

# Review of Cloud Gaming in the Kingdom of Saudi Arabia

Waed Waleed Al-Abweeny<sup>1</sup>, Nouf Mohammed Almajel<sup>1</sup>, Wiem  
Abdelmonem Ben Khalifa<sup>1</sup>, Amal H. Yaseen<sup>2</sup>

<sup>1</sup>Information Science Department, College of Arts, Imam Abdulrahman Bin Faisal  
University, Dammam, Saudi Arabia.

<sup>2</sup>Mathematics Department, College of Science, Imam Abdulrahman Bin Faisal University,  
Dammam, Saudi Arabia.  
Email: walaboweeny@iau.edu.sa.

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## Abstract

Cloud gaming is a revolutionary way to enjoy the latest games anytime and anywhere without worrying about hardware or software requirements. It's no wonder that many gamers are turning to cloud gaming for access to the best gaming experience available. cloud gaming can be a great way to save money. Many games can be rented for a fraction of the cost of buying them outright. This study examines the history of video games in the world and in the Arab region, focusing on the spread in Saudi Arabia and its transformation into cloud games. Cloud gaming is a revolutionary way to enjoy the latest games anytime and anywhere without worrying about hardware or software requirements. It is no wonder that many gamers are turning to cloud gaming for the best gaming experience available. Cloud gaming can be a great way to save money. Many games can be rented for a fraction of the cost of buying them outright. This study examines the history of video games in the world and the Arab region, with a focus on their spread in the Kingdom of Saudi Arabia and their transformation into cloud games. A set of recommendations were made, such as trying to create a cloud video game platform with an Arab character, which will increase the chances of designing games that fit the Arab-Islamic identity. Telecom companies cooperate with universities in the Kingdom by creating and innovating electronic game platforms that operate on the cloud. Intensifying scientific research that studies the reality of cloud games in the Kingdom of Saudi Arabia to develop solutions to problems and obstacles facing the development of cloud games in the region. Searching for ways to raise the efficiency of the infrastructure of cloud platforms in the Kingdom of Saudi Arabia, which will help the spread of cloud games in the region. Interest in exhibitions and electronic game competitions to attract young talents and exploit them in the development of cloud games.

**Keywords:** Cloud Gaming; Saudi Arabia; Gaming Industry; 5G; Video Game and E-Sport.

## 1. Introduction

Recently the world has seen a significant development in the world of cloud gaming. International and local companies specialized in the field sought to develop their services. Especially after the advent of the fifth generation (5G) network. Which characterized by its high speed in sending, receiving, and downloading data. reducing response time and improving the flexibility of wireless services.

When data transmitted at a speed thousands of times faster than the speed provided by 3G or 4G. Players will not suffer from any slowdown while playing. This will be gone with by an increase in competition during the game. As data will be send at a high and stable speed at the same time. which makes players experience an enjoyable and exciting experience. Playing games today required expensive hardware. The most popular are video game consoles (Xbox, PS4, switch), a gaming PC, or Amazon Fire TV (Android TV) set-top box. With the cloud gaming revolution, expensive hardware is not required. It could play on an old computer or a standard laptop (The Best Cloud Gaming Services for Streaming Video Games, 2020).

The Middle East has seen significant and rapid growth in the gaming market. As capabilities have evolved into playing virtual reality games. Especially in a period during the Corona pandemic. Games have become one of the things that people relied on most to spend their time during the pandemic. Along with the development of the concept and services of cloud gaming so the gaming industry is the biggest beneficiary of the Covid pandemic problem when people began to spend a lot of time at home on their computers, tablets, or smartphones.

In the Arab region, countries classified. According to its population's interest in video games. Egypt at first rank, the United Arab Emirates at second, Saudi Arabia at third, and Iraq forth. According to the YouGov report (Gaming and Esports: The Next Generation, 2020).

