UNIT 8: COMPUTER GAMES DEVELOPMENT

Learning Aim A: Investigate technologies used in computer programming

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Unit 8: Computer Games Development

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Chapter 1

Background and Motivation

The ability to interact digitally with individuals through online gaming has always been a central aspect of our modern worldwide entertainment. A strong link between games and the development of technology has always existed through the enhancements of the gaming industry. This link can be seen from one of the earliest games invented.

Dating back to 1971, when the first official commercially sold video game; playable on the first ever arcade machine 'Computer Space' was made by Nolan Bushnell and Ted Dabney, who later founded the iconic game company Atari. Next, portable gaming came into the spotlight as Atari introduced the world's first handheld game console Atari Lynx. Atari released many "game changing" games in the 1990s, including: Pac-Man, Mario Bros and Doom. Finally, to our current era, where ground-breaking technological discoveries like VR (Virtual Reality) and AR (Augmented Reality) are used by gamers globally on personal computers such as PS4, PC and mobiles devices. Today, VR and AR are recognised as a trendy and fast emerging piece of technology and remains to be a topic of interest in the world of computer games.

As current and emerging technologies continue to be an instrumental contribution to the modern application of game development, it makes us wonder how the future of the gaming industry would look like from a gamer's standpoint. One thing to consider when discussing the future of gaming is the trends in the social and technological elements of computer games. From the social side, influencers stream their gameplays on platforms such as Twitch to bring entertainment and game tips for their followers. While from the technological side, wearable gaming such as the Oculus Rift S enables games to be more engaging and immersive for the user's experience. Another thing to consider is the expansion of technology and how it has impacted the design and development of games. We intend to cover these components as they highly reflect the future of gaming and what we could expect.

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Chapter 2

P1 | Trends of Computer Games

2.1 Introduction

In this chapter, we aim to cover the fundamentals behind the social and technological aspect of the gaming industry, namely computer games. Applications of social and technological trends such as game streaming, Esports, wearable gaming and high-quality graphics will also be briefed including the impacts they bring.

2.1.1 Social Trends

The social trends of computer games help us understand how they will change the games industry as we position ourselves next to the users to see how their requirements are met. We will be looking at game streaming and eSports to understand what makes these topics trendy.

2.1.1.1 Game Streaming

Streaming is a technology that is used to deliver media content to computers in 'real time'. Streaming, in general, has been around since the 1990s, but didn't really become popular in the way we know it today until Adobe Flash made live streaming of video content possible and higher bandwidth networks became available.

However, game streaming started becoming popular in the mid-2010s, especially on Twitch, a live game streaming platform that was founded on June 2011. Twitch is arguably now the world's biggest live (game) streaming platform, with over 15 million active users every day. Its popularity grew for its live streaming features and rise in interest in eSports, another social trend in the gaming industry. Twitch also has non-gaming categories, the most popular being IRL (In Real Life), where streamers chat with their followers in real-time. The creative category is also commonly used on the platform, by: artists, programmers, animators, cosplayers, and designers who want to show their work to their supporters. A well-known game influencer in the game industry is Ninja, the most popular game streamer on Twitch, with almost 15 million followers.

Watching other people play games does not sound like an exciting thing to do, and yet thousands do it by the minute. There are many reasons for why people would rather watch others play than experiencing the games for themselves. The three most important are: the entertainment from the stream, the chat channel and the game being played, and being part of a live social experience.

2.1.1.2 eSports

eSports is a form of video game sport where professional players compete individually or as teams for money. The most common video game genres in the sport are: MOBA (Multiplayer Online Battle Arena), FPS (First-Person Shooter) and BR (Battle Royal) games.

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The very first sign of eSports took place at Stanford University in October 1972, that invited players to compete in a space combat game called 'Spacewar'. Next, Atari held the Space Invaders Championship in 1980, which attracted over 10,000 people across the US. But, the real big event in the history of video game competitions was when the Xbox live was released in 2002, enabling players to play with each other online, thanks to multiplayer online gaming. From then, the potential of eSports piqued the interest of developers and they started getting more involved, leading to more money being made, better broadcasts and higher production values.

