

The impact of web technology in multimedia games development

Aaron Trotter

Ulster University, Magee, trotter-a1@email.ulster.ac.uk

Abstract

This paper examines how the advance of technology has impacted multimedia game development and how the developers have adapted. The development tools and publishing mediums are discussed and an assessment is made on what the future holds in terms of web games.

1. Introduction

Browser games are not a new concept and have been around since the late 1990s through the advent of dynamical hypertext mark-up language known as DHTML. Originally, designed for drop down menus and image rollovers, developers saw DHTML as a window into the future [1].

Unlike other mediums, the web allowed game developers to publish their own games to the world without the need to go through an independent publisher. This flexibility gave birth to a new industry that changed gaming forever.

The advance of web technologies has seen the rise and fall of various frameworks and plugins. As modern computing and coding practices have changed, so has the quality of games. Browser games are becoming ever more feature packed with some rivalling early triple A games and modern mobile games.

2. Early Standards

Traditional games were predominantly shipped on cartridges through publishers and sold by retailers. However, following the video game crash of 1983, publishers were hesitant accepting new games from third party developers [2]. The large capital requirements to publish a game in-house discouraged small companies and independent developers from producing games for consoles and therefore, developers began exploring new mediums.

Many game developers looked to the web to produce interactive and engaging content. The early dynamic web technologies such as HTML, CSS, PHP and JavaScript provided limited tools and functionality and so, developers had to 'think outside the box' when planning their games. Although multiplayer in games had been around for decades, the web browser allowed developers to seamlessly integrate online capability to their games through a server-sided database and account creation via web forms. The simplicity of online integration brought forth greater interest in web technologies for game development and thus popularised new genres such as social gaming.

Browser games were advantageous as they did not require any third-party client to be installed other than a web browser or a browser plug-in and were largely accessible. The accessibility of the web browser gave developers more control over their games as updates could be rolled out frequently without the worry of users using different versions. The web browser also allowed developers to publish their own games as they did not need to produce and ship the physical copy.

Although JavaScript was not intended for games, it soon became the main method of web game development as it allowed for basic interactivity and audio. However, performance of JavaScript games was

typically slow and they were not widely supported by browsers. Additionally, game developers saw a huge increase in piracy, cheating and fraud in their JavaScript games because of the publicly available and changeable source code [3].

By 2000, the Adobe Flash browser plug-in was installed by 90% of web users and the Adobe Shockwave browser plug-in was installed by 60%. As these runtimes had a large established user base, developers looked to them as an alternative platform for game development. Unlike JavaScript, Flash and Shockwave provided developers with a visual IDE that supported larger games. As the code was precompiled, it was not easily available to users.

Shockwave was much more versatile than Flash and could support complex games through greater interaction and supporting much more detailed animations. However, Flash continued to gain popularity especially between non-programmers as they could develop interactive videos that played like games without the need to learn how to code. Flash also was much less performance heavy than Shockwave.

Improving internet infrastructure encouraged the demand for 3D web graphics increased and tools such as Viewpoint and NxView became popular amongst developers. However, these platforms were largely unsuccessful and could only reach a niche market of hardcore browser gamers. It is suspected that web users did not want to install any additional browser plug-ins. Later, Macromedia and Intel extended the life of Shockwave by incorporating 3D capability [4].

3. Mobile and modern computing

For many years, Flash and Shockwave maintained their dominance for browser game development and became ever more similar with each update. Nevertheless, as focus moved to mobile, the integrity of browser platforms was revalued.

3.1. THE END OF AN ERA

In a letter to Apple, Steve Jobs discussed his thoughts about Flash. Jobs' comments reflected that of the web community and Flash has since seen a decline in usership. Flash is insecure. It is a closed, proprietary system subject to hackers and rogue software. Jobs believes that software going forward should be open to reduce vulnerabilities. Adobe rarely releases patches for Flash and unless it is fully integrated into a 3rd party platform there is no guarantee that users will download security updates. [5]. In 2015, security concerns led to popular web browsers temporarily blocking the technology as well as Facebook's chief of security, Alex Stamos calling for Adobe to kill Flash.

Another reason was quality. Some blamed Flash for the rise in poor quality games comparing it to the days leading up to the Video game crash of 1983. As Flash required little to no programming, anyone could create games and upload them to the web. On the other hand, some developers feel that the variety of Flash games brought about a cult following and if Flash became no longer supported, then tens of thousands of games on the internet would no longer be playable [6].

