UNIT 08 COMPUTER GAMES DEVELOPMENT

Assignment 1

Learning Aim A
Investigate technologies used in computer gaming.

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Introduction

In the modern day there are many current and emerging technologies that are constantly evolving. This evolution has led to stark change in social and technological trends in computer gaming, regarding user requirements and the larger gaming industry. Furthermore, the current and emerging technologies also have, and are likely to continue to have an impact on game development now and in the future. Throughout this paper I will discuss how the different technologies and user requirements can impact game development and design.

Social trends in computer gaming

There are many variables and factors to consider when discussing and evaluating social trends in computer gaming. This section will aim to cover all these points that can determine several factors within the social trends of computer gaming, while discussing how these factors affect each other and the significance of each one individually.

Popular genres

There are many genres of games, however there are primarily 17 popular genres. These are

- Role Playing Games (RPGs)
- Massively Multiplayer Online (MMO)
- Massively Multiplayer Online Role-Playing Games (MMORPG)
- Simulation Games
- First Person Shooter Games (FPS)
- Strategy games
- Action Games
- Action-Adventure Games
- Real Time Strategy (RTS)
- Sports Games
- Educational Games
- Adventure Games
- Puzzle Games
- Multiplayer Online Battle Games (MOBA)
- Survival Games
- City Building Games
- Racing Games

(Andrea, 2022)

The genres available to people have changed over the last few decades, with the introduction of completely knew genres that people might have not thought possible, such as the popularization of multiplayer games and widespread internet access shifting the trend from pixelated single player games, to "First-Person Shooter, Real-Time Strategy, Survival Horror and MMO" in the 1990s. (Fandom, 2022) This is evidence of how with the introduction of new

genres and ability to play new games on newer systems can impact game development, as more games will be designed around those systems and user requirements to play online, further impacting the trends.

An example of a difference between multiplayer and single player would be the "Call of Duty" game series, released by Activision, and "The Elder Scrolls" game series, developed and released by Bethesda, most notable The Elder Scrolls V: Skyrim, and The Elder Scrolls IV: Oblivion.

"The Elder Scrolls" has sold over 58 million copies worldwide with only five games in the series (Wikipedia, 2022), while "Call of Duty" has sold over 425 million copies with nineteen games. Both games are widely successful, with the last three games of The Elder Scrolls series collecting multiple Game of the Year awards from different outlets, and the substantial number of figures sold with the Call of Duty series. Even though these are two completely different genres, one being single player RPG, and the other an FPS multiplayer game, they both produce successful results, and therefore are both consider heavyweight franchises within the gaming scene, with a large and loyal fanbase following each game, respectively. This leads to more investment within both games, including many more resources, even though these are two completely different games therefore have completely different player bases.

Player base

The player base also has a crucial role in deciding the social trends regarding computer games and their development and design. An example of this is that while some people are more inclined to play multiplayer games, there are those who prefer single player games where they do not have to interact with other users. Similarly, this can be applied to every genre of video game, and even franchises specifically, leading to certain game genres being developed more and franchises having more resources invested into them.

Furthermore, there are many kinds of players in video games, such as hardcore fans or the more lighthearted casual gamer. Due to this, and other factors such as age rating for the game or the players sex, games may be developed for specific users and will naturally not appeal to all users.

An example of this could be Stardew Valley, which is a farming simulator game that is easy going and much simpler compared to an FPS like Call of Duty which requires intense focus and includes a large skill gap between users. Therefore, games for more casual gamers will not appeal to those who prefer the high action fast paced nature of an FPS game like Call of Duty.

Production

There are many different ways to produce a game, from indie game development which refers to the production of games without large financial backing like a big company i.e., Bethesda as previously mentioned. Another way a game can be produced is a AAA title, which is often the result of big corporations like Activision, Ubisoft, Blizzard, and Bethesda to name a few. These

games often have large teams working on them with individual duties and responsibilities, unlike solo or small team indie game developers. Furthermore, another factor that can affect production is whether a game will be free to play or not, as this leads to other factors being considered during development such as whether or not to include microtransactions.

