On Game Design: A History of Video Games

By Jason Weesner [01.11.07]

Introduction

So, you want to be a video game designer? There are many articles and books available on the subject and the fundamentals of good game design can be attained through any combination of approaches: job experience, educational training, or more of hobbyist tact. However, many published resources deal largely with game design theory which is often little more than conjecture or discourse with no practical application for the budding video game designer. Outside of entry-level test positions, beginning video game designers may find the industry difficult to get into without any experience. Educational programs may focus on some aspects of game development, but not provide enough emphasis on game design or how it applies to other disciplines.

With all that being said, this series of articles won't guarantee you a professional career as a video game designer, but it will help give you a great deal of background in the role as well as some applicable exercises and a solid grounding in the vocabulary of game design. Each article will cover a specific facet of design, but skirt theory as much as possible in favor of a more practical approach. So, no master lists of rules for game design or Twinkie denials! But, that's not to say that we'll proceed with no caveats. There's only one: most of this information comes from personal experience and, as any small print at the bottom of a medication advertisement will tell you, your experience may differ!

Now, a quick, spoiler-free rundown on what you can expect in this and future installments:

- 1. A brief history of videogames: a quick jaunt through some of the events, products, and trends that would eventually help define the modern video game designer.
- 2. The experience of design. Honing and applying good game design skills in relation to brainstorming and creative solution making. Where do good ideas come from?
- 3. The application of good and bad ideas. Different forms of documentation: pitches, specs, and design docs. The various roles of design in production. A dictionary of game design terms.
- 4. Programming and technical design for the aspiring video game designer. Programming basics and how the video game designer uses this for scripting and communicating creative ideas to the tech department.
- 5. The video game designer's canvas. The artistic aspects of game development and their relationship to good game design.
- 6. Series wrap-up. Interviews with real video game designers about real game design.

At 822 Orange Avenue in Coronado, California there's a nondescript dry cleaner sitting next to an abandoned, art deco movie theatre. The theatre has been dark and closed for over a decade and the property owners would rather let it rot than consider allowing somebody to invest a respectable money and time into making it special again. To say the magic is gone from these places is a gross understatement. But, it wasn't always like this. If we were jump into a time machine and dial up a blue skies and sunshine week in the summer of 1982, we'll find quite a different scene. The Village theatre is showing a double feature of the Road Warrior and Escape From New York and Ed's Model & Hobby Shop is open for business next door.
The abandoned Village Theatre next to the Island Cleaners. The Island Cleaners was once Ed's Model Shop.

Because of Internet commerce, mega-stores, and the resulting slow death of small business, stepping into Ed's Model Shop has no real equivalent / comparison to any place today. Part of the Model shop is indeed models: Revell, Airfix, and AMT, but beyond this there are shelves of Dungeons & Dragons modules and player's guides: the Village Of Hommlet, the Monster Manual, the Dungeon Master's Guide, Deities & Demigods (the illegal Cthulu version), etc. On a nearby counter are several rotating racks filled with Ral Partha lead ogres and orcs and ember hulks. This probably sounds likes one of today's hobby shops, but there's something more to this place. Scattered around the store floor and huddled in a dark back room are a wide assortment of arcade video games and pinball: William's Black Knight, Namco Pac Man and Galaga, Atari Battlezone, and even the good old black and white Space Invaders with the color overlay. But, wait. There's more. On a nearby wall are a variety of games for the Apple 2 (the predominant home computer at the time), Atari 400/800, and IBM PC: Akalabeth (Lord British's precursor to Ultima), Raster Blaster (awesome pinball simulator), Temple Of Apshai (Early RPG similar to Final Fantasy or Dragon Quest), Avalon Hill strategy games (conversions from their board games), and Wizardry are in cardboard boxes or zip lock bags with photocopied manuals.

This is where the history of the modern video game designer starts; somewhere toward the end of the 1970's and the early 1980's at the nexus of four significant trends: the popularity of traditional roleplaying and strategy games, the success of arcade video games, the boom in affordable home computing, and the market saturation of home consoles like the Atari 2600. The following quick jaunt through videogame history is not meant to be too comprehensive, but pay attention to the different landmarks and events because they'll be referenced in all the articles to come!

**Traditional Board Games**

Many types of traditional board games have been around in some form or another for centuries. Strategic games like Go have enjoyed lasting popularity around the world from as early as 200 BC in ancient China. Ancient Egyptians played an adventure-like game called Senet to plot their journeys through the afterlife. Monopoly (essentially a simulation) was first played in 1904 to teach...
There are many important elements of traditional board gaming that apply directly to video game design. Let's look at a very simple board game: Tic-tac-toe. Tic-tac-toe is probably one of the earliest video games ever created back in 1952 on an ancient British computer called the EDSAC (Electronic Delay Storage Automatic Calculator) where it was referred to as Noughts and Crosses. Tic-tac-toe consists of: a board separated into nine squares and two sets of player pieces representing the opposing "armies" of X and an O. The rules are simple. Two players alternate turns placing down X's and O's until one of them gets three in a row or the board is all full and nobody wins. So, what can we draw from this simplistic game in relation to video game design? Well, for starters, a couple of fundamental elements of all games: game space and the game mechanic.

A game space is defined by any number of criteria (generally boundaries and movement units) in which a game takes place. This can be everything from our simple Tic-tac-toe board to a bunch of interconnected snakes and ladders to a football field to a sunken ship in a moonlit lagoon. A game mechanic can be anything from a player's movement to a win condition (three of an X or O in a row) to an individual game rule or device. In Tic-tac-toe, one of the main game mechanics is that a player can only put down one piece at a time in an empty square. In Mario 64, something as simple as Mario not being able to step on lava is a great example of a single game mechanic.

There are a ton of traditional board game companies that have been influential on today's video game genres, most notably roleplaying games (RPG's), strategy games, and simulations. A quick look back at some successful board game companies reveals a virtual tangle of roots connecting paper and pencil to pushing pixels:

**Tactical Studies Rules (TSR):** TSR was founded by Gary Gygax in Lake Geneva, Wisconsin back in 1973. Dungeons & Dragons (1974) and Gamma World (1978) were two of their most popular products which brought roleplaying games to the mass market. Today's RPG's (like Final Fantasy and Dragon Quest) are not that much different than their paper predecessors. Complex battle systems can be boiled down to simple exchanges of virtual dice rolls and hit tables. Beautifully rendered cinematics are essentially the same mechanics used by dungeon masters to describe fantastic places and events.