Jobs went on to say that Apple, like Google and many others have adopted the new and open standards on mobile and the web. Over the years, JavaScript has had many updates and together with HTML5 allows developers to create advanced graphics without relying on third party browser plug-ins. Unlike modern platforms, Flash is built upon old technology that is draining mobile battery life and is incapable of backwards capability with touch input [7].

In response, Adobe killed Flash and released Adobe Animate in 2016. Animate is advertised as Adobe's solution to HTML5 and is a combination of Flash and Shockwave revamped to meet the latest interactive standards. However, some game developers claim that Animate is "too little, too late" as modern game engines can export directly to web languages but, it is still a viable option for producing interactive videos [8].

3.2. MODERN STANDARDS

HTML5 is the new powerhouse behind browser games through cross platform capability and powerful JavaScript integration. HTML5's canvas element is designed to draw graphics on the fly with JavaScript and has resulted in the development of JavaScript game engines such as Phaser, Impact and PixiJS. JavaScript game engines are designed to develop complex 2D games and work by running through a thin wrapper on the browser with native-like performance [9]. Canvas, like SVG, allow fully scalable and smooth rendering of vector and raster graphics. They are also supported by all major browsers. Although these technologies are incapable of rendering graphically intense games, they have gained support from web application developers through interactive mapping and schematics [10].

As high speed internet is still not widespread, developers have failed to establish a large enough user base for server-sided rendering technologies and thus, critically acclaimed products such as OnLive have flopped. Cloud gaming technologies work by streaming games through the web browser, mobile applications or native desktop applications, however, limited bandwidth means that graphical quality must be sacrificed for frames per second. As games are rendered on the server-side, no additional plug-ins are required to play triple A games on the web. It is said that such technology is way ahead of its time and will become standard once internet speeds catch up [11].

Some developers have chosen to use hardware acceleration to render games that are too large to be compiled directly in the browser on the client-side.

3.3. HARDWARE ACCELERATED GRAPHICS

WebGL, developed by Mozilla Foundation is a JavaScript API for rendering 3D graphics through HTML5's powerful canvas element. It is an emerging web standard and is currently integrated in all major web browsers without the need for any 3rd party plug-ins. WebGL allows for complex 3D objects and environments to be quickly rendered in the browser by using the player's graphical processing unit, GPU. However, WebGL faces many restrictions especially on the mobile market as mobile GPUs often struggle to process games and thus, have a decreased performance [12].

Browser plug-ins are still widely used, however, are becoming less popular. Game Engines such as Unity have developed their own browser plug-in so that full 3D games can be played directly in the browser without a reduction in quality. They work by caching data on the hard disk to allow for decrease loading times, however, are largely not cross platform compatible [13]. Runescape is a fantasy game developed by Jagex and is one of the most successful browser games. Released in 2001, Runescape runs through a browser with rendered on the player's locally machine through the Java web plugin. Although Java limited the graphical intensity of the game, Jagex were able to bypass the performance heavy dynamic shadows by baking shadows directly on the textures. This added to the look and feel of the game.

To improve Chrome's security, speed and stability, Google announced it would block webpage-instantiated NPAPI (Netscape Plug-in API) plug-ins by default starting in January 2014 [14]. This was a huge blow to the browser gaming community as Google Chrome had the largest share of the desktop and mobile browser usage of 36.29% at the time which has risen to 51.76% by 2017 [15]. Therefore, game developers who made use of Unity and/or Java browser plug-ins had to rethink how they targeted to their players.

Jagex, like other companies saw HTML5 as the future for browser games and developed an HTML5 game engine. HTML5 gave Runescape players the opportunity to again play through the browser and this time with a series of graphical improvements and a vastly largely draw distance. It also could allow the game to be playable on mobile devices. Dean Ollive, content development manager at Jagex commented on the new HTML5 engine saying that "If you look at a lot of our long-term competitors, with HTML 5 we surpass them" [16]. However, following multiple betas the HTML5 game engine was scrapped. It was found that the client was not fast enough even on high end computers and the performance problems were more intractable than originally anticipated [17].

4. Multiplayer and Social Gaming

Improving internet speeds has made online gaming much more practical as players can talk to each other in real time and meet each other in-game at a low network latency [18].

Web games transformed online gaming as well as modern computing by revealing the new market of social gaming. The accessibility of web games allowed for users to play more frequently and in shorter sessions [19]. The main genre to cash in the web browser's accessibility was multiplayer real-time virtual worlds also known as MUDs, Multi-User Dungeons or Multi-User Domains. MUD players can play in their leisure, by entering commands that resemble a natural language and their progress is databased. This means that regardless of the player's geographical location, they could start where they left off. [20].

