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Ph.D. Dissertation of Economics

**Crafting Over The Top (OTT)
platforms strategies in the perspective
of industry efficiency and consumer
convenience**

산업 효율성과 사용자 편의성 관점에서의
OTT 플랫폼 전략 수립

February 2020

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Technology Management, Economics, and Policy Program
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Crafting Over The Top (OTT) platforms strategies in the perspective of industry efficiency and consumer convenience

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이 논문을 경제학박사학위 논문으로 제출함
2020 년 2 월

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Abstract

Crafting Over The Top (OTT) platforms strategies in the perspective of industry efficiency and consumer convenience

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The Internet platform economy has grown rapidly in the last decade and has now become the center of the global economy. Although the Internet platform originally emerged as an intermediary between sellers and consumers, the accumulated consumers and capital increased the Internet platform's own competitiveness. It has grown and evolved to a level where it can produce and sell products on its own. Additionally, innovation has led to the emergence of many new Internet platforms. To be a market leader, companies need to pay attention to consumer-centric innovation to discover and solve consumers' inconvenience. Therefore, to explain the Internet platform growth and consumer-centric innovation, I choose the OTT platform for study, which is receiving a lot of attention from consumers and industries globally.

OTT platforms began attracting consumer attention, starting with YouTube in

2005, and Netflix in 2016, and has been very active, affecting many industries and consumers. This dissertation compares the impact of the emergence of OTT platforms based on different business models to the related industries through technical efficiency analysis, and determines the inconveniences with advertising from using the OTT platform. It also calculates the degree of consumer advertising inconvenience as an economic value, and emphasizes the importance of establishing a strategy for companies to solve these problems.

The first study examines the impact of global OTT platforms on the growth of domestic related industries as they dominate the OTT market. Global OTT platforms, YouTube and Netflix are based on different business models, and I examine the impact of strategic differences on efficiency. YouTube and Netflix are leading global OTT platforms with the highest growth rates and market shares. YouTube is a content sharing site based on advertising, while Netflix is a premium content site based on subscription. I look at the impact on the related video content industry as YouTube and Netflix entered the Korean market. The video content industry was largely divided into video production industry, production-related service industry, and distribution industry. However, due to the closure of many companies and problems of data collection, production-related service companies were excluded from this study. For the study, I divide them into three periods: before YouTube entered the Korean market, after YouTube entered the Korean market in 2008, and after Netflix entered the Korean market in 2016, and explore the effectiveness of their entry on the video content production and distribution industry in Korea. The technical efficiency of video content distribution industry in Korea has grown significantly since the entry of YouTube, while the technical efficiency of video content production industry in Korea has shown an increase since Netflix's entry. YouTube is a channel that can effectively deliver video content advertising and this stimulated

the distribution and spread of content, while Netflix contributed to the efficiency of production either by creating content on its own or by investing in content production.

The second study looks at the inconvenience factors for online video advertising that consumers feel on the OTT platforms. It examines the perceived inconvenience with advertising in the OTT platforms, focusing on the length, repetition, and position of advertising, which are the typical factors in online video advertising. The mediating effects of the entertainment and information provided by the advertising were also examined. I also consider that the degree of inconvenience with advertising will be varied according to the consumer's characteristics, such as consumption of online video content and online shopping habits and perform cluster analysis according to consumer's characteristics. The group is divided into a watching and shopping group (group2) and a searching and considering group (group1). In the case of group 2, long advertising, frequent repetitions, and interruptive position of advertising was found to directly increase the inconvenience, but the inconvenience is reduced if the long advertising is interesting. On the other hand, group 1 considered it inconvenient only for long advertising, and only partial mediation effect is found for repetition if the advertising was interesting. As a result, the degree of inconvenience with advertising is high in the group with high content consumption and online shopping. The technological functions that improve the efficiency of advertising, such as frequent repetition and the playback position of advertising do not reduce the degree of inconvenience despite providing entertainment and information in the advertising. However, in relation to the length of the advertising, inconvenience is reduced when the advertising is interesting.

Finally, the third study focuses on the phenomenon where consumers try to reduce their consumption of advertising by blocking them or subscribing to paid services. I measure the economic value of the consumer's feelings and derive the

cost to pay for blocking the uncomfortable advertising. Assuming there is a virtual online ad-blocking program, this study conducted a conjoint analysis based on five factors of online video advertising (behavioral ads, repetitive ads, ad length, ad position, and skippable ads) and the available service charges. I find that consumers are willing to pay the highest cost for blocking advertising based on personal information and pay about KRW 30 as the length of an advertising is reduced by one second. In addition, based on the derived cost, I simulate the change in market shares by changing the composition of factors when platforms construct a virtual ad-blocking service. Therefore, this study will help to establish management strategies when changing the advertising strategy or entering a new market.

Keyword: OTT platform, consumer-centric innovation, advertising inconvenience, structural equation model, mixed logit model, Meta-frontier analysis

Student Number: 2017-38378

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Chapter 1. Introduction

1.1. Research background

With the rapid development of the Internet, and information and communication technology (ICT), the economic environment has rapidly shifted from an industrial economy to digital economy (Goldfarb & Tucker, 2019), with a significant growth in the Internet platform economy. This dissertation specially sought to study the emergence of new Internet platforms, and in particular the impact of the OTT platform on consumer and industrial changes.

Platform economy is the activity of connecting two or more user groups through an intermediary called a platform, and exchanging goods, services, and information^①(Armstrong, 2006; Rochet & Tirole, 2003; Täuscher & Laudien, 2018; Kenny & Zysman, 2015). A platform is defined as a two-sided market or multi-sided market where there are multiple interacting users. Rochet and Tirole (2003) defines a business model based on the platform, for example, software, portals and media, payment systems, and others. Tiwana et al. (2010) mention platforms from the perspective of marketing (product lines), software engineering, economics, and information systems (infrastructural investments, and industrial organization).

In the platform economy, there is a network effect between users; a direct network effect that increases the utility of users in the same group and an indirect network effect that occurs between different user groups. The indirect network

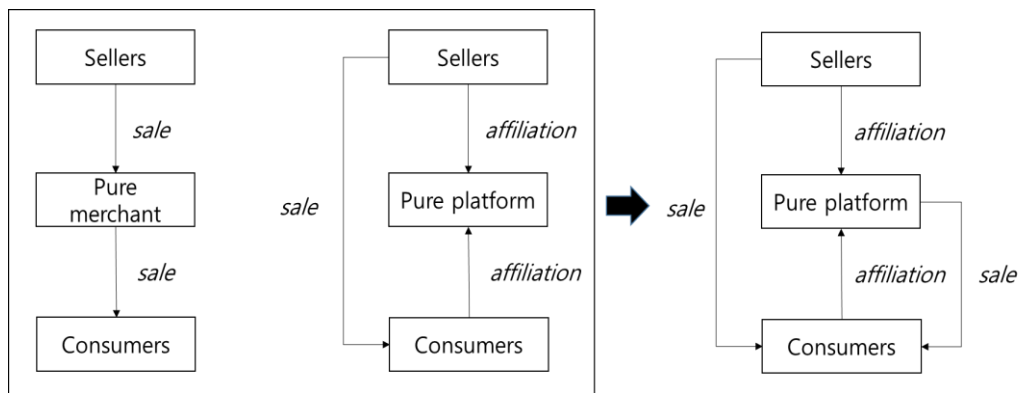
^① The platform economy mentioned in this dissertation refers to the Internet platform economy that has grown based on the Internet (Kenny & Zysman, 2015; Tiwana et al., 2010).

denotes the positive externalities between different groups because the more users there are on the other side, the more likely that a better deal will take place. For example, for a platform that provides a variety of content, the more users that gather and use, leads to the external effect of more content providers participating.