The Kingdom of Saudi Arabia is one of the leading countries in the regional gaming industry. witnessing a significant increase in the growth of video games and cloud games. This is through its physical infrastructure prepared and prepared to receive global developments. It considers a large local market. Especially with the presence of many numbers of talents. Prince Mohammed bin Salman's National Strategy for Gaming and E-sports aims to develop the industry and make the Kingdom a global hub by 2030. (His Highness, Chairman of the Board of Directors of the Saudi Electronic Sports Federation: Saudi Arabia Is a Regional Leader in the Electronic Games Industry, 2022).

This study examines the reality of cloud gaming in the Kingdom of Saudi Arabia and its development. It looks at the advantages and disadvantages of transformation, as well as ways to overcome them. The importance of this study is due to the lack of studies on the reality of Saudi Arabia on cloud games. It will review the reality of electronic games since entering the Kingdom and their transformation into cloud games.

We will review several studies that have been concerned with aspects of cloud gaming.

González-Limón and Rodríguez-Ramos quantified scientific activity in cloud gamification technology by analyzing scientific output reported in one of the most relevant databases (WoS).

The bibliographic analysis allowed them to discover and indicate the development of research in cloud gamification and future directions. The article provided the first bibliometric analysis of this topic, useful for generating future research proposals and identifying potential research hotspots. (González-Limón & Rodríguez-Ramos, 2022).

A new enhanced cloud gaming encoding technique was proposed by (Salah et al, 2021) to accelerate motion estimation by up to 32.9% and reduce encoding time by 12.2%. It is applicable to any game object and video encoder, but supporting different type of game objects such as 3D objects may require more research. ("Optimization of Video Cloud Gaming Using Fast HEVC Video Compression Technique," 2021).

The study of Zimmermann, (2021) used a survey and interviews to identify eligible respondents to answer the research gap and identify success factors that facilitate or hinder cloud-gaming usage. The validity and significance of the results are limited due to demographical and psychographic differences, and cloud-gaming-services are only recently considered market-relevant.

Mazhar and Mizher (2020) proposed a fast cloud game coding technology that uses game object information to skip the time-consuming motion estimation process. The proposed method can speed up traffic estimation up to 43% and coding time up to 18%. It can be implemented within any game object and with any video encoder with minimal modifications. However, support for different types of game objects such as 3D objects may need further investigations. ("Efficient Video Encoding Acceleration For Cloud Gaming," 2020).

Laghari et al. (2019) reviews the QoS factors that affect the QoE of cloud gaming, such as bitrate or data rate, frame rate, throughput, packet loss, and delay. It also provides review and analysis of previous cloud gaming models and models based on the QoS of video and network parameters. QoE definitions, design for QoE, study and contextualize utilization, and mobility and challenges are presented to lead to better cloud gaming models.

Babaei et al., (2017) investigated the effect of game situations on players' visual attention maps (visual attention maps). It has been shown that players have similar visual interest maps when they are in the same game condition. A case-based model is proposed to improve the accuracy of drawing visual attention and its effect on stress. The results showed that the proposed model improved the visual attention map prediction by up to 17.4% on average compared to the game attention model.

Cai et al., (2016) provided an overview of cloud gaming research, covering platforms, optimization techniques, and commercial cloud gaming services. It will help readers gain an understanding of the recent developments in this area.

Cai et al., (2016a) classified cloud gaming platforms into three types based on how games are integrated with platforms, reviewed the history of cloud gaming services, and shared our visions into future technologies, business models, and social impacts.

Gaming Anywhere is the first open-source cloud gaming system. presented by (Huang et al. 2014). designed for high extensibility, portability, and reconfigurability. It is efficient, scalable,

adaptable to network conditions, and achieves high responsiveness and streaming quality. It can be used by researchers, game developers, service providers, and end users for setting up cloud gaming testbeds, which will stimulate more research into innovations for cloud gaming systems and applications.