Multiplayer

As previously mentioned in popular genres, multiplayer is a crucial feature when considering social trends in computer game development and design, as games that allow users to interact with each other and play with their friends have much more possibility than a single player game. Furthermore, if users are able to interact with each other then they have the possibility of creating further friendships and other relationships, likely leading to increased playtime and more time overall on the game. This directly shows how important it is for certain games to be multiplayer in order to fully take advantage of all social trends and remain popular.

It is also important to consider the fact that it is much easier for companies to allow users to play their games online due to popular mainstream services like PlayStation and Xbox which host users on their systems and allow them to play the games created for them.

Artificial intelligence

AI has grown exponentially in the last few years, with machine learning and complex algorithms developed constantly to help improve the logic and decision-making ability of the AI. This leads to an enhanced user experience as it allows users to play against stronger and better opponents (bots). As a result of hardware advances in recent times there are even some machines that have dedicated hardware for this purpose, machine learning.

The examples of AI in video games are vast and endless, however some notable examples to consider include:

- AI pathfinding algorithms, where the AI decides the best possible path to the destination and then executes it.
- NPC development, where the world development is built up through the use of Non playable characters that the player can interact with.
- Computer simulation board games, where the player can play against the opponent, a computer, and enjoy the same experience as playing against a player.
- Similarly, in most sports and shooting games there exist options to play against bots in order to practice or play the game regularly.

While artificial intelligence is incredibly important in games development, as it opens many more doors and possibilities for the games that can be made, it is not uncommon to find that artificial intelligence is not well known or misrepresented and misunderstood leading to general animosity towards AI and can be devastating for the development of machine learning in the future.

Emerging technologies

Technological innovation is constantly progressing forward, evolving our idea of the latest technology and what it is possible in the modern day and age. Due to the progressive 6development of new technologies at a rate of which not seen before in history, we now have technologies such as VR, virtual reality, AR, augmented reality, AI, artificial intelligence as mentioned above, and Ray Tracing, among many others. A few years ago, these technologies would not have been considered feasible, let alone a possibility of actually being created. However, the fast progression of the technology industry has birthed these devices and advanced the gaming industry with new genres and ideas for games developers to create and experiment with.

With the everchanging nature of technology, which is ironically similar to the change in human nature between individuals, advancements are being made every day. With each invention and development being a potentially new social trend for users to elevate to a new level and shine a new light, there is no telling what development may come next.

Security of integrated services and multiplayer environments

Alongside the development of the video games industry, the development of platforms which enable users to purchase and play video games has evolved as well. There are a range of services available for every device.

These services include:

- Steam for PC
- Epic games for PC
- Riot Client for PC
- App store for Apple
- Google Play store for Android
- PlayStation store for PlayStation
- Xbox Store for Xbox

These are platforms that enable users to purchase and play video games, and these platforms also provide a place where developers can earn money through the purchase of their games, and microtransactions within those games. Furthermore, these services are also dedicated to ensuring the safety and reliability of their platforms, as otherwise they would lose business and dedicated developers which allow them to earn revenue proving that the reliability of their platform is paramount. Lastly, with the development of these platforms, it also enables indie developers to market their games and products which leads to more games being available for users and a wider variety of development.

Technologies used in computer gaming

There are a plethora of technologies involved in computer games, both their development and consumption. As a result of this, there are many businesses and companies dedicated to

advancing these technologies and therefore it is important to keep updated on games technology.

Benefits and limitations of different platforms for development

When deciding what applications to develop video games on and in turn what user base to develop for, each has its own benefits and limitations.

Personal computers

Personal computers (PCs) are typically tower systems with hardware inside, however there are also laptops which people are able to use.

Some of the benefits of developing a game for PC include:

- Easy games development
- A large user base to develop for
- Access to integrated services like steam

While on the other hand some of the limitations for PC include:

- Unknown technological specifications of the user

This is due to the fact that developers for PC games want to make their application as widely accessible for all users, however due to the nature of personal computers and the technology industry, users have a wide variety of parts and preferences when buying and building their own PCs, and developers have to consider this and ensure that their application can reach as many users as possible.