As such, the greatest feature of the platform is that it connects different groups of users (producer-consumer) and provides the organization and rules by which they can operate (Gebregiorgis & Altmann, 2015; Baek et al., 2012). According to Van et al. (2016), the platform that connects producers and consumers in the platform ecosystem is described as a provider that provides an interface, and an owner who manages the platform IP and mediates the participants and how they work. Defining a platform requires examining the differences from business models that existed before the platform was formed. Van et al. (2006) defined the pre-platform business model as a pipeline. The pipeline economy is a classic value-chain model, where input and output are in one place and a product is created by itself from a linear series of activities. Conversely, in a platform, the community where different user groups meet and the resources owned by them are important assets. Hagiu (2007) compared merchant's strategy to identify a two-sided platform strategy. A merchant does not produce goods, but buys goods from sellers and sells them to consumers, whereas a platform in the two-sided market is defined as a strategy that allows sellers of the same type (affiliated sellers) to sell goods directly to buyers of the same type (affiliated buyers) (Hagiu, 2007). As a result, as defined by previous studies, a platform does not make or purchase a product directly and then sell it to a consumer, rather it is a system that connects sellers who have a product to sell and consumers who want to buy. It can be called a common marketplace.

However, in the last two decades, platforms have grown with the development of the Internet and ICT and evolved enough to change the definition of existing platforms. Figure 1-1 reconstructs the evolving platform economy with reference to Haigu (2007). The platform, which has been growing for a long time, has attracted many consumers and accumulated a lot of capital. The powerful platform has expanded into new services, enabling it to produce and sell products on its own. The third model in figure 1-1 shows that the platform has grown to a stage where it can produce and sell goods on its own, rather just play the role of an intermediary that connects sellers and consumers.

Figure 1-1. Evolution of platform economy



**note: reconstruction, Hagi (2007)*

Over The Top (OTT) platforms, which are now rapidly growing worldwide and generating large revenues, is an example of the third model in figure 1-1. In this study, OTT provides various media content to consumers over the Internet, and differentiates itself from traditional cable, satellite and terrestrial broadcasting.

Further, the growth and proliferation of devices like smartphones and tablets have provided the opportunity for the growth of OTT platforms, allowing consumers to consume content freely without the constraints of time and space. Therefore, the emergence of OTT platforms represents the evolution of the platform.

OTT platforms started producing content by either investing or producing content of their own. The OTT platform has emerged as a destructive creator and also provides a positive influence on surrounding industries. The innovative global OTT platforms and the emergence of related technologies also had a significant impact on content industry. Therefore, this study will also include how the global OTT platform affect the efficiency of the overseas content industry.

OTT platforms make a profit by producing and selling content directly to consumers and have moves away from monetization through advertising. Netflix, a leading OTT platform, does not advertise and operates as a subscription based service. YouTube also offers services that are not advertise when subscribing to the premium services. Most of the new OTT platforms are trying to operate through subscription based services, without advertising (Cunningham et al., 2016; Gimpel, 2015). While there have been Internet platforms that attempted to operate on a subscription basis without advertising, they have not grown as much as the business model of the OTT platforms (Wang et al., 2005; Prasad et al., 2003). For consumers to be satisfied with subscription based services, they need to be based on the following: convenience, essential, added value, usage frequency, and perceived service quality (Wang et al., 2005). In the case of Internet platforms pursuing the subscription model, it is necessary to establish a strategy by identifying what differentiated services will be provided and how far they can solve consumers'

inconveniences. I investigate online video advertising as one of the inconvenience factors for consumers. As OTT platforms grow, online video advertising is also growing rapidly and consumers spend a lot of time watching video advertisements while consuming video content. This increases the consumer's inconvenience and the spread of ad-blocking programs and subscription based OTT services represent this reality. As OTT platforms grow, the level of inconvenience from online video advertisements also increase. Therefore, this study looks at the factors that cause inconvenience in online video advertising and factors that can reduce it. I also convert the advertising factors that cause inconvenience into economic value.

1.2. Problem description

With the development of IT, the Internet platform economy is growing. While there are numerous companies based on Internet platforms, like search engines, online shopping, portals, and shared services are being created and lead the global market, many others did not grow and either merged with other companies or shut down. This may be due to the network effect that is a characteristic of the Internet platform economy. A platform with many users is more efficient, and consumers naturally move to a platform that has more resources and more users. In addition, one of the other characteristics of the Internet platform economy is that consumers can easily move to new services, because there is little or no cost to switch to other services. As a result, in the Internet platform economy, monopolies with many users are created. However, new innovative companies challenging these monopolies are constantly coming up. Therefore, the series of dynamic processes of companies

entering, growing, and exiting the market is also repeated (Teece, 2007; Cincera & Galgau, 2005; Gong, 2004).

This study discusses the need for consumer-centric innovation for Internet platform companies to survive in the market and grow. In particular, it looks at the OTT platforms. Superior products are making consumers smarter and consumers' demands are also growing (Berthon et al., 2007; von Hippel, 1986, 1989). For a company to succeed, it must be chosen by smart consumers, so it must listen to the needs of the consumer. OTT platforms have rapidly grown from the time that YouTube was launched in 2005 and many similar products are appearing. However, there is a limit to the number of consumers choosing the OTT platform. The choice from consumers is based on: differentiated content type, convenience of consumption environment, price, etc., and consumers try to look for the least inconvenient (Jiang et al., 2013; Ozturk et al., 2016).

One of the biggest inconveniences for consumers using OTT platform are the online video advertising (Awad & Krishnan, 2006; Hoofnagle et al., 2012; Phelps & Ferrell, 2000; Tucker, 2012, Pashkevish et al., 2012; Ducoff, 1996; Kim, 2018). As advertising is increasingly time-consuming, repetitive, or inserted in the middle of the content, consumers look for the subscription based platforms without the hassle of advertising, or blocking the advertising. Advertising is the most fundamental revenue source for the platform economy. While consumers understand that it is fair to see the right amount of advertising in terms of content consumption, as advertising becomes more sophisticated, the consumers' inconvenience also increases. The study examines the main causes of the inconvenience felt in online video advertising, and what is it worth when consumers convert it into economic value.

To prepare for external shocks, such as the emergence of companies with disruptive technologies, the existing companies must constantly innovate. If they fail to innovate, they will not grow and will shut down. In case of OTT platform market, YouTube, and Netflix have different business models that initiated from consumer-centric innovation. YouTube is an advertising-based platform focused on consumer participation, while Netflix is a subscription-based platform focused on professional contents. In the aspect of inconvenience in online video advertising, Netflix was the only company to initiate subscription services without advertising. YouTube also offers a premium service without advertising and is trying to reduce the customer's inconvenience about online video advertising. YouTube's future steps will affect existing industries and differences in efficiency. When studying the results of consumer-centric innovation from an OTT company, it is expected that companies will be able to refer to them in the development of their business strategies.

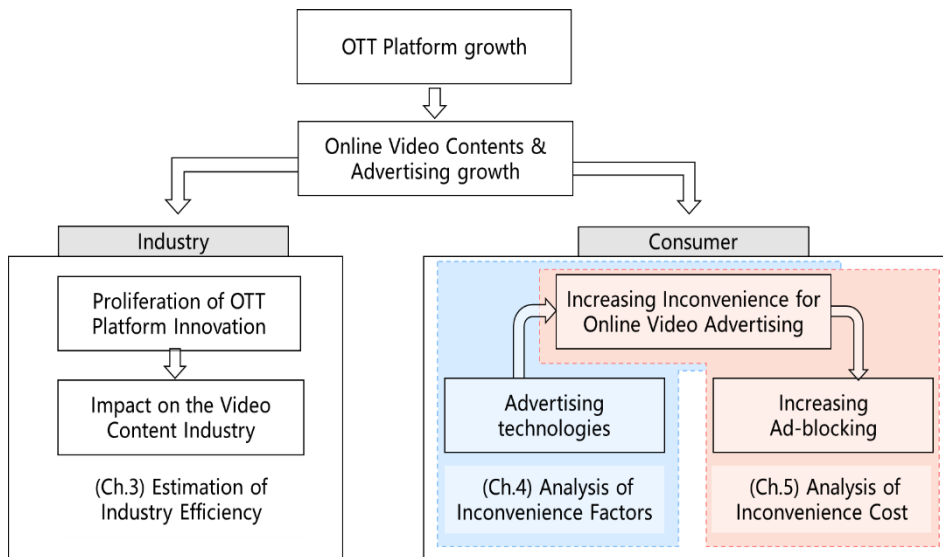
1.3. Research objectives

This study insists on the need for consumer-centric innovation, especially for consumer utility and industrial growth. The OTT platforms that dominate the global market have affected the growth of the video content industry. However, behind the rapid growth of the global OTT platform, consumers have become more uncomfortable with online video advertising, and they have begun to avoid or block advertising.