## 2. The evolution history of video games

The history of video games dates to the first cathode ray tube-based missile defense systems in the late 1940's. These programs were later translated into simple games during the 1950s. Through the 1960s, more computer games developed, the gradual increase in sophistication and complexity. Video games differed in various qualities: arcade, mainframe, console, personal computer, and handheld games (2013).

In 1952, a Professor A. Douglas at Cambridge University created the world's first video game (OXO). This game was a tic-tac-toe simulation where the player plays against the computer. In October 1958, American physicist William Higginbotham created the world's second video game - Tennis for Two. The game was a tennis simulator. Russell and colleagues developed Space-war for the DEC PDP-1 computer in 1962.

In 1971 the first arcade video game was Computer Space. which laid the foundation for a new entertainment industry within the United States, Japan, and Europe. Designed by Atari Inc. The idea of the game developed from the game Space-war. This game was the official launch of the video game industry. Galaxy Game was released in 1971, around the same time as Computer Space launched. (Nyitray, 2019) (Neil, 2022).

The Magnavox Odyssey was the first home video game console released in September 1972. Ralph H. Baer developed the idea and developed a prototype with Bill Harrison and Bill Rusch. The American version came with 12 matches and included games such as Table Tennis, Skiing, Simon Says, Hockey, Football, Cat and Mouse, Haunted House, Submarine, Roulette, and States. In November 1972, Pong was created by Allan Alcorn as a training set by Nolan Bushnell and Atari released a home version in 1975. Pong is the first successful video game, and many companies have since produced games like Pong.

In 1973, Atari released Space Race, the first arcade racing video game. It was not successful but inspired Japanese video game developer Taito to make a clone game called Astro Race. Atari made a second attempt at launching a racing game Gran Trak 10 in 1974, designed by Larry Emmons of Cyan. Alan Alcorn then overhauled it and had it ready for wide release in May 1974. The tank designed by Steve Bristow and developed by Lyle Rains was created to move Kee Games away from only producing copies of Atari games. Atari helped make Tank's commercial success.

Gun Fight, released in 1975 by Taito, was the first game to depict combat between humans. It was designed by Tomohiro Nishikado and licensed to Midway for North America. Midway's version used a microprocessor.

In 1977, the market shifted from North America to Japan due to the success of the Nintendo Entertainment System. In 1978, Space Invaders was released as the first major video game in Japan and North America.

In 1979, Galaxian developed and published by Namco as a fixed-shooter video game. The player controls a Galaxip starfighter on a mission to protect Earth from waves of alien. (1970s in Video Gaming - Codex Gamicus - Humanity's Collective. . . , n.d.).

Pac-Man is an arcade game developed by Namco and released in 1980. It is a popular game from its release to the present day. It developed from the traditional dimension to the three-dimensional drawing and designed different games for the character of Pacman, such as Pac-Man World.

In 1981, many games appeared as a Defender that produced by Williams Entertainment, and Nintendo company produced the Donkey Kong game , consisting of only 4 stages, and it considered the first game in both the "Donkey Kong" and "Mario" series of games. And the Frogger game, produced by Sega, and the Galaga game, which is a Shootout-Up game, produced by the Japanese company Namco.

Also in 1982, four new games appeared: Try Game and Robotron: 2084, both produced by Williams Entertainment. Miss Pac-Man is an arcade electronic game developed and published by Namco, Billy and Midway, Miss Pac-Man is a female character after the main character of the game's protagonist, Pac-Man, was a male character. and Hidden hole! game Produced by Activision.

Tetris is a puzzle video game conceived by Alexei Pajitnov in June 1984, while working at the Russian Academy of Sciences in Moscow. Elite is a space trading video game developed by David Braben and Ian Bell and published by Acornsoft in September 1984.

Super Mario Bros. is a 1985 platform video game developed and distributed by Nintendo Entertainment and is the sequel to the 1983 Mario Bros. It released for family computers and the Nintendo Entertainment System in Japan on September 13, 1985, followed by North American versions in October 1985 and European versions in May 1987. The game Gauntlet is a 1985 fantasy-themed hack-and-slash arcade game developed by Atari Games. and noted as being one of the first multiplayer dungeon crawl arcade games.

