Trends Research Paper: Simulations in Training
IT6750 – Trends and Issues in Instructional Technology
Team members: Danielle Beck, Ginger Nichols, & Diane Verrilli
December 7, 2008

Simulations in Training

"Tell me, and I will forget. Show me and I may remember. Involve me, and I will understand." – Confucius, 450 BCE

Introduction

As you look out the window, you see dark clouds enveloping the aircraft. Bolts of lightening are getting closer. The wind and rain are growing much stronger. Your crew is becoming nervous and so are the passengers. While this is occurring, your co-pilot has a heart attack.

Luckily, this was a training exercise which took place in flight simulator. Pilots all over the world use flight simulators to become accustomed to flying a plane before they ever take the real controls. "Nowadays, most of us wouldn't dare board an airplane if the pilot hadn't first gained sufficient experience in a flight simulator" (Business Smart International, White paper, p.3).

Simulations have been used to help people learn for decades in many fields such as pilot education, firefighting, and in the military. Simulations can be as complicated as mathematical models to topics more basic such as people-skills development tools (Conner, 1997-2006).

People learn best by doing. Simulations and learning games create real-world and feel- like-you're-there actions provide the opportunity to engage, have fun, and truly learn. Much of the work in the area of simulations is rooted in experiental learning, which is based on learning by doing (Conner, 1997-2006).

What's a Simulation?

There is a large amount of literature on simulation spanning many decades. In order to discuss simulation there needs to be a definition of what it is. Basically, simulation is the process of designing a model of a real or imagined system and conducting experiments with that model. The purpose of simulation experiments is to understand the behavior of the system or evaluate strategies for the operation of the system. Assumptions are made about the system (Smith, 1998, p. 1). It is important to note, that simulations use models to analyze how a system works (p.1).

According to Wikipedia's definition, "Simulation is the imitation of some real thing, state of affairs, or process. The act of simulating something generally entails representing certain key characteristics or behaviors of a selected physical or abstract system" (Simulations, 2007, para. 1).

Who Uses Simulations?

At present simulation methods are used in many areas, including the military, air traffic control, engineering, construction, energy, finance, computer technology, pharmacology, healthcare, manufacturing, training and education. "War and business

are useful examples of areas in which simulations have been developed, but simulations are also widely used in recruitment and training for all jobs which require behavioral skills" (Jones, 1987, p. 21). Simulations are established part of police training, air transport, medical care, and in the law (Jones, p. 21). Simulations can be used for modeling systems in order to gain insight into the functioning of the system (Simulations, 2007).

Organizations that use Simulations

Military

Military simulations, more commonly known as war games, have been used to test and refine warfare without having to actually go out into the battlefield. Virtual environments are useful replacements for textual, graphic, and other paper-oriented representations that have dominated military decision making for centuries. The Simulator Networking (SIMNET) program of the late 1980's and early 1990's showed the value of simulations using computer-driven, 3-D immersive and networked combat simulators. Twenty-five years later many advances have been made in the military simulation area (Smith, 2008).

"Following the introduction of SIMNET, all major simulation systems, both virtual immersive systems and constructive wargames, have been developed as networked devices that can interoperate with other simulations to create lager and richer representation of the battlespace" (Smith, 2006, p. 3). This field has been on the cutting edge and is often transformed as new computer technologies have emerged from Silicon Valley. Just like many other industries, the simulation industry has experienced disruptions due to innovations in other areas. An example of a disruption was the entry of gaming technology into the simulation industry, which appears to be following patterns Clayton Christensen (1997) has described in *The Innovators Dilemma*.

Military simulation and training has evolved over the years due to numerous technological advances. There has been an explosion of consumer-grade computing power which has led to a corresponding explosion in software applications. The computer gaming industry is a great example of this explosion in which products like Quake, Unreal, and an annual load of new competitors present some of the best virtual environments available at consumer price levels (Smith, 2008, p.2). "The commercial world will be the fountain from which advanced virtual environment technologies spring and the foundation to which the military will go for new innovations" (p. 2). The National Research Council Committee on Modeling and Simulation described the convergence of entertainment and defense simulation in their 1997 report (Smith, 2006 and National Research Council, 1997). This trend will most likely continue into the future.

