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국내 클라우드 게이밍 서비스의 비즈니스 모델에 대한 사례연구

박 재 영◆, 김 성 철°

A Case Study on Business Models of Cloud Gaming Services in Korea

Jaeyoung Park◆, Seongcheol Kim°

요 약

5G 이동통신 서비스가 상용화되면서 막대한 규모의 5G 네트워크 투자를 정당화할 수 있는 킬러 서비스에 대한 관심이 높아지고 있다. 클라우드 게임이 5G 네트워크의 킬러 서비스로 주목받고 있는 가운데 클라우드 게임 시장은 주요 IT 기업들이 진입하며 빠르게 성장할 것으로 기대가 되지만 클라우드 게임의 비즈니스 모델에 대한 연구는 지금까지 거의 수행되지 않았다. 본 연구는 한국에서 운영되고 있는 클라우드 게이밍 서비스의 비즈니스 모델이 어떻게 개발되어 구현되고 있는지를 체계적으로 분석하는 것을 그 목적으로 한다. 이를 위해 우리나라가 보유한 최고의 5G 환경에서 운영되고 있는 세 개의 클라우드 게이밍 서비스를 대상으로 사례연구를 진행했다. 선정된 세 개 사례의 비즈니스 모델을 체계적으로 분석하기 위해 본 연구는 문헌연구와 관련 전문가 인터뷰를 활용하여 자료를 수집했고 고객 가치 제안, 수익 공식, 핵심 자원, 핵심 프로세스라는 네 개의 요소로 구성된 비즈니스 모델 개념을 분석의 틀로 활용했다. 본 연구의 결과에 따르면 다수의 게임을 보유한 GeForce Now와 Xbox Cloud Gaming이 KT의 GameBox에 비해 우세한 가운데 특히 Microsoft의 Xbox Cloud Gaming은 차별화된 맞춤형 게임 콘텐츠를 제공함으로써 가장 높은 가격에도 불구하고 성공할 가능성이 큰 것으로 판단된다.

키워드 : 클라우드 게이밍, 5세대 이동통신, 비즈니스 모델, 게임 산업, 사례연구
Key Words : Cloud gaming, 5G, Business model, Game industry, Case study

ABSTRACT

Cloud gaming is expected to be an increasingly significant service, which will justify an enormous investment for building out 5G networks. Even though major information technology (IT) companies pay attention to cloud gaming services, there are only a few studies on the business models of cloud gaming services. Therefore, this study aims to analyze how well business models of cloud gaming services have been developed and implemented in this growing market. As such, a case study of three cloud gaming services was conducted in Korea, where 5G service was firstly commercialized in the world. Data were collected via literature surveys and interviews with seven experts. Additionally, a specific business model framework, which consists of four elements (i.e., customer value proposition, profit formula, key resources, and key processes), is applied to the case study. Our results showed that NVIDIA's GeForce Now and Microsoft's Xbox Cloud Gaming are expected to prevail in the market, while KT's GameBox is in a relatively weak position. In addition, Xbox Cloud Gaming has a relative advantage of supplying differentiated games despite its high price.

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◆ First author : School of Media and Communication, Korea University. pjyvw@korea.ac.kr, 학생회원
° Corresponding author : School of Media and Communication, Korea University. hiddentrees@korea.ac.kr, 종신회원
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Ⅰ. Introduction

The network evolution has paved a new path for new media business. This path begins with the adoption of new technology and with an innovative business model[1]. In particular, because most new media businesses are based on the Internet, their dependence on the network is undeniable. In this context, the introduction of the 5th generation network (5G) has enabled businesses to explore new opportunities. The 5G is theoretically twenty times faster than 4G; it is one-tenth less delayed while it simultaneously provides service for ten times more devices[2]. This means that the commercialization of the 5G network would help new media businesses enjoy faster Internet speed, lower latency, and more connectivity—all of which were not possible in a 4G network environment. As such, the game industry naturally pays strong attention to cloud gaming, which is an innovative service, may become a reality thanks to the spread of 5G[3].

Cloud gaming is regarded as innovative because of its unique advantages, which come from the differentiated and distinct gaming process of cloud gaming. In a cloud gaming situation, games are placed in the remote cloud, instead of on players' devices. Additionally, players' commands are delivered to the cloud, where they are then processed. After the in-game process (occurring in the cloud), videos corresponding to players' gameplay are then provided to players simultaneously. Furthermore, because games are stored in a remote cloud—instead of on personal devices—players can enjoy high-end games regardless of their devices' specifications. Not only this, but also game developers can manage and enhance games more conveniently. Accordingly, cloud computing technology providers may also garner new business opportunities in the game industry[4]. However, cloud gaming can guarantee a high-quality gaming experience only when the transmission of players' commands, the processing of game signals, and the streaming of game videos are concurrent. Thus, building a high-speed network and reducing input lag are essential for cloud gaming. Therefore, the advent of the 5G network has the capacity to change cloud gaming from simply a technological possibility to market reality.

