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“Simulations”: Are They Games?

By Marc Prensky

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You can have a game that's not a simulation and a simulation that's not a game, but when you get one that does both, it's a real kick-ass situation.
- Elliott Masie

In the summer of 2000, the hottest game on the market, after *Millionaire*, was *The Sims*, from Maxis, a division of Electronic Arts.²¹ *The Sims* is the latest joy to spring from the fertile mind of game genius Will Wright, who brought us *Sim City* and a whole host of other economic and systems simulations. Maxis was one of the first to make simulation games really popular, in large part because they added a highly intuitive, fun interface to what had previously been presented mainly as numbers. In many if not most previous simulations, in fact, *all* you saw were numbers — in reports, in charts — all very abstract representations of what was going on. (This is still, today, the case with many training simulations). With *Sim City*, you could actually see each element of city grow — or decay — depending on what you did. Buildings, roads, utilities and other objects were built by dragging icons, and those icons or “tiles” changed dynamically depending on the variables in the underlying model. Roads filled up with traffic or decayed, factories grew or died, disaster struck when services, such as fire or police, were insufficient.

Not only that, but *Sim City* and its successors incorporated a *variety* of ways of modeling dynamic systems, including linear equations (like a spreadsheet), differential equations (the province of System Dynamics simulation like *Stella*) and cellular automata, where the behaviors of certain objects came from their own properties and rules for how those properties interacted with neighbors rather than from overall controlling equations. This gives them a much more ‘realistic’ feel than pure spreadsheet or system dynamic-based simulations.

A whole host of other consumer simulation games have adopted many of their techniques (as well as their top down “2 ½ D” isometric point of view) to other situations, such as history (Age of Empires) and outer space (Command and Conquer), and as we will see, many training simulations have now taken this route as well. Creating a world piece by piece and watching each piece grow or decay has become part of the language of games, which makes it part of the vocabulary of the Games Generation. Today if you were to say “I want this to be like a ‘sim’ game,” most people would know what you mean. *The Sims* takes the whole concept a step further by letting you create and control the inhabitants of *Sim City*, right down to their going to the toilet (and don’t forget to do it!).

As we’ve already noted in Chapter 5, simulations are a genre of computer games. But lately “simulation,” long the province of gamers, scientists, and the military, has emerged as a huge buzzword in training. Elliot Masie, the founder of the Masie Center, an influential consultant and conference organizer in the technical training arena, has declared it a key area of interest, and organizes entire conferences around it. So what *is* simulation? Is it the same as Digital Game-Based Learning? How do the two relate?

There are a host of definitions of “simulation,” ranging from:

- any synthetic or counterfeit creation
- the creation of an artificial world which approximates the real one
- something that creates the reality of the workplace (or whatever place)
- a mathematical or algorithmic model, combined with a set of initial conditions, that allows prediction and visualization as time unfolds.

All of these are useful. But the most interesting point of view to me is from J.C. Herz, who contends, as we previously discussed, that simulation is not a noun, but a verb. (Or in her terms a predicate rather than a subject.) So if an object (real or virtual) “simulates” something, it is a simulation. If a “toy” simulates something it is a simulation. If a “story” “simulates” something it is also a simulation, and if a game “simulates” something, it is a simulation as well. In this definition “tools” can also be simulations and often are.²²

So simulations are *not*, in and of themselves, games – they need all the additional structural elements we have discussed — fun, play, rules, a goal, winning, competition, etc. — to make them into what Masie calls “kick-ass situations.”²³ There are lots of good reasons to simulate things or processes in training — the ability to “practice in safety” and to do “what if” experimentation being two of them. But simulations in themselves can easily, once the initial novelty wears off, and if attention is not paid, become almost as boring as tell-test training, even though you may be actually doing something.

Examples might include virtual reality (VR) simulations of going through a building or getting to a place — interesting the first time, perhaps, but not more. They might also include numbers-based simulations with no visual interface — *BOring*. Another example might be highly technical, complex, non-competitive “what-if” models (these are, technically, ‘toys,’ but no one except the creators might want to play with them.) Or physics simulations — here’s how gravity, or friction, or the solar system works — interesting, but so what? Even simulated tasks, which many praise as “learning by doing”, can easily lack any motivating factors and turn into merely a succession of “boring things to do.” As one participant put it – “the simulation was more fun than the rest of the course, but not much more.”

