000s	% of Total	Grand Total	% of Grand Total
Total S&G Articles*	213	100	244	100	363	100	295	100	1115	100
Business Simulation Education Learning Articles	34	16.0	74	30.3	124	34.2	72	24.4	304	27.3
Leading Business Education and Learning Topics	Percentage based on the number of business education and learning articles not total S&G articles									
Experience	5	14.7	19	25.7	23	18.5	45	62.5	92	30.3
Strategy	3	8.8	20	27.0	25	20.2	43	59.7	91	29.9
Decision Making	6	17.6	17	23.0	24	19.4	38	52.8	85	28.0
Bloom's Taxonomy, Learning Outcomes & Objectives	7	20.6	19	25.7	15	12.1	39	54.2	80	26.3
Teamwork	6	17.6	15	20.3	21	16.9	24	33.3	66	21.7
Motivation	2	5.9	10	13.5	7	5.6	22	30.6	41	13.5
Theory Application	1	2.9	7	9.5	3	2.4	22	30.6	33	10.9
Involvement	1	2.9	7	9.5	7	5.6	16	22.2	31	10.2
Integrate Ideas	1	2.9	1	1.4	3	2.4	9	12.5	14	4.6

* Article is defined as a published manuscript and excludes editorials, reviews, rejoinders, news items, etc.

As we moved from the 1970's business education and learning articles to the 1980's articles, strategy formulation as a topic jumped from fifth place to first. This can be explained through the growing sophistication and complexity of business simulation games. According to Biggs (1990) "there are two dimensions of complexity in business games – game variable complexity and computer model complexity" (p.27). As described in the section on the changing technology of business games above, business simulations were becoming far more complex as they moved from hand-scored to mainframe to personal computer based games. This advance in technology allowed for business games to incorporate more products, geographic regions, and far more decision variables. As such, game participants' abilities to formulate more robust strategies in business games emerged and strategy formulation became a more important reason for the use of business games. At the same time, the development of decision-making skills and the teamwork aspects of business games became generally accepted by game users and declined in importance as reasons for using business games during this time period.

Table 2: Rank Order of the Five Major Educational and Learning Objectives by Decade

	1970s	1980s	1990s	2000s
Learning outcomes and objectives	1	2	5	3
Decision-making skills	2	4	2	4
Teamwork	3	5	4	5
Experience gained	4	3	3	1
Strategy formulation	5	1	1	2

In the 1990s, strategy formulation remained the most important reason for the use of business games as business simulations continued to grow in size and complexity. Also in the 1990s, the development of decision-making skills jumped back up from fourth place in article topics to second place. The reason for this likely involved the movement of relatively all business simulation games from mainframe to personal computers. With the coming of personal computer based games, business simulation games were able to include many new decision support tools. This allowed business game participants to experiment with decisions (often before actual decision submission) and more deeply analyze individual decisions and their outcomes.

In the 2000s, experience as an article topic jumped from third place to first and learning objectives and outcomes moved from fifth place to third. A major force causing these changes is the broad movement in business education to demonstrate learning relevance, accountability and value through outcomes measures of business learning. Accrediting organizations like the Association for the Accreditation of Collegiate Schools of Business (AACSB - formerly the American Association of Collegiate Schools of Business) and the Association of Collegiate Business Schools and programs (ACBSP) are refocusing the educational priorities of business schools by asking them to adopt outcome measures to demonstrate student learning rather than the traditional measures of what was being taught in the classes. This movement is being driven in concert with the broadened international reach of both of these business school accrediting organizations.

As vehicles for instruction, business simulations remain as powerful today as they were when first introduced. They allow for dynamic business decision-making where players formulate a strategy and then carry out a series of decisions to implement the strategy. Game participants receive feedback which demonstrates the consequences of their decisions and the participants are able to evaluate their strategies and, if necessary, reformulate their strategies. The experience gained from the repeat iterations of decision periods provides direct feedback to players from which they are able to learn.

In a business simulation, decision results are directly attributable to the decision-making skills of the players involved. In contrast, case analysis procedures remain static and analogy based where one learns from a detailed example of a managerial situation

which can be carefully analyzed and assessed. One can formulate decisions based on the case situations but students are never tested with actual implementation or feedback. If tested at all, it is in terms of a sequel to the case which describes what the business did and what happened. If students recommend a course of action other than that which was actually chosen by the company, they have no way to evaluate their solution.

The development of the internet has allowed for distributed computing and greater automation in simulation design. Students can be asked to undertake more frequent decision iterations which provides for more experience than ever before and greater opportunities at strategy formulation. Participants can interact with a simulator on their own time and learn at their own pace, often a pace that is more rapid than when batch operated simulation games predominated. In addition, game participants can interact with a wider audience of players than ever before including students from different educational institutions and different countries which enables a comparative external evaluation of decision-making skills.