The cloud gaming market has grown considerably since 2019, when 5G was first introduced. According to Newzoo[5], global cloud gaming market revenues are expected to increase from $356 million (U.S.) in 2020 to $3.2 billion by the end of 2023. Notably, despite the strong growth potential of the market, there are few academic studies on cloud gaming from a business perspective. To fill this gap, this study aims to analyze how well the business models of cloud gaming services have been developed and implemented in this growing market. Additionally, this study offers insight into how current business models can be enhanced and made more efficacious. As such, this paper conducted a case study of three cloud gaming services in Korea. First, data were collected via a literature survey and interviews with experts. Then, a specific framework of business model, which consisted of four elements (i.e., customer value proposition, profit formula, key resources, and key processes) was applied to the case study.

This study chose the Korean cloud gaming market as an important target. First of all, Korea launched the first commercial 5G service in the world in April 2019. According to the Ministry of Science and ICT[6], 5G service subscribers in Korea reached over 15.84 million in May 2021. In fact, Korea has the most advanced 5G network in the world, and it is now the front runner in offering 5G service. In addition, Korean companies are doing well in the global gaming market. For example, in 2020, the Korean gaming industry earned $6.56 billion, thus ranking fourth in the world's gaming industry by gaming revenues[7]. As such, Korea, because of its 5G infrastructure and its competitiveness in the gaming industry, is therefore the ideal location for exploring cloud gaming services. Furthermore, it must be noted that major IT companies (including Microsoft) selected Korea as the first Asian country to launch their cloud gaming service[8].

Ⅱ. Literature Review

2.1 Cloud Gaming

Cloud gaming is a cutting-edge way of gaming and is distinguished from the conventional gaming approach in that it separates the role of the player's thin client from that of cloud-based servers. In cloud gaming, a system collects a player's command and delivers it to the cloud server, converts the command into an in-game interaction, renders the interaction, encodes the rendered action into video, and then streams the video back to a player's device[9]. The thin client is in charge of the action's beginning and end, but all the intermediate stages of actual in-game processes take place in the cloud. (See Figure 1, which illustrates the cloud gaming system.) This process benefits traditional stakeholders in the game industry, such as gamers and game developers, but now, also service providers—who had been outsiders before. For gamers, the benefit is they can play anywhere, anytime, with any device—regardless of the game's quality. As for game developers, they can directly connect to gamers without retailers, which increases overall profits. Better yet, games are not hardware installed by individual gamers; this can prevent piracy. Service providers, the new stakeholders in the industry, can demonstrate the potential of the cloud-based remote game business with already-deployed cloud resources[4]. In summation: cloud gaming embraces more consumers, solves chronic problems within the game market, and expands the game industry to new technological areas beyond the traditional game market. As such, cloud gaming means innovation in the game industry, rather than simple changes to the traditional gaming system.

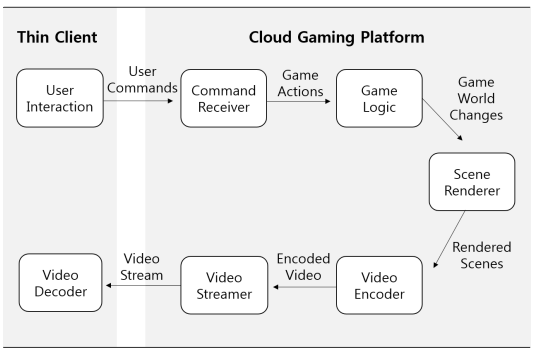

Fig. 1. Framework of a cloud gaming system[4]

However, cloud gaming is not a brand-new concept. In the late 2000s, startups such as OnLive and GaiKai launched cloud gaming services[10]. Although Ross[11] first introduced cloud gaming as viable and important content for cloud computing technology in 2009, cloud gaming was not yet a feasible service because of low-quality network infrastructure. Because cloud gaming is processed remotely instead of operating as downloaded programs on a single device, 5G—with its incredible speed, low latency, and hyper-connectivity—is essential.

Notably, major IT companies have entered the cloud gaming market because cloud gaming is in a new phase, now that the first 5G service was launched in 2019. Google's Stadia, NVIDIA's GeForce Now, Microsoft's Xbox Cloud Gaming, and Amazon's Luna are examples of cloud gaming services launched by IT giants[12]. Naturally, because Korea led the world's first commercialization of 5G service, it also stands out in the cloud gaming market. For example, SK Telecom introduced Microsoft's Xbox Cloud Gaming, LG Uplus introduced NVIDIA's GeForce Now, and KT introduced its own subscribed cloud gaming service[13]. However, as more and more players compete in the market, it is unclear which one will lead the Korean cloud gaming market.

2.2. Previous research on cloud gaming business model

Previous studies focused on the technological challenges facing cloud gaming as a viable industry. For instance, several studies deal with optimization techniques for cloud servers[14] or strategies for efficient data transmission between cloud servers and thin clients[15,16]. Then, to this body of research, user experience of cloud gaming was added[17,18]. However, the analysis of cloud gaming services, approached from a business model perspective, is limited because cloud gaming has only just now

begun to be recognized as a promising market.