Alfred Hitchcock’s formula for a successful movie is to *remove* the boring bits.²⁴ To get something interesting and engaging in simulations, the boring bits must be removed as well, and fun added. Making them into games is a great way of doing this.

Elliott Masie calls the difference between a game and a simulation the extent of mind set of the learner. “In a game, what we’re triggering is the competitive/cooperative spirit, what we’re triggering is a playfulness, and what we’re triggering is the achievement, greed and victory element. All of which I think have not only a psychological impact but an actual physiological impact on folks.”²⁵

Take, for example, the flight simulator. Often thought of as a brainstorm of the military, the flight simulator was originally conceived as an entertainment device for fairs.²⁶ Nevertheless, the flight simulator is acknowledged, rightfully so, as a revolution in learning and training. Pilots and prospective pilots can spend hours and hours doing something remarkably close to actual flying, experiencing all sorts of scenarios and “what-ifs” in terms of weather, location, flying conditions, time of day and of course mechanical difficulties without risking either expensive planes or peoples’ lives. (This is what I mean by “practice in safety.”) Not only has flight simulation become *de rigeur* for pilots, but it has spawned a whole generation of virtual flyers, who virtually pilot incredibly realistic versions of everything from 747’s to the latest military jets and attack helicopters.

I maintain that, although there are people who just “love to fly” in simulators, simulated flight can become boring, in the same sense that driving your car to work is boring or doing any moves over and over is boring. What is *not* boring in a flight sim is two things — learning and competing. Both happen when goals, rules, challenges such as emergencies, and sometimes narrative as well (“you are deep in enemy territory”) are added to the “toy,” i.e. when the simulation *also* becomes a game. The goal can be to “learn to take off,” or to “land successfully 10 times,” or to “deal with wind shear,” or to “land safely even though your two starboard engines just flamed out,” or to “shoot down as many enemies as you can and come back safely,” or to “figure out the best way to attack the target,” or whatever. Goals can be either be built-in to the game or self-or instructor imposed, but as soon as you add them, suddenly there is more engagement,

whether or not there is actually a “score.” Masie points out that making a simulation into a game changes our inhibitions. “There is a permission to move out of our sort of staidness,” he says.²⁷

We try things in play we might not try in life.

Another example of this “engagement” issue is found in military simulations. Military simulations traditionally have very different objectives from entertainment simulations. Entertainment sims are driven by excitement and fun. Players must want to play and use them over and over, so to increase excitement dangerous and unrealistic situations, exaggeration of hazards, multiple lives, and heroics are acceptable, and even desirable. Defense simulations, on the other hand, “overwhelmingly stress realistic environments and engagement situations. The interactions are serious in nature, can crucially depend on terrain features or other environmental phenomena, and generally rely on the user’s ability to coordinate actions with other players.”²⁸

Put another way, creators of military simulations work hard to be as “physically” correct as possible, at whatever level of detail is appropriate. If it takes a full two minutes for a tank’s main cannon to cool down after a shot before you can reload and shoot again, that’s what it takes in the simulation. It’s important for trainees to know this, or they might have unrealistic expectations in battle, with highly negative consequences. But in a tank *game* you want to just click that mouse and cream the hell out of your opponents.

That’s often a big problem with using simulations as learning tools. Reality (as anyone who’s ever attended a business meeting can attest) can lead to boredom, which then actually *reduces* learning. Navy trainees who in a submarine simulation were being taught to look through the periscope and count the tic marks to tell the target distance found this boring, and didn’t do well — until the Navy made it into a game, *Bottom Gun*, that let them blow anything under a certain distance out of the water. Totally unrealistic from the point of view of reality, but highly effective from the engagement and learning perspective — it got them to count those tic marks! (The Navy is still testing this, but the preliminary results show it to be true.)²⁹

This raises the issue of what is known as a simulation’s “fidelity.” Many trainers differentiate between “low fidelity” and “high fidelity” simulations. Low fidelity simulations are situations where one or a few elements are abstracted from reality to be emphasized. For example, you are baking, but all you have to do is set the time and temperature for the altitude you are at — you don’t have to put things in the refrigerator, the ingredients are not messy, etc. They can also be metaphorical or hypothetical cases with only a few factors, such as “Imagine that you and the other five people at your table are in an leaky lifeboat on a shark infested ocean, and your lifeboat can only hold four people. You must decide how to cope with this situation.” Thiagi suggests that low fidelity simulations result in the learning of general principles and insights that can be

used in a wide variety of situations.³⁰ They are also very useful for beginners who would be confused by too many details.