How educators use business simulation games

In contrast to the reasons why educators use simulation games, the key pedagogical themes relating to how business simulation games are used have undergone greater changes over the last 40 years. Much of this change in how games are used is related to the technological changes in business games as discussed earlier in this paper. Table 3 presents the results of a search of the 304 *Simulation & Gaming* papers devoted to business simulation, education and learning and presents seven main themes related to how educators use business simulation games based on the topics of these papers.

The how of business simulation game usage will be discussed under the topics of teamwork, the interactive nature of games, game complexity, functional games, debriefing exercises, using the internet, and employing quantitative skills. Although teamwork remains a consistently important theme as to both how and why business simulation games are used, and has been the leading topic of how games are used over the past 40 years, it is only the third most mentioned topic in the last decade. Recently, the two themes of interactivity and complexity have emerged as predominant in concert with a third theme, the employment of the internet for online gaming.

While a major focus of gaming research forty years ago was determining the right size (number of participants) of simulation teams for efficient decision-making and how teams should be formed (e.g., random, self selection or game administrator selection), these issues are not of much current interest. As the number of part-time, geographically separated and ethnically diverse students grew in business programs, the diversity of teams became a more significant focus of business gaming research. Further, with the advent of the internet and the development of online learning and distance education classes, teamwork took on a new meaning. Teams can now be formed in different geographic areas and still undertake synchronous interaction online. Even classes which are conducted in the traditional one or two on-campus meetings per week that allow for

face-to-face contact among team members exhibit different forms of team interaction because of the internet. Interactive forms of games allow teams to schedule their meetings more freely and to choose when they want to make decisions. Further, as games have become more complex because of advances in computing power, the need for group discussion and decision-making to understand and manage this complexity has become greater.

Table 3: How Business Simulation Games Are Used

	Decade		Decade		Decade		Decade		40 Years	
	1970s	% of Total	1980s	% of Total	1990s	% of Total	2000s	% of Total	Grand Total	% of Grand Total
Total S&G Articles*	213	100	244	100	363	100	295	100	1115	100
Business Simulation Educational Learning Articles	34	16.0	74	30.3	124	34.2	72	24.4	304	27.3
Leading Business Education and Learning Topics	Percent based on the number of business education and learning articles not total S&G articles									
Teamwork	6	17.6	15	20.3	21	16.9	24	33.3	76	25.0
Interactive	2	5.9	8	10.8	9	7.3	31	43.1	50	16.4
Complexity	2	5.9	13	17.6	6	4.8	28	38.9	49	16.1
Functional	3	8.8	12	16.2	13	10.5	16	22.2	44	14.5
Debriefing	1	2.9	3	4.1	7	5.6	17	23.6	28	9.2
Internet	0	0.0	0	0.0	5	4.0	18	25.0	23	7.6
Quantitative Skills	0	0.0	7	9.5	1	0.8	14	19.4	22	7.2

* Article is defined as a published manuscript and excludes editorials, reviews, rejoinders, news items, etc.

The use of interactive games has transferred far more of the learning responsibility of business games to the game participants while making the games less dependent on active instructor operation and manipulation. As such, instructors generally set the parameters for the simulation competition and enrol the students into the business game but do not have to concentrate very much on the physical and technical day-to-day operations of the simulation (e.g., inputting student decisions and printing results). Game administrators can now concentrate more on the learning and decision-making aspects of the exercise while participants input decisions at pre-set decision deadlines and retrieve results at specified times.

The increase in computing power, the advent of the internet and the increase in interactivity have all enabled game developers to construct more complex simulation exercises. Consequently, more interactions among business decision variables can be modeled and with the asynchronous operations of business games, more decisions can be undertaken during any simulation competition. As models of business games get closer to simulating the complexity of actual businesses, business education researchers are more interested in knowing how the increased complexity of games affects student learning. While early business games were too simple to allow for complete strategy development, current games are specifically designed for this purpose. The result is that game administrators are able to add exercises such as the development of complete business plans to the ongoing nature of business game decision-making.

Debriefing has grown tremendously as a topic of interest in simulation research in the last decade. The discussion of the learning intent of a business simulation exercises coupled with feedback from the students as to what they have experienced and learned has always been a central part of business simulation gaming research through the decades. The growth in research devoted to debriefing in the most recent decade is likely related to the growth in importance of outcome-based learning measures which have been mandated by business school accrediting bodies. A debriefing exercise of some type is a natural, and necessary, expectation for any outcome assessment procedure.

The internet as a vehicle combined with inexpensive hosting and memory storage services has allowed for distributed computing and provides for easy national and even international reach for business simulation game providers. Business educators have a selection of possible sources which makes it very easy and inexpensive to set-up and conduct business simulation exercises. Student access to the internet is pervasive which makes it very easy to physically administer business simulation games.