In the past, the military focused on large combat operations that occurred on a specified battlefield where all participants were expected to be combatants. Recently, things have changed for military operations. Large combat operations are a thing of the past and have been replaced by small units having to confront urban environments where the military is called upon to perform humanitarian operations, search, reconnaissance, faculty defense, and combat operations all on the same day. "There can no longer be combat only representations of the world" (Smith, 2008, p. 4). Current missions will focus on smaller areas, making it possible and desirable to represent very high levels of detail in the area of operations. Simulations using

virtual environments can be used to recreate combat operations in a small area such as a single city block, where trainees can communicate and build a body of knowledge that will impact future missions. Confrontations in the future may be focused on political, military, economic, social, infrastructure, or information domains. Simulations in virtual environments capable of representing such a diverse world accurately and effectively will be a significant challenge and focus in the future (p. 4).

The military is not the only organization that uses simulations.

Health Care

"The first medical simulators were simple models of human patients" (Simulations, 2007, para. 25). In the past, you could see human simulations created in clay and stone, which were used to demonstrate clinical features of diseases and the effects these diseases had on humans.

More recently, "Medical simulations are increasingly being developed and deployed to teach therapeutic and diagnostic procedures as well as medical concepts and decision making to personnel in the health professions" (Simulations, 2007, para. 22). Simulations have been developed for training procedures as basic as blood draws to complicated procedures such as laparoscopic surgery (para. 22).

Healthcare is a rapidly changing industry and needs to find ways to keep up with these changes. It has become apparent that the application of simulation methods can be instrumental in addressing the multi-faceted challenges healthcare is facing at present, and will face in the future. "Simulation methods used in industry will require adaptation for health care, because patients are not typical customers, mainly because they are more responsive and increasingly keen to exercise meaningful and informed choice. It is after all their lives that could be at stake!" (Kulijis, Paul, and Stergioulas, 2007, p. 1449).

"Simulation allows significant exploration of multiple options without spending enormous amounts of money on staff, training, equipment, and most importantly, without risking the possible degradation in the level of healthcare" (Barnes, Benson, Quiason, and McGuiness, 1997, p. 1280). One successful simulation is described by Barnes et al. where a reduction in patient waiting time and overall time in the medical facility was the goal. A number of key elements were discussed including project planning, communication, user-friendly simulation software, use of actual data, and the ability to use the simulation as a decision-making tool. A typical analysis question could be "what would happen to waiting time if patients visits (volume) increased by 30% and everything else remained at their current levels?" (Barnes et al., 1997, p. 1284). The decision-making tool was a what-if analysis, which allowed clinical management and staff to explore multiple scenarios that would have been impossible to obtain with other analytical methods using the same time frame, resources, and effort (Barnes et al.).

More recently, medical simulation training has been used to improve education. According to the Immersion Medical web site, hundreds of schools in the United States and around the world provide hands-on health care education to medical, nursing, and allied health students. Medical simulations used in combination with traditional training methods can provide a comprehensive learning opportunity for students. Medical simulators can be a resource for training a team and for providing

a more flexible and less costly training environment than other training methods (Immersion Medical, 2008).

Along with cutting down on costs, medical simulations also offer immediate training opportunities. Normally, students would have to wait for a real-life opportunity to present itself, but simulations can be used at any time and offer a wide variety of clinical scenarios for students to work through (Immersion Medical, 2008). Other benefits to using medical simulations include the ability to create a risk-free environment for improving patient safety, the ability to practice skills and new techniques without harming anyone, training in an environment with the look and feel of the actual environment, objective assessments, certification and testing (Immersion Medical).