“High-fidelity” simulations, on the other hand, are attempts to model reality as closely as possible. They include models that use a large number of factors and complex relationships among these factors, and physical objects that are the same as their real-world counterparts. For example, a “high-fidelity” flight simulator combines the actual cockpit from an airplane containing all the exact instruments and controls with a computer driven rear screen projector shows what the pilot would see in real life. The virtual reality program responds to the pilot trainee’s every action and dynamically changes the outside view and the readings on the cockpit controls. In business, high-fidelity simulation includes highly realistic modeling of on-the-job challenges, like an authentic, sales-call role-play. High-fidelity simulation, says Thiagi, results in very reliable transfer of training. Users learn exact procedures that they can apply to their work situations. It’s great for practicing concrete, consistent steps in a standardized procedure.³¹

The reality is that there is always a continuum between the two extremes. “It is impossible,” says Will Wright, “to tell where “high-fidelity” simulation begins.”³² And it is often hard to tell without testing precisely how much fidelity is necessary to get across the required learning — it is often different for beginners and those who are more advanced. The degree of fidelity required is very important from a cost perspective as well as a learning perspective. As the Military has found out, extreme high fidelity simulations are not cheap. They are now using commercial simulations, in some cases to “off-load” certain tasks from higher-cost assets.³³ But low-fidelity or high, *all* simulations can be made into games.

Making a Simulation into a Game

How do we make simulations into games? First we need to begin by adding some or all of the formal structural elements of games — fun, play, rules, a goal, winning, competition, etc. As Eric Goldberg explains, “As a business person I want to screw up and learn from my mistakes. As a gamer, I want to win.”³⁴ Boring simulations assume that the former is enough motivation. It isn’t. Not for a kick-ass situation, anyway. The *worst* simulation games are merely a set of learning points with the simulation part designed only as a sneaky way to get the player to each of them. The best keep pulling you to continue to the end in spite of yourself.

One of my favorite games of all time, the one that got me into this field, is called *Life and Death*.³⁵ The first version that came out on the Macintosh in the mid-80’s was about performing an appendectomy. (A later version graduated you to brain surgery.) In *Life and Death* you don’t get to operate right away — first you have to find a patient who

actually has appendicitis, as there are other reasons as well for pain in the gut. So you begin by conducting examinations – you are paged into various rooms and find people lying there whom you can question, examine and perform tests on. You discover you must palpitate to see what side the pain is on. You need to do x-rays to distinguish between certain things. When you finally get a correct diagnosis of appendicitis you go to the operating room, pick up your scalpel and begin cutting – only to have the patient die because you forgot to scrub. Next thing you know you’re in the morgue staring at a toe-tagged body. If you make a less fatal mistake you are sent temporarily to “medical school” where you are given a quick hint on what not to do next time. There’s a lot to learn along the way — cutting through muscles, dealing with bleeders, administering Lidocaine and other drugs at the proper times — a lot of which I still remember 15 years later. But my goal, dammit, was *never* to learn this stuff; it was just to save at least one patient.

So you don’t have to hit people over the head with learning points, or “failure points” — just make them want to win. The people I know who say they learned important things from simulation games — whether budgeting tradeoffs from *Sim City* or survival skills from *Oregon Trail* or how to do manage a business from *Roller Coaster Tycoon* — generally learned these things surreptitiously and “stealthily” not directly. Too many so-called simulation “games” are just a series of mini-role plays where you are being fairly obviously directed to a “right” answer. Occasionally, unintended consequences (“unexpected failure”, in Schank’s terms) can produce lasting learning as well. I still remember my chagrin when after firing a particularly nasty employee in an HR sim he hit me with a million dollar wrongful termination lawsuit.

Simulation can be a fabulous way to learn, but to keep most learners’ engagement you have to keep making it fun — fun from the *player’s* not the creators’ perspective. Perhaps counterintuitively, having an extremely “high-fidelity” simulation that exactly imitates life can sometimes take the fun out of it. So can not giving the player enough choices, or enough humorous or even outrageous possibilities — one of the great things about the design of consumer simulations is the sheer number of options they give you. “They said we could be a toy company,” said one e-commerce simulation player, “but we wanted to be a *sex toy* company.”³⁶ Sorry. Forget it. Not part of our design. Of course adding fun can be tricky, since different audiences have different ideas of what “fun” is. Speaking of his FBI simulation *Angel Five*, Ed Heinbockel of Visual Purple said they *loved* the surveillance part, even though to him it was like watching paint dry.³⁷ But the thing to always be wary of is pleasing yourself as the designer, or even the clients paying the bills, at the expense of the players. Makers of consumer games are generally in a situation where the developers and the players are the same people — “we just make games we would like to play,” says one.³⁸ Makers of training games often are not.