The Legend of Zelda is a 1986 action-adventure video game by Nintendo, released in North America in 1987 and designed by Shigeru Miyamoto and Takashi Tezuka. It is the intro to The Legend of Zelda series and was the first home game to include an internal battery to save data.

In 1987, Contra is an electronic game produced by Konami, Double Dragon is beat 'em up video game developed by Technōs Japan and distributed by Taito, Punch-Out!! is an electronic boxing game produced by Nintendo Entertainment, and R-Type is a horizontally scrolling shooter arcade video game developed and released by Irem . The player controls a star ship, the R-9 "Arrowhead".

In 1988, a group of games appeared such as Mega Man 2, Ninja Gaiden, and Super Mario Brothers 3. Mega Man 2 is an electronic video game of action and platforms, produced and published by Capcom, and works on several video game systems. Ninja Gaiden is a platform game, produced by Tecmo Corporation, and is the first installment in the Ninja Gaiden series.

Prince of Persia is an action video game developed by Broderbund and designed by Jordan Mechner in 1989. It did not become popular in the Arab world due to the operating system of the game. SimCity is an open-ended city-building video game series designed by Will Wright and published by Maxis in 1989. It became a best-selling computer game and franchise in 2000.

In the decade of the 1990's, the game industry continued as in the past decades developing existing games and producing a series of them, such as the Super Mario gam. which continued to produce versions of it in 1990, 1992 and 1996, and the game The Legend of Zelda, and it had versions in 1991, 1993 and 1998, and new games appeared with a new character such as "Pokémon Red and Blue" and "Star Fox 64" by Nintendo.

New tools have been released since the beginning of the 2000's, such as the Xbox, Xbox 360, and Xbox One, which included many games such as Halo: Combat Evolved, portal, and Batman: Arkham City etc.... Sony's PlayStation 2, PlayStation 3, and PlayStation 4 also included many games, such as Grand Theft Auto: Vice City, Portal2, and Overwatch etc...

We noticed Japanese companies continued to dominate on the market, such as: Sega and Sony with the PlayStation. Although North American and European companies made several attempts. Through the fourth generation of gaming systems, they failed in their attempts in the end. The situation remained the same until the sixth generation of video games. when successful gaming systems from non-Japanese companies began to emerge with Microsoft and the Xbox.

Table (1) show the most popular Cloud Gaming Platforms.

#	Cloud Gaming Platforms	Establishment	Embedded operating system	Owner company	Free Trial Period	Advantages
1	GeForce Now	launched in beta in 2013 and announced on September 30, 2015.	Windows, macOS, Android, iOS, Shield TV, Chromebook, Tizen and WebOS devices	Nvidia	One hour/session	Keep games you purchased if you cancel the service
2	PlayStation Now	announced on January 7, 2014	Windows	Sony	Have Free trial	Over 800 games can be played on PS4 or PC
3	Jump	September 19, 2017	Windows, macOS, Linux	CEO Anthony Palma	14-day free trial	adds new games every month
4	Google Stadia	in late 2019	Games can be streamed directly to the TV without	Google	The service is free for the first two months	Streaming was done perfectly at speeds over 40 Mbps

			additional hardware. Android and computers.			
5	Project xCloud	in late 2019	Android phones and tablets	Microsoft	You can sign up for the preview period	The list includes more than 50 games
6	Shadow	2020	For Windows 7 and later, MacOS 10.10 and later, Ubuntu 18.04 and later, along with Android 5.0+, iOS 11.0+, Android TV and Apple TV	Blade	-	Games and progress can be imported from Steam, Epic, Uplay, Battle.net, Origin, GOG, and many other digital delivery platforms.