Business models are of crucial concern to every commercialized service because they are so closely related to corporate performance. Ojala and Tryvainen[19], in particular, stand out as two people who were interested in cloud gaming business models at an early stage. They selected G-cluster, one of the famous starter companies of cloud gaming, as the subject of their case study and analyzed changes to G-cluster's business models over five years, from 2005 to 2010. They found that the business model was simplified, and that intermediate retailers had been reduced, which led to increased profits. Also, they concluded that game piracy is impossible in the cloud gaming system. However, because they analyzed only one service – and the cloud service was itself in its early stage of development – the study's results covered the general advantages of cloud gaming rather than analyzing a business model to find factors that affect the performance of the company. Another study, conducted by Moreno and his colleagues, explored another business model of cloud gaming in four detailed domains[20]. However, the paper only proposed a possible business model for the Kusanagi project, an end-to-end cloud gaming infrastructure, instead of analyzing actual business models of operating services. Recently, a study entitled "Competitive advantage elements in the global cloud game market" which focuses on the cloud gaming market strategy, has been published just as the cloud gaming market has begun to grow quickly[21]. This study suggested competitive advantage elements in the global cloud gaming market via the actual cases. Yet, the paper does not specifically analyze or compare business models of individual cloud gaming services; rather, it focuses on current cloud gaming services, and uses them to illustrate each's competitive advantage over the other.

Thus, this paper seeks to rectify the lack of business model-oriented research on cloud gaming, an oversight that seems odd, given how rapidly the cloud gaming market has been growing. Therefore, this case study provides a meaningful analysis of business models of existing cloud gaming services in Korea.

2.3 Business model framework

By way of definition, a business model is a strategical method employed by a company as a longitudinal choice or a plan[22]. An innovative business model, for example, is essential for new media, such as cloud gaming, because new media are a complex business system that combines new technologies, new business models, and new social systems[23]. This paper adopted the business model framework developed by Johnson, Christensen, and Kagermann because their framework might be the most suitable for analyzing business models of emerging cloud gaming services[24]. For example, based on the literature analysis of new media companies' performances[25], Kim revised their business model framework, and then applied it to the more dynamic and innovative new media market environment.

Their framework consists of four elements: customer value proposition (CVP), profit formula, key resources, and key processes. Each element is described below.

CVP, the first element of this business model, is the proposition that targets fulfilling customer demands, which had been left unsatisfied before the service's launch. A core value of the framework is the belief that a successful service creates its value to attract customers with unmet needs. Secondly, profit formula is a system by which the service produces profit based on the price, costs, and margins of the service. This concept includes revenue model, cost structure, margin model, and resource velocity. Thirdly, key resources indicate available assets for developing the service. Assets include people, channels, products, facilities, equipment, and diverse resources that help to deliver value. Finally, the last element is key processes, which describe the service's operational and managerial systems.

Both CVP and the profit formula closely relate to the way in which the service defines its distinctive value. Key resources and processes are responsible for the delivery of that value. Accordingly, these

four highly interdependent elements of the business model framework will affect the success of the service.

Ⅲ. Methodology

This study conducted a case study based on GeForce Now, Xbox Cloud Gaming, and GameBox, three cloud gaming services that are currently applicable in the Korean market. Because the business model of new media is a complex topic, and is affected by many factors, a case study that allows researchers to derive the comprehensive implications for further studies is an appropriate contribution to the field[21,26]. In particular, cloud gaming—a target new media of this study—has a short history; as such, it is difficult to apply an empirical analysis with real data. The methodological approach of employing the case study approach can be justified if the cases being targeted are unique, yet representative[27]. GeForce Now, Xbox Cloud Gaming, and GameBox are cloud gaming services currently available in Korea, a country unique because it has become the best testing site for cloud gaming services. Furthermore, these three services can be considered to be ideal cases for analyzing the early-stage business model of cloud gaming services.

Additionally, secondary data were collected for case studies. The main sources of data were related academic papers, company websites, press releases, reports, and newspaper and magazine articles. For the systematic analysis of each case, the business model framework designed by Johnson et al.[24] was used. Utilizing their framework made it possible to select the best data for the case studies, and to organize complex factors effectively[26].

Interviews provided another resource for collecting data. These interviews were conducted with seven game experts, including five designers, engineers, and marketing experts working at major Korean game companies. Two researchers that specialize in the game industry were also interviewed.

Each interviewee answered questions about the three services, and they did so based on their experience as game industry practitioners or researchers. Afterward, the answers were then organized based on the business model of Johnson et al[24]. (Table 1 provides an overview of the seven interviewees, and the interviewee number is recorded as a reference for the case study.)

Table 1. Overview of the seven interviewees

Type	Practitioner					Researcher	
Job	Game Designer		Game Engineer		Game Marketing Expert	Game Industry Academic Researcher	
Interviewee Number	1	2	3	4	5	6	7

Ⅳ. Case Studies

4.1 Profiles of three case services

GeForce Now is the service maintained by NVIDIA, which is a major multinational technology corporation located in the United States. NVIDIA entered the game industry as a device developer. The matchless product of NVIDIA is its graphics processing units (GPUs) for gaming and other high-quality graphic processing (which is called 'GeForce'). In particular, NVIDIA expanded its reach in the gaming industry by officially launching its cloud gaming service, 'GeForce Now,' on February 4, 2020 (after its beta service). Officially, GeForce Now was unveiled in Korea on the same day through a collaboration with LG Uplus, a local internet service provider (ISP). Additionally, NVIDIA unveiled performance of cloud gaming service in February 2021—one full year after it had already been offering the service. According to the announcement, various games had already been streamed for more than 155 million hours through GeForce Now, and more than 130 million game scenes had been recorded with the 'NVIDIA Highlights' function[28].