Consoles

Consoles includes devices such as a Nintendo Switch, PlayStation 4, PlayStation 5, Xbox 360, Xbox One, Xbox Series X, and Xbox Series S. These are hugely popular and used by most users as they are simpler to establish than PCs, however, have similar levels of output when compared to middle/low range PCs. This makes them viable for younger users and helps increase the amount of people able to access games through these platforms.
Some of the benefits include:

- Largely popular consoles
- Good hardware for games
- Dedicated for playing video games so therefore optimised
- Extensive history, therefore loyal fanbases
- Physical and digital games

Some limitations include:

- It can cost more to develop for
- Including console controls and testing can be harder
- It is harder to get disc distribution for the games

- With Nintendo Switch, the controls can be specific to input types only available on this console, limiting portability

Mobile devices

Mobile devices can be harder to develop for, due to the wide variety of mobile devices which means games have to be tested and developed for specific screen sizes and mobile hardware specifications. Devices include Apple iOS and Android primarily.

Some benefits include:

- Big investment for higher priced games on mobile iOS
- Android is much cheaper to develop than iOS devices. Open-source code
- Almost everyone has a mobile phone. Huge market for customers

Some limitations include:

- iOS is very expensive to develop for
- Apple has to manually review all applications and approve them
- Development for Apple devices is usually restricted to Mac Apple devices
- Hardware of mobile phones is limited compared to other devices

Web-based

Web based application include things such as browser games and can usually be accessed and used by any computer that can open an internet browser. Some platforms that are used to play web-based games are Adobe Flash, which is largely outdated now, and HTML 5.

Some benefits include:

- Web based applications are supported on all web browsers
- No requirements for plugins
- Flash games can be easily animated and allow easy visuals

Some limitations include:

- Flash is largely discontinued due to security and vulnerability concerns in browsers
- No physics involved in Flash, has to be manually developed
- Unable to save games
- Usually, lower quality and smaller than normal games
- Limited by certain browsers

Hardware options and their involvement in development

The hardware is vital in computer systems, as it allows for everything that is seen on the screen to occur. Gaming hardware is hardware specifically designed to run games on them and are the most important factors when considering what specifications that the games developed should be able to run.

CPU

The central processing unit (CPU) of a computer is considered the brains of a device. It handles all the instructions that the computer follows using the arithmetic-logic unit (ALU) to carry out the mathematical operations for each instruction and storing the result to memory.

With regards to video games, CPUs are responsible for ensuring that the computer system is able to run the video game by meeting the requirements. This can involve changing the settings of the video game in order to meet the systems capabilities as detected by the CPU. Most commonly, AMD and Intel CPUs are used when playing video games, and the available performance is dependent on the power of the CPU.

As a result of their expensive development, powerful CPUs are generally not cheap and therefore many PC gamers may choose to go for less powerful CPUs and take a hit on game performance or game quality, depending on what the user prefers. Another option for users includes overclocking the CPU where they force the CPU to run faster than is recommended, increasing performance and temperature of the component. While this can be done safely and stably, doing so is still risky and voids any manufacturer warranty.

Similarly, to taking hits to quality, this is how game consoles are able to use worse CPUs and remain affordable compared to high quality PCs. This usually comes in the form of lower framerates and being unable to handle larger loads of data and information that might be required of the CPU.

GPU

A graphics processing unit (GPU) has the sole responsibility to produce images on the display, working alongside the CPU. The workload of the GPU depends on the complexity and quality of the images that the GPU is required to output, meaning that the more polygons and high-quality images can require high specification GPUs.

In regard to video gaming, GPUs are usually standalone cards which can be connected to the motherboard through a slot. Furthermore, GPUs for gaming usually have standalone RAM dedicated to processing images. It is common to see a minimum standard of GPU when searching for what is required to play a game. Consoles and mobile devices contain the own GPU as well.