Take, for example, a customer service simulation, of which there are, by now hundreds. Typically a customer (animated or in video) walks into to the hotel, or the auto dealership, or even the bar, and needs help, and you, the employee, get to have a

simulated conversation with that customer, based on a “tree” structure with branching choices. The results are different as a result of your decisions. Non-game-based simulation creators will often design this with a fixed mix of customers who are as real as possible (in video, no doubt); in a number of different types and situations, each designed to play out one of the points you are teaching about. There is feedback along the way, certainly, including the customers’ having negative reactions to things you do wrong. When you fail you would typically get a lot of feedback, often in text, but sometimes even an “expert’s” explanation of why you were wrong, possibly through a so-called “war story” of someone telling you what once happened, either in text or video. This may work — assuming you care enough about your job and the program to want to actually practice it and get the right answers. But it typically still feels like *training*. If not forced by trainers or other pressure to complete the thing, many users would just go for the obvious and outrageous wrong answers, get whatever fun there was from the customers’ negative reactions and leave it at that.

Here’s another way to design this type of simulation as more of a game. You, the player, get to *design* your customers, from millions of possibilities. You decide what they look like, what their personality is, what mood they are in that day. You also decide what mood *you* are in that day – happy, depressed, wanting to be somewhere else, hung over, etc. Then you set the game on play and it randomly generates customers. The customers are computer animations – not realistic, but exaggerations. If you piss them off they trash the place. If you do the right thing they kiss you, or give you good stuff, or money, etc. — outrageous, memorable stuff. You have a goal – accumulate as much “success” as possible – become the top salesperson, or the bartender with the most “regulars,” or keep your “cool meter” at a certain level, no matter what they customer does. But you don’t have to get there right away, and in fact it’s *hard* to get there. You can explore the whole range of bad scenarios, which you do immediately because you’ve already heard, by word of mouth, that they are so much fun. In each situation there is not just a list of three choices but a gallery of the most creative (and outrageous) things to say in that situation that you can even add to, and they will show up (after being vetted) in other’s games later. Prizes are offered for the cleverest phrases and approaches that work. Unexpected diversions occur, like holdups or amorous interludes. There is also a multi-player mode, where live players run the customers, and their role is to make you lose your cool as they continually interrupt you. You *do* learn the right things to do and say, because there’s something personally fun in it for you — the whole list we saw about what makes games engaging, including winning, on the game’s terms or on your own. It’s fun — not like learning the lesson is fun, but like having the best city, or theme park or Sim family is fun. This is the design approach that led to the creation of a game called *Where in the World is Carmen Sandiego’s Luggage?* rather than a simulation called *Customer Service at SAS Airlines*. (See Chapter 9).

Other designers, with a more cinematic/narrative bent, might design the goals and structure of their simulation game differently, setting up, for example an inciting incident at the beginning which makes you, the player, *really care* about the end result.

My point is that just because something is a simulation does *not* mean it's engaging, and that a simulation game, to be effective does *not* necessarily have to be a totally realistic portrayal of the situation or job. *Elements* that are real need to be combined in an interesting, entertaining and addictive way, to make the player have fun and care. In fact the content and messages of a "simulation" and a "simulation game" can be exactly the same — the difference comes from the game's engagement and challenges.

The Role of "Processing" in Simulation

While much can be learned from just "playing" the simulation game, to be most effective in terms of learning the game must be "processed," or reflected upon. "I think we've got to be really careful," says Masie, "because there's an assumption in the game that people will learn from their experiences. But part of what happens, and I think this is true in athletics as well, is that the endorphin rush of the game in many ways makes us very non-analytical about our own success and failures."³⁹ So simulation games are often followed by "debriefings" where the players sit down and discuss what happened, usually led by an instructor or coach. In the military, this is known as the "after action review," when the players climb out of their simulated tanks or cockpits or command tents and discuss the battle. Some of the feedback comes player-to-player — "You know when you went over that hill, and the red tank was over there? I was trying to get your attention because I would have hit that guy for you." However a good debriefer or processor will help players highlight and generalize the various lessons learned so they can later apply them to other situations.