The biggest reason for professional gamers to compete in this sport is the prize money that wait in the tournaments. Monthly salaries of average pro gamers can range from $1000 to $5000, as the highest paid League of Legends player can earn up to $15,000 per month.

2.1.2 Technological Trends

Trends in the technological aspect of computer games help us understand how the future of gaming will progress as we take a look at how technology will continue to help advance gaming into its full potential to meet requirements of gamers and the industry itself. We will be looking at wearable gaming and high-quality graphics to see what makes them a trending topic.

2.1.2.1 Wearable Gaming

Much like its title, wearable technology is a user-friendly device that can be worn. A fitness watch is a prime example of a wearable technology; that can help users track all relevant health and fitness related information.

The history of wearable technology started with wrist watches, which was worn by people to tell time. The first of its kind was made by Peter Henlein, which were small pocket watches, worn as necklaces. Watches had advanced from pocket watches to wrist watches and smartwatches. The superior smartwatches nowadays exceed the main purpose of a watch to tell time. The best-selling smartwatches are arguably the Apple Watches, as over 22.5 million smartwatches out of the 45 million that was shipped in 2018 was sold by Apple. This impressive piece of wearable tech connects to your iPhone to deliver notifications, send texts, make calls, and even run apps along with many other features, that no ordinary watch can do. There is no wonder how this technology fell into the gaming category, due to its convenience.

Wearable gaming is a wearable gadget that acts like an extended tool for gaming in order to make computer games more engaging to improve the user's experience. The world's first piece of wearable gaming device was the Casio GD8, a digital watch with a built-in car racing game. Today, wearable gaming is seen as a technological trend in the gaming industry and is being pushed into breath-taking levels. VR and AR headsets are great examples of wearable gaming devices that is used to enhance games by making them more realistic, bringing us closer to realistic gaming experiences. Wearable gaming is commonly seen as an element of the future in the gaming industry, as most VR and AR games aim to be as realistic as possible.

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2.1.2.2 High-Quality Graphics

Thanks to the advancements in game designing tools, high-quality graphics in computer games never ceases to amaze gamers. Some well-known games that feature outstanding graphics include: Red Dead Redemption 2, Assassin's Creed: Odyssey, Mortal Kombat 11, etc. However, these stunning visuals did not always exist in the gaming industry.

It all started in the 1970s, where classics like Asteroids and Breakout allowed players to navigate and interact with mazes and simple shapes. Then, in the '80s, improvements with polygons allowed sprites to be made in much more detail in video games such as Super Mario Bros and OutRun. Next, the early '90s was a huge step up for game graphics as developers started using 2D textures to create illusions of 3D spaces in video games like DOOM. When Quake came on the shelves, millions of players worldwide sat in front of their PCs to experience the first title to feature fully 3D rendered worlds.

Nowadays, cartoonish graphics has become more popular in computer games such as Overwatch and Fortnite with bright colour palettes. This style appeals to a wide audience, probably because of its simple but eye-catching nature. As time passes, technology continues to advance along with computer games and its graphics. Game development software like Unreal Engine is good for creating high-quality graphics in games, supporting graphics programs like 3ds Max.

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Chapter 3

P2 & M1 | Design and Development of Computer Games

3.1 Introduction

In this chapter, we take a detailed look at examples of current and emerging technologies to learn about how they impact on the design and development of computer games to meet the requirements of the users and the computer games industry.

3.1.1 P2 | Current and Emerging Technologies

Current and emerging technologies are seen everywhere in the gaming industry in our current era, changing the design and development of computer games. The two examples of current and emerging technologies that impacted the gaming industry that we will be looking at are virtual and augmented reality, including the hardware and software that they bring.