### 3. The Evolution of Video games in Arab World

Video games in the Arab world are among the developing industries in the Arab region. which began to appear in Atari and the second generation of video game systems in 1976. There are attempts to develop local Arab games, as some of them met with success. At the beginning of the twenty-first century, Radwan Qasimia and Muhammad Hamza developed two 2D arcade games, Harb 73 and Stone Throwers, which both revolve around the October War and Palestinian uprising. Under the Ashes was the first commercial game in the Arab world and was followed by a sequel, Under Siege.

In 2002, 3D Technologies produced Zoya, an adventure game inspired by the Tomb Raider series, but it failed to achieve its goal. Afkar Media tried to fix this situation by reproducing the game, but its sales reached only about a thousand copies. In 2003, Imaginations produced The Legend of Zord, a fantasy game inspired by Arab history and in 2005, Wadi Bashir, a racing game with Middle Eastern hints. (Video Games in the Arab World, 2020).

Turath the Jordanian company produced a game called Jenin Path of Heroes in 2003. After that, they returned to producing Wild Racing in 2008, which was an animal racing game.

Arab attempts to produce games continued, with Jordanian company Kirkat releasing Desert Masters in 2006 and Egyptian company Khayal producing Bouha in 2007. In 2006, the Lion of Fallujah game was released, talking about the American occupation of Iraq. In 2008, Tariq's Treasure and Musician were released.

The Syrian Joy Box Company founded in 2008 and produced simple games for Al Majd TV. Maktoob began distributing Arabized browser games, including War of Kings in 2008, Damoria in 2009, and Stardoll in the same year. Tahaddi started Arabizing many games, including Legends of Power in 2009, Ragnarok Online, and Crazy Kart in 2009. Game Power 7 launched The Hope of the Korean Peoples in 2009.

Emirates Tahadi Arabized Gaia Heroes in 2010, Falafel Games produced Knights of Glory in 2011, and in 2013 the company launched a version of the game on the iPhone platform. Most of these games were exclusive to the PC platform as well as the browser, due to their wide reach and reasonable prices. Despite the popularity of the PlayStation platform, it was not a target for developers at the time.

Rekaz In the Trail of ibn Battuta was released in 2013 on PlayStation 3, Steam, and other platforms, but it received low reviews. Despite this, the developer produced another game titled Badia, which achieved success and reached the PC Gamer Show. Kirkat Studio started working on Palace of Legends in 2006, and the game was released in 2018 for mobile. Rampling Games Studio also started working on Knights of Light, which tells about the Battle of Qadisiyah.

The Arab region has become an important market for international companies, such as Square Enix, which launched the Tom Reader (Tomb Raider) series of games in 2013. The second title in the series is Rise of the Tom Raider (The Tomb Raider) in 2016, and the third series release Shadow of the Tomb Raider in 2018.

Ubisoft Arabized its games, especially the Assassin's Creed series, starting with Assassin's Creed 4: Black Flag in 2013. In 2015, the company announced the dubbing of Assassin's Creed Syndicate in Arabic, which received mixed reactions. After this game, no other dubbed game in the series has released, and the company has kept translation only until now. (Video Games in the Arab World, 2020).

Sony released Detroit: Toward Humanity with an Egyptian dub in 2018, which criticized for its poor performance and incompatibility with classical preference but praised for its quality.

Battlefield 1 was the first game to launch servers in the Middle East in early 2017, followed by PUBG and Fortnite. PUBG later launched the mobile game PUBG Servers for the Middle East. Fortnite also announced servers in the region.

As for the Arab sports universities. The Tunisian Federation of Electronic Sports in Tunisia obtained a license to operate as a sports university 2018, while the Saudi Federation for Electronic and Intellectual Sports established in 2017. In Syria, the activity ran by the Syrian Electronic Sports Association. The member states of the International Federation of Electronic Games from the Arab world include Egypt, Tunisia, Lebanon, the Kingdom of Saudi Arabia, Syria, and the United Arab Emirates. (Video Games in the Arab World, 2020).