Therefore, the first study analyzes the impact of global OTT platforms on the domestic video content industry, with regard to efficiency. The second study

examines the factors that make consumers uncomfortable with online video advertising and the factors that could reduce them, by consumer type. The third study calculates the amount that consumers could pay by measuring the economic value of inconvenience of online video advertising. It also simulated the platform provider's service strategy by changing the inconvenience factors according to the results generated.

Figure 1-2. Impact of the OTT platform on consumer utility and industry



1.4. Thesis outlines

This thesis consists of six chapters with three papers. Chapter 1 introduce the entire of thesis, and Chapter 2 show the research framework and related literature review. And then, three papers follow in Chapter 3, 4, and 5. Chapter 6 examines the results of the papers and discusses the policy implication.

Figure 1.3 Thesis outline

Ch1. Introduction		
Ch2. Literature review and research framework		
<p>Ch3. Impact of the Global OTT Platform on the Video Content Industry Efficiency</p> <p>Punch line YouTube drove the innovation in the domestic content distribution industry, and Netflix drove the innovation in the domestic content creation industry.</p> <p>Method Meta-Frontier Analysis, Tobit Analysis</p>	<p>Ch4. Mediating Effect of Online Video Advertising Characteristics on Perceived Advertising Inconvenience</p> <p>Punch line The inconvenience of the online video advertising has increased where there are additional technical functions, such as the frequency, location of advertising.</p> <p>Method SEM, K-Means Clustering</p>	<p>Ch5. Inconvenience Costs of Online Video Advertising</p> <p>Punch line Platform can increase market share by reducing the length of ads, by reducing the use of personal information, or by blocking all advertising.</p> <p>Method Mixed Logit, Simulation</p>
Ch6. Overall conclusion		

1.5. Contributions

This study supports the importance of consumer-centric innovation of the Internet platform economy, which has grown to an extent where it can produce and sell its own products. The global OTT platform, which has the highest growth rate and is spreading all over the world, is one of the representative Internet platforms. It is important to look at the impact of the global OTT platform on consumers and industries. While consumers have a positive benefit of the OTT platform's growth, the consumers' inconvenience from the online video advertising has increased, and the advertising avoidance and blocking have spread. It makes sense to identify advertising inconveniences that consumers experience when using the OTT platforms and suggest economic interpretations and countermeasures for it.

From the industry's perspective, as the representative global OTT platforms spreads, it is meaningful to examine the countries that have adopted these platforms.

As consumers can consume a variety of content, their utility increases, and the domestic industry has new opportunities for growth. However, the proliferation of overseas content could prevent the growth of domestic industry or the content market could erode. Therefore, it is meaningful to examine the impact of the global OTT platforms on the efficiency of the domestic content industry.

Chapter 2. Literature review

2.1. The importance of consumer-centric innovation

IT technology, which is growing at a rapid pace, caused constant changes in the environment around us. Companies want to increase efficiency through innovation in the changing business environment, and consumers are becoming smarter because of innovative products and services. Smart consumers are also a stimulus for companies to innovate further. Consumers are growing as well as evolving companies, and companies are focused on innovation for the choice of smarter consumers (Berthon et al., 2007; Gamble et al., 2015; Desouza et al., 2008).

There are many studies on consumer-centric innovation as consumer involvement is emphasized in terms of company innovation. However, the terms and definitions of consumer-centric innovation in each study have been used differently. The studies on the importance of active participation and contribution of consumers in the process of idea generation, product development, services, etc., use terms, like use-centric innovation (UCI), co-creative innovation, customer co-creation, and crowdsourcing (Gamble et al., 2015; Ebbesson, 2012; Piller et al., 2010; Greer and Lei, 2012; Howe, 2009). Conversely, other studies emphasize that company innovation should be targeted at consumers; what they really want, and to quickly identify and respond to their needs (Christensen, 2013; Lewis, 2004; von Hippel, 1986, 2005; Choy & Park, 2016). As technology advances and consumers' technology acceptance gets shorter, it is difficult to easily identify consumer needs. Therefore, it becomes important to identify the hidden needs by observing consumer'

behavior and analyzing consumer' data.

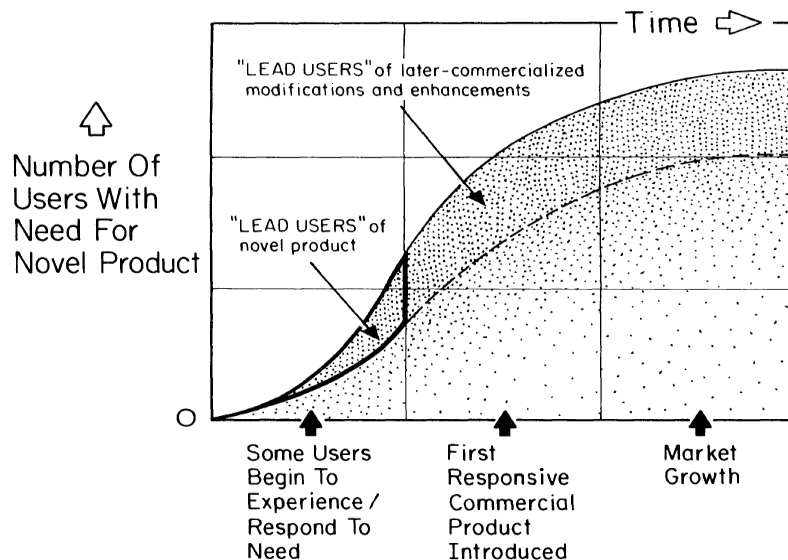
The consumer-centric innovation in this study is closer to the latter case. It is important for a company to identify hidden and rapidly changing consumer needs. To this end, this dissertation identifies consumer inconveniences and analyzes the differences in efficiency by the business strategy of the company.

Christensen explained innovator's dilemma, by focusing on the consumer's point of view; that newly emerging technologies can be a cause of failure for existing good companies (Christensen, 2013). Technologies can be largely sustaining or disruptive. Sustaining technologies focus on improving current product performance for major customers in major markets, while disruptive technologies are not easily recognized in existing major markets and can be easily ignored, but are rapidly growing from new or existing non-major customers and threatening existing major companies (Christensen, 2013; Lewis, 2004). It is important that companies listen to their customers; not just the major customers, but also those who are on the outside and dissatisfied with the existing products. Today, when companies actively enter and exit the market and their life span tends to be short, they need to focus on disruptive technologies.

Von Hippel (1986) argues that the source of differentiated products is the lead user. For successful new products, it is important to study what consumers really want to do but market analysis is not easy because only a few consumers experiment with new products of cutting-edge technology it is difficult to analyze this data. Therefore, it is important to study the lead users who could predict the future market, as it is possible to predict the spread of new products through them. Figure 2-1 defines the process of a lead user's expansion.