3.1.1.1 Virtual Reality

Virtual reality is a computer-generated simulation of a three-dimensional virtual environment that can be interacted by the user, with the use of special electronic equipment such as the VR headset. The first of its kind was invented by American computer scientist Ivan Sutherland in 1968.

Virtual reality brought many hardware and software into the gaming industry. For example, this is seen by Oculus VR, an American technology company founded by Palmer Luckey which specializes in VR hardware and software. Their biggest hardware product is the Oculus Rift S, released on March 2019; this headset has many features like the LCD panel, allowing amazing visuals with resolutions of 2560x1400. This VR set also features a pair of VR controllers (VR Touch), making the user feel like their virtual hands are their real ones in the real world. The Oculus Medium is a digital sculpting software released on December 2016 that supports VR headsets, allowing users to develop and view their 3D models in virtual reality at all angles.

3.1.1.2 Augmented Reality

Augmented reality is a technology that displays computer-generated images on the user's view of the real world, with the use of special electronic equipment such as the AR smart glasses, or simply the mobile device screen. The first AR system (Virtual Fixtures) was developed in 1992 at the U.S. Air Force Armstrong Laboratory which was used to improve human performance in remotely manipulated tasks.

We see this in action with Pokémon GO, an augmented reality mobile game developed by Niantic in July 2016. The game contains AR features like the 'catch mode view' where an image of the Pokémon is layered on top of the user's view of the real world. Recently, the game studio, another AR mobile game, Minecraft Earth, was released in early access in October, this year. Minecraft Earth's AR features are superior to Pokémon GO: with Minecraft Earth's 'build mode view' you can implement a canvas anywhere on the view, where you edit and view your build at any angle or perspective.

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3.1.2 M1 | Design and Development

VR and AR enhance computer games by making them more engaging and immersive, improving the user's gaming experience. These reality-replacing technologies have become a useful asset for developers, designers and gamers of the gaming industry:

Game development has been taken to the next level, as developers can 'develop' their virtual or augmented reality games with game development software. One example of this is Unity3D, a cross-platform game engine made in June 2005. When VR and AR games became a trendy topic in the industry, Unity stepped up its engine by implementing premade VR and AR features and HMD (Head-Mounted Display) support for developers to use and test their VR/AR projects.

Game design has been taken to its incredible level as well, as designers can 'design' their 3D models with digital sculpting software in more perspective and detail than ever before. Blender, for example, is a graphics software where game designers can use to create their 3D models. Now, VR and AR brought new reality-breaking graphics software which enables designers to create their models with Oculus Medium virtually in VR, or with 3D Doodler in an augmented manner in AR.

Gaming in general has also been enhanced massively, as gamers can 'game' and experience these engaging and immersive worlds created by these developers and designers with HMD like the Oculus Rift S or AR smart glasses like the Google Glass. Computer games have changed a lot since its origin, improved by new technologies overtime, but with these breath-taking techs, we can say that we are getting closer to breaking the visible boundary between reality and virtual reality.

3.1.2.1 Requirements of Users

The three main requirements of a user's experience in virtual reality shown in the VR Triangle in Figure 3.1. Interaction is when VR is responsive to the user's input (e.g. VR controllers), immersion is when ideas or concepts are brought to life in VR for the user's experience, and imagination when the user feels the presence of the virtual world that VR provides.
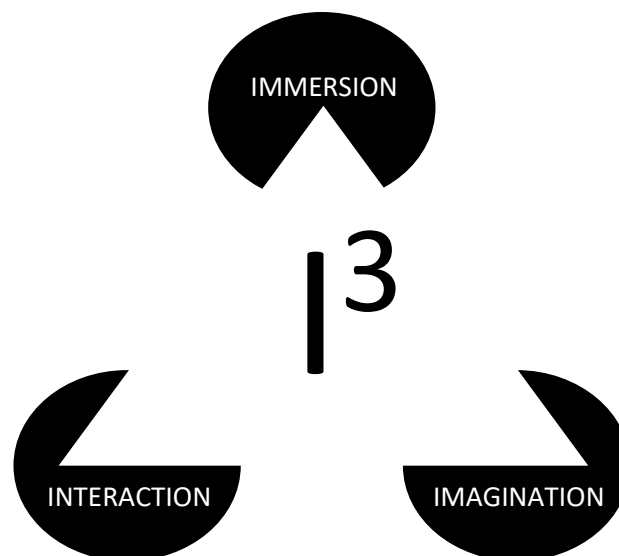
Figure 3.1: VR Triangle