Xbox Cloud Gaming, which is Microsoft's cloud gaming service, offered its service worldwide—including Korea—on September 15, 2020. Microsoft selected SKT for its network partner to enter into

the Korean market. It is widely known that, since 2001, Microsoft has been a global leader in the video game market, largely because of the success of its console, the Xbox. Along with console development, Xbox aggressively acquired game developers, such as Bungie and Ensemble Studios, to gain a competitive edge over hardware. As a result, Microsoft reported that its revenue from the third quarter of 2021 was $41.7 billion[29] (19 percent higher than the former quarter). Xbox and cloud-related services strongly contribute to Microsoft's revenue increase. In fact, Xbox Cloud Gaming is a combination of Microsoft's two primary values of offering gaming and cloud-related services. With Xbox Cloud Gaming, Microsoft truly offers a new way of game distribution, playing, and sharing.

Of the three, GameBox is the only cloud gaming service managed by a local Korean player, KT. KT officially launched GameBox on August 12, 2020, and, among the three internet service providers in Korea, KT is the only one that has independently developed cloud gaming services (instead of supporting other global services). KT's profit, in the second quarter of this year, was KRW 410 billion, up 19.92 percent, compared to the same period of last year[30]. This is seen as a result of the increase in the number of its 5G subscribers, who pay more than 4G mobile network users. Additionally, these subscribers may become potential customers of cloud gaming services. Finally, KT is strengthening the foundation of its cloud gaming service by opening a 5G standalone service (which handles data only with 5G, without using the 4G mobile network) on July 15, 2021. Below, Table 2 summarizes the profiles of GeForce Now, Xbox Cloud Gaming, and GameBox.

Table 2. Profiles of three case services

	GeForce Now		Xbox Cloud Gaming	GameBox
Official Launch Date	2020.02.04		2020.09.15	2020.08.12
Service Provider	NVIDIA		Microsoft	KT
Network Partner	LG U+		SKT	KT
Type	Basic	Premium	Ultimate	One-type Voucher
Subscription fee (KRW)	Free	12,900	16,700	9,900
Content Library	400+		150+	130+
Age limit	18+		all	15+
Available Country	71		22	1
Available Channel	Mobile: Android/iOS		Mobile: Android/iOS	Mobile: Android
	PC: Windows/ Mac OS		PC: Windows/ Mac OS	PC: Windows
	IPTV: U+tv UHD2/3, U+tv Free2		Xbox console	IPTV: Gigagenie 1, 2

4.2 Business model analysis

To suggest the insights for the cloud gaming market, which is in its early stage of development, the business model of three available services in Korea (i.e., GeForce Now, Xbox Cloud Gaming, and GameBox) are analyzed. As a framework for analysis, four components (i.e., CVP, profit formula, key resources, and key processes) of the business model presented by Johnson et al.[24] were adopted.

4.2.1 CVP

Inherent to CVP is the belief that a good business model must begin by meeting the unmet needs of the target market. To discover the distinctive value of each service, this paper primarily categorized the potential customers of cloud gaming according to their unmet demands. The first category is existing video game users that have their own devices. This type of user has a device customized for gaming—which is also called a console—but the number of games that can be played is limited, which gives rise to their primary dissatisfaction: players need to buy every game they want to play which is caused by the feature of the consoles themselves. Therefore, the first type of players indicates are of people who want to play more games with the console they possess, but without an extra fee. The second type is users who cannot play games at all because they

do not have high-performance devices. Notably, they are not the customer of the conventional computer game market. Players need to install the game files on their devices to enjoy the traditional games and, in this case, the quality of the hardware is closely related to the number of games it is possible for them to play. Cloud gaming services can solve this problem by handling games in an advanced cloud server. Hence, type two includes newly identified consumers who want to play games with their low-performance devices, such as mobile phones, as cloud gaming developed (Interviewee 6). The last type of potential customer is marked by the older generation of game users; these are people who cannot freely play games due to social, economic, or temporal reasons[21]. Until now, this group has been the most excluded user in the game market. Due to their busy daily lives, they feel it is too difficult to make time to play games in earnest; sometimes they feel the games available are too unfamiliar. Therefore, games that require either a lot of concentration or a comprehensive investment (such as a new or dedicated device) are not suitable for this group. Users who refer to type three expect to play games anywhere, anytime, with any device, and during a short window of free time. Three services appeal to different types of potential users, and do so depending on the individual characteristics of each service.

GeForce Now has the largest PC game library (more than 400 PC games available). The reason why people can enjoy such a large number of games is that GeForce Now can be linked with major game platforms, such as Steam of Valve, Origin of EA, Battle.net of Blizzard, and Epic Games Store of Epic Games. Although there is a limitation, in that it does not develop games directly, GeForce Now has attained many game titles through active cooperation with game developers (Interviewee 5). This specific advantage of GeForce Now, namely that many games can be enjoyed without being limited by the device, would be a great temptation for type two users who want to play high-quality games with low-function devices.

Xbox Cloud Gaming's key strength pertains to games played with consoles, since the origin of cloud service is in Microsoft's Xbox video games itself (Interviewee 2). Xbox Cloud Gaming provides exclusive games, which are only offered as individual Xbox video game packs. While GeForce Now attracts users with quantitative excellence, Xbox Cloud Gaming puts weight on the qualitative value of the service by displaying exclusive console games. Because it is critical to have attractive games made especially for cloud gaming services, Microsoft's Xbox customized games offer key advantages (Interviewee 4). This distinctive advantage of the service captivates type one users who have consoles, but who are also bored by the limited number of games they can play.