Video game events began to appear in the Arab world in the 2010s, with events such as the Global Game Jam and Run Double Jump. The World Games set a record in Egypt as the most attended global gaming event, followed by other Arab countries such as Algeria, Bahrain, Jordan, Kuwait, Morocco, Saudi Arabia, Sudan, Tunisia, and the UAE.

Video games are not without events or some of them occurring in the Arab region or its vicinity. One of these places is the Levant, which was the scene of events in several video games, including Assassin's Creed, which was taking place during the Third Crusade and its hero, Altaïr Bin Lahad, frequents several cities such as Jerusalem, Damascus, Acre, and Masyaf. since Syria is part of the Levant, it has appeared in several other games such as Uncharted 3: Drake's



Deception, Rise of the Tom Raider, and Zoya - the Syrian game - which takes place in the city of Palmyra. Lebanon also appeared in two Lebanese games, The Special Force and The Special Force 2. Other regions, such as Iraq, appeared in several games, including The Lion of Fallujah and Tom Clancy's Splinter Cell: Conviction.

The Arabian Peninsula featured in many games, such as Battlefield 1, Uncharted 3, and Call of Duty: Black Ops 2. It distinguished by its role in the Great Arab Revolt and the First World War. The UAE government banned the sale of the game Speak Ops: The Line, which featured the city of Dubai, the legend of Zord, the Gulf of Oman, and Egypt. Other games have also featured Egypt, such as Al-Rikaz: In the Trail of ibn Battuta, the Call of Duty 2 game, and the Assassin's Creed Origins game. Libya also appeared in the game Global Ops: Commando Libya.

Arab e-sports activities spread in the Arab world, with PUBG Mobile being the most famous game. Other games such as Fortnite, Dota 2, and League of Legends were also included. Counter Strike: Global Offensive also held tournaments for the Middle East and qualifiers, attracting interest from software or computing companies.

The MOBA Dota 2 and League of Legends games have held many international tournaments, with revenues in the millions. The League of Legends organized a huge tournament for the Middle East in the city of Riyadh, with prizes of two million dollars. The tournament sponsored by Intel Corporation and organized by Riot Games. Tournaments were also organized for Dota 2 in the Middle East, one of which titled "Dota 2 Middle East Battle" with prizes of USD 10,000 and organized by Gamers Hub.

The Counter Strike game is one of the most famous shooting games, having held a tournament in 2006 in Dubai. Its popularity has increased over the years, and companies such as NVIDIA and HP have started to hold tournaments for the Middle East region. The Overwatch game also participates in local tournaments, such as the Arab Community Cup, which has prizes of USD 5,000. In 2018, a tournament held for Tom Clancy's Rainbow Six Siege, sponsored by NVIDIA, with prizes worth 1130 Bahraini dinars.

Battle royale games are popular in the Arab world, with the most famous being PUBG and Fortnite. PUBG held several tournaments for the Middle East, including the "Middle East Challenge Cup", which was available to players from some Gulf countries besides to Egypt and Morocco. This contest sponsored by OPPO. Also, NVIDIA sponsored the Arabian Gulf Championship from PUBG and a Fortnite tournament in Egypt. with prizes worth 30,000 Egyptian pounds.

The E-Sports Summit event in Egypt included PUBG, Fortnite, Apex Legends and FIFA, and held from September 26 to September 28, 2019.

The UAE is working to become the capital of digital games by attracting the best talent and expertise. holding events to attract international companies and hosting the "Insomnia Dubai" electronic games festival.

The Queen of Bahrain is working to benefit from the growth of the mental and electronic sports sector globally. She inaugurated the Bahrain Federation of Mental and Electronic Games and is

keen to support emerging companies and talents. Bahrain is currently on the throne in combat electronic sports, after Sayed Hashem Ahmed Khalil crowned with the bronze medal in the World Championship in the electronic combat game Martial Kombat 11 (Evo 19). Kuwait, the Sultanate of Oman, Tunisia, and Morocco are also interested in localizing digital games and supporting entrepreneurs in this sector.