**Avalon Hill:** Avalon Hill was founded in 1958 by Charles S. Roberts. Avalon Hill popularized the strategy / war gaming genre with innovative game elements: hexagonal grids on boards for increased movement choices, variations in terrain, and complex combat rule sets based on actual historical events. Games like Final Fantasy Tactics and Warcraft are all design descendents of Avalon Hill games minus the historical aspects. Some of Avalon Hill's most popular titles were Panzer Blitz (1970), the Battle Of the...
Bulge (1965), and Blitzkrieg (1965). One of the coolest things about Avalon Hill games were the big, bookshelf style boxes they came in which contained not only the game, but usually an exhaustive amount of supporting materials which offered a wealth of information to both casual and hardcore gamers.

**FASA (Freedonia Aeronautics & Space Administration):** FASA was founded in 1980 by Jordan Weisman and L. Ross Babcock. Two of FASA's bigger titles that made the translation from board game to video game were Mechwarrior and Shadowrun which still enjoy large followings. Jordan later went on to form FASA Interactive who took over the handling of the Mechwarrior videogame series from Activision.

**Game designer's Workshop:** GDW was founded in 1973. Arguably, their biggest success was Traveler (1977) which took the traditionally fantasy realm of RPG's and placed it in a futuristic setting mixing roleplaying with strategy-like space combat. Video game designer's Workshop dissolved in 1996.

**Games Workshop:** Games Workshop was found in 1975 by Sir Ian Livingstone and Steve Jackson (not to be confused with Steve Jackson of Steve Jackson games who we'll also talk about in due course). What started as a distributor for existing products (like D&D) became a developer and publisher of the immensely popular Warhammer (1983) series. Ian Livingstone took a few minutes to answer some questions in relation to his experience:

What was your background in gaming prior to founding the Games Workshop? - "I played Avalon Hill and SPI games as a hobby and wrote articles for a Diplomacy fanzine before co-founding Games Workshop in our London apartment in 1975."

The Games Workshop published a wide variety of licensed and original properties. How difficult was it to create and market an original property versus a licensed property? - "The early years of Workshop focused on publishing games under license like Dungeons and Dragons, Traveller, Runequest, etc but we realised that we needed to create our own content to secure our future. Hence the launch of White Dwarf magazine, Citadel Miniatures, board games like Talisman and of course the hugely successful Warhammer. We had a dedicated fan base who were eager to buy original Workshop content and that was very gratifying not to mention making our job easier!"

A lot of today's single player video games rely on a lot of the same types of systems you used in your Fighting Fantasy series of books. Can you talk a little bit about the creative process you used for coming up with narratives and game systems in the Fighting Fantasy books? - "The main idea behind Fighting Fantasy was to create exciting interactive adventures that were easy to play but had plenty of choice and consequence. We wanted them to be accessible and involving. The reader had just three characteristics to keep track of - Skill, Stamina and Luck. This was to allow the adventures to flow smoothly without unnecessary rules checking. The adventures themselves were mainly based in fantasy environments with quests that challenged the readers. Deathtrap Dungeon was a particular favorite of mine as it was a game about survival. It also required the reader to have to fight to the death Throm the Barbarian, an NPC who was your friend and ally. I wanted the reader to feel emotional about the decision! I still get comments about it today - 22 years after publication."

What was your first exposure to video game design and how much did it differ from traditional game design? - "My first go at video games design was in 1985 when I was asked to design Eureka! This was the launch title for Domark, a new British publisher. (Domark became part of Eidos in 1995). Eureka! was a PC adventure game based on time travel. The experience I had gained from writing Fighting Fantasy game books was obviously very useful in creating the structure of the adventure. The frustrating part of it was that I couldn't do it all by myself! I needed the help of programmers and artists. Suddenly I was part of a team involved in an ethereal process. There was no visibility of what the game was going to play like for what seemed like ages."

Having seen first hand the rapid growth and resulting ups and downs of the traditional gaming market, can you draw any parallels to the video game industry and its future? - "The industries are quite similar in many ways: establishing strong brands and franchise, you are only as good as your last hit, follow consumer trends, game play is everything, don't complicate stuff, keep costs under control and innovate or die!"

Do you play any video games for fun and, if so, which ones? - "Funnily enough I enjoy playing Tomb Raider: Legend, Hitman: Blood Money and Just Cause but I'm also enjoying FIFA '07, Guitar Hero and several NDS titles."

**Simulations Publications Inc. (SPI):** SPI was started in 1969 by Jim Dunnigan (also the designer of Avalon Hill's Panzerblitz) as a publisher for Strategy & Tactics magazine. SPI became famous for a wide range of historical strategy games like War In the East, War In the Pacific, and the Campaign For North Africa.

**Steve Jackson Games:** Steve Jackson was founded in 1980 by Steve Jackson. Steve Jackson games popularized self-contained simulation and adventure games. SJG is best known for GURPS (Generic Universal RolePlaying System which created an all-purpose system for all genres of roleplaying), Ogre, and Car Wars as well as a variety of card games and traditional board games. Steve Jackson was kind enough to answer a few questions in relation to his experiences as one of the original video game designers:

What inspired you to become a video game designer? - "It was completely accidental. I answered a "help wanted" ad; the ad was for a job editing a zine (yes, it used the abbreviation "zine" in 1976) for what turned out to be a game company. I didn't even get the job, but one thing led to another."
What are some of your favorite, classic board games? - "How old is classic? Chess (though I have not played in years now), Monopoly, Scrabble, Risk, Axis & Allies, Cosmic Encounter. And lots of the old SPI games, with the most hours going to Strategy I."

Steve Jackson Game’s famous Car Wars in the original, fancy packaging!