Further, other studies say that the lead user can be a non-former consumer and that they feel uncomfortable and anxious with the existing product and tries to solve problems (Christensen, 2013; Choy & Park, 2016). It is also important for companies to listen and solve the problems of those who are not major customers or who have not used the product outside-in strategies (Day & Moorman, 2010; Day, 2014).

Figure 2.1 Lead users' position (Von Hippel, 1986)



2.2. Evolution of the Internet platform economy

Internet platforms are at the heart of the digital economy and affect all industries. The digital economy is a economy in which major economic activities depend mainly on the factors of production, such as digitalized and networked information and knowledge (Mesenbourg, 2001; Tapscott, 1996; Terranova, 2000). The Internet platform has played an important role in the growth of the digital economy.

The Internet platform economy began to grow and spread rapidly as the Internet and computing technologies improved and connectedness and communication improved (Evans & Schmalensee, 2016). The platform connects two or more user groups, enables transactions between them, and generates profits and benefits for the participants. Rochet and Tirole (2003) analyze the function of platforms as an intermediary in buyers and sellers' two-sided markets from a variety of perspectives and their price allocation. Haigu (2007) also compares the concept with merchants to define the concept of platforms. Market intermediaries can be broadly divided into merchants and platforms. Merchant purchase goods from sellers and resell directly to buyers, whereas a two-sided platform provides a place for affiliated sellers to sell directly to affiliated buyers. The platform has an indirect network effect that increases its utility when there are more counterparties. Sellers prefer the merchant mode when there is fierce competition between products or high complementarity between products. If there is asymmetric information about the product or when they plan to invest in the product continuously, sellers would prefer the platform mode (Haigu, 2007). On the other hand, Van et al. (2016) says that there is a platform in the rapidly changing IT ecosystem growth and explains the pipeline business model and its differences to understand the platform. The pipeline model is a traditional value-chain model, in which activities are performed in a series of preceding sequences. The input at one end solves everything internally, from production to sale, in the form of a finished product at the other end, through a series of steps. However, the platform model is different in terms of creating value through interactions with external producers and consumers.

The platform has an indirect network effect, which increases its utility with

more counterparties, and grows with the number of users or the network size strengthens market dominance (Katz & Shapiro, 1985; Liebowitz & Margolis, 1994). As a result, the platform is in fierce competition to attract more users and tries to secure excellent products to differentiate itself from other platforms. In the case of pay TV, most consumers choose a platform that has their favorite content, and securing highly popular content is a competitive strategy for platform companies (Nicita & Rossi, 2009; Weeds, 2015).

Sellers do not have a reason to do exclusive deals with a particular platform. They adopt a strategy of maximizing sales by supplying products to as many platforms as possible. The platform also takes appropriate strategies to maintain relationships with various sellers as well as popular sellers (Jiang et al., 2011; Belleflamme & Peitz, 2010; Hagiu, 2006). Rather than agonize over the “chicken-or-egg problem” between sellers and consumers, which is the fundamental operating principle of the platform (Parker & Van Alstyne, 2005; Eisenmann et al., 2006), the platform should be dedicated itself to building the appropriate business model in response to the changing circumstances (Rochet & Tirole, 2003). Hence, a platform cannot differentiate itself by relying on sellers or simply providing places and services. It also competes for exclusive contracts, and more recently, has started to develop its own products production and sales.

In the case of OTT platforms, the ownership of premium content is important to business success and hence, there is focus on securing differentiated content (Carlsson and Walden, 2007; Orgad, 2009; Shin, 2006). Further, there are the high entry barriers in securing differentiated content, which should be overcome (Geradin, 2005). Netflix first began investing directly in content in 2007 and has gradually

increase its original contents (Matrix, 2014). Other OTT platform competitors such as YouTube and Amazon have also increase their production of original content.

As such, it was noted that if initially, the platform focused on the role of a medium that enabled trading of goods, it evolved to produce and sell goods on its own with a large number of consumers and sufficient capital.

2.3. Impact of Over The Top (OTT) platforms

An OTT platform is an online video provider that delivers video content to consumers based on the Internet (Erman et al., 2011; Sujata et al., 2015). It was with YouTube, a free video-sharing site established in 2005 and acquired by Google in 2006, that OTT services began to become popular with the public.

YouTube, began by sharing amateur online video content, quickly specialized and monetized and it believed that the OTT platform ecosystem started with form after YouTube. Companies entering the OTT platform can be: existing Internet related services or group based on mass media or premium content.

In Cunningham and Silver (2013) and Cunningham et al. (2016), Internet based OTT companies, such as YouTube, Apple's iTunes, Netflix, Amazon, Yahoo!, Facebook are named NoCal because they are located in Silicon Valley, Northern California, and Hollywood-based traditional broadcasters, such as Hulu and Disney media companies are named SoCal because they are located in Southern California. The NoCal companies have grown on the basis of Internet technology and do not have premium content, but focus on sharing of content by amateurs or external content producers based on advertising. Therefore, they grew because they solved

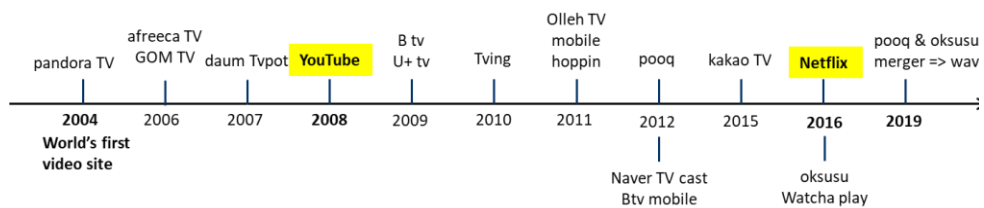
the problems of royalty payments and copyright infringement, and most of them started an advertising based business model. In the OTT platform market, the SoCal companies are latecomers; they developed and broadcasted traditional media, and expanded the broadcasting channel to the OTT platform. Thus, most SoCal derived OTT platforms are based on subscription-based or purchase-based business models.

Depending on the business model that operates the OTT platform, it can be divided into video-on demand (VOD), subscription-based, advertising-based, or authentication-based bundle services (Waterman et al., 2013). Platforms like iTunes and Amazon started with VOD, a model where consumers buy and watch the content individually. It allows the purchase of individual content, such as content that missed airtime, popular past content, and movies that consumers can watch anytime and anywhere. Netflix offers subscription-based unlimited services. Unlimited content services are an evolving form of VOD services for individual content purchases and are a business model that has led to cord cutting as consumers no longer rely on cable TV and terrestrial TV (Wayny, 2018; Strangelove, 2015; Burroughs, 2019), as well as changes in consumer behavior, such as driving and viewing multiple content at once (Jenner, 2016; Matrix, 2014). YouTube started out as an ad-based free service. Platforms and content producers generate revenue through online video advertising that consumers watch before and after the video content.

Korea's OTT market started with PandoraTV in 2004, which is the world's first online video site (Shim, 2008) and was a user-based content sharing service. Figure 2.1 shows the timeline of Korea's OTT platforms and shows the changes in the market with the launch of YouTube in 2008 and Netflix in 2016. In Korea, the emergence of global "dinosaur platforms" such as YouTube and Netflix led to the

fluctuations in small companies, and mergers and acquisitions of existing companies. Empirical studies show that when global conglomerates enter the domestic industry, they have a positive or negative impact on the existing environment (Acquier et al., 2017; Newman, 1997; Moazed & Johnson, 2016).

Figure 2.2 OTT platform timeline in Korea



2.4. Problems of online advertising

The growth of the OTT platform has activated the distribution of video content and boosted the online video advertising market. The more advertisements that are exposed to an unspecified number of people, the more likely they are to be recognized by people. However, advertising is not only expensive, they are also an inconvenience to consumers who do not want to see them. As the number of online advertising using various technologies increases, the degree of inconvenience to consumers also increases (Brajnik & Gabrielli, 2010; Cho & Cheon, 2004).