Memory

Memory split between read only memory (ROM), and random-access memory (RAM). ROM is used to store software as this remains between shutdowns and can be used to save data. RAM is used to temporarily store data when the CPU is working with it, and generally with more RAM, the faster the computer tends to run. An exception to this is by including more RAM sticks than total RAM occasionally. This means that instead of having 1 16gb RAM stick, you have two 8gb RAM sticks, and this is much faster. For PCs, it is much easier to upgrade and update RAM, whereas for Consoles this is nearly impossible. Recently it has become popular to

store game data in the cloud, where it can be used from any device, allowing for upgrades and changes to the system without fear of losing all progress.

Output
Output refers to the sound and display of a system, and comes in the form of monitors and speakers, or headphones.

Gaming PCs often having gaming monitors in order to accommodate them, often having much higher refresh rates and colour accuracy on the screens. The frames per second (FPS) refers to how many times an image refreshes on a screen in a second, so a 60hz/60FPS monitor will refresh 60 times a second, while a 144hz/144FPS monitor will refresh 144 times a second. The higher this value is, the better, as it leads to smoother gameplay and a less input delay time. Furthermore, there is also screen quality to consider, like 1080p (1080 pixels on the screen) and 4K (1440 pixels on the screen) being the two notable contenders at the moment. The higher this number, the better quality the graphics displayed are.

Input
Input is arguably one of the most important aspects of computer gaming, as without inputs it would be impossible to play at all. Input allows the user to do anything in a game, from moving a character forward, steering a car sideway, and even opening a pause menu is all due to the input.

In computer gaming it is crucial to minimise the time it takes for inputs to register in the game, this is also called input delay. PCs are much faster than consoles when it comes to responding to inputs and outputting them on screens, giving them a competitive edge over their console counterparts.

The difference between keyboard and mouse vs controller is a widely debated topic, however generally keyboard and mouse is harder though it provides an advantage as it allows users to press more buttons than a controller allows, and it is easier to make 'flick' movements with the mouse than a controller joystick.

Recent developments have allowed for input types such as voice and kinetic (physical) movement through voice recognition and body tracking technology, however the market for these kinds of games is very niche and it is unlikely to gain much traction as players typically do not enjoy yelling into their microphones when the voice recognition is not functioning as it should.

There is also touch input that has been developed and is often used in controllers as a game pad in the middle, providing the player with another way to interact in their games, often required to do sweeping motions or specific touches to use this.

Storage
Storage is different from memory as memory is typically used to refer to RAM, while storage specifically means components like hard disk drives and solid-state drives. In the past there also

used to exist optical drives (CDs) and floppy disks, however with the advancements of technology, computers are typically no longer able to accept such storage types without an external adapter such as a CD reader.

Recently hard disk drives have begun to be obsolete, with the focus shifting towards solid-state drives. While hard disk drives included rotating parts physically writing memory onto the disk, SSD writes through a pool of NAND flash, which is made up of floating gate transistors, which is why it is more expensive for the same amount of storage as HDD. This also means that SSD read/write times can be and generally are much faster than HDD.

New technologies

New and emerging technologies for computer games means that there are new platforms for computer games to be played. Some examples this include VR, virtual reality, which in recent years has become a viable possibility with advances in hardware. This means for compute games development, developers now have the option of creating games for VR and expanding their audience base. Furthermore, it has become common for games to be made for both standard devices like PCs and consoles, and also giving VR a separate build. This is proven with games like 'The Elder Scrolls V: Skyrim' and 'The Elder Scrolls V: Skyrim VR'. Another example of this would be the survival horror game 'The Forest', which also has a VR equivalent, 'The Forest VR'.

Another example of new technologies within gaming that have recently come into the limelight is Augmented Reality, or AR. Unlike VR which requires a headset to play and places the user in a mostly virtual environment, AR uses the real time environment and, true to its name, augments reality to enhance the users experience. The best example of this is Pokémon GO, which uses a smartphones camera, gyroscope, clock, and GPS in order to create a location based augmented reality environment for the user to catch Pokémon and battle with gyms.

Software options and their effect on development

When discussing game development and the technology that supports it, software is crucial to talk about as it allows games to be developed in the first place. From the operating system that supports the game engines, to the programming languages the games are written in, all of these choices are equally important and as such, their effect on game development is spans farther than initially assumed.