One advantage of *digital* simulation games is that much of this processing can be built-in. As you're playing, the game itself can tell you that you could be doing better and ask you if you want to know why, with the player setting the level of processing you want. There is generally a mode in a digital simulation to "replay" what happened for one or all players to see — and artificial-intelligence-based "critiques" can be added to this. Networked game players often use chat and messaging to debrief with each other, both during and after a game, and a non-playing coach can be watching and messaging as well. One particularly good reason for making a simulation into a game — something that someone is motivated to play over and over — is that after the debrief players can often learn a lot by doing it again.

Fun Digital Game-Based Learning Simulations: Monte Cristo

Monte Cristo, a French company, specializes in management simulations. It's founders come out of top business schools, consulting companies and investment banks. With titles like *Wall Street Trader*, *Start-up*, *Airport Tycoon*, *Economic Wars* and *Business*

Strategy you would think that their target market is training, right? Wrong! Monte Cristo is a consumer games company.⁴⁰

They did grow out of business. The first commission they had was from the European Commission who wanted to show the members of the Commission and all the members of the European Parliament the advantages of going to the Euro. But once they had built the market engine, the founders figured it could probably be used for a wider purpose such as simulating the whole stock exchange itself. Hence the first game that they produced was called *Trader 97*.

They chose the consumer market rather than the training market because they wanted to take a more mass-market approach with more multimedia. “Training tools tended to be more sober, a lot of excel graphics and spreadsheets,” says Marc Robert, head of Marketing for Monte Cristo. “We wanted a more “ludique”, more entertaining approach to it hence the idea of going mass market. And we were influenced by the French TV show called “Capital,” whose objective is to bring economic and business issues to the general public.”

The Monte Cristo simulations are both well-modeled underneath, and as graphically exciting as any other commercial game on the screen. The offices, trading floor and pub (where you get gossip) in Wall Street trader are state-of-the-art 3D and gorgeous, as are your digs in *Start-up* (you have a lot of capital). You have little employees walking around (like in *The Sims*) and you can see how busy they are and even what their mood is. You get to recruit and motivate your staff, design, develop, manufacture and sell a variety of real-looking products from videogame consoles to mobile phones to cyber-TV, and manage the entire company over five years, hopefully to success.

All of Monte Cristo’s various games can be networked and played online (if you have the CD), and several are massively multiplayer, including *Star Peace*, where teams of 500 to 1000 players build *Sim City*-type worlds that are huge and ultimately interconnected, *Economic Wars*, where you play the head of a country, and *Business Strategy*, where you play the head of a multinational. Their goal is to eventually link together games like *Wall Street Trader*, *Start-up*, *Economic War* and *Business Strategy* into one huge online management simulation at many different levels.

Management training — outside of work! Doesn’t it just feel like more work? No, and that’s the point. While *Sim City* and *Roller Coaster Tycoon*, two of the biggest selling games in North America,⁴¹ have a lot of management detail, people have a lot fun playing them. “When *Sim City* first came out over 5 years ago, people said “a game where you manage your own city? That sounds like work,” says Robert. “When we talk about *Start-up 2000*, a game where you start up your own company, we sometimes get the same reaction. Well it is in a way, but also a occasion for people to know what it feels like to be in the shoes of a Jeff Bezos or a Bill Gates.” The trick is not making it look or sound too serious. “You want a graphical interface that’s going to be amusing

and fun for the eyes, but at the same time based on a very realistic model, says Robert. You want them to think that if they're succeeding in the game, somehow there's a parallel to reality."

Monte Cristo, which calls itself the Management Games Company, has two main target markets. The first is university and college students, especially in business schools. The second is young executives, people in their 30s or 40s, "some of whom were the first people born with the computer," says Robert "They played *Pong*, they played *PacMan*, they had an Atari and maybe an Apple II. They've played it all."

In the future the company plans to do all kinds of management games, from managing a space station, to managing a zoo and aquarium, to managing a holiday resort, to managing a sports team. So you might find yourself playing a team owner like Ted Turner or George Steinbrenner, rather than a Bezos or Gates.

Given the combination of underlying veracity and visual appeal of their management games, its not surprising that corporations have approached Monte Cristo looking for training versions. But they have turned all these offers down to stick with their consumer focus. I talk more about their reasoning for this in Chapter 15 [of *Digital Game-Based Learning*.]

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