The advance of technology allowed for MUDs to expand digitally and support entire 3D worlds. With the addition of a full 3D environment, many MUDs evolved into MMORPGs (Massively multiplayer online role-playing games). MMORPGs saw time and emotional investments like no other genre. By 2005, it is estimated that the average MMORPG gamer was online four times more than other internet users [21] and it is estimated that by 2006, 8% of all MMORPG players spend 40 hours per week or more in online environments. A study by Nicholas Yee found that games that could emotionally attach players had an increased player retention [22]. The accessibility of the web browser provided a medium for players to access their emotional desires on the go. Yee also found that players did not just play MMORPG to escape from reality, but also to meet with others.

The social aspect of MMORPG's coined the modern term of 'social gaming'. Runescape is an MMORPG, and initially developed as a graphical MUD. It is recognised by the Guinness Book of World Records as the world's largest free massively multiplayer online role-playing game with over 200 million accounts created [23]. Like other MMORPG's, in Runescape, players can interact through trading, chatting or participating in mini-games and activities. It even has an entire in-game economy built upon player interaction.

In recent years, social gaming has seen a huge increase as technology is becoming more intertwined with everyday life through the internet of things, IOT [24]. Social media giants such as Facebook have invested millions into integrating user's social profiles with games. It is recognised that games with a social aspect such as leader boards and/or a chat system see a larger player retention. By integrating social profiles, players can compete against friends and their data logged [25]. Modern game engines can compile games in native code as well as in WebGL. Providing each platform shares the same database, modern computing is providing the means for cross platform support. This means that regardless of the device players are using, they will be able to continue where they left off.

5. Indie Development

In terms of game development, the improvement of web infrastructure has allowed for wide spread publication of game source code, software walkthroughs, tutorials as well as access to user groups and web forums. As a result, developers can now make use of online manuals and code snippets from other developers to decrease development times and retrieve helpful advice on their work.

E-learning has given the opportunity to create games for anyone with an internet connection and an interest in game development. However, video tutorials and development documentation significantly vary in quality (often in relation to the cost) and thus, live teaching is still more favourable to e-learning for professionals [26]. E-learning and increased online support for game developers has led to a huge increase in the number of individuals and small companies developing games as it has significantly reduced the need to hire specialists for different sections of the development pipeline.

As game development is becoming more accessible through e-learning, statistics from digital distributions platforms such as Steam are showing explosive growths in the amount of games being released. Since 2014 the number of games released on Steam have more than doubled each year and thus, digital marketplaces are becoming swamped with many poor-quality games. To reduce the number of poor quality games being released on Steam, the Valve Corporation (Steam founders) devised a sub-platform for Steam

called Greenlight. Greenlight allows indie game developers to receive funding and feedback from the community through early access and other perks so that they can release better polished games. Although the rationale behind Greenlight is highly debated, it has greatly reduced the number of poor quality games being released with only 30% of games making it out of Steam Greenlight [27].

6. Conclusion

The current state of web architecture is very promising and has given a new lease of life to older game genres. Over the years, browser games have been victim to hackers and cheaters creating a stigma in the gaming community. The rise of mobile has given browser games a second chance, however, restrictions have been put in place to increase security, performance and cross compatibility.

Although the web is behind in game performance to other platforms, it is estimated that the advancement of web technologies soon will see a dramatic interest in internet gaming. When internet speeds allow for massive amounts of data to be sent and received, cloud visualisation will become more common place. This will mean that all devices regardless of how powerful they are, will be able to stream complex and graphically intense games. Until then, browser games will continue to push the boundaries of the web browser and become seamlessly integrated in mobile technology.