Operating system

There are many operating systems available for PC gamers, however the primary operating system for playing games is usually Windows. While Windows is more casual, Linux is more much more specialised and generally used by developers. There have been many debates between the two about which is better, however ultimately it all comes down to what is being done on the machine and the users preference for the system. While there are other operating systems other than Windows and Linux, these are not often used, with the exception of Mac OS developed by Apple.

Programming languages

The programming language that a game is written in plays a huge role in development as well, as it often decides the kind of game that is developed. This varies depending on the platform the game is intended to be released for. Currently the dominant language for developing video games is C++, an object-oriented language, used by engines such as Unreal Engine 5 which specializes in developing 3D games. There are other languages available such as C# and Java for video game development, with C# being used in game engines and Java within Android, however C++ remains the most popular after over 30 years of use.

Device drivers

Device drivers are crucial software for running games as they allow hardware to communicate with the operating system and it allows the system to identify what components have been connected to the computer. Device drivers tell the computer, console, or mobile device what hardware is connected and plugged in, and what it is supposed to do.

This is how peripheral (external) devices are connected to the video games, such as monitors and controllers. It is important for device driver software to remain updated in order to ensure that everything is communicating effectively.

Graphic options

Similarly, to device drivers, graphics software is also important as they are the reason why the computer is able to display, create, and edit computer graphics on the screen. Computer systems use APIs (application programming interfaces) to manage tasks related to the software and the GPU. The APIs are largely sets of routines and protocols which make games development easier for the developers. For Microsoft there is DirectX, and OpenGL is an open-source alternative.

Audio options

Finally, there is audio which is another important aspect of software. Within video games, audio plays such a vital role in establishing the ambience and feeling of a game. Through the use of audio, specifically music, in video games, developers are able to evoke feelings from the player that might otherwise be impossible to bring forth.

Music within games can also help to link common themes within the game, such as danger or an enemy attacking by constantly playing a theme during these times. Similarly, sound effects can also be used to teach the player about what effect the actions they are doing have, that being positive and negative effects.

Music files can tend to get quite bulky within the video game due to the large number of sounds that accompanies them, and as such there are a number of file formats that help ensure the games performance is not hindered by the audio files.

Use of game engines and how they aid computer game development

Developing a computer game is a huge task to achieve from scratch, as doing so would include aspects like rendering images to screens manually alongside ordinary tasks like actually programming the game and all of its involved features. Thus, to make games development easier there are specifically designed software for this called game engines. These game engines a mix of designer and programming environments, through creating the graphical assets of the video game, and then using programming to decide how it is all supposed to interact. There are a variety of available game engines from Unreal Engine to Unity.

Rendering engines

The role of the rendering is done by the game engine is one of the crucial roles of the game engine. This is usually done through virtual cameras that can be made to focus on the relevant parts of the game where the player is doing something, such as a first- or third-person camera, or a cinematic camera for cutscenes. The rendering speed of the game depends on the FPS of the monitor and processing speed of the computer speed, and as such the faster the FPS and the faster the rendering. Games that cannot handle the game loaded will run with slower FPS and appear to be lagging.

Physics engines

While developing a game, it is also important to ensure that the physics are developed as well. Due to the fact that a game is completely virtual, even physics has to be manually implemented and programmed, such as gravity and the many other different laws of physics. As a result of this repeated need to do this, most game engines include premade physics so that developers can dedicate more time to making the game and advancing the progress.

Collision detection

Collision detection is equally important in video games, as this is the part of the game where it is possible to have two different objects within in the game interact and collide. For example, in a game without collision detection the player would not even be able to stand on the floor as they would just phase through. A collider can be attached to almost anything and are sometimes invisible, such as when creating invisible world borders so the player cannot leave the playable area. A player will also have a collider however due to the complex shape of players and all the animatable parts, it is more common to have a simple capsule collider for the player, often leading to body parts clipping through walls in-game.

Scripting

In order to actually program how the game works and different features within the game scripting is essential. Even something as turning a flashlight on inside of the game will have a script in order to achieve this. The language scripting takes place in depends on the game engine used, for example Unity has C# and Unreal Engine uses C++.