What do you consider to be fundamental game elements that apply across all types of gaming media (board games, video games, etc.)? - "Elements"? I realize I may be misinterpreting, but I'm going to take that as "elements of a good game." It has to be fun - SOME kind of fun - that should be obvious. It has to be learnable, and the learning itself should be fun. For me, at least, a roleplaying element is important. I see roleplaying everywhere - Monopoly is roleplaying. Any really engrossing simulation is roleplaying. If there's no roleplaying, there should be a serious challenge to the intellect: Chess, Scrabble . . . even Yahtzee presents a challenge. People who just roll the dice will not prosper. A social game should have a "wow" factor. If everyone at the table goes "Wow!" once in a while, they'll remain interested, and perhaps someone else should come to see what's happening. And there needs to be an element of both competition and risk, whether it's interplayer, player vs. environment, or players cooperating vs. the environment. A game with neither risk nor competition is tedious. I think humor is an important element, and use it in most of my games, but I acknowledge that it's not vital."

How do you come up with an idea for a game? Do you start with an overall concept or a single game mechanic? - "A concept, always. I have to know what my game is ABOUT before I start. Sometimes a mechanic occurs to me independently and I write it down, but I cannot ever recall going "Here's a mechanic, I have to make a game about it." I don't think that mechanics in themselves inspire the imagination."

Do you play video games at all? Which ones? - "A few. I don't have time to try nearly all of them, but some that I have tried and then liked enough to play over and over and over: Puzzle Pirates, Caesar III, the "original" Sim City, and Starcraft. And various rogue-like games ate my brain for a while. More recently, I very much admired Katamari Damacy, though I don't own a console system so was saved from playing it over and over and over and over and over."

So, what do traditional board games have to do with the modern video game designer? Arguably, the origin of the video game industry can be tracked back two different sorts of applications: the simulation of game space on a computer as well as the automation of game related systems (like the ability of a computer program to fulfill the role of a dungeon master). We'll see elements of traditional board game theory in future articles being applied to just about every video game system / mechanic you can think of. A comprehensive knowledge of traditional board games is certainly not a prerequisite for becoming a video game designer, but a basic understanding of the various genres and systems can be a definite asset. Combat systems, weapons balancing, character development, and game narrative are just a few examples of traditional board gaming elements that can be adapted to related aspects of video game design.
Home Consoles

In its simplest terms, a video game is a combination of three elements: a CPU (Central Processing Unit), a display (television or computer monitor), and an input device (joystick, button, etc.). The CPU calculates the game's current state, accepts feedback from an input device, and then updates the game's state and outputs the result to the monitor.

The first video game console I personally owned was the Atari 2600. To witness a very important moment in my development as a video game designer as well as hundreds of thousands of other children across the country, our next destination in the time machine is December 25th, 1978: Christmas morning. Like most of the other houses on our block, there's a Christmas tree in the window with the remnants of a morning of opening Christmas presents. I'd begged and pleaded with my parents for the better part of the year and finally, when I'd just about lost all hope, my Father waited until the very last minute to bring a large, wrapped box out of his closet: an Atari 2600. The pack-in game at the time was Atari Combat: a collection of simple two player battlefields with either tanks or planes and a variety of ammo types. My Dad and I played a variation on tank combat with a maze and reflecting bullets. Things went fine until I discovered and exploited a flaw in the game which allowed me to shoot through some walls and destroy my opponent's tank in an otherwise well-defended position that I wouldn't have been able to reach otherwise. Needless to say, my Dad decided that he didn't care for video games (and hasn't played anything since) while I decided that I would like to try and fix the problem somehow.

The Atari 2600 was released in 1977 and sold well over 25 million units along with millions of software cartridges ranging from original hits (Adventure, Combat, Yar's Revenge, etc.) to arcade conversions (Pac-Man, Space Invaders, Missile Command, etc.) to some of the first movie license titles (E.T. and Raiders Of the Lost Ark). If you think modern consoles like the Playstation or Xbox are expensive at launch, consider this: the Atari 2600 cost $199 when it debuted! However, the Atari 2600 wasn't the first home console. That honor belongs to the Magnavox Odyssey which was created by Ralph Baer (who also created Simon) back in 1972. The original Odyssey (like its successor the Odyssey 2) accepted primitive (and quite large) circuit board cartridges that played a variety of games. Additional overlays came with the games that could be put on the television to depict color! Mr. Baer was kind enough to answer some questions about his background and experiences with home consoles:

What was your educational background and how did you end up designing the Odyssey? - "I was a radio and TV technician from 1939 to 1943 when I was drafted into the US Army. After I came back from overseas' service in 1946, I went back to school and graduated with a B.S. degree in Television Engineering. While at Loral in 1951, I designed a complete projection TV set along with one other engineer. So I clearly "knew" TV technology, having also worked part-time on design of TV studio equipment while in college. Being totally at home with that technology plus inspiration resulted in the novel concept of using a standard home TV set as an interactive game device (though we certainly didn't use that term back then). It was not a big stretch for me to come up with an answer to the question: "What can we do with 40 million U.S. TV sets now in peoples' homes other than tuning in the few network stations then available. Playing games was my answer."

"I might mention parenthetically here that having gone to small college long before the early 1950's Space War days; I had no
Editor's note: a CRT is a Cathode Ray Tube; one of the earliest devices for transmitting information on a television or computer monitor screen. A PDP-1 is a Programmed Data Processor which was the first computer to play Space War!

Your work basically pioneered what has become a multi-billion dollar industry. Back when you designed the Odyssey, did you have any idea of just how big the home console industry would become? - "First of all, there were eight consecutive developmental game systems which we built during the 1966 to 1969 time period, number seven of which was the Brown Box, the predecessor of the production version, the Magnavox Odyssey 1TL200 system. Secondly, no one could have predicted then how big this new electronic game category would be in a few years, primarily because the unbelievably rapid progress of the semiconductor industry could also not have been foreseen then...and it is, of course, the rapid move from discrete transistor designs to IC's and on to microprocessors (all in the span of less than a decade) that was the rocket that propelled all electronic product design."

Editor's note: an IC is an integrated circuit.