There is a growing sense that the availability of simulations is now creating a shift in how medicine will be taught and practiced in the future. For instance, the FDA voted to approve carotid stent placement and simulation-based training that supports its use in April 2004. Additionally, the Society of American Gastrointestinal Endoscopic Surgeons adopted guidelines incorporating medical simulation training in its laparoscopic surgery program (Immersion Medical, 2008). Medical simulation trainings will continue to be incorporated in medical and health care training programs in the future.

Corporate Training

"Tell me, and I will forget. Show me and I may remember. Involve me, and I will understand." – Confucius, 450 BCE

An International Data Corporation (IDC) survey predicts that the use of simulations will quadruple by 2008 (Conner, 1997-2006). With the number companies using simulations growing each year, it's no wonder that the call for more variety of simulation training is also growing. No longer is simulation training just for the military, pilots or medical workers. The field has expanded to include soft skills as well. Those soft skills include everything from leadership techniques, financial skills, people skills and even being CEO for a day. Edgar Dale, a noted education psychologist, reports that simulations and direct experiences "generates as high as 90% information retention rate. In comparison, traditional teaching techniques such as lectures result in a mere 10% retention score" (BTS, White paper #2, p. 5).

It's those organizations who utilize the new world of e-learning and simulations in particular that will rise above the rest. "The organizations that care the most about training use simulations to do their training and development heavy lifting" (Aldrich, 2004, p. 8). By using simulations companies have come to the conclusion that adults learn best by doing. Malcolm Knowles first announced in 1970 that we learn differently as adults, than we do as children. Knowles defined four specific characteristics of adult learners (BTS, White paper #2, p. 2):

- Adults have a life-centered orientation to learning and problem solving
- Adults have a desire to draw on experience as a resource
- Adults have a need to be self-directing; they enjoy planning and carrying out their own learning exercises
- Adults need an opportunity to apply and try out learning quickly

Using simulations gives learners the chance to "learn by doing" in a risk free environment, which leads to a greater understanding and retention of the material (BTS, White paper #2, p.3). It allows learners to observe the impact or consequences of their decisions without causing any undue harm to the company. A good, realistic simulation is "a powerful tool that facilitates individual and group learning in a simulated environment that replicates a typical organization. It allows learners to be placed in a role that challenges them to discover how they can improve their decision making, communication, leadership and team work all in a completely safe environment" (Business Smart International, White paper, p. 4).

As Clark Aldrich states, "Simulations place end-learners in selectively lifelike situations, requiring them to successfully manipulate some aspect of their environment" (2004, p. 57). Simulations have gained ground in corporate settings because of the ability to let learners learn by doing, but it hasn't always been that way in business. For decades, it seemed acceptable to promote high potential employees even if they hadn't proven themselves in a management type situation. Today, the ever growing complexity of the business world requires much more than just being good at your job, but an understanding of business in general – how business works or business acumen. This is where simulations can step in and help with training new managers or employees in a realistic, but safe environment.

Under normal circumstances managers and employees alike do not have the ability to see the full effect of their decision making. By using simulations companies can test strategies, identify potential trouble spots, and plan accordingly.

> Each functional or sub-process group learns about the initiative by seeing it unfold, by working through the intricacies of the system, drilling into the roles and behaviors that they and other groups will need to undertake, by doing a test-run of all of the activities that will take place (BTS, White paper #1, p. 8).

The eLearning Guild produced the "Soft Skills Simulation Report" in February of 2005 (Conner, Websites and Related Resources section) which defined soft skill simulations as situational simulations. "Their primary objective is to teach the student how to deal with behaviors and attitudes of people. Situational simulations can include Role Play, Sale Processes and Business decision making and analysis" (Alessi and Trollip, 2005, p. 1).