The Saudi Ministry of Communications and Information Technology estimates that the information technology sector contributes about 4% of the domestic income, with a value of USD 24 billion. Tournaments such as the Riyadh Games Festival and emerging Saudi companies have involved in the development of digital games, which spread locally and regionally. Examples include Abo Khashem, Reunion, Rakaz in the footsteps of Ibn Battuta, and the video game.

Arab countries are competing to localize the digital games industry, led by the Kingdom of Saudi Arabia, which recently signed agreements with parties concerned with digital games globally. This includes the Saudi Federation for Electronic and Intellectual Sports, headed by Prince Faisal bin Bandar bin Sultan bin Abdulaziz and a memorandum of understanding with the "NEOM" company to create a global capital of electronic sports and an international tourist destination.

We noticed that the Arab society remained a consumer until the beginning of the first decade of the twenty-first century. Then the idea of Arabizing global video games spread. The Arab world is one of the recent target markets for global video games. Video game culture is spreading in the Arab world among children and youth. Governments encourage the video game industry as an important source of income.

#### **4. Transfer Kingdom of Saudi Arabia to cloud Gaming**

Cloud gaming is an emerging technology in the gaming industry that allows users to stream high-end games through handheld devices such as laptops, tablets, and mobile phones with fast network connections without regular hardware upgrades. Game consoles/PCs/laptops are not applicable. Expected These factors will positively impact the market growth. Furthermore, the adoption of cloud technology in the gaming industry is expected to drive the demand and participation in multiplayer games for various games and drive market growth over the forecast period.

The Kingdom realized the importance of switching to cloud gaming to achieve and comply with Vision 2030, by exploiting the available resources and developing them to produce platforms and programs based on reviving the economy and raising the level of development and well-being of the Saudi citizen (Infinium Global Research - Research Reports, Consulting, Business, and Industry Analysis, 2021).

The introduction of 5G technology has revolutionized the gaming sector in Saudi Arabia, with the government investing in 5G infrastructure to gain microeconomic benefits.

Microsoft has adopted cloud service technology in its upcoming game Crackdown 3 to enhance the theme of "destruction". This technology will include effects of destruction and large explosions in the online phase of the game, which will not depend on the power of the Xbox One only but will use fake Xbox One devices and special servers. Microsoft adopted the cloud service in Crackdown 3 due to the need for massive and comprehensive destruction, which requires computer processing capacity not available in Xbox One devices. Clouding provided the service.

Sony has also had a share in the magnificence of cloud technology by announcing its new cloud service, PlayStation Now. PlayStation Now is a paid cloud service announced by Sony in 2014. It only supports games for the PlayStation 3, with the possibility of supporting PlayStation 4 games in the future. Users can subscribe to a Subscription service or rent games individually for 4 hours, 7 days, 30 days, or 90 days.

Square Enix is one of the world's largest game development and manufacturing companies, and its new project, Shirna, is based on the idea that network capacity depends on consolidation, not on CPU power. It provides high speed and performance to devices, facilitating synchronization and sharing between players, and this greatly supports the multiplayer phase. It is expected that game industry companies will rely heavily on the Shirna service in their future games, due to the support it will provide for games, especially the large ones.

Saudi Arabia's cloud gaming market is expected to reach USD 30.07 million in 2026 due to the growing penetration of high-speed internet and smart devices, the increasing utilization of gaming as a service and digital transformation, and the increasing popularity of social media platforms, e-sport promotion, and free play modes. However, latency and responsiveness issues may limit the market growth.