Consumers experiencing high level of inconvenience with advertising have started using ad-blocking programs, such as Adblock Plus (PageFair, 2017; Shiller et al., 2018). It started with the fact that consumers have a right to save their time and money from unnecessary advertising, but it is a threat for platforms and content

providers because they depend on advertising revenues (Shiller et al., 2018; Miroglia et al., 2018).

There are many studies on the competition between consumers and advertisers in the platform industry. Rysman (2004) studied the Yellow Pages; Kaiser and Wright (2006) studied magazines; and Wilbur (2008) studied advertising in two-sided television markets. Choi (2015), Anderson and Gans (2011), and Tag (2009) analyzed the effect of ad-blocking on the Internet platform ecosystem. Anderson and Gans (2011) and Tag (2009) suggest that the spread of ad-blocking programs means that the number of advertising sensitive customers have increased, but advertisers could be able to increase the number of advertising and increase revenue from less sensitive customers. However, increased advertising leads to more customers who are uncomfortable with advertising and the quality of the platform decreased because of declining revenues from the spread of the ad-blocking programs. When the quality of the platform's content decreases or consumers' discomfort from advertising increases or advertisers' profits fall, more ad-blocking programs will be used by consumers and, paradoxically, advertisers will increase advertising revenue by increasing advertising (Anderson & Gans, 2011; Tag, 2009). According to Redondo and Aznar (2018), if consumers are aware of the ad-blocking program, the rate of its actual use is very high and when consumers have a negative perception of advertising, the rate of continuous use of ad-blocking programs is relatively higher than when they have a positive perception of advertising. Hence, I consider it important to find a solution to the problem of advertising.

As a countermeasure against ad-blocking behavior, platforms provide the paid services to consumers that does not have advertising. For the platform, the

subscription model may be better because it can guarantee more stable income (Pauwels & Weiss, 2008; Wang et al., 2005; Elvy, 2017). However, consumers who choose the subscription model demand higher quality of services than the consumers of existing advertising based service (Elvy, 2017; Lambrecht & Misra, 2016). According to a survey of consumers using AdBlock, consumers admit that making money through advertising is a natural right of platforms and content providers but the inconvenience with it is a different matter and they are willing to pay for content in different ways^②. Therefore, the platform provides to provide the subscription-based services instead of advertising. For example, YouTube Premium does not provide advertising and Hulu also combines advertising and subscriber services. Netflix never had any advertising and only operates on subscription-basis.

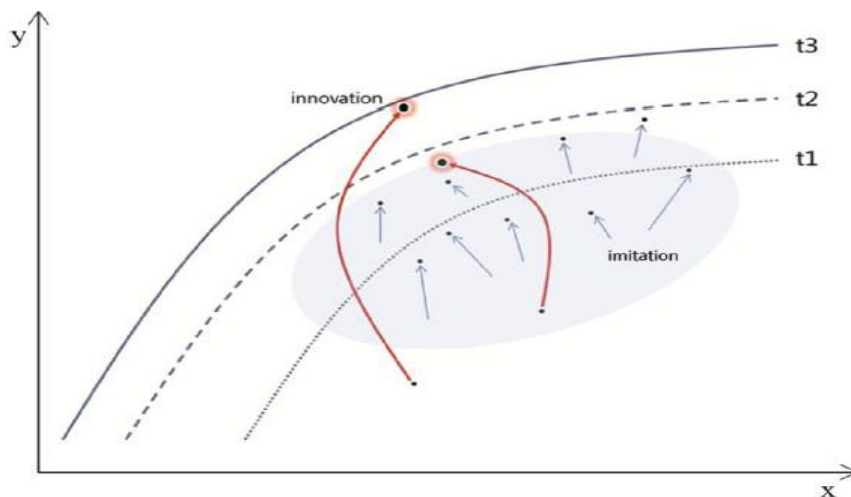
2.5. The spillover effect of innovation

Schumpeter (1934) states that a series of processes that create new things and transform them with technological innovation drive the corporate economy. He called it “creative destruction” when emerging companies develop technology and innovate and develop products and processes that replace existing leaders (Schumpeter, 1942). Ultimately, he said that the economy develops through a process in which successful entrepreneurs are born and imitators emerge in succession. Hathaway and Litan (2014) observed that the industry is growing through s reallocation of resources, such as the entry of competitive companies and the exit of who have lost their competitiveness.

^② <https://blog.getadmiral.com/research-adblock-users-open-to-supporting-publishers/>

Lee et al. (2017) proved that successful innovations will be transferred to the industry through imitation. The results of innovation spread to other companies by imitation, and they grow together. Therefore, innovation and imitation are the most important factors to improve productivity (Audretsch, 1995; Audretsch and Thurik, 1999; Klomp & Van Leeuwen, 2001). If many companies imitate, the total productivity of industry increases. While successful innovators improve their own productivity, fewer companies will succeed in imitation and the productivity of certain industries will be reduced on average. In figure 2.3, these explain the industry productivity increases when the imitated companies are succeeded.

Figure 2.3 Incidence and imitation of industry (Lee et al., 2017)



In recent years, due to the development of the Internet and digital technologies, the acceleration of technological development, expansion of convergence and integration with other industries and technologies, and the reduction of product development and acceptance cycle, Chesbrough (2003) argues that, innovation must

be improved through open innovation, not closed innovation. Open innovation means that companies can create value in the process of product development, process, and marketing by using external knowledge and provide the generated value back outside. It is an innovation methodology that can maximize the value of business. However, the company would have to have the absorptive capability to make what it brought from outside its own. Cohen and Levinthal (1990) defined that absorptive capability as the ability to recognize, absorb, and apply external knowledge. There are cases where an entity fails to internalize the knowledge introduced from outside and perishes. If companies focus only on open innovation without having their own internal absorptive capabilities, they will not succeed because they will be limited in their ability to internalize and grow new technologies.

The emergence of global OTT platforms opens new distribution channels in the country. Domestic OTT platforms can grow through imitation and consumers can gain experience (Shankar et al, 1998; Zhang & Markman, 1998; Bass, 2004; Bondad-Brown et al., 2012), OTT platforms create opportunities for the growth of video content related companies, which are the main resources driving the OTT platform (Picard et al., 2016; Ganuza & Viece, 2013). With the advent of global OTT platforms, consumers can consume a variety of video contents to satisfy their needs (Jeffres, 2004; Perse, 1990) and competitive domestic content companies can easily enter overseas markets (Picard et al, 2016; Ganuza & Viece, 2013). However, if the content industry of the country where the global OTT platform has entered does not keep up with the competitiveness, it will be eroded by the overseas content distributed through the global OTT platforms. Therefore, some people consider the proliferation of content by advanced countries negatively as it causes the content

industry of latecomers to decline (Kim, 2004; Wildman, 1995; Wildman & Siwek, 1988).

Chapter 3. Impact of global OTT platforms on video content industry efficiency

3.1. Introduction

The pattern of consumers' content consumption is changing significantly. Consumers can enjoy content anytime, anywhere on a smartphone. In particular, video content consumption is soaring (Ulin, 2019; Bentley et al., 2019), as it loved as a content suitable for modern life patterns; the video content is short and edited for fast consumption in limited time and place and also does not require as much concentration as text content. One of the major influences on this consumption pattern is the emergence of the OTT platforms, which are online video providers delivering video programming content to consumers over the Internet (Erman et al., 2011; Sujata et al., 2015). Earlier, to watch video content, broadcasting service providers would use a broadcast dedicated networks, or consumers would purchase and use content in VOD format. However, with the advent of OTT platforms, the environment has been developed in such a way that content can be freely provided and used if not only broadcasting service providers but also general consumers could have access to the Internet.