But how can we group the different kinds of simulations? As Clark Aldrich states in *Learning by Doing*, there are really four types of traditional online simulations (Jenna Sweeney's Blog, March 24, 2007):

- Branching stories – learners make decisions that branch the story down different paths
- Interactive spreadsheets – learners allocate resources and the simulation generates a graph
- Game-based models – learners participate in entertaining and competitive games
- Virtual products and virtual labs – learners are allowed to interact with products or a lab in a virtual setting

Within the different types of simulations there are several characteristic as well. First, is the simulation synchronous (users participating at the same time) or

asynchronous (users participating at different times)? Here is a list of other characteristics that may be used in simulations (BTS, White paper #3, p. 4):

- Learn-by-doing – complete tasks or apply new behaviors
- Discovery approach – role play simulation
- Context-based insight – develop learners understanding of a situation
- Goal-based scenarios – distinct, desired outcome
- Consistent feedback – storyline with feedback
- Maximum user engagement – full of graphics, audio and video
- Ties to business metrics – based on a business situation
- User-driven experience – no particular order to the simulation, learner drives their experience

By using the different types of simulations and incorporating as many of the characteristics listed, simulations provide learners a unique, individualized experience to which to learn from. But as Jane Boston notes, most of learning actually takes place during a debrief session after the simulation training has taken place (Aldrich, 2004, p. 204).

> Debriefing what has happened – what a player experienced, felt during the simulation, and is feeling afterwards, what strategies were tried and what happened, what other strategies might have been applied, what else the player needed to know or be able to do, analogies to real-life situations, how the players' own values and experience influenced their actions – are all important items for discussion (Aldrich, p. 204).

Even with all the benefits of using simulation training, technology and training budgets are usually very tight, even in good times, which make it difficult to put out the expense for more sophisticated training and development (Business Smart International, White paper, p. 3). With that said, "A well designed simulation will yield much better results and prove more cost effective, despite the initial expense of design and facilitation" (Business Smart International, White paper, p. 5).

So what about the future?

Future View of Simulations and Instructional Design

To understand the future direction of simulations in training, one must take a look at the audience that instructional design professionals will design content for in the future. Companies presently employ individuals from the Baby Boom Generation, Generation X (Gen X) and Generation Y (Gen Y). Research has shown that each generation has its own unique learning style.

Many Baby Boomers hold or held positions as corporate trainers, and designed training that appealed to their learning preferences that, in general, achieves objectives through a logical linear progression. This generation was used to learning in a logical sequential fashion. Baby Boomers are reaching retirement age and as they leave their positions, individuals from Gen Y will fill their vacancies. As the demographics of corporate employees shift, the training delivered to employees must change as well. Gen Y does not always find success in the training techniques that served Baby Boomers well (Boehle, 2008). Table 1 below illustrates the differences in the three generations and their learning style.

Table 1: Comparison of learners by generation (Boehle, 2008, para. 3-13).

Generation	***Baby Boom***	***Gen X***	***Gen Y***
Age Range in 2008	43-61	31-42	18-30
Acceptance of Technology	Not as open to new technology	Accept technology and like interactivity within training	Fully integrated into using new technology
Preferred Learning Environment	Linear, traditional classroom setting	Linear setting with learner-directed choices	Not as structured, self-paced and learner directed
Teach me…	What the instructor has laid out as objectives	What I need to know	Why I need to know this.
Simulations and Games	Have difficulty learning from simulations and games	Accept simulations and games in training	Accept simulations and games in training

One area that instructional designers can leverage to improve training simulations is technology. It is very important to keep in mind the differences in technology adaptation and use by the three different generations, but with Baby Boomers leaving the workforce, it maybe more important to focus on Gen X and Gen Y when designing instruction. Also, it is difficult to design training that accommodates all three generations' learning styles but typically training developed for a younger generation, will be accepted by the next older generation (Boehle, 2008).

Gen X is accepting of new technology, having grown up with video games and the emergence of the Internet. On the other hand, Gen Y is connected at the hip to new technology. They do not remember the time before the Internet. They are gamers, bloggers, and stay connected with friends through social networking sites such as Facebook and MySpace. Simply put, Gen Y has fully integrated technology into their lives and expects training simulations to live up to their advanced technology expectations.