## **5. Companies that have shifted to cloud gaming offerings**

### **5.1 Zain Company**

"Zain Saudi Arabia" has announced a partnership with NVIDIA, the leading company in cloud computing. This partnership will enable subscribers of regional telecom companies to enjoy a huge range of cloud games within the fifth generation (5G) and home fiber packages, without the hassle of upgrading their own devices. GeForce NOW is one of the world's leading open cloud gaming platforms from NVIDIA, optimizing the PC gaming ecosystem by streaming from global NVIDIA GPUs. Zain Saudi Arabia has designed an advanced infrastructure that meets the requirements of cloud games, which require very fast transmission of players' commands to servers and quick response transfer to their screens in fractions of a second. Riyadh ranked first among the capitals of the world in the speed of the 5G Internet, which reached an average of 317.3 megabits per second, since the start of its wider 5G network. Since the start of its wider 5G network, which currently covers 51 cities through more than 5,000 towers (Zain KSA Launches GeForce NOW Beta in Saudi, 2021).

NVIDIA's GeForce NOW provides a real-time gaming experience from Zain's game cloud to your mobile, desktop, Mac, SHIELD TV, or Android device. You can log in to your account in

the online store and broadcast your game library or play your favorite games for free using the cloud save service. You can pick up your game from where you left off on any supported device and wherever you are.

## 5.2 STC Company

Cloud infrastructure provider Radian Arc, leading digital enabler stc Group, and gaming platform Blacknut announced the launch of cloud gaming services for millions of customers in Saudi Arabia. stc Group customers can enroll in a subscription or add to their existing plans to access Blacknut's large library of over 500 premium games directly on their mobile and tablet devices. This partnership allows stc Group to offer AAA gaming experiences at modest costs like traditional video game platforms (Sharma, 2023).

The partnership aimed to make cloud gaming more affordable and accessible to all audiences in Saudi Arabia, improving the cost and quality of gaming experiences for many stc customers. To do this, the partnership is developing a gaming structure to enhance the experience for e-gamers.

## 5.3 Mobily Company

Mobily Gamers has partnered with D11 gaming to create a gaming and esports platform. D11 will provide and manage a customized gaming ecosystem solution for multi-platform gaming, including casual, AR, VR, Cloud, esports and all related aspects. Mobily has taken the initiative to cater to this segment by collaborating with D11 Gaming (Press Release, 2023).

## 6. Conclusion and Recommendations

Cloud gaming is the new way of playing video games by streaming them over the internet onto a PC, smartphone, tablet, or smart TV. It is a great way to save money and access hundreds of games for a fraction of the cost of buying a console or a gaming PC. It is also convenient and easy to access, as all you need is a good internet connection and a library of games. Cloud gaming is the perfect way to get your gaming fix without investing in expensive hardware. Saudi Arabia is the largest gaming market in the Gulf, with USD1 billion in 2021 and expected to reach USD6.8 billion by 2030. UAE and Egypt are the next regional competitors, with USD520 million and USD172 million in 2021 respectively. Combined, they are forecast to generate USD3.1 billion in total gaming revenue by 2025. Vision 2030 seeks to diversify the economy away from hydrocarbon revenue by investing in nontraditional sources of revenue.

Saudi Arabia is investing in gaming and esports to take advantage of the fast-growing global industry and enhance its international reputation. With strong support from the state, Saudi gamers are encouraged to increase their participation and interact with global counterparts, enhancing the impact of gaming on Saudi youth culture. The gaming industry is likely to benefit from increased support from the government, greater participation from citizens and residents, and greater interest from private companies over the coming years. After reviewing the reality of cloud games in the Kingdom of Saudi Arabia, we recommend the following:

1. Trying to create a cloud video game platform with an Arab character, which will increase the chances of designing games that fit the Arab-Islamic identity.
2. Telecom companies cooperate with universities in the Kingdom by creating and inventing electronic game platforms that operate on the cloud, as universities are a fertile environment for innovation and invention.
3. Intensifying scientific research that studies the reality of cloud games in the Kingdom of Saudi Arabia to develop solutions to problems and obstacles facing the development of cloud games in the region.
4. Searching for ways to raise the efficiency of the infrastructure of cloud platforms in the Kingdom of Saudi Arabia, which will help the spread of cloud games in the region more widely, as it has become a source of income.
5. Interest in exhibitions and electronic game competitions to attract young talents and exploit them in the development of cloud games

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