Pandora TV, the world's first OTT platform, was born in Korea in 2004 (Shim, 2008). Since then, Afreeca TV and GOM TV have opened a new video content platform market, but they have gained popularity only among some Korean enthusiasts and have not achieved much growth. However, the Korea OTT platform market began to grow rapidly with the entry of YouTube in 2008, and with Netflix in 2016. The emergence of the global OTT platforms has spurred the emergence of

new OTT platform companies in Korea, or has affected existing companies to increase their value through mergers and acquisitions, while companies without competition have been affected by the suspension of services (Park & Kwon, 2019). The emergence of global OTT platforms can be seen not just as a new company or business model, but also as an innovator who transforms existing industries and has a profound impact on the surrounding industry (Limbach, 2014; Grove & Baumann, 2012; Gimpel, 2015).

The emergence of innovators as a destructive creator in a particular industry can be said to have both positive and negative impacts on the existing environment (Acquier et al, 2017). Some studies show that the emergence of global OTT platforms plays a positive role including the creation of new distribution channels, the activation of related content industries, and the spread of foreign cultures (Shankar et al, 1998; Zhang & Markman, 1998; Bass, 2004; Bondad-Brown et al., 2012). On the other hand, there are also negative views that the United States is unilaterally spreading its culture and expanding and strengthening its influence (Shankar et al, 1998; Zhang & Markman, 1998; Bass, 2004; Bondad-Brown et al., 2012). The emergence of a global OTT platforms faces different situations in different countries and it can help to address the regulatory policies by identifying how they affect the growth of related industries. Therefore, this study compares the influence of global OTT platforms, such as YouTube and Netflix on the overseas video content industry. It examines the change in the efficiency of video content production and distribution industry of domestic OTT platforms before and after YouTube and Netflix entered the market.

3.2. Literature review

The emergence of a global OTT platform opened new distribution channels in the country. For content distribution, the launch of the global OTT platform can be a new distribution channel, which will benefit for smoother distribution, greater economies of scale and interactive technologies (Doyle, 2010; Bennett & Strange, 2008; Roscoe, 2004). The entry of the global OTT platform has created an environment in which domestic OTT platforms can grow through imitation, and provide the opportunities for the growth of video contents companies, which are the main resources driving the OTT platform (Picard et al, 2016; Ganuza & Viece, 2013). The competitive domestic content companies can easily enter overseas markets (Picard et al, 2016; Ganuza & Viece, 2013). According to Kenny and Zysman (2015), the global OTT platform has a positive effect as it enables domestic content producers to reduce barriers and costs incurred in entering into overseas markets as well as domestic distribution.

However, if the domestic content industry does not keep up with the competitiveness, it will be easily eroded by overseas contents distributed through the global OTT platform. The overseas content distribution will increase, eventually reducing the position of domestic content distribution industry (Arsenault & Castells, 2008; Warf, 2007). Straubhaar (2007) argues that it is important to increase competitiveness with its own characteristics, because domestic content is not enough to beat overseas contents that have proven marketability from a large capital and a large number of consumers. In addition, according to Porter (1998) and Wada et al. (2014), since globalization can lead to global technological homogenization, it also

emphasized that specialized knowledge in each region must lead to differentiation. Therefore, some studies have a negative view that the content industry of the latecomer will decline due to the spread of contents of developed countries (Kim, 2004; Wildman, 1995; Wildman & Siwek, 1988).

From the consumer's side, the appearance of global OTT platform got to be able to allow consumers to gain experiences (Shankar et al, 1998; Zhang & Markman, 1998; Bass, 2004; Bondad-Brown et al., 2012). With the advent of OTT platform, consumers can consume a variety of video contents to satisfy their needs (Jeffres, 2004; Perse, 1990).

YouTube has evolved from the content produced by the general consumers to the professional broadcast programs. YouTube has provided an environment for the growth of bottom-up content creation, such as having a significant impact on the creation of Multi-Channel Network (MCN)^③ companies. Netflix, on the other hand, is a subscriber-based service that offers only specialized contents such as TV contents and movies. Netflix invests heavily in creation and acquisition of specialized content such as joint ventures with professional content producers, purchased and distribution of contents from specialized content companies, and recently, Netflix has been increasing its own content production. Although YouTube and Netflix have different propensities, they have a high share in the global market. So, there will be differences in the impact of YouTube and Netflix on the video content industry and its efficiency. Existing research also examined the growth process of the global market by selling television contents overseas and the impact

^③ A multi-channel network(MCN) is an organization that works with video platforms to offer assistance to a channel owner.

of the emergence of new platforms on content creation and distribution (Chalaby, 2003; Steemers, 2014).

The impact of the global platform on each country is immense. YouTube and Netflix occupy the first and second largest share of the OTT platform market in foreign countries^④. Even if a country already has its own OTT platform, or a new OTT platform has been created after the launch of YouTube and Netflix, YouTube and Netflix are mostly in the top position with a high share^⑤. The emergence of YouTube and Netflix, which is spreading around the world, has had a significant impact on changes in many countries, including the telecommunications, media, and content industries, and is recognized as a creative destruction or innovator (Gimpel, 2015; Weezel, 2010; Nee, 2013). If YouTube has successfully introduced a consumer participation based video platform as a business model, Netflix is a successful example of offering a paid platform model in most free Internet platform environments. Netflix is also a new business model that allows the platform to create and sell contents on its own. The existing platforms acted as an intermediary between producers and consumers, generating revenue through advertising (Rochet & Tirole, 2003; Hagiu, 2007; Eisenmann et al., 2006). Schumpeter called creative destruction when emerging company develops technology and innovate, and develop products and processes that replace existing leaders (Schumpeter, 1942). In addition, the economy was developed through the success of entrepreneurs who succeeded in creative destruction and the success of imitators. With the advent of YouTube and

^④ <https://www.pcmag.com/news/364353/netflix-and-youtube-make-up-over-a-quarter-of-global-interne>

^⑤ <https://insights.parrotanalytics.com/svod-market-demand-report-q1-2019>

Netflix, many imitators, OTT platform began to emerge, the words and occupations like YouTuber emerged, and the emergence of MCN sector led to economic growth. Above all, the growth of the OTT platform led to the growth of the content industry. Existing studies have shown that IT development has driven the growth of the digital content industry, and that the growth rate is high as new distribution channels are created (Choi & Oh, 2009; Tsai et al., 2008; Evens, 2010).

The emergence of new platforms, OTT platform and the development of devices such as smartphones and smart pads have expanded the channel for distributing content and increased the need for consumers' contents. Consumers got to be able to easily access and consume contents anytime, anywhere, and can easily consume contents created anywhere in the world. However, these has increased the need for contents, and the future competition will depend on who develops and holds creative contents (Flew, 2014; Van der Pol, 2007; Rowley, 2008). Developing contents tailored to consumer needs is risky, but, once it is successful, the value generated is very high. There are only a few developed countries where the content industry is successful and does not have a high probability of success (Tsai et al., 2008; Oakely, 2004; Hoskins & Mirus, 1988; Chang & Ki, 2005; De Vany & Walls, 1999).

I wanted to look at the efficiency of companies to measure its growth. Efficiency is a concept of "relative efficiency", if there are comparison groups, calculates the efficiency value of companies in the industry, based on their relative distance from the production function frontier (Aigner et al, 1977; Meeusen et al., 1977). Efficiency refers to the ratio of performance to resources in an effort to achieve a specific goal. Relatively, high efficiency and low efficiency are judged by

criteria such as whether they perform better with the same resources or spend less resources to achieve the same performance. A company's innovation not only significantly increase its efficiency like its output relative to its input, but can also shift the production function of the industry. As a result, increased efficiency can represent a company's success in innovation (Lee et al., 2017; Shin et al., 2018; Lee et al., 2018). Therefore, this study aims to compare how the emergence of YouTube and Netflix influenced the efficiency of existing content companies by period.