Arguably, Simon was the precursor to games like Konami's Dance Dance Revolution. Is it fair to say that innovation was one of the prime directives of technology in the early 1980's? - "Innovation is the "prime directive of technology" at all times, always was, always will be. Coming up with creative electronic games, starting in the mid-seventies was just the natural result of the availability of low-cost electronic components. Then, I was the outside electronics design support for Marvin Glass and Associates, the largest independent toy-and-video game designers in the US at the time. We invented toys and games. The TMS-1000, T.I.'s first low-cost 4-bit processor was available (and I first built it into a programmable record changer) and everybody else was also building games based on that microprocessor,....so I used it and did Simon, Maniac, Computer Perfection, Amazatron, Super Simon and other games with Marvin Glass' support and cooperation. Simon was actually based on a less-than-successful Atari arcade game called Touch-Me. (P.S. You really should read my book, "Video games: In the Beginning"...this stuff is all in there in great detail and accompanied by tons of illustrations)."

Editor's note: TI stands for Texas Instruments who we'll briefly touch on later with their TI-99 home computer. As for Mr. Baer's book, you can find all the information for it at the end of this article in the series' suggested reading list.

Where do you get ideas / inspiration for different products? Do you have any philosophies for product design? - "Whether it's being able to play the piano, painting portraits or being an outstanding mathematician, it's all in the genes...you either have got "it" or you don't. Put creative inspiration together with technical knowledge (also gene-dependent) and you get novel products. If you are missing one or the other ingredient of this combination, you will never create truly novel products. That is not to say that you cannot get great product development from designers and engineers who do not necessarily have original product ideas of their own. We would be in trouble without them. The bottom line is: Do what you're naturally talented for...no amount of practicing will make you a violin virtuoso if it isn't in your genes. As to philosophies for product design: Try to imagine what would be neat to do that isn't already being done (a tough requirement) and come up with ideas that will meet that requirement. it ain't easy."

Do you currently play any video games? - "Rarely. I mostly watch them over the shoulders of my grandkids. I am, however, still involved in creating novel video game accessory products and, in fact, just signed a license agreement for one with a major producer...can't talk about it though."

To date, there are roughly four periods of home consoles: the 8-bit 1st generation, the Nintendo days (or the 8-bit 2nd generation), the 16-bit era, and the 3D "next" generation. Additionally, it's important to note a paradigm shift around the middle of the 16-bit generation when the compact disc became the preferred media of choice and radically altered the production model for making game. There are plenty of resources available both on the net and in your local bookstore / library to discuss all of these consoles and ensuing events in more detail, so I'll just provide a general overview starting with...

The 8-bit 1st Generation: this first generation is easily defined by four events: the Atari 2600 enabling the transition of home consoles from a hobbyist market to a mass market, the start of the console wars, the birth and boom of the third party market, and the great video game crash.

Atari was founded in 1972 by Nolan Bushnell and Ted Dabney. Their first product was an arcade game called Pong which was inspired by Bushnell seeing the original Odyssey. In 1974, Atari made its move into the home console market with a home version of Pong. Here are some quick facts about Atari:

- In 1976, Steve Wozniak and Steve Jobs worked on Breakout and other projects for Atari before leaving Atari to form Apple computer.
- Atari 2600: at its 1977 debut, the 2600 cost $199. It sold 25 million units through its lifetime.
- Atari 5200: 1982. this system was in direct competition with the Colecovision as the successor to the Atari 2600. Unfortunately, the system wasn't backwards compatible with the 2600.
Atari 7800. 1986. $140. The 7800 was released during the heyday of the Nintendo Entertainment System, but enjoyed very little success even though Atari had included backwards compatibility with the Atari 2600.

Atari Lynx. $190. 1989. 2 million units sold. This was a handheld system that was graphically superior to the Nintendo Game Boy, but, again, stood no chance of success against the market dominance of the Nintendo brand.

Atari Jaguar. $250. 1993. 2 million units sold. This was the last gaming system that Atari released. It was intended to compete with Sony's first generation PlayStation and the Sega Saturn.

So, what is a "console war"? Just about every successful product ever made has spawned numerous competitors, successors, and imitators. Video game systems are no exception to this trend. After the huge success of the Atari 2600, several traditional toy companies jumped in on the home console phenomenon to varying degrees of success. The three biggest competing products up against the Atari 2600 came from Magnavox (formerly a television and stereo manufacturer who started the home console business with the original Odyssey in 1972), Coleco (the COnnecticut LEather COmpany), and Mattel (makers of Hot Wheels and Barbie).

Magnavox Odyssey 2: the successor to the original Odyssey, the Odyssey 2 debuted in 1978 and sold 1 million units sold over its lifetime. As a competitor to the Atari 2600, it's graphics and sound capabilities were about the same, but it also offered an underutilized, full membrane keyboard which was well ahead of its time. The Odyssey 2 library offered a few unique titles (the board game-like Quest For the Rings for example), a ton of simplistic sports and arcade games, and a couple of copycat titles that got Magnavox in some legal hot water (a Pac-Man clone called K.C. Munchkin and a Donkey Kong clone called Pickaxe Pete).

ColecoVision: the ColecoVision debuted in 1982 and, at the time, was considered the crème de la crème of home gaming consoles. Coleco struck deals with Nintendo, Universal, and Konami to create near arcade perfect ports of games like Donkey Kong, Ladybug, Congo Bongo, and Zaxxon. In addition Coleco manufactured a number of hardware expansion accessories like a steering wheel, a full computer system called the Adam, and even an Atari 2600 emulator! Over its lifetime, Coleco sold 6 million units of the ColecoVision.

Mattel Intellivision: In 1979, the house that Barbie built released the Intellivision ("Intelligent Television") for $299! The system featured a slight improvement over the Atari 2600's graphics and sounds, but featured a much more complex controller that included a numeric keypad and color overlays for each game. Mattel sold over 2 million units in 1982 alone!