References

- [1] D. Puklek, "History of Web Browser Games," 2009. [Online]. Available: <http://ezinearticles.com/?History-of-Web-Browser-Games&id=2670093>. [Accessed 10 02 2017].
- [2] D. Gutman, "The Fall And Rise Of Computer Games," *Compute!'s Apple Applications*, vol. 5, no. 2, pp. 64-65, 1987.
- [3] A. Sethi and R. Allen, "Defending online games from piracy, cheating and fraud," 2014. [Online]. Available: <http://www.develop-online.net/analysis/defending-online-games-from-piracy-cheating-and-fraud/0198678>. [Accessed 10 02 2017].
- [4] T. Harris, "How Web Animation Works," 2000. [Online]. Available: <http://computer.howstuffworks.com/web-animation7.htm>. [Accessed 02 11 2017].
- [5] B. Barrett, "Flash. Must. Die.," 2015. [Online]. Available: <https://www.wired.com/2015/07/adobe-flash-player-die/>. [Accessed 11 02 2017].
- [6] P. Klepek, "The Death of Adobe Flash Is Coming, And Game Developers Are Worried," 2015. [Online]. Available: <http://kotaku.com/the-death-of-flash-is-coming-and-not-everyones-happy-1717824387>. [Accessed 11 02 2017].
- [7] S. Jobs, "Thoughts on Flash," 04 2010. [Online]. Available: <http://www.apple.com/hotnews/thoughts-on-flash/>. [Accessed 11 02 2017].
- [8] eLearning Chef, "Flash > Animate, a new beginning (?)," 2016. [Online]. Available: <http://elearningchef.com/flash-animate-a-new-beginning/>. [Accessed 11 02 2017].
- [9] D. Szablewski, "THE AWESOMEST WAY TO CREATE EVEN MORE AWESOME HTML5 GAMES!," 2017. [Online]. Available: <http://impactjs.com/>. [Accessed 11 02 2017].
- [10] W3C, "GRAPHICS," 2016. [Online]. Available: <https://www.w3.org/standards/webdesign/graphics#uses>. [Accessed 11 02 2017].

- [11] E. Narcisse, "What Went Wrong With OnLive?," 2012. [Online]. Available: <http://kotaku.com/5936608/what-the-hell-happened-with-onlive>. [Accessed 11 02 2017].
- [12] K. Curran and C. George, "The Future of Web and Mobile Game Development," *International Journal of Cloud Computing and Services Science (IJ-CLOSER)*, vol. 1, no. 1, pp. 27-28, 2012.
- [13] Unity, "Unity Web Player," 2017. [Online]. Available: <https://unity3d.com/webplayer>. [Accessed 11 02 2017].
- [14] J. Schuh, "Saying Goodbye to Our Old Friend NPAPI," 23 09 2013. [Online]. Available: <https://blog.chromium.org/2013/09/saying-goodbye-to-our-old-friend-npapi.html>. [Accessed 11 02 2017].
- [15] StatCounter, "Browser Market Share Worldwide," StatCounter, 2017.
- [16] D. Ludlow, "RuneScape 3 and its HTML 5 engine have launched," 08 2013. [Online]. Available: <http://www.expertreviews.co.uk/games/26831/runescape-3-and-its-html-5-engine-have-launched>. [Accessed 11 02 2017].
- [17] M. Gerhard, "RuneFest's Big Reveals," Runescape, 10 2014. [Online]. Available: <http://services.runescape.com/m=news/runefests-big-reveals>. [Accessed 11 02 2017].
- [18] J. McGonigal, "Gaming can make a better world," 2016.
- [19] C. Klimmt, "Exploring the Enjoyment of Playing Browser Games," *CyberPsychology & Behavior*, vol. 12, no. 2, p. 231, 2009.
- [20] G. Hansen, "A Distributed Persistent World Server Using Dworkin's Generic Driver," *Cand. Scient. Thesis*, p. 1, 2002.
- [21] A. Barak, *Psychological Aspects of Cyberspace: Theory, Research, Applications*, 1 ed., Cambridge University Press, 2008.
- [22] N. Yee, "The Psychology of Massively Multi-User Online Role-Playing Games: Motivations, Emotional Investment, Relationships and Problematic Usage," in *Avatars at Work and Play: Collaboration and Interaction in Shared Virtual Environment*, R. Schroder and A. Axelsson, Eds., Springer, 2006, p. 10.
- [23] Runescape, "RuneScape in Guinness World Records!," 2008. [Online]. Available: <http://services.runescape.com/m=news/runescape-in-guinness-world-records>. [Accessed 10 02 2017].
- [24] D. J. Barrett, "The Internet of Things: Dr. John Barrett at TEDxCIT," 2012.
- [25] N. O'Neill, "What Exactly are Social Games?," 2008. [Online]. Available: <http://www.adweek.com/digital/social-games/>. [Accessed 10 02 2017].
- [26] M. Prensky, "Digital Game Based Learning," in *Digital Game Based Learning*, McGraw-Hill Trade, 2003, p. 442.
- [27] J. Jamarque, "40% Of All Steam Games Were Released In 2016," 2016. [Online]. Available: <http://fraghero.com/40-of-all-steam-games-were-released-in-2016/>. [Accessed 17 02 2017].