Notably, GameBox started from a different point than the other two services. While the other services are maintained by global players, GameBox is operated by a local Korean network provider. As such, GameBox should utilize network subscribers of KT who have relatively high accessibility to the cloud gaming service due to a lack of KT's experience and awareness in the game industry (Interviewee 3). Therefore, KT should choose a strategy to convert its local subscribers to GameBox users. Even though the quantity and quality of GameBox's game library are relatively lower than the other two services, GameBox has lowered the entry barriers for KT users via active discount promotion strategies in the early period of service release. Therefore, GameBox would be attractive to type three users, those who have less experience with games and want to experience games in a more casual manner.

In summary, type two, those who would respond positively to a higher total number of games, will opt for GeForce Now; type one, who values

Strong in Type 2 ⬆	Strong in Type 1 ⬆	Strong in Type 3 ⬆
GeForce NOW	**Xbox Game Cloud Gaming**	**GameBox**
Provide the largest number (400+) of PC games, but higher price for SKT, KT users	Provide exclusive games which only available in Xbox console before	Lower entry barriers for KT users, but lacking in qualified contents

Fig. 2. Degree of value proposition to each consumer type

exclusive high-quality games, will prefer Xbox Cloud Gaming; and type three, those who want to play games more casually, will choose GameBox to fulfill their unmet desire. (See Figure 2, which shows the relationship between consumer type and each service.)

4.2.2 Profit formula

The profit formula indicates that having a proper profit structure is important for the sustainability of a business, and in Korea, every service available is managed based on a subscription fee. The subscription pass consists of two types for GeForce Now: a basic pass and a premium pass, and each pass is divided by price. The basic pass is free for every user, including SKT and KT network users, but the number of opened games or the allowed time of playing is limited. The premium pass is KRW 12,900, which is a medium-level price among the three services. GeForce Now maintained profit by utilizing the free pass as a hook for users who are interested in the service but were not yet sure about paying for the cloud gaming service. By supplying a free trial, GeForce Now lowered the entry barrier, which then led some of them to subscribe for the full service.

Xbox Cloud Gaming is the upgraded version of the online gaming pass of Xbox service. The pass is called the “ultimate pass” and it costs KRW 16,700, which is the highest price among the three services. However, because it is easier to lead lower-level pass subscribers to upgrade their subscription to the ultimate pass, the service depends on the positive reactions of existing subscribers—who love gaming and have experience of paying for the subscription—to increase the profit of the service.

GameBox provides the lowest-cost service, at KRW 9,900. Notably, this price can be lower than the others because KT is less responsible for the game license fee as a cost. For example, GameBox does not possess a large or exclusive game library, like the other two services do, but they can appeal to users who care about price the most. Furthermore, a large number of KT users easily encounter GameBox as their first cloud gaming service because diverse discount promotion is offered to them.

In summation: every service selected subscription-based profit formula as its main structure, but the strategy (including price) is differentiated to harmonize with the feature of each service (Table 3 is the organized table of profit formula for each service). However, it is also important to note that there was a common opinion among experts that the market is still too early to evaluate the cost-effectiveness of subscription fees (Interviewee 2 to 7). In fact, they emphasized that it was not the number of games, but the attractiveness of compelling titles, that would be the rational criteria for determining an appropriate subscription fee. They assumed that gamers would pay for a

Table 3. Profit formula for each service

	GeForce Now		Xbox Cloud Gaming	GameBox
Type	Basic	Premium	Ultimate	One-type Voucher
Price (KRW)	Free	12,900	16,700	9,900
Profit Formula	Free + Subscription		Subscription: Extra service for existing subscribers but the highest in price	Subscription: The lowest subscription fee for any kind of network users
Strategy	Limited version of service in free - A hook for users who have interested on GeForce Now - Low entry barrier		Extra service for existing subscription choice - Easy to lead lower-level subscribers to upgrade - Advantageous for user acquisition	Low price & Existing KT users - Less responsible for game license fee - Appealing to price sensitive users - Large number of KT users are relatively easy to encounter it as the first cloud gaming service

service offering a few good games, rather than a service with many games, but without engaging titles. Additionally, they added that network and cloud technologies that can build a qualified gaming experience are the top priority.

4.2.3 Key resources

Key resources that GeForce Now has are its game graphic processing technology and a game library. GeForce Now is the cloud gaming service of NVIDIA, which is a company that designs devices, such as GPUs. Even the name of the cloud gaming service—GeForce Now—follows the label of NVIDIA's primary line GPU, 'GeForce'. GeForce Now has established a game processing system with top-level graphic processing technology in a cloud server that provides high-quality game videos (Interviewee 1). Furthermore, its core asset is that it offers the largest volume of the game library; notably, this is closely related to the service's CVP.