Unfortunately, this puts corporate training quite a bit behind when it comes to training simulations. Current simulations impress Baby Boomers and Gen Xers, but the technology behind them is relatively simplistic in comparison to what tech savvy Gen Y uses in their daily lives (Toth, 2008). According to Thomas Reeves (2008),

> Some argue that the increased fidelity of contemporary video games decrease the likelihood that members of the Net Gen (Gen Y) will be satisfied with the relatively dull screen layout and limited interactions of most training games and simulations. In any case, with new evidence suggesting that playing video games does more good than bad and with the new workforce increasingly made up of workers who have spent large amounts of their free time playing these games, Instructional Designers and educational researchers are advised to continue to explore the real and potential effectiveness of training games and simulations in the workplace (p.16).

Because many Gen Yers are so tech savvy, instructional designers need to improve the technology within simulations to appeal to this generation. Right now, there are a few options available for those seeking to improve training by implementing technology. They include:

- Developing new technology
- Taking gaming elements and putting them to use in digital simulations
- Using new and existing technology that learners already use as a training tool (Toth, 2008)

Developing brand new technology to change training simulations is not always a practical solution. Due to time and budget concerns, the instructional designer may not have the available resources or computer programming skills to develop new technology to cater to the learning styles of Gen X and Gen Y learners (Toth, 2008).

Simulations Incorporate Gaming Elements

Rather than developing new technology for simulations, the instructional designer may choose to add computer gaming elements to a digital simulation to create more appeal to learners. It may seem to some that gaming elements and simulation elements are one in the same but they really are not. Clark Aldrich (2004) defines gaming elements as the items that make the simulation fun. Simulation elements are the items that convey the information to the learner.

Some current training simulations already use elements from gaming. Fast-forward, rewind, speed up, slow down and pause features do not seem like they originated in the world of gaming but they did. These features seem like they are natural elements of a simulation but they came from the gaming world.

A gaming element that may engage learners is the addition of keeping score in the simulation. One big difference between a game and a simulation is that games typically have some kind of goal. The goal could be to rescue the princess or to accumulate more points than your competitor. The goal of a simulation is to communicate information and improve job performance. In the world of corporate training, a high score like you might see in a video game can motivate learners to attempt to outperform their peers through friendly competition (Aldrich, 2004).

Using elements of a game is one way to make simulations more interesting for learners, but what about using an entire game to create simulations? This is where instructional designers can use existing new technology to improve the simulation experience. One such area that trainers are stepping into is Second Life (Schreck, 2008).

Companies Using Second Life

What is Second Life? Second Life is a 3D virtual world created by users and accessed through the Internet. It is the brainchild of Linden Labs and was opened to the public on June 23, 2003. Individuals and corporations can purchase "land" within Second Life to create their own virtual world. Residents of Second Life have avatars that resemble real human bodies (www.wikipedia.org).

Although many individuals use Second Life as a social networking tool, many well-known companies like IBM and Xerox have established presences in Second Life. Linden Labs markets Second Life as having many benefits to business clients

including the ability to reinforce the company's branding by building a virtual community dedicated to the brand, to hold meetings with employees through out the world, and as a tool to deliver training to employees (www.secondlifegrid.net).

Since Second Life is a virtual world, instructional designers can build virtual classrooms that actually simulate a real classroom. Gina Schrek from Synapse 3Di conducts and creates training sessions for companies in the Second Life environment. Schrek cites a team building exercise she completed for a company in Second Life which allowed employees from all over the world to participate in this real-time training done in the virtual world. Participants had the experience of being in the classroom environment with peers that they might only contact by telephone due to geographical restrictions (Schrek, 2008).

IBM has a business center in Second Life offering simulations to consumers to market IBM products (www.ibm.com). IBM has over 30 Islands in Second Life and has established a strong presence there for training and development (Schreck, 2008). A valuable tool for sales people has been the ability to simulate a sales call. The session is recorded, then played back to the salesperson and critiqued by other salespeople. One just does not get this kind of experience with real clients in the real world (Semuels, 2008).