There are three different types of developers: first party, second party, and third party. First party developers are owned by a company that produces the hardware they're developing on like Microsoft, Sony, or Nintendo. Second party developers make software specifically for one platform usually due to part ownership by a console manufacturer or publisher. Third party developers make software for whatever platform they want and are usually independent. During the height of the Atari 2600's popularity, software for the platform was made exclusively by Atari until several employees broke off from the company and started their own development company. This was the birth of the "party" system as it's known today.

Activision: Activision was started in 1979 by Atari programmers David Crane, Larry Kaplan, Alan Miller and Bob Whitehead. Activision's first big success was Pitfall which pretty much ushered in the genre of the platformer (a term named for the action of a character jumping from platform to platform like Mario or Sonic).

Imagic: Imagic was founded in 1981 by Rob Fulop who was the programming lead on Night Driver and Missile Command for Atari. Cosmic Ark and Demon Attack were two of Imagic's big hits with Demon Attack release on the Atari 2600, Intellivision, and Odyssey 2 (one of the few third party titles for this console).

M-Network: one of the stranger third party developers was actually an offshoot of a first party developer: Mattel. Starting in 1982, Mattel released a bunch of ports of their Intellivision titles for the Atari 2600 including Astro Smash, Armor Battle, and a couple of Tron licensed games!

Intense competition, product pricing, and an over surplus of software resulted in an event that would change the video game landscape forever: the great video game crash. The events that lead up to the great video game crash took place in the United States from 1983 - 1984. Low quality, high profile titles like Pac-Man (Atari 2600) and ET (also on the Atari 2600) were over...
manufactured and sold poorly. In the case of Pac-Man, the cost of development was well over one million dollars which was unheard of at the time. Atari manufactured 12 million cartridges, but only sold 7 million. For the ET game, Atari paid around $20 million dollars for the rights to ET and sold only 1.5 million of the 4 million cartridges produced. Ouch!

The average game in 1982 cost around $30. Due to a glut of first and third party titles, the market became quickly flooded with product which meant that more titles ended up in the discount bin and developers and publishers started to see profits drop. At the time, video games sold mostly through toy and hobby shops instead of electronics shops which were still mainly appliance (televisions, refrigerators, etc.) sellers. As consumers became wary of new software and stopped buying games, toy and hobby shops stopped selling the games and a ton of inventory got sent back to the manufacturers. As profits dropped, Mattel, Coleco, and Magnavox dropped out of the video game business.

The Colecovision was one of the bulkier consoles around at the time, but also one of the most powerful.

The original 8 bit generation video games are simple by today's standards: the graphics are rudimentary, the sounds are distinctly electronic, and the controls are mostly limited to single digital joysticks and a few buttons. But, there's an elegance to these old games that owes a lot to these limitations and can serve as an inspiration to today's video game designers. Simplicity is elegant when it's done right. We'll come back to this sentiment in a future article, but, for now, take a look at any of the games we've mentioned so far and see just how fun they are with seemingly so little to work with.

The Nintendo Days

Roughly translated from Japanese, Nintendo means "Leave Luck to Heaven". Nintendo was founded in 1889 to make Hanafuda ("Hana" means flower); a popular Japanese card game based on flowers. In the 1980's, Nintendo enjoyed a great amount of success with arcade games like Donkey Kong, Donkey Kong Jr., and Popeye. In 1983, Nintendo released a home gaming console in Japan called the Famicom (Family Computer) along with ports of their successful arcade titles. By the end of 1984, the Famicom was a huge success in Japan and Nintendo began to make plans for distribution in North America.

The great video game crash officially ended in 1985 which happened to be the same year that Nintendo introduced the Famicom to North America under the name of the Nintendo Entertainment System (NES). With Magnavox, Coleco, and Mattel out of the videogame market and Atari struggling with the Atari 5200, the game hardware industry shifted from America to Japan with the ensuing success of the NES. One of the biggest components of Nintendo's success was the introduction of a quality assurance program which assured that any games for the system had been tested and approved by Nintendo. This program helped to solve the problem of poor quality software which had burned consumers in the past and greatly contributed to the great video game crash. Over the course of its lifetime (Nintendo discontinued the NES in 1995), the NES sold more than 50 Million units and over 350 million games making it one of the most successful game consoles of all time. Here are some quick Nintendo factoids:

- Gunpei Yokoi was hired in 1965. He would go on to co create Mario and Donkey Kong as well as creating Kid Icarus, Metroid, and the GameBoy. He died in 1997 in a car crash shortly after leaving Nintendo and the failure of the Virtual Boy.
- Shigeru Miyamoto (arguably one of the most famous video game designers on the planet) was hired as an artist in 1977 and co created Donkey Kong with Gunpei Yokoi in 1980. Miyamoto also created the Legend Of Zelda. The Famicom (Nintendo NES) was released in 1983.
- Mario was originally named Jump Man.
- The NES cost $199 at launch.
Nintendo wasn't the only player in town during the mid-80's. The SG-1000 Mark III sounds like one of Speed Racer's cars, but it was actually the only other major competitor to the NES. In 1986, Sega released its SG-1000 Mark III in North America as the Sega Master System. Although the SMS was technically superior to the NES, Nintendo had exclusive agreements with most of the large software publishing houses which meant that the SMS had a much smaller library to choose from and fewer high profile titles. Regardless of the SMS failure, Sega would soon come out with a product that would usher in a new era and dethrone the NES. How about some quick Sega factoids?

- Sega stands for SErvice GAmes.
- Sega was founded in Hawaii in 1940 to provide amusement games to American Servicemen, but made the majority of its money in Japan from photo booths.
- Sega's first arcade game was a submarine simulator called Periscope which was released in 1965.
- The Sega Master System sold 13 million units over its lifetime.
- Alex Kidd was the first Sega mascot.
- Nintendo had 90% of the game market, so Sega eventually gave North American distribution rights to Tonka (toy truck maker).

Sega's ill-fated Saturn console. As far as game systems go, it's the king of 2D gaming, but, ultimately, lost out to a new generation of 3D games available on competing consoles.

16-Bit Era
Before we dive into an exciting and transitional period in home gaming history, it's probably a good time to make the distinction between 8-bit and 16-bit. These terms refer to a computer processor's ability to address information. An 8-bit CPU can address 8 bits of data in a single operation while a 16-bit CPU can address 16 bits of data in a single operation. In simple terms, the more data a CPU can process per operation, the more powerful the game system is. We'll go into greater detail in a future article.