In contrast, Xbox Cloud Gaming holds cloud computing technology and Xbox console games as its key resources. In fact, Microsoft, the service provider of Xbox Cloud Gaming, is famous for its advanced cloud computing technology, Azure. In addition, Microsoft has been actively taking over various game developers to establish an exclusive game library for Xbox for 20 years. Finally, Microsoft has continued to invest in cloud technology and game titles based on its capital strength (Interviewee 3). Thus, Xbox Cloud Gaming has overall key resources related to cloud gaming: cloud as infrastructure and game as content.

GameBox, in comparison, owns a leading asset for the network structure. Unlike the global players, who collaborate with local internet service providers to enter the Korean market, only KT has direct ownership of 5G network structures, which is essential for cloud gaming. Furthermore, interviewees have predicted that there are advantages to having its network in the process of maintaining the cloud gaming service. In particular, five out of seven interviewees said that the most important resource in cloud gaming is the 5G environment (Interviewee 1, 3, 4, 6, 7). However, they also pointed out that KT has less experience in the game industry than either NVIDIA or Microsoft, and they criticized KT for not having strength in key resources beyond networks.

In summary, GeForce Now is strong for game streaming quality and game library. Xbox Cloud gaming has strength in its cloud computing technology, cloud server deployment, and exclusive game library. While GameBox has differentiated itself by owning the competitive edge of network infrastructure. Although global service developers can present cloud computing, or gaming technology and content diversity, as their competitive resources, a local service provider can only offer a 5G network operator as theirs (Table 4 illustrates key resources of each service).

4.2.4 Key processes

Key processes focus on how global and local players operate their services in the Korean market. Global service providers collaborate with Korean Internet service providers (ISPs) to get into the Korean market efficiently. For instance, GeForce

Table 4. Key resources of each service

Origin	Global		Local
Service Provider	Nvidia: Device designing company esp. GPUs	Microsoft: Software and hardware company	KT: Network company
Service	GeForce Now	Xbox Cloud Gaming	GameBox
Key Resources	High-level Graphic Processor Unit The largest game library by linking with major game platforms	Advanced cloud computing technology Xbox console games	Direct ownership for 5G network
Strength	Game Streaming Quality Game Library	Cloud Server Deployment Exclusive Game Library	Network Service

Table 5. Key process partners for each service

Origin	Global		Local
Service	GeForce Now	Xbox Cloud Gaming	GameBox
Key Process Partner	Servicing with local network partner LG Uplus	Servicing with the biggest local network partner SKT	Only conducting local business

Now cooperates with LG Uplus and Xbox Cloud Gaming works with SKT (the biggest local network provider). Because the network is the core infrastructure for cloud gaming services, it is inevitable that providers who do not possess network structure will find network partners. GameBox, by contrast, was developed by a local network provider, so it does not need to find a local process partner. However, this can also make it hard for them to expand their service globally (Table 5 describes key process partners for each service).

In addition, the Korean government's defensive attitude toward foreign services—including cloud gaming—was predicted (Interviewee 7) as a challenge for global players' servicing process. Even though global players cooperate with domestic Korean network operators, various regulations could limit the operation of the services, especially as the popularity of cloud gaming increases. However, some experts also pointed out that it is still too early to worry about this problem. For now, it is more important to grow the market so that the cloud gaming service itself can be successful (Interviewee 6,7).

V. Discussion and Conclusion

This paper analyzed four elements that comprise the business model framework introduced by Johnson et al.[24] of three cloud gaming services in the Korean market. This study found that each service fulfills customers' different unmet needs on the CVP side. Users who want to play games with their low-performance devices—such as mobile phones—may prefer GeForce Now, which provides a large library of games. Xbox Cloud Gaming will satisfy players by supplying exclusive console games through the cloud for those who want to play more games with the console they already own, without extra purchasing costs. GameBox will be the favored choice, with its low entry barriers, for consumers who want to play games anywhere, anytime, and with any device—and want to do so in a casual manner. The subscription fees, in increasing order of expense, are as follows: GameBox, GeForce Now, and Xbox Cloud Gaming. The profit structure strategy of each is closely related to the target of each service, since CVP and profit formula address how to define the value of the service. Key resources and processes are largely decided by the origin of service providers. The two global services under consideration here, GeForce Now and Xbox Cloud Gaming, both possess advanced technology and content repository. As such, they can compensate for their more limited understanding and shortage of network infrastructure in the local market by finding local partners. A local service, by contrast, takes advantage of the network itself and network users as its central resources, thus compensating for this weakness. Cloud gaming services, which are still in their early stage, are largely controlled by technology. This is why KT—which has the strength in the network—can compete with global companies despite its relative lack of experience in the game industry. However, technology alone cannot lead to business sustainability. Therefore, GeForce Now and Xbox Cloud Gaming, which have the largest repository of games, are expected to prevail. In addition, Microsoft's Xbox Cloud Gaming, which focuses on console-tailored games, has a relative advantage despite its high price. However, if KT expands its content and GeForce Now focuses on the quality of its game library, the winner in this competition can change. (See Table 6, which summarizes the result of this study.)