Second Life has found a home at IBM because management can see the value and potential for the future. Hall and Nguyen (2007) spoke with Chuck Hamilton of IBM's Center for Advanced Learning. Hamilton cited the following reasons as to why Second Life is successful at IBM:

- Sense of self: Ability to create an avatar to look the way you want to look
- Death of distance: Ability to bring together people from across the globe
- Power of presence, space, and co-creation: Ability to collaborate and interact socially
- Pervasiveness of practice: Ability to learn in a safe environment by practicing
- Enrichment of experience: Ability to create diverse experiences, e.g., battlefield simulations, building molecules together, walking through a rain forest

  (Quoted from Hall and Nguyen, 2007, para. 9)

Second Life has the potential to elevate training simulations to new heights. The possibilities of this medium are still being discovered. Since training via simulation in Second Life is such a new phenomenon there are still issues to be worked out like developing best practices for the environment. Corporate trainers will need to work through issues with firewalls and company security as well as getting management to accept this type of medium as an acceptable training resource (Gronstedt, 2007).

UPS Adapts Training to Gen Y

Another company adapting training programs for Gen Y and using more simulations is UPS. UPS is a well-known package delivery company. For years, new delivery drivers were taught and expected to memorize the "340 methods" of UPS package delivery during two weeks of classroom lecture (Hira, 2007, p.1). The methods cover everything from the correct way to carry one's delivery truck keys to how to lift

packages. After these two weeks of training, drivers were sent out to conduct regular delivery routes.

In 2003, UPS management noticed a large turnover rate among the 20-somethings in the workforce about 30 to 45 days out of training. Those Gen Y employees, who made it through the first 45 days on the job, took three to six times longer to become proficient at their jobs than past employees. These facts sounded an alarm for UPS management since expansion plans called for the creation of 25,000 new driver positions within the next five years and their primary candidate pool would consist of individuals from Gen Y (Hira, 2007, p. 1).

To get more information on what was going wrong with the present driver training UPS conducted a survey with its Gen Y employees. Through this survey, Gen Y employees indicated that two weeks of classroom lecture did not effectively communicate the expectations of the actual job. Other information gained by surveying Gen Y employees included:

- Employees wanted hands-on experience
- Employees liked using computers, but did not necessarily like learning from them
- Gen Y employees question everything and always want to know the why behind everything they are taught
  (Hira, 2007, p. 1-2)

The survey results were extremely helpful for UPS, and were used to design a new training program for Gen Y workers. A 1.8 million dollar grant from the Department of Labor allowed UPS to bring on students from Virginia Tech, MIT, an Indian animation company, the Institute for the Future, and UPS executives to work together for three years to develop a new training program (Hira, 2007).

September 17, 2007 marked the opening of UPS' training center called Integrad to serve as home to the pilot training program. To help explain the "why" to new hires, Integrad includes both physical and computer-based simulations. There are simulators using actual UPS trucks to practice lifting and lowering packages, for learning the proper technique for exiting the truck, and a falling simulator to help train one's body to compensate for on the job hazards that may cause one to fall. UPS has computer-based simulations where trainees watch an animated version of a task and later are presented with quizzes to assess what they learned from the simulation (Hira, 2007).

Although data measuring the impact of the program is not available yet, UPS will consider the program successful if first-year drivers motor vehicle accidents decrease by 15% and work-related injuries decrease by 20% (Hira, 2007). UPS' commitment to its employees is definitely evidenced in this willingness to adapt to meet employees training needs (www.pressroom.ups.com).

As you can see, instructional designers must meet the needs of the learner when designing training programs. As Baby Boomers leave the workforce and their positions are filled with Gen Y employees, corporate training programs must adapt to meet the needs of those learners. Because Gen Y generally likes to learn by hands-on methods and is extremely tech-savvy, instructional designers should prepare to incorporate more technically advanced simulations into corporate training.