The Sega Mega Drive was released in Japan in 1988. In 1989, Sega released the Mega Drive in North America as the Sega Genesis at a cost of $199. The Sega Genesis came with a pack-in cartridge called Altered Beast which was a near perfect port of the Sega arcade hit. At the time of the Genesis' debut, Nintendo still commanded up to 90% of the American videogame market, so Sega made a concentrated effort to release more sophisticated, edgy titles like the Phantasy Star series and Sonic the Hedgehog. Sonic the Hedgehog became Sega's mascot in 1991 and the series went on to sell over 44 million copies! The Genesis' superior graphics and sound combined with a hipness that skewed to an older audience which enabled Sega to take a chunk out of Nintendo's market share.

The successor to the NES was the 16-bit Super Famicom which was released in Japan in 1990. Several months later, Nintendo released the North American version of the Super Famicom as the Super Nintendo for $199. The Super Nintendo offered a slight increase in performance over the Sega Genesis, but also became the home to a lot of arcade hits (Street Fighter made its home debut on the SNES) as well as some very famous RPG's like Square's Final Fantasy and Chrono Trigger.

A third contender in the 16-bit era was NEC's PC Engine. The PC Engine came in a variety of formats, but, most importantly, was the first home console to have CD-based games. The PC Engine enjoyed a great deal of success in Japan, so NEC released it's North American counterpart, the Turbografx, in 1987. Even though it came out before either the SNES or the Genesis, poor North American marketing and a small library of games killed it before it could make a dent in the 16-bit market. In retrospect, the Turbografx was ahead of its time especially when it came to CD-based software. Games like Y’s featured fully animated cinematics, CD quality sound (music AND speech!) and a considerably bigger game experience due to the increased storage capacity of the CD over the traditional cartridge.

But wait! There was actually a fourth 16-bit home console that enjoyed a moderate amount of success even thought it was never really a contender. SNK (Shin Nihon Kikaku is Japanese for "New Japan Project.") Playmore was founded in 1978 and produced a string of arcade hits: Vanguard, Athena, and Ikari Warriors. In 1989, SNK debuted a cartridge-based arcade system called the Neo-Geo MVS (Multi-Video System) which featured a wide variety of fighters, sports titles, and shooters that were arcade quality and cost about $500 each. The Neo-Geo home system was release in 1990 at a cost of $649. Later, the system was reintroduced with CD's instead of cartridges which lowered the price of the software. Most of the hit SNK titles for the Neo-Geo were Street Fighter style brawlers like Samurai Shodown, Fatal Fury, and Art Of Fighting.

Towards the end of the 16-Bit era, both Sega and Sony tried out various upgrades to prolong the shelf life of their consoles. Sega introduced the Sega CD which ended up as a dumping ground for poor quality, full motion video titles like Night Trap and Ground Zero Texas and ports of cartridge-based games with shoddy cinematics tacked on. On a personal note, I was especially bummed by the lack of quality software since I had to take out a line of credit in order to pay close to $400 for the damn thing! Sega also introduced a "32-bit" (in reality a 16-bit add on to the Sega Genesis processor) called the 32X which died a quick death with only a few titles in its library. Nintendo approached both Phillips and Sony to produce a CD add-on for the SNES. Unfortunately (for Nintendo), they ended up choosing Phillips which ultimately left the scorned Sony to create one of the most successful home consoles of all time.

The importance of the switch to CD-based software can't be stressed enough. Prior to the advent of the CD as a medium for game development, games were limited in scope by the size of the cartridge they came on. While some of the larger cartridges like Strider for the Sega Genesis reached sizes of 8 megabits (8 million bits = 1 million bits per megabit), a single CD could hold up to 650 megabytes (5452595200 bits = 8,388,608 bits per megabyte)! In future articles, we'll take a closer look at just what bigger and better storage capacity means to video game design and production.

The "Next" Generation

The next generation of home consoles was initially defined by three big hardware manufacturers and later joined by a large software developer. We've already talked a bit about Nintendo and Sega, but the king of the first couple of rounds of the next generation wars was ultimately Sony and their revolutionary Playstation. Sony originally had a deal with Nintendo to produce a CD add on to the Super Nintendo, but when Nintendo pulled out of the deal (which their lawyers said favored Sony too much) to sign a deal exclusively with Phillips, Sony decided to develop their own home console.

Towards the end of the 16-bit era, one of the growing trends in gaming was 3D (polygons and textures) which gave games a greater level of immersion and realism. 3D had been used to great effect in arcades (Battlezone, Star Wars Arcade) as early as 1980 and on home computers since the early flight simulators back in the late 1970's. In the early 1990's, Sega introduced Yu Suzuki's Virtua Fighter and Virtua Racing which revolutionized the genres of fighting and racing games. In 1994, Sony released the Playstation 1 which was the first home console to be built around 3D graphics and gaming. Here are some quick Sony facts:

- 1991: Nintendo CD announced at CES (precursor to E3).
Each generation of PlayStation has built upon the foundations of the previous generation with improving graphics and sound as well as greatly improved storage capabilities. The first PlayStation was CD based. The PlayStation 2 was DVD based. The PlayStation 3 has adopted a new media format called Blu-ray which supports high definition video and even more storage capability than DVD. In future articles we'll talk about the various formats as well as some of the more noteworthy titles that have been released for the different models of PlayStation.

In 1993, Nintendo debuted Star Fox for the Super Nintendo which used a special Super FX chip to power rough 3D graphics and game play. In 1994, Nintendo partnered up with Silicon Graphics to produce the Ultra 64 hardware which powered two 3D arcade games: Cruisin' USA and Killer Instinct. By 1996, the Ultra 64 hardware was available in the form of a home console called the Nintendo 64 with Mario 64 as a pack-in cartridge. Mario 64 was not only the first title to come out on the N64, but also one of the finest examples of 3D platform game play ever created. Camera, controls (Nintendo's analog joypad), and incredibly consistent level layout and game mechanics redefined the genre and opened the doors for future titles in the genre like Spyro, Ratchet & Clank, and Jak & Daxter. In 2001, Nintendo introduced the Gamecube which marked the end of Nintendo's cartridge days in favor of a mini-disc format and 3D graphics that were comparable to the PlayStation 2.