The result of this study indicates that a different, and appropriate strategy for each service should be

Table 6. Business model summary for each service

Service	GeForce Now	Xbox Cloud Gaming	GameBox
CVP	Strong in Type 2	Strong in Type 1	Strong in Type 3
Profit Formula	Free + Subscription	Extra service for existing subscribers but highest in price	The lowest subscription fee for any kind of network users
Key Resources	High-level GPU Linking with Steam engine	Advanced cloud computing technology Xbox console games	Direct ownership for 5G network
Key Processes	Servicing with local network partner LG Uplus	Servicing with the biggest local network partner SKT	Only conducting local business

adopted. Global services (e.g., GeForce Now and Xbox Cloud Gaming), need to intensify their powerful game libraries and resources. GeForce Now should continuously deliver the most online games with high-level graphics. The customized plan for Xbox Cloud Gaming varies slightly; it should provide diverse games for Xbox consoles through its superior cloud servers. However, global services can only operate with the support of network operators. Using the characteristics of cloud gaming, which are only available in the 5G network, network operators can gain the upper hand in negotiations with global cloud service providers. Furthermore, network providers can attract more 5G subscribers by supplying more enjoyable 5G services. This inevitable partnership will also make it easier for the government to respond to global services.

Local services, such as GameBox, should focus on existing customers and creating an efficient operation process. GameBox has direct access to the network, which makes it relatively easy to operate services. Also, it reduces overall costs by promoting mainly cloud gaming services to existing 5G users. Its low price can thus compensate for its shortcomings, namely, its small total number of games. Cooperation with small and medium-sized Korean game developers, who have a high understanding of Korean gamers, can also complement GameBox's games. Korean-style cloud gaming services, which are not feasible for foreign services, may indeed emerge through such a collaboration. Different efforts, made by global and local services, eventually lead to diverse consumer responses. Consumers will then be empowered to access more foreign and local games with a stable network. 5G users who did not enjoy games before will become interested in the future, so the game industry itself will continue to grow.

It may be difficult, at the present, to determine which service will attain superiority over the other services, because cloud gaming is still in its early stages. Nonetheless, this paper does present viable strategies for each service to consider.

This paper also has academic value: Namely, this study differs from previous studies that only conducted business model analysis for a single service or virtual service. This study is meaningful as an exploratory study of identifying the marketability of cloud gaming services by conducting a business model analysis on the officially released services of the Korean market, specifically.

There are some limitations of this study. Firstly, it is hard to estimate the success of each service, given that the cloud gaming market is in its early stage. If, however, more services emerge as the cloud gaming market continues to grow and as the performance of services is enhanced, it will be possible to analyze how the business model affects actual performance. In addition, regarding profit formula, this study only focused on a revenue model because data on the three companies' investments and costs were unavailable. As such, future studies may need to access data on how much these companies have invested in cloud gaming and how

much they have spent for their operation. In such a future study, the researcher could conduct more sophisticated analysis of the profit formula.

References

[1] R. Stöber, "What media evolution is," *Eur. J. Commun.*, vol. 19, no. 4, pp. 484-505, Dec. 2004.

[2] J. G. Andrews, S. Buzzi, W. Choi, S. V. Hanly, A. Lozano, A. C. Soong, and J. C. Zhang, "What will 5G be?," *IEEE J. Sel. Areas in Commun.*, vol. 32, no. 6, pp. 1065-1082, Jun. 2014.

[3] C. S. Rhee and H. Rhee, "Social cultural issues in game industry in the fourth industrial revolution," *J. Korea Game Soc.*, vol. 18, no. 1, pp. 73-82, Feb. 2018.

[4] K. Jain, A. K. Jaiswal, A. K. Jaiswal, S. Gupta, and A. Rajput, "Cloud gaming: a survey on future of gaming," *IJRASET*, vol. 8, no. 4, pp. 2157-2162, Apr. 2020.

[5] G. Fernandes, *The global cloud gaming market is on track to generate revenues of $3.2 billion by 2023*(2020), Retrieved Jul. 29, 2021, from https://newzoo.com/insights/articles/cloud-gaming-business-market-revenues-and-ecosystem/.

[6] C. Park, *Statistics of Wireless Communications Service Subscribers*(2021), Retrieved Jul. 28, 2021, from https://www.msit.go.kr/bbs/view.do?sCode=user&mId=99&mPid=74&pageIndex=&bbsSeqNo=79&nttSeqNo=3173406&searchOpt=ALL&searchTxt=

[7] J. Clement, *Leading gaming markets worldwide 2020, by revenue*(2021), Retrieved Jul. 24, 2021, from https://www.statista.com/statistics/308454/gaming-revenue-countries/.

[8] Y. Lee, *Access to the Cloud . . . SKT starts the main game with MS*(2020), Retrieved Jul., 28, 2021, from https://www.mk.co.kr/news/it/view/2020/09/953858/

[9] R. Shea, J. Liu, E. C. H. Ngai, and Y. Cui, "Cloud gaming: Architecture and performance," *IEEE Network*, vol. 27, no. 4, pp. 16-21, Aug. 2013.

[10] J. Mangalindan, *Cloud gaming's history of false starts and promising reboots*(2020), Retrieved Jul. 15, 2021, from https://www.polygon.com/features/2020/10/15/21499273/cloud-gaming-history-onlive-stadia-google.

[11] P. E. Ross, "Cloud computing's killer app: Gaming," *IEEE Spectr.*, vol. 46, no. 3, p. 14, Mar. 2009.

[12] H. Lee, *Post mobile game, 'cloud game'*(2021), Retrieved Jul. 25, 2021, from https://m. etnews.com/20210713000039.

