

Sara Kazemi
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An Analysis of the Video Game Development Industry

The video game development industry was arguably born out of the Cold War. Funded by the U.S. military, and powered on for the first time in February 14th, 1946, the Electronic Numeric Integrator and Calculator (ENIAC) was one of the first programmable computers, and it attracted many scientists and mathematicians who were interested in the idea of devising an artificial intelligence (Donovan, 2010). Mathematicians Claude Shannon and Alan Turing were confident that one step towards the development of a true artificial intelligence would be to show that it was possible for a computer to defeat a human in a game of chess (Donovan, 2010).

While developing computer games began as an academic and military endeavor to show what computers are capable of, the commercialization of video games emerged in the 1970s with the advent of arcade games like *Pong* and, later, the development of the first home gaming consoles such as the Magnavox Odyssey (Desjardins, 2017). Many companies were contenders in the early video game development market, but by 1982, Atari controlled 80% of the market (Trautman, 2014). However, it was Atari's failure, due to an overproduction of a haphazardly developed *E.T.* game and the disgrace of being found guilty of insider trading, that led to the Video Game Crash of 1983—a phenomenon that almost wiped out the industry altogether in the United States (Trautman, 2014). It took the Japanese company, Nintendo, entering the American market with the Nintendo Entertainment System (NES) to resuscitate the industry in the West (Trautman, 2014). With Nintendo came other industry leaders from Japan—Sega and Sony Playstation; these were the three major corporations that dominated the industry for the rest of the 1980s on through 1990s (Trautman, 2014).

The video game industry is constantly evolving. Since smart phones have become ubiquitous, mobile gaming has taken hold of the game industry. According to market intelligence firm Newzoo, mobile games currently account for over half the revenue gained on the global video game market (Wijman, 2018). Even giants like the aforementioned Nintendo have entered the market, publishing mobile games based on familiar console games such as *Animal Crossing: Pocket Camp* and *Super Mario Run* on the Google Play Store and Apple's App Store. But rather than develop these mobile games in-house, companies like Nintendo look to smaller development companies that have proven success in the mobile gaming market. A prime example of this is Nintendo's partnership with DeNA, a development company that has gained billions of dollars in revenue in the mobile games sales (Grubb, 2016).

Not only are longstanding video game companies transitioning to enter the mobile gaming market, but Amazon is, too. Amazon, first established by CEO Jeff Bezos in 1994 as an online bookstore, is headquartered in Seattle, WA, and employs 563,100 people (Biography.com, 2018). Bezos, who graduated from Princeton University in 1986 with a double Bachelors of Science degree in electrical engineering and computer science, saw opportunity in the Internet (Biography.com, 2018). Although he founded Amazon as an online bookstore, Bezos continued to diversify his company by offering a greater array of products—adding CDs and DVDs in 1998, an on-demand video service in 2006, the Kindle e-reader in 2007, and the Kindle Fire, an Android-based tablet, in 2011 (Biography.com, 2018).

In addition to expanding the variety of products they offer, over the past decades, Amazon has produced or acquired several subsidiary companies, a number of which reflect the company's recent interest in the video game industry. In 2014, Amazon bought out Twitch, the popular video game streaming service, at a staggering price of \$970 million in cash (Kim, 2014).

In the same year, Amazon established its first branch of Amazon Game Studios (AGS) in Seattle, WA (Lien, 2014). Today, AGS has locations in San Diego, CA; Seattle, WA; Orange County, CA; and plans to expand to Europe (Amazon Game Studios, 2018b).

AGS has attracted several industry veterans. When the San Diego branch of Amazon Game Studios opened in 2017, it brought in the former CEO of Daybreak Games (formerly Sony Online Entertainment), John Smedley, as its Studio Head (McWhertor, 2017). According to his LinkedIn profile, Smedley is a 30-year veteran of the industry who left his computer science undergraduate degree program at San Diego State University in 1988 because his own game company was thriving (Smedley, n.d.). Smedley is best known for his work on the massively multiplayer online roleplaying game (MMORPG) *EverQuest* (McWhorter, 2017; Amazon Game Studio, 2017a).

Later, in 2018, Christoph Hartmann, former president of Take-Two Interactive and founder of the 2K Games label, was brought in as the Vice President of AGS (Amazon Game Studios, 2018a). Most notably, for the past 20 years, Hartmann has been leading the teams that have developed the *NBA 2K* games, *Borderlands*, *Bioshock*, and *Civilization* (Amazon Game Studios, 2018a).

Kim Swift and Clint Hocking, two high profile developers in the game industry, had also been recruited as Senior Designers at AGS (McWhorter, 2014). Swift gained notoriety as a student while enrolled in DigiPen's Computer Science in Real-Time Interactive Simulations Bachelor of Science program when her team developed the game project that would ultimately earn her a position at Valve, where she would rework her team's project as the award-winning game, *Portal* (McWhorter, 2014). Hocking is known for his work on *Far Cry 2*.

In an interview with AGS San Diego Studio Head, John Smedley commented that Amazon is “serious about being a big player in games” and “hiring the best” (Takahashi, 2017). Smedley goes on to explain why high-profile developers like him are so attracted to the studio—Amazon is customer-focused and has a lot of resources at their disposal (Takahashi, 2017). Developers like Smedley at AGS cite that one advantage of being a subsidiary of Amazon is that they have access to interacting with other companies under the Amazon umbrella. For instance, developers can work with employees at Amazon Web Services (AWS) to help shape Amazon’s cloud infrastructure so that it meets a game’s needs (Lien, 2014). Built-in livestreaming features are also made easy through Amazon’s acquisition of popular video game streaming service, Twitch (McWhertor, 2016). Amazon even has its own game engine, Lumberyard (Takahashi, 2017).