Conclusion

Simulations have been used in training programs in many types of fields such as pilot flight training, firefighting, engineering, finance, manufacturing, healthcare, the military, and the list goes on. The use of simulations for training will continue to be used in the future. People learn by doing, and simulations create real-world-like environments, allowing trainees the opportunity to engage in the activity and truly learn in a risk free environment. Simulation training allows learners to observe the impact or consequences of their decisions without causing any undue harm to themselves or the organization.

The availability of simulations has created a shift in how training is accomplished in many industries and organizations. Technology advances and the gaming industry have both had a large impact on the simulation industry by helping to improve simulation training.

With the number of organizations that use simulations for training growing each year, it is no wonder that the call for more variety of simulation training is also growing. No longer is simulation training just for the military, pilots or medical workers. The field has expanded to include soft skills such as leadership training, driver training, financial skills, and people skills. This is a trend that will continue in the future.

Team Roles

Diane Verrilli

- Sections: Introduction, conclusion, military, and healthcare
- Researched, wrote sections and edited final paper and helped edit presentation

Danielle Beck

- Section: Current corporate training
- Researched and wrote section, created presentation and helped edit Webpage

Ginger Nichols

- Section: The future
- Researched and wrote section, created Webpage, and helped edit presentation

References

Aldrich, C. (2004). *Simulations and the Future of Learning*. San Francisco: Pfeiffer.

Aldrich, C. (2004, November 6). Simulations and the future of learning. *IT Conversations Podcast.* Retrieved November 29, 2008, from http://itc.conversationsnetwork.org/shows/detail372.html#

Alessi, S. and Trollip, S. (2005). The Soft Skills Simulations Research Report. *The eLearning Guild*. Retrieved December 5, 2008, from http://www.elearningguild.com/research/archives/index.cfm?action=viewonly2&id=91&referer=http://www.elearningguild.com/research/archives/index.cfm?action=view&frompage=1&StartRow=1&MaxRows=40

Barnes, C., Benson, C., Quiason, J., McGuiness, D. (1997). Success stories in simulation in health care. *Proceedings of the 2007 Winter Simulation Conference*. Retrieved November 18, 2008, from http://www.informs-sim.org/wsc97papers/1280.PDF

Boehle, S. (2008, February 19). How to design e-learning for multiple generations. *ManageSmarter*. Retrieved November 29, 2008, from http://209.85.173.132/search?q=cache:S_81LXnGACwJ:www.managesmarter.com/msg/content_display/training/e3ifd9d309a05210550b50be9a8c2ab5001+boehle+how+to+design+elearning+for+multiple+generations&hl=en&ct=clnk&cd=1&gl=us&client=safari

BTS. (2008). Simulation: The force for accelerating time to values of corporate initiatives [White paper, #1]. *BTS Website.* Retrieved November 29, 2008, from http://www.bts.com/media/pdfs/whitepapers/Simulation_ForceForAccelerating.pdf

BTS. (2008). A case for simulation: A review of research on the impact of simulation. [White paper, #2]. *BTS Website.* Retrieved November 29, 2008, from http://www.bts.com/media/pdfs/whitepapers/a_case_for_sim_whitepaper.pdf

BTS. (2008). Simulation: What makes it so effective? [White paper, #3]. *BTS Website.* Retrieved November 29, 2008, from http://www.bts.com/media/pdfs/whitepapers/Sim_what_makes_effective_whitepaper.pdf

Business Smart International. (n.d.). Why companies are using advanced business simulations in management development programmes [White Paper No. BSI0063]. *Business Smart International Website*. Retrieved December 5, 2008, from http://www.business-smart.com/

Christensen, C.M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.