3.3. Methodology

3.3.1. Stochastic frontier analysis

SFA first estimates the frontier production function, which represents the set of maximum outputs that can be produced using a given number of inputs. Then it calculates technical efficiency (TE) based of the frontier production function estimated. The TE of a company indicates the relative level of technology of the company compared to the level of best technology expressed in the form of a frontier production function. If the output level of one company produced by a given level of input is not on the frontier production function, it means that the company's production is inefficient.

The technical efficiency is measured as shown in the following equation (1) based on Battese and Coelli (1992) to reflect the change in efficiency over time.

$$Y_{it} = f(x_{it}, \beta) e^{V_{it} - U_{it}}, i = 1, 2, \dots, N, t = 1, 2, \dots, T \quad \text{Eq.(1)}$$

where Y_{it} is the output of firm i at time t ; x_{it} is the input vector of firm i at time t ; f is the production function; β is the parameter of the production function, and V_{it} is a random error with distribution of $N(0, \sigma_v^2)$ and independent of U_{it} . U_{it} is a non-negative random variable indicating technology efficiency of firm i at time t . V_{it} is a general random error in the regression equation, and U_{it} represents the inefficiency of the firm. U_{it} itself is not negative to show that it is always inefficient and assumes that U_{it} follows a half-normal distribution.

From equation (1), the technology efficiency, TE_{it} of firm i at time t is given by the following equation (2).

$$TE_{it} = e^{-U_{it}} = \frac{Y_{it}}{f(X_{it}, \beta)e^{V_{it}}}, i = 1, 2, \dots, N, t = 1, 2, \dots, T \quad \text{Eq.(2)}$$

In general, the Cobb-Douglas and translog functions are the most widely used production functions in SFA. However, the Cobb-Douglas production function tends to oversimplify the relations between input and output variables as linear combinations of input variables only. Therefore, this study uses the translog function instead. Assuming a random effect, a time-varying production model, and a production function of the translog form, equation (1) can be expressed as the following equation (3).

$$\ln Y_{it} = \beta_0 + \sum_{m=1}^3 \beta_m \ln x_{mit} + \sum_{m=1}^2 \sum_{k \geq m}^2 \beta_{mk} \ln x_{mit} \ln x_{lit} + V_{it} - U_{it} \quad \text{Eq.(3)}$$

where m represents the m^{th} input variable at time t of the i^{th} company. Y_{it} indicates the total output values at time t of the i^{th} company, and x_i represents the input variables, capital (K), the number of employees (L), cost of goods sold (COGS,M) of the i^{th} company.

3.3.2. Meta-frontier analysis

As mentioned in the Introduction, the comparison of technology efficiency between groups cannot be performed using the traditional SFA because the technical efficiency of a particular company cannot be compared with those that operate with other technologies. Therefore, this study uses the meta-frontier production function (Battese and Rao, 2002) that combines the production function of all groups to compare the efficiency levels of other groups operating under different technical conditions. The meta-frontier production function model from Battese, Rao, and O'Donnell (2004) is defined as follows:

$$\begin{aligned} Y_{it}^* &= f(x_{it}, \beta^*) = e^{x_{it}\beta^*}, i = 1, 2, \dots, N, N = \sum_{i=1}^R N_j, t \\ &= 1, 2, \dots, T, \\ \text{s. t. } x_{it}\beta^* &\geq x_{it}\beta_{(j)} \text{ for all } j = 1, 2, \dots, T \end{aligned} \quad \text{Eq.(4)}$$

where j represents each group and β^* is an unknown variable vector of the meta-frontier function satisfying the following equation. From the above equation (4), the meta-frontier production function graph is located above the graph of the production frontier function of each group for all periods. That is, the meta-frontier production function is an envelope for the frontier function of each group based on the same technology. For simplicity, the function f in equation (1) is assumed to be $e^{x_{it}\beta(j)}$. Equation (1) can be divided as follows:

$$Y_{it} = e^{-U_{it(j)}} \times \frac{e^{x_{it}\beta(j)}}{e^{x_{it}\beta^*}} \times e^{x_{it}\beta^* + V_{it(j)}} \quad \text{Eq.(5)}$$

By dividing both sides of equation (5) by $e^{x_{it}\beta^* + V_{it(j)}}$,

$$\frac{Y_{it}}{e^{x_{it}\beta^* + V_{it(j)}}} = e^{-U_{it(j)}} \times \frac{e^{x_{it}\beta(j)}}{e^{x_{it}\beta^*}} \quad \text{Eq.(6)}$$

Where the first part of the right side $e^{-U_{it(j)}}$ is the technical efficiency of the group j , and the second part is the ratio of the j th group frontier function to the meta-frontier function, which is called the technology gap ratio (TGR) or meta-technology ratio (MTR). The TE^* indicating the technical efficiency of the meta-frontier function is calculated as the product of TE and TGR and can be expressed as follows:

$$TE_{it}^* = \frac{Y_{it}}{e^{x_{it}\beta^* + V_{it(j)}}} = TE_{it} \times TGR_{it} \quad \text{Eq.(7)}$$

There are two methods of measuring the parameters of meta-frontier functions: linear programming (LP) and quadratic programming (QP). LP is a method of minimizing the sum of the absolute values of the deviations, and QP is a method of minimizing the sum of the squares of the deviations. According to Battese, Rao, and O'Donnell (2004), LP and QP are defined as follows.

$$\text{LP: } \min_{\beta^*} L^* = \sum_{t=1}^T \sum_{i=1}^N |x_{it}\beta^* - x_{it}\hat{\beta}_{(j)}|, x_{it}\beta^* \geq x_{it}\hat{\beta}_{(j)} \quad \text{Eq. (8)}$$

$$\text{QP: } \min_{\beta^*} L^* = \sum_{t=1}^T \sum_{i=1}^N (x_{it}\beta^* - x_{it}\hat{\beta}_{(j)})^2, x_{it}\beta^* \geq x_{it}\hat{\beta}_{(j)} \quad \text{Eq.(9)}$$

3.3.3. Tobit analysis

TE, TE*, and TGR values are derived from factors such as capital, the number of employees, COGS that each company can control internally to improve efficiency. The MFA method is to compare the technical efficiency of groups using different technologies, but it does not indicate whether the difference in technical efficiency between groups is statistically significant. Therefore, in this study, after controlling for other factors affecting technical efficiency, I confirmed the statistical significance of the difference for technical efficiency between groups. The model used for

analysis is shown in the following equation (10).

$$\begin{aligned} TGR_{LPi} = & \text{CONSTANT} + \beta_1 \ln_sales + \beta_2 est_year \\ & + \beta_3 timetrend + \beta_4 DUM1 + \beta_5 DUM2 + \epsilon_i \end{aligned} \quad \text{Eq.(10)}$$

In this study, the Tobit model is applied to equation (10) due to a limited range of the dependent variable. The value of β/δ can be estimated based on the maximum likelihood method, assuming that the error term ϵ_i follows the normal distribution $\epsilon_i \sim N(0, \delta^2)$. To investigate the effect of an independent variable on the technical efficiency from the meta-frontier, we set TGR_{LP} as a dependent variable and control the company size (sales), the company age (establishment year), the time trend which is used as an instrument variable reflecting the advance of associated technologies. And to find out the difference between the groups, I compared ‘after YouTube’ as dummy variable 2, and ‘after Netflix’ as dummy variable 3.