The start of the 16-bit era was the also the start of the decline of Sega as a hardware manufacturer and their ultimate transition into a software publisher / developer only. After the success of the Sega Genesis, Sega's first response to the oncoming threat of Sony's PlayStation was an add-on for the Genesis called the 32X. The 32X featured its own processors that piggybacked onto the Genesis' hardware and provided rough 3D game play similar in style to Sega's first 3D arcade games (Virtua Racing and Virtua Fighter). Shortly after, Sega debuted the true successor to the Genesis called the Sega Saturn. In comparison to the PlayStation, the Saturn was underpowered in the 3D department, but was a real powerhouse in the 2D department. Unfortunately, 2D style games were quickly becoming a dinosaur in comparison to newer 3D titles like Toshinden, Ridge Racer, and Wipeout which were all initially exclusive releases for the PlayStation. The Saturn quietly died over the next few years until it was retired and Sega released its final home console, the Dreamcast. Though the Dreamcast was a vastly superior machine in comparison to the Playstation, Sony's dominance of the market left little room for any competitors and, as a result, Sega bowed out of the hardware market in 2001 to concentrate exclusively on software for multiple platforms.

In 2001, Microsoft jumped into the next generation console wars with their introduction of the Xbox. The Xbox was not only graphically superior to the Playstation, but also featured an internal hard drive and access to a robust online multiplayer network called Xbox Live. The Xbox debuted at $299 and went on to sell over 24 million units in its lifetime which put Microsoft firmly in second place between Sony and Nintendo. In 2005, the successor to the Xbox, the Xbox 360 debuted to usher in the third round of next generation consoles to compete with the Playstation 3 and Nintendo Wii.

So there we have a "quick" tour the history of the home console. Some of you may be grousing at this point that I've skipped all the handheld gaming systems, but I'll actually cover these in a future article. As it stands, almost all of the consoles I've mentioned are important in one way or another even if they aren't readily available anymore. Luckily for the budding video game designer, recent years have seen extensive selections of the software libraries for these home consoles released on a variety of compilations for most of the current generation of home consoles. Computer based emulators also do an admirable job of emulating just about every home console and game ever created!

The Arcade Experience

Arcades weren't always adjuncts to bowling alleys, upscale restaurants, and miniature golf courses. Arcade games weren't always ways of passing the time in laundry marts or proving one's mastery at trivia in a dive bar. If we jump in the time machine again and venture back to a different corner of Coronado during the early 80's, we'll find ourselves at an odd looking mini-mall which looks something like a cross between a townhouse complex and a twisted hacienda. At one end of the mall is Wendy's; Coronado's first franchised fast food restaurant. At the other end, down a partially obscured staircase, behind smoked glass windows is a hubbub of noise called Supercade. It's not the best arcade in town. That's over the bay bridge at a place called Spanky's Saloon which is out of our range unless somebody's parents agree to drive, but Supercade is easily within biking range.
and just a few steps from the beach. That's not to say that there aren't other places in town to play games. Even Safeway had a couple of games at the peak of arcade popularity. In the early 80's, arcades were an exciting place to be. Over a period of just a few years, rapidly advancing technology and a hungry marketplace produced a seemingly nonstop flow of new games and genres on a weekly basis.

Many people are quick to think that arcade games were the origin of home consoles. Sure, many of the earliest home console hits like Missile Command, Donkey Kong, and Pac-Man were, indeed, translations of arcade hits, but the history of video games predates even the first arcade game. There's some amount of controversy over who invented the first video game. Ralph Baer's Odyssey (which we talked about earlier) is actually predated by a Pong-like tennis simulator called Tennis For Two which was created by Willy Higinbotham in 1958. In 1961, Steve Russell, Martin Graetz, and Wayne Wiitanen created Spacewar; a simulation of space combat which Nolan Bushnell later converted into an arcade game called Computer Space in 1971. In 1972, Al Alcorn designed the first successful coin operated arcade game: Pong (which was developed for Nolan Bushnell's fledgling Atari).

Arcade games introduced and refined many genres (both game play and presentation). There are other arcade game genres that aren't covered here that we'll look at in future articles. For now, these four categories should cover enough ground. Let's run through a few terms and examples:

- **Classic arcade (presentation):** classic arcade games were usually based around a simple, fixed screen (no scrolling) game mechanic: Pac-Man (maze game play), Missile Command (shoot down incoming missiles with a trackball controller), Joust (air-based, medieval combat on vultures), Centipede (shoot complex patterns of bugs), etc.
- **Shooter (genre):** not to be confused with FPS (First Person Shooters), the original shooters usually consisted of a single player ship battling endless waves of alien ships. In 1978, Taito produced Space Invaders; the grand daddy of shooters that was hugely successful and launched an industry of copycats (some better than others) like Phoenix (also Taito) and Galaxian (Namco). Outside of pinball, Space Invaders was also the first arcade video game with a high score table. Scramble (Konami) and Vanguard (SNK) were both introduced in 1981 and featured a progression of side scrolling (a playfield / background that scrolls from side to side) levels of varying terrain and enemies. Both of these games are distinct ancestors of later, successful games like R-Type, Gradius, and Raiden.
- **Fighter / Beat-'Em-Up (genre):** fighting games first started appearing in arcades in the 1980's: Renegade (Taito), Final Fight (Capcom), Double Dragon (Technos Japan), and Golden Axe (Sega) were all popular side scrolling fighters. Capcom introduced the Street Fighter series in 1987, but it wasn't until Street Fighter 2 in 1991 that the fighting genre exploded. Street Fighter 2 introduced a varied line-up of world fighters each with complex fighting styles with a wide assortment of moves and blocks. Street Fighter 2 paved the way for a whole industry of copycats like Mortal Kombat and SNK's Art Of Fighting and Fatal Fury series. In 1991, Sega debuted Virtua Fighter which brought fighting games into the realm of 3D.
- **Simulator (genre + presentation):** this is a very broad term that covers everything from racing games (Virtua Racing and Ridge Racer) to various sports titles like Sega's Top Skater or Namco's Alpine Racer. Simulators (as a genre) generally try to copy their real life counterparts as closely as possible whether its in the presentation or the execution of rule sets and statistics.