Overall, Amazon continues to have the best customer relations reputation among 100 most recognizable companies reviewed by 24/7 Wall St. (Thoelcke, 2017). It is speculated that the company’s online retail innovations such as Amazon Prime, 1-click ordering, and their experimentation with brick-and-mortar retail locations have contributed to customer service success (Thoelcke, 2017). In support of Amazon’s reputation, Louis Castle, the head of AGS Seattle, stresses that it is AGS’ overarching goal to be the most customer-centric game studio (Amazon Game Studio, 2017b). Amazon also has a stellar reputation as an employer, earning a Glassdoor rating of 3.8 out of 5 (Umbro, 2018). Additionally, Amazon is doing well financially, with an expected annual profit increase of 26.5% (Nasdaq, 2018).

Despite these positives about Amazon overall, AGS has encountered its own difficulties, seeing both the departure of Kim Swift, who joined E.A. Sports, and Clint Hocking, who returned to Ubisoft (Van Allen, 2017). Following this loss, it was announced that AGS’ most

anticipated project, *Breakaway*, was on indefinite hiatus (Van Allen, 2017); in 2018, the game was cancelled altogether (McWhertor, 2018). To date, AGS has yet to ship a single title, and just two titles—*Crucible* and *New World*—remain listed as in-development (McWhertor, 2018).

Despite AGS' setbacks, it is apparent that they are still looking for the best developers to fill their ranks. The demand for game developers, especially entry-level positions, has been on a decline since 2014 while the number of jobseekers has increased (Indeed Blog, 2017).

Traditionally, games had been developed by teams at large studios like Square Enix or Blizzard, which were financially backed by larger game companies like Nintendo or Microsoft. However, by the 2000s, this approach led to an overproduction of games with little emphasis on quality, and because these games did not sell, publishers eliminated the funding for many game development studios, effectively limiting the demand for labor (Indeed Blog, 2017). Because there are only limited positions available at larger game development studios that still receive funding, many developers are opting to work on independent games (Indeed Blog, 2017).

Companies like Amazon Game Studios are still hiring, but it is rare to see entry level positions unless posted as internships. AGS, for instance, is currently seeking software development engineers, but their ideal candidate should have five or more years of industry experience (Amazon Game Studios, 2018b).

Considering the current state of the job market, to work towards securing a job as a software development engineer in the game industry, the best plan of action would be to begin seriously developing one's portfolio—developing games independently, making massive contributions to others' public projects on GitHub, and acquiring an internship with one of the many game studios like AGS to gain industry experience. Networking is another important resource for any job seeker. Some opportunities happening in September are the San Diego Girls

in Tech Happy Hour Mixer in Downtown San Diego and the San Diego Game Jam at the Art Institute in Mission Valley. In October, the STEM Career Fair will occur on campus at San Diego State University.

Education can also help prepare a prospective game developer for a job in the industry. California State University Monterey Bay's (CSUMB) Computer Science Bachelor's degree completion program gives students the opportunity to work with a team on larger-scale development projects while developing a strong foundation in software development. The degree completion program is an online program, which means team members must become acquainted with collaborating remotely, something becoming increasingly more common in the technology field, as reported by companies like GitHub, Stack Overflow, and GoDaddy (Mykhoparkina, 2018).

In CSUMB's online program, there are a number of courses offered that can help a student evolve into a well-rounded video game developer. More specifically, in CST 325, Graphics Programming, students develop an understanding of how to utilize a system's GPU along with its CPU; in CST 370, Algorithms, students learn to produce and understand algorithms that can lead to better artificial intelligence in games; and in CST 499, Directed Group Capstone, teams are required to develop a project of their choice, providing the opportunity to create and showcase a game.

As a student pursuing her second Bachelor's degree, I am not required to take any electives; however, I have already taken a number of computer science electives as part of my Computational Linguistics Master's degree at San Diego State University: CS 550 (Artificial Intelligence), CS 582 (Intro to Language Processing), CS 652 (Emergent and Adaptive Computing), and two seminar courses in Agent-Based Simulation and Artificial Intelligence.

These courses have provided me with a foundational understanding of common algorithms in artificial intelligence, an area that continues to evolve in the video game industry.

As evidenced by the Cold War-era research led by scientists like Claude Shannon and Alan Turing, the traditional role of artificial intelligence (AI) in games has been to defeat a human opponent (Donovan, 2010). Today, AI is now used for more than just creating a skilled, non-playing character (NPC). Learning algorithms or heuristics are also used to develop elements within the game, such as unique quests, worlds, or species (Parkin, 2017). Some games have been developed entirely by AI, using training data to form a model of what characteristics and qualities of games make a user's experience enjoyable and memorable (Parkin, 2017).

The video game development industry has gone through many changes. In fact, the state of the industry is not what it was even just two decades ago. Game developers are using AI in new and creative ways to automate some of the development process and to develop novel game elements and genres. Not only are games being produced differently by larger game studios, but there has been a shift to many game developers working for small, independent studios due to a drastic decline in the demand for labor at larger studios. Furthermore, it is much harder to find entry-level positions in this industry. Therefore, it will be imperative for any job candidate to begin developing their portfolio early and to update it often. An unpaid internship might be a necessary prerequisite to a paying job.

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