Conner, M. L. (1997-2006). Simulations and learning e-games. *Ageless Learner*. Retrieved November 28, 2008, from http://agelesslearner.com/intros/simulations.html

Gronstedt, A. (2007, August). Second Life produces real training results. *T+D.* Retrieved November 29, 2008, from http://www.astd.org/NR/rdonlyres/F3C38970-2C51-4437-9A4E-BDBA9703F2B0/15723/76070844.pdf

Hall, T. & Nguyen, F. (2007, September). IBM@Play on Second Life. *Learning Circuit.* Retrieved November 29, 2008, from http://www.astd.org/NR/rdonlyres/F3C38970-2C51-4437-9A4E-BDBA9703F2B0/15723/76070844.pdf

Hira, N. (2007, November 7). The making of a UPS driver. *Fortune.* Retrieved November 29, 2008, from http://money.cnn.com/magazines/fortune/fortune_archive/2007/11/12/101008310/

How corporations use virtual worlds. (2008). *The Second Life Grid*. Linden Research, Inc. Retrieved November 29, 2008, from http://secondlifegrid.net/slfe/corporations-use-virtual-world

Immersion Medical. (2008). Medical simulation training benefits. *Immersion Medical.* Retrieved November 22, 2008, from http://www.immersion.com/medical/benefits1.php

Jones, K. (1987). *Simulations: A Handbook for Teachers and Trainers*. (2nd ed). Kogan Page Limited. London.

Kulijis, J., Paul, R., and Stergioulas, L. (2007). Can health care benefit from modeling and simulation methods in the same way as business and manufacturing has? *Proceedings of the 2007 Winter Simulation Conference*. Retrieved November 18, 2008, from http://portal.acm.org/citation.cfm?id=1351798

National Research Council (1997). Modeling and simulation: Linking entertainment and defense. Washington, D.C.: National Academy Press.

Reeves, T.C. (2007). Do generational differences matter in instructional design? Retrieved November 29, 2008 from The University of Georgia: http://it.coe.uga.edu/itforum/Paper104/ReevesITForumJan08.pdf

Schrek, G. (2008, November 14). Quick start guide to Second Life. *An Experiential Toolbox for Trainers.* Symposium conducted at the Rocky Mountain ASTD Fall Event, Lakewood, Colorado.

Second Life. (n.d.). *Wikipedia: The free encyclopedia.* Retrieved November 29, 2008, from http://en.wikipedia.org/wiki/Second_life

Semuels, A. (2008, May 10). Strait-laced in the real world, workers do business in fantasy guise in a parallel reality on the web. *Los Angeles Times.* Retrieved November 29, 2008, from http://articles.latimes.com/2008/may/10/business/fi-secondlife10

Simulation. (2007, November). *Wikipedia: The Free Encyclopedia*. Retrieved November 18, 2008, from http://en.wikipedia.org/wiki/Simulation

Smith, R. D. (1998). Simulation article. *Model Benders*. Retrieved November 30, 2008, from http://www.modelbenders.com/encyclopedia/encyclopedia.html

Smith, R. D. (2006, January). Technology disruption in the simulation industry. *JDMS*, Volume 3, Issue 1, 3-10. Retrieved November 27, 2008, from http://www.scs.org/pubs/jdms/vol3num1/JDMSvol3no1Smith3-10.pdf

Smith, R. D. (2008). The Future of Virtual Environment Training in the Army. *Handbook of Virtual Environments Training*. Retrieved November 22, 2008, from http://www.modelbenders.com/papers/Smith_VE_Handbook.pdf

Sweeney, J. (2007, March 27). Choosing the right type of simulation. *Corporate Training and eLearning Blog*. Retrieved December 5, 2008, from http://www.cramersweeney.com/cs_id/trainingblog/2007/03/choosing-right-type-of-simulation.htm

Toth, T. (2008, November 14). Overview of training technologies. *An Experiential Toolbox for Trainers.* Symposium conducted at the Rocky Mountain ASTD Fall event, Lakewood, Colorado.

UPS Corporate Public Relations (1994-2008). Safety training fact sheet. *UPS Pressroom*. Retrieved November 29, 2008, from http://www.pressroom.ups.com/mediakits/factsheet/0,2305,856,00.html