[13] I. Choi, *The game is now over the clouds . . . IT giants' battleground, cloud games*(2020), Retrieved Jul. 2, 2021, from https://www.chosun.com/economy/tech_it/2020/12/10/AJWGZXMNIZDBJEYPPNRVX6FXWA/.

[14] C. Y. Huang, K. T. Chen, D. Y. Chen, H. J. Hsu, and C. H. Hsu, "GamingAnywhere: the first open source cloud gaming system," *ACM Trans. Multimedia Computing, Commun., and Appl. (TOMM)*, vol. 10, no. 1s, pp. 1-25, Jan. 2014.

[15] M. Claypool, D. Finkel, A. Grant, and M. Solano, "On the performance of OnLive thin client games," *Multimedia Syst.*, vol. 20, no. 5, pp. 471-484, Feb. 2014.

[16] K. I. Kim, S. Y. Bae, D. C. Lee, C. S. Cho, H. J. Lee, and K. C. Lee, "Cloud-based gaming service platform supporting multiple devices," *ETRI J.*, vol. 35, no. 6, pp. 960-968, 2013.

[17] M. Jarschel, D. Schlosser, S. Scheuring, and T. Hoßfeld, "Gaming in the clouds: QoE and the users' perspective," *Math. and Comput. Modelling*, vol. 57, no. 11-12, pp. 2883-2894, Dec. 2013.

[18] I. Slivar, M. Suznjevic, L. Skorin-Kapov, and M. Matijasevic, "Empirical QoE study of in-home streaming of online games," in *13th Annu. Wkshps. Netw. and Syst. Support for Games*, pp. 1-6, Dec. 2014.

[19] A. Ojala and P. Tyrvainen, "Developing cloud business models: A case study on cloud gaming," *IEEE Softw.*, vol. 28, no. 4, pp. 42-

47, Apr. 2011.

[20] C. Moreno, N. Tizon, and M. Preda, "Mobile cloud convergence in GaaS: A business model proposition," in *Proc. HICSS 2012*, pp. 1344-1352, Maui, HI, USA, Jan. 2012.

[21] C. Lee, H. Lee, and S. Kim, "Competitive advantage elements in the global cloud game market," *J. Korea Game Soc.*, vol. 20, no. 5, pp. 3-11, Oct. 2020.

[22] H. Mintzberg, *Rise and Fall of Strategic Planning*, New York: Free Press, 1994.

[23] A. Takeishi and K. Lee, "Mobile music business in Japan and Korea," *J. Strategic Info. Syst.*, vol. 14, no. 3, pp. 291-306, Sep. 2005.

[24] M. W. Johnson, C. M. Christensen, and H. Kagermann, "Reinventing your business model," *Harvard Busin. Rev.*, vol. 86, no. 12, pp. 50-59, Dec. 2008.

[25] S. Kim, "New media ventures business models and performance in the foreign market," *Korean J. Broadcasting and Telecommun. Stud.*, vol. 24, no. 2, pp. 42-69, Mar. 2010.

[26] S. Kim, H. Kim, and H. Lee, "An institutional analysis of an e-government system for anti-corruption: the case of OPEN," *Government Info. Quart.*, vol. 26, no. 1, pp. 42-50, Jan. 2009.

[27] R. Yin, *Case study research: Design and methods*, 3rd Ed., Thousand Oaks: Sage, 2003.

[28] J. Lee, *Nvidia unveils performance to mark 1st anniversary of GeForce Now's launch* (2021), Retrieved Feb. 8, 2021, from https://www.epnc.co.kr/news/articleView.html?idxno=200742.

[29] T. Warren, *Microsoft reports strong Windows, Xbox, and cloud growth for Q3 2021*(2021), Retrieved Apr. 27, 2021, from https://www.theverge.com/2021/4/27/22406254/microsoft-q3-2021-earnings-revenue-xbox-cloud-services-surface-gaming.

[30] Y. Kim, *Three telecommunication companies, operating profit is doubled in Q2 . . . controversy over 5G quality*(2021), Retrieved Jul. 19, 2021, from https://biz.chosun.com/it-science/ict/2021/07/19/6MOTMBBSJFHSFJFCXBVCLJZYDU/.

박 재 영 (Jaeyoung Park)

2021년 2월 : 고려대학교 미디어학부 졸업

2021년 3월~현재 : 고려대학교 일반대학원 미디어학과 석사과정 재학

<관심분야> 뉴미디어 서비스, 클라우드 컴퓨팅, 엔터테인먼트 산업

[ORCID:0000-0003-0841-6951]

김 성 철 (Seongcheol Kim)

1987년 2월 : 서울대학교 경영학과 졸업

1989년 2월 : 서울대학교 대학원 경영학과 석사

1996년 8월 : Michigan State University Telecommunicaion 석사

2000년 12월 : Michigan State University Mass Media 박사

2008년 3월~현재 : 고려대학교 미디어학부 교수

2020년 6월~현재 : Digital Business (Elsevier 발간 국제학술지) Co-Editor

2020년 7월~현재 : 스마트미디어 서비스 연구센터(SSRC) 센터장, 지능정보기술과 사회문제 연구센터(CIS) 센터장, 고려대 4단계 BK21 미디어학교육연구단 단장

<관심분야> 뉴미디어, 디지털비즈니스, 미디어산업

[ORCID:0000-0001-6703-4465]