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However, virtual reality has many of its disadvantages along with its advantages to the users:

Advantages	Disadvantages
▪ Keeps you active. VR games such as Beat Saber is very engaging, requiring user's hand motion with VR controllers, making them a great way to burn calories while gaming. ▪ Virtual worlds. VR offers users a chance to explore new worlds. ▪ Improving confidence. Research show that VR gaming make kids become more expressive.	▪ Can be expensive. VR headsets can easily cost more than $600 to $900. However, smartphone VR headsets should cost no more than $100. ▪ Addiction. VR gamers can become too attached to the virtual world and become disconnected and unaware of the real world and their families and friends. ▪ Physical and mental damage. VR headsets can cause eyestrain, nausea, anxiety, etc.

The table below shows a brief comparison between virtual reality and augmented reality, including their purpose, applications, and best-selling hardware.

	Virtual Reality	**Augmented Reality**
Purpose	VR immerses the user into a virtual world.	AR displays computer-generated images onto the user's view.
Applications	Computer games, employee training, exercises, etc.	Computer games, education, video collaboration, etc.
Best-selling Hardware	Oculus Rift S, Samsung Gear VR, HTC Vive, etc.	Google Glass Eyesight Raptor, Kopin SOLOS, etc.

3.1.2.2 Oculus Rift VS Oculus Rift S

We see changes in the development and design of VR headsets which is aimed to improve the user's experience and to meet their requirements with Oculus VR's Oculus Rift and Oculus Rift S.

The Oculus Rift was the first commercially sold VR headset by the company; the product was very successful, raising almost $2.5 million from 10,000 contributors. Then, in May 2019, the new Rift S replaced the original headset, showing off more features, such as the pair of controllers (VR Touch) which tracks your hands in the virtual world.

However, there are still many disadvantages along with its advantages with the Rift S compared to original Rift:

Advantages	Disadvantages
▪ Lower initial price. The original Rift was released for $399 initially, while the Rift S has hit the market for only $399. ▪ Higher resolution visuals. The LCD panel instead of OLED allows less "screen-door effect", less instances of black spaces between pixels that	▪ No HDMI support. This is a compatibility issue as the Rift S is only compatible with DisplayPort. ▪ Heavier headset weight. The Rift S weighs in at around 1.2 pounds while the Original Rift weighed at around 1 pound. This is a drawback of the Rift S's new and improved physical design.

break the immersion of VR. LCD also allows higher resolution numbers, 2560x1400 LCD panel replacing

- Faster and easier setup. The Rift S uses "inside-out tracking" with cameras built into the headset, offering easier, faster setup. The Oculus Rift took 30 minutes while the Rift S takes around 15 minutes to setup.

- Some tracking issues. It does not track very well in areas with a lack of lighting. Also, the Rift S's inside-out tracking ability does not cover an entire 360-degree scope around the user, this could cause problems with some VR games.

- Lower quality and less isolated audio. The use of tiny speakers aimed into the user's ears is of a lower quality and less isolated than the original Rift's audio system.

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Chapter 4

D1 | Evaluation and Conclusion

4.1 Evaluation

Computer games have come a long way since its origin. As technology continues to advance and impact the development and design of computer games, with new and emerging technologies, new social and technological trends are created in the industry. These trends may reflect the future of gaming as they help shape up the industry with new entertainment systems.