Arcades are a different experience now. In the United States, most are boutique type experiences like Dave & Busters while a few smaller arcades can still be found here and there at bowling alleys and miniature golf courses. The days of the 1980's style, dedicated arcade are long gone; replaced by the affordability and availability of home consoles.

**Home Computers**

Around the same time that I got my Atari 2600, my Dad decided to invest in his own state of the art machine. In 1979, much to my Mom's chagrin, he came home with a large, tan box with a rainbow colored Apple logo on it. In his words, the Apple was "state of the art" which translates to an incredibly successful marketing campaign by Apple to put their product in the hands of a public that really didn't know why they needed it yet. Dad played around a bit with Visicalc (early spreadsheet program like Excel) as well as Wordstar (word processing), but it wasn't until I sat down and fired up Apple Basic that I quite realized what we'd bought.

Home computing was originally the realm of hobbyists and tinkerers. In the late 1970's, home computers became big business, mass-market items which steadily began to appear in more and more
homes as they became more affordable and more versatile. Arguably, the most popular computer at the time was the Apple II. At $1300, it wasn't exactly cheap and it didn't offer the graphical or audio prowess of some of its soon-to-be competitors like the Atari 400 / 800, IBM PC Jr., or Vic-20 or 64. Apple games were limited by the Apple's 48K of RAM (Random Access Memory where game assets are stored during execution) and large 5.25 floppy diskettes with a little over 100 Kilobytes of storage. The graphics were mostly low resolution and low color with a rudimentary system of objects called shape tables and an inefficient means of display (for games) based on page flipping (buffering two different screen images and flipping between them). Sound effects were either blips and bleeps or crude attempts at wave synthesis that sounded like a McDonald's drive-through speaker on the fritz.

But, it wasn't all bad news for the Apple II's capabilities. What it did offer was a period of refinement and reinvention for a number of board game genres that took them from the paper and pencil world to the digital world.

For the first time, home computers put the power of development into the hands of the public. Budding video game designers had access to languages like BASIC (Beginner's All-purpose Symbolic Instruction Code), Pascal (an early form of object oriented programming), and COBOL (Common Business-Oriented Language) which offered relatively powerful and intuitive means of talking directly to the home computer hardware. As more hardware manufacturers got into the home computing business, the allure of game development began to manifest itself in more game-related features like sprites, high resolution graphics, dedicated sound chips, and a wider variety of controllers.

Radio Shack's home computer lacked color graphics of any sort, but featured a built-in monitor and floppy drive. Some of the original text adventures first appeared on the nicknamed Trash 80!

Home computers and gaming became synonymous as early developers harnessed the power of high level languages (like BASIC) as well as lower level languages like assembly and machine code which allowed direct access to the hardware and, as a result, greater speed in otherwise slow graphics routines. The first generation of computer video games fell into four categories: board game translations (computer automated gaming processes like turns, movement, and asset management), arcade games (Sierra Online's Cannonball Blitz and Jawbreaker had more than a passing resemblance to Donkey Kong and Pac-Man respectively), role playing games (Wizardry and Ultima were predecessors to games like Final Fantasy), and a slew of both text and graphic-based adventure games. Here's a rundown on some of the more popular, early home computers:

- Atari 400 and Atari 800. 1979. These entry-level home computers were Atari's first and most successful foray in to the home computer market. The 400 had a membrane keyboard that was difficult to use while the 800 had a full keyboard. Though they never reached the popularity of the Apple II, both systems were great gaming machines with arcade quality graphics and sound.
- Commodore VIC-20: 1980. $199. 2 million units sold.
- Commodore 64: 1982. $595. 17 million units sold!

Today's computers are far more powerful than their predecessors, but are still comprised of the same basic components: processors, hard drives, graphics adaptors, and random access memory. In a future article in the series we'll take a look at how home computers became ground zero for video game development and revolutionized the process of game design while heralding the dawn of the modern video game designer.

Jason Weesner, Crystal Dynamics, is a senior game designer which means that he's old enough to remember D-Paint, knows his
way around a Galaga machine, and occasionally requires a hearing aid to take directions.

Reference List

Links

- The Escapist Magazine has a nice interview with FASA founder Jordan Weisman. Not to namedrop, but I briefly worked on one of the doomed Xbox A.I. titles with Jordan and he's 100% accurate when he says that "it was not a movie that anybody was going to walk out of saying 'Gosh, now we get to play the game.'
- "Triumph Of the Nerds": this fascinating PBS series covers the start of the home computer industry.
- The Apple 2 History web pages provide a comprehensive rundown of the Apple computer series as well as noteworthy software.
- The Classic Gaming Museum is a great resource for game and console reference.
- Nintendoland is a fantastic website covering a lot of interesting Nintendo history.
- Ralph Baer's personal website has a lot of nice, historical reference material.
- Steve Jackson games has an in-depth history of the company as well as online versions of some of their more popular titles.

Books

- "Videogames: In the Beginning" by Ralph H. Baer: a fascinating look at the dawn of the video game industry from the father of video games. One of the coolest things about this book are the tons of Mr. Baer's original technical and design notes appearing in their original form!
- "Phoenix: the Fall and Rise Of Video Games" by Leonard Herman: a more extensive history of the video game industry.
- "The Ultimate History Of Video Games" by Steven L. Kent: Mr. Kent is one of the foremost authorities on video game history.
- "Game Over" by David Sheff: a great companion piece to both Phoenix and the Ultimate History Of Video Games. Check out an interview with David Sheff.
- "Arcade Fever" by John Sellers: a wonderful picture filled journey through recent arcade game history.
- "1000 Game Heroes" edited by David Choquet: a massive compendium of past and present video game characters from the home consoles and arcades. Taschen Books publishes a staggering amount of great design reference.