Animation

Finally, there is animation. Animation is responsible for anything involving making game objects move with a display showing them moving. For example, an object disappearing and reappearing in another location without any effect would not be animation, however if the object slid across the screen then it would likely be animation. Further examples of animation would be a door opening and closing, or a player's character moving his legs while walking.

Comparison on how current and emerging technologies impact games development and the users' requirements and larger expectations

Current and emerging technologies have a huge impact on computer games development alongside changing the users' requirements and larger expectations of the industry. With the introduction of new technology into the scene the games development scene is expected to keep up with the latest technology, leading to users having high expectations when hearing of a game being developed while they are interested in it. An example of games that have had to adapt with the newest technologies would be "The Witcher 4" being developed by CD Projekt Red. With the release of Unreal Engine 5, they decided to make the switch from their proprietary technology REDengine as Unreal Engine 5 was a better fit for them. (Obedkov, 2022)

Current technologies

The current technologies within games development have progressed substantially since their inception from floppy disks and games being limited to simple ideas like Space Invaders. Currently some of the most notable technologies in video games include:

- 3D graphics
- Virtual Reality
- Facial recognition
- Voice recognition

These technologies could not have been imagined over forty years ago when games like Pac-Man and Space Invaders were the highest end games that could be developed with the technology at the time. The technology mentioned above is intentionally vague as some will be discussed deeper below.

Virtual reality

Virtual reality has been at the forefront of the video games industry for a while, as although the software existed for it long before, the hardware that would make this possible has only recently become available and viable for the general public. This has led to a shift in development as it has allowed for games to become accessible to a wider audience, therefore making VR development a profitable option for video games developers. Furthermore, with the increase in VR available it has led to users wanting to experience more and more VR games, setting higher expectations for games development, and overall growing the industry.

There are numerous VR kits out there and just to list some examples of VR technology:

- Meta Quest 2
- HP Reverb G2
- Valve Index
- Sony PlayStation VR

These are just some of many examples of VR technology that has had an impact on game development and user requirements when considering what games to purchase and the larger expectations of the video games industry.

Emerging technologies

As the technology industry grows and the potential customer base is ever expanding, the advancements in technology remain constant and with new and emerging technologies coming out so often it is important to remain up to date in order to understand the latest trends that might arise out of these technologies. It is also important to remain updated as emerging technologies are either the result of user requirements and the larger expectations of the video games industry, such as advancements in the consoles (PlayStation 5 to the next PlayStation), or they are the cause for change in user requirements and larger expectations in the video games industry.

Some examples of emerging technologies that are holding an impact in the video games industry are:

- Advancements in AI
- Augmented reality
- Blockchain gaming
- The Metaverse

Augmented Reality

Arguably the most similar to virtual reality, augmented reality differs from virtual reality by using a mix of real-world elements and "augmenting" them, rather than creating a completely virtual environment as you would with virtual reality, hence the name augmented reality.

Although there have been some examples of augmented reality in the real world that have been popular, most notably Pokémon Go, augmented reality still remains an idea that will be fully exploited in the future.

Other than Pokémon Go, some notable games that use AR are include:

- Zombies, Run! Where the player advances the game by literally running.
- Spirit Camera, where the player defeats ghosts they can see on their screen through the camera.

Although the market for augmented reality games is mostly restricted to mobile devices currently, with the advancements of technology creating lenses that can be used to display images, augmented reality is set to grow and boom. As a result of this advancement and the new market that can be created from this emerging technology, the user requirements for the games they want to be created will shift to this market, similarly to virtual reality, and the larger expectations of the video games industry will shift to have games developed for this technology as well.

It is likely that although these two technologies are similar, they will be made to compete with each other alongside each other and will both have a great impact on computer games development, user requirements within video games, and the larger expectations of the video games industry.

Evaluation

While both current and emerging technologies are crucial when discussing the requirements of the users and the larger expectations of the video games industry, it is necessary to dive deeper and elaborate on how both individually affect the development of computer games and their development and design.