Game influencers worldwide from live streaming platforms and video game tournaments encourages their audience. On Twitch, you can 'follow' your favourite game streamers to keep up to date with their content and for eSports, you can support your favourite player or team as they participate in future matches, much like any other sport. This act of support shows how the influencers are also encouraged by their viewers for the entertainment they provide. This explains how social trends have impacted the gaming culture with the bonds that are created between game influencers and their viewers in the industry. We see these bonds made with popular game streamers like Ninja with his 15 million followers and popular eSports teams like Astralis with their 250 thousand followers.

Speaking of entertainment, technology has pushed entertainment into unbelievable levels, which makes us question when we will finally meet its incredible limit. The popularity of wearable gaming has been growing, thanks to technology bringing new and impressive emerging technologies into the spotlight. This proves to be a big factor for changing the development and design of computer games, as nowadays, our industry aims to make computer games as realistic as possible with: new wearable gaming devices like HMDs (VR/AR headsets) to make the experience more engaging, and high-quality graphics seen in games like Red Dead Redemption 2 to make the experience more immersive.

In addition, there is a strong link seen between wearable devices and virtual reality. As people crave for more immersive experiences, the VR market continues to provide users with more immersive sensations with new VR peripherals that a headset cannot provide alone. The VR controllers are the most popular VR peripheral device due to its easy use and engaging input features. As VR peripheral creators attempt to cover the fact that you are using a controller, devices like the Manus VR are made. This genius piece of tech is a glove that makes input features that controllers provide wearable. These development and design changes can also be seen with movement tracking devices like the Virtuix Omni which uses a sensor-based treadmill that tracks your movements on the pad to determine which direction you are moving in. The new Cybershoes is also like a wearable version of the Virtuix Omni, using rollers on the bottom of the shoes to track the user's movements on the carpet. This clearly shows that, the existence of the virtual reality market, estimated to worth of over $43 billion by 2024, has made a huge impact on the gaming industry as developers and designers create computer games that support these special VR devices to satisfy hungry gamers.

On the other hand, augmented reality has also affected the way computer games are made in numerous ways. The biggest hit in the AR games industry so far was Pokémon Go from July 2016, raising over $2.45 billion revenue in May 2018 from over 800 million downloads. The increase of the

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popularity of AR games occurred when Apple released ARKit on September 2017, an augmented reality development platform for IOS mobile devices, which enabled developers to build high-quality AR experiences in their AR apps. For instance, environments captured in view can have animated 3D virtual texts, objects and characters added to them. Now, with Mojang's new AR mobile game, Minecraft Earth, released in early access in October 2019, the game picked up from where Pokémon Go left. The game already has reached over 500,000 downloads in a single month. And, with Minecraft's huge fan base, this could potentially be the second biggest AR game yet. Now, the augmented reality market seems to be overpowering the virtual reality market as it is set to exceed over $50 billion by 2024, according to a research in 2018.

4.2 Conclusion

As we reach more innovative heights in the world of VR development, this piece of technology continues to be more of a necessity in other aspects of the tech industry. For instance, Architects and Designers today see huge potential in using VR to help with initial design mock-ups, improvements of house renderings, house viewings and more. We believe VR is expected to grow in popularity outside of the gaming world through its intuitive mechanics and fundamental use case.

For us to understand how we can continue to improve the design and development of reality-replacing computer games to satisfy a gamer's needs, it is essential for us to investigate the flaws of these emerging technologies. For instance, one major flaw of AR gaming is the risk of the user's safety. This can be due to the fact that the user's view of the real world can be blocked by the computer-generated images that are layered on top of AR glasses, while VR headsets cover the user's entire view as VR games usually require a lot less movement. AR mobile games sensations like Pokémon Go, is about enticing users to play outdoors and search and collect avatars at different locations with the use of GPS navigation. Many articles have reported this as dangerous as users can become unaware of their surroundings by the AR features these AR games bring. Ever since the release of Pokémon GO, there has been 19 reported deaths.