In the past, communication about and distribution of business simulation games was through traditional textbook publishers. Although some traditional publishers continue to offer and distribute business simulation games (often as a supplement attached to a textbook), the current movement is towards internet based software companies that offer stand-alone business (and other) simulation packages. Companies such as Innovative Learning Systems, Capsim, Industry Player Simulation Games, Forio Business Simulation Games and others are internet based companies that market and operate their simulations on the internet. In addition, some game authors are now selling and supporting their games on the internet. Finally, there are companies that have developed simulations for their specific industry which they market to universities (IBS and Estee Lauder).

Aside from the technical advantages offered by internet based simulation games, instructors are aware of the heavy use of the internet on the part of their students. Students are accustomed to communicating and game playing on the internet. They interact using social communication software like *Facebook* and *Yahoo*. They play so called 'massive multiplayer realtime online games' such as *World of Warcraft* (www.worldofwarcraft.com) and visit virtual worlds like *Second Life*

(www.secondlife.com). As such, it is quite easy to administer business simulation games on the internet and, importantly, students expect and prefer computerized simulation games to be administered in this fashion.

While business simulation games may be used as only a small part of a business course, the trend seems to be in the direction of the simulation game becoming the centerpiece of the business course. Business policy or business strategy simulation games are particularly well suited to being the centerpiece for learning in a capstone business course. According to a major survey of business game users (Faria & Wellington, 2004), business strategy games (also referred to as top management games) are the most frequently used in business education programs.

The employment of functional business games that focus on the specific activities of business organizations has remained a fairly steady topic among business educators over the past forty years but the ranking of this topic has declined in the 2000s (see Table 3). Marketing games, accounting focused games, stock market and finance games, and human resource management games are all examples of popular types of functional games. Despite the growth in total enterprise management tools and games, particularly those available on the internet through software companies, businesses still depend on functional experts for their day-to-day operations. Towards this end, most business schools remain organized along functional lines with their degree and program offerings. Consequently, the use of functional games to help educate business students in specialized disciplines continues despite the decline in ranking among publications discussing how business games are used.

Finally, gaming research would suggest that game administrators have become more interested in having participants demonstrate the use of quantitative skills while participating in business games. The availability of more sophisticated analytical software tools combined with easier data manipulation and interchange facilities means that business simulation outputs can be more easily assessed and analyzed than ever before. Students can apply forecasting tools to simulation output as well as undertake a detailed analysis of product profitability or business segment profitability. The basic breakeven analysis or cash flow analysis tools associated with simulation games in the decades of the 1970s and 1980s have not been lost in the current decade either. The business game participant today has access to a highly sophisticated array of quantitative business tools to apply to the business simulation being used. In doing so, game participants are developing the skills to apply these same tools in other business courses and in later career jobs.

Conclusions

As an educational tool, business simulation games have grown considerably in use over the past 40 years and have moved from being a supplemental exercise in business courses to a central mode of business instruction. The business simulation game has become a major form of pedagogy for use in business education.

Business simulation games have evolved in many ways over the past 40 years. The availability and use of computers for business games has grown enormously. The physical size of computers (and their costs) have declined from the large mainframes to portable hand-held devices with superior power. All personal computers and hand-held devices have communication capabilities and access to the “information highway.” Game administrators and participants can access simulations anywhere and be connected to all other participants. The Internet and world-wide-web allows for the integration and linkage of databases including images, audio and real-time videos. As the video images are digitized, they can be readily modified and integrated into the business games. Simulations have become more sophisticated and realistic. Decision support modules and software tools have become more comprehensive and understandable with sophisticated graphical user interfaces. Expert systems and artificial intelligence are being embodied into business games with the use of intelligent agents or avatars. Virtual reality is emerging and can place participants in a three dimensional world with real-time activities.

Although changes in technology are providing more opportunities to improve the simulation gaming learning experience and a number of pedagogical innovations are emerging to drive the way in which simulation games are used, the fundamental reasons as to why educators use business simulation games have not changed much over the past 40 years. How instructors employ business simulation games has been less static and offers tremendous promise for future research and experimentation. Game users have adapted to the technological changes in business games to change how teams are formed, upgrade the assignments that are used with business games, and are demanding more from the business simulations to train and motivate student participants.

With the growing use and portable distribution of highly interactive computer technology, the continuance and growth of business simulation gaming as a critical instructional tool over the next 40 years is assured. Given the speed of technological change in business games, the manner of how business games are used will continue to change dramatically. Games will continue to better reflect the real-world business environment as their complexity grows. With the growth in computing power, coupled with the growing ease of use, student participants may be expected to not only engage in business gaming decision-making but be asked to construct their own “improved” versions of the business games.

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