The impact of current technologies on computer games development

Current technologies without a doubt are some of the largest influencers when it comes to designing computer games and deciding what paths to take with development in the future.

Current technologies that impact computer games development to meet the requirements of the user and the larger video games industry include things like consoles, handheld devices (i.e., Nintendo Switch), mobile applications, PCs, and virtual reality. These current technologies in the video games industry are at the forefront of impacts when discussing the impact of current technologies, as they are the most popularized facets of the gaming industry and are therefore highly regarded.

Due to this high regard in the computer games industry, users and the wider computer games industry alike have been influenced by them and has led to an era where video games must be made for these technologies in order to be successful.

As a result of this, the impact of current technology in computer games design and development to meet the requirements of the user and the computer games industry cannot be underestimated and has had major effects on the video games industry.

The impact of emerging technologies on computer games development

Although not as prevalent as current technologies due to their nature of existing in the future, emerging technologies are also of great importance when considering the impact of emerging technologies on computer games development in order to meet the requirements of the users and the computer games industry.

Some of the most important emerging technologies that can and will impact computer games development include augmented reality, advancements with virtual reality, and most importantly the metaverse.

While the true definition of the metaverse cannot yet be defined due to its incomplete nature, its concept and can be explained as a general term for the future of the internet, and therefore the future of video games. With the rebranding of Facebook, and all its subsequent businesses like Instagram and WhatsApp, to "Meta" in order to pursue this idea of the metaverse, it is clear to see that it has had a large impact on industries outside of video games and computer games development, it is only a matter of time before it spreads and computer game development will be focusing on this new technology. (Ravenscraft, 2022)

Through this we can tell that although emerging technologies does not hold as great of an impact as current technologies, the potential they have for the future is endless and their impact once that future arrives will be monumental. Due to this, it can be said that emerging technologies also has a large impact on computer games development to meet the requirements of the user and the computer games industry.

Conclusion

To conclude, while both current and emerging technologies in computer games development are crucial, current technologies currently hold more prevalence due to their nature in the present and instant accessibility rather than an intangible idea that will bear fruit within a few years. Therefore, current technologies such as VR, consoles, handheld gaming devices and PCs, currently have a greater impact on computer games design and development to meet the requirements of the users and the computer games industry over emerging technologies however, within the not-so-distant future, these emerging technologies will become the new current technologies and completely revolutionize the video games industry, among others.

Bibliography

Abramovich, G. (2202, October 9). *Examples of AR in action*. Retrieved from Adobe: https://business.adobe.com/resources/5-realworld-examples-of-augmented-reality-innovation.html

Andrea, H. (2022, September 13). *Tech 21*. Retrieved from Tech 21: https://www.tech21century.com/types-of-computer-video-games/

Fandom. (2022, September 13). *Game Fandom*. Retrieved from Game Fandom: https://gamicus.fandom.com/wiki/1990s_in_video_gaming

Obedkov, E. (2022, August 9). *CD Projekt on switching to Unreal Engine 5: "It's a perfect match for us to use this technology"*. Retrieved from Game World Observer: https://gameworldobserver.com/2022/09/08/cd-projekt-on-switching-to-unreal-engine-5-new-witcher-saga

Ravenscraft, E. (2022, April 25). *What is the metaverse?* Retrieved from Wired: wired.com/story/what-is-the-metaverse/

Stein, S. (2022, September 29). *Best VR Headsets*. Retrieved from CNET: cnet.com/tech/gaming/best-vr-headsets/

Strickland, D. (2022, June 8). *TweakTown*. Retrieved from TweakTown: https://www.tweaktown.com/news/86728/activision-sold-25-million-call-of-duty-games-in-one-year/index.html

Tyler, D. (2022, September 8). *Advances in technology*. Retrieved from Game Designing: https://www.gamedesigning.org/gaming/advances-in-technology/

Wikipedia. (2022, September 13). *Wikipedia*. Retrieved from Wikipedia: https://en.wikipedia.org/wiki/The_Elder_Scrolls

Wirtz, B. (2022, September 22). *Augmented Reality*. Retrieved from Game Designing: https://www.gamedesigning.org/gaming/augmented-reality/