3.3.4. Data collection

This study is to examine how the entry of global OTT platforms affect the technical efficiency of Korean video contents companies. In addition to launching the world’s first video contents site, Korea is one of the few countries where Google, the world’s number one search engine, has entered overseas but is not ranked first. As such, Korea has not only its own technical skills in terms of IT services, but also cultural differences such as languages have a great influence on services (Reinecke &

Bernstein, 2013). Meanwhile, Korea is experiencing growing pains such as the emergence and convergence of its own OTT platform company, but it is not keeping up with the reputation of global platform companies, YouTube and Netflix. As Korea's representative OTT platform market is operated as an additional service type by telecom companies, broadcasters, and portal companies, there was a limit in determining the efficiency of the OTT platform for these large companies. As another way to determine the efficiency of the global OTT platform, I wanted to understand the growth of the video content sector, which is a major resource of the OTT platform. If the efficiency of Korean video contents companies has increased since entering the global OTT platform, it can be said that the domestic video contents sector has been activated through the OTT platform. On the other hand, if the efficiency of content companies had decreased, it could be said that entering the global OTT platform prevented or negatively affected growth of content companies. As the global OTT platform companies entered the market, I tried to determine whether domestic video contents companies could grow or whether overseas video contents flooding prevented the growth of domestic video contents. Relevant company data was collected from KISLINE and KISVALUE databases operated by Korean credit rating companies. According to the Korean Standard Industrial Classification (KSIC) classification criteria, among 'motion picture, video, broadcast programme activities' (591), they are divided to 1) 'motion picture, video and broadcast programme production activities' (5911), 2) 'motion picture, video and broadcasting programme post-production activities' (5912), 3) 'motion picture, video and broadcasting programme distribution activities' (5913). Among them, production activities (5911) and distribution activities (5913) were narrowed down

to the research subjects. In the post-production activities (5912), companies did not develop into an industry to support the production activities such as translation, subtitles, copying, etc. Of the 10 companies that were covered during the research period (2005~2018), five were closed and the financial information was not properly reported. As a result, I decided to exclude them from the study.

Starting from the end of 2004 when Korea's OTT platform first appeared, it was targeted for research from 2005 to 2018 in consideration of YouTube's advent in 2008 and Netflix's advent in 2016. I collected total of 167 companies and 938 observations from 1) 'motion picture, video and broadcast programme production activities' (5911), and total 21 companies and 141 observations from 3) 'motion picture, video and broadcasting programme distribution activities' (5913) as unbalanced panel data. To determine the efficiency of a company, I took the sales (Y) of the company as an output variable and capital (K), number of employees (L), and COGS (M) as input variables.

To compare the efficiency of each group, I divided it into three groups: 1) Domestic OTT platform period (2005~2007), 2) YouTube advent (2008~2015), 3) Netflix advent (2016~2018). First, technical efficiency was measured by SFA for each group, and MFA was performed to compare the technical efficiency of each group.

3.4. Results and analysis

Table 3-1 and Table 3-2 are descriptive statistics of the study samples. In both the production and distribution sectors, the average input and output of the companies

involved in the third period was the highest and the production activity was active. This is before and after Netflix enters Korea, and the industry has been activated by the launch of the global OTT platform and the creation of many new domestic OTT platforms (Kim et al., 2016; Park, 2015). Overall, the content industry was stagnant in the first and second periods, and grew rapidly in the third period.

Table 3-1. (Production) Descriptive statistics of input and output variables

<i>Variable</i>	<i>Domestic OTT Platform (2005~2007)</i>		<i>After YouTube (2008~2015)</i>		<i>After Netflix (2016~2018)</i>	
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>
Sales(Y)	15,111,062	19,289,590	18,790,711	33,146,398	29,096,443	49,798,466
Capital(K)	22,411,961	30,239,160	25,067,568	36,894,082	47,835,372	77,575,315
Number of employees(L)	41	36.9	45	51.76	75	108.25
Cost of goods sold(M)	12,603,929	16,382,787	15,523,162	29,639,038	24,443,202	45,047,617
Observations	209		523		206	

Note: Sales, capital, and cost of goods sold are presented in units of one thousand Korean won (1 USD is equal to 1,200 KRW as of 28, Sep, 2019).

Table 3-2. (Distribution) Descriptive statistics of input and output variables

<i>Variable</i>	<i>Domestic OTT Platform (2005~2007)</i>		<i>After YouTube (2008~2015)</i>		<i>After Netflix (2016~2018)</i>	
	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>	<i>Mean</i>	<i>Standard deviation</i>
Sales(Y)	27,954,357	33,491,210	38,952,893	37,809,104	60,726,975	48,208,102
Capital(K)	46,571,023	70,810,898	44,328,219	62,463,223	68,476,572	75,686,006
Number of employees(L)	49	37	35	35.57	48	47.31
Cost of goods sold(M)	17,304,658	26,521,886	26,820,236	30,188,542	43,866,574	43,866,574
Observations		32		81		28

Note: Sales, capital, and cost of goods sold are presented in units of one thousand Korean won (1 USD is equal to 1,200 KRW as of 28, Sep, 2019).

Table3 and Table 4 show the measurement coefficients and standard errors for the SFA and MFA, which are frontier production functions in the form of translog. Meta-frontier function is represented by linear programming (LP) and quadratic programming (QP).

Table 3-3. (Production) Estimation results of group and meta-frontier production functions

<i>Variables</i>	<i>Group-frontier</i>			<i>Meta-frontier</i>	
	<i>Domestic OTT Platform (2005~2007)</i>	<i>After YouTube (2008~2015)</i>	<i>After Netflix (2016~2018)</i>	<i>LP</i>	<i>QP</i>
<i>Constant</i>	12.448*** (1.002)	11.948*** (1.555)	26.481*** (1.050)	26.598	26.741
$\ln x_k$	-0.597 (0.586)	0.037 (0.271)	0.148 (0.618)	0.088	0.041
$\ln x_l$	0.768 (0.704)	0.835** (0.344)	1.414** (0.597)	1.454	1.480
$\ln x_m$	-0.304 (0.560)	-0.575*** (0.206)	-2.519*** (0.614)	-2.481	-2.458
$(\ln x_k)^2$	0.049 (0.043)	-0.016 (0.012)	-0.051 (0.036)	-0.043	-0.042
$(\ln x_l)^2$	0.019 (0.036)	0.038** (0.018)	0.002 (0.032)	0.005	0.006
$(\ln x_m)^2$	0.082*** (0.018)	0.032*** (0.007)	0.070*** (0.008)	0.073	0.071
$\ln x_k$ $\times \ln x_l$	0.095* (0.055)	0.021 (0.022)	0.056 (0.044)	0.047	0.045
$\ln x_l$ $\times \ln x_m$	-0.075 (0.050)	0.036*** (0.013)	0.089*** (0.032)	0.081	0.082
$\ln x_m$ $\times \ln x_k$	-0.149*** (0.026)	-0.085 (0.016)	-0.140*** (0.026)	-0.133	-0.134

Notes: Stars indicates: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. parenthesis indicates standard errors. x_k , x_l and x_m are inputs; the capital, the number of employees and the COGS, respectively.

Table 3-4. (Distribution) Estimation results of group and meta-frontier production functions

<i>Variables</i>	<i>Group-frontier</i>			<i>Meta-frontier</i>	
	<i>Domestic OTT Platform (2005~2007)</i>	<i>After YouTube (2008~2015)</i>	<i>After Netflix (2016~2018)</i>	<i>LP</i>	<i>QP</i>
<i>Constant</i>	15.452 (14.877)	-14.921*** (0.997)	23.948*** (0.997)	-3.330	-46.444
$\ln x_k$	-1.574 (1.746)	1.130 (0.703)	0.299 (0.697)	1.812	5.490
$\ln x_l$	6.298*** (1.762)	2.460** (0.989)	3.424*** (0.969)	4.038	2.427
$\ln x_m$	-0.016 (1.405)	1.341* (0.725)	-2.976*** (0.725)	-0.942	0.795
$(\ln x_k)^2$	0.092 (0.085)	0.050 (0.049)	0.448*** (0.071)	0.0781	-0.103
$(\ln x_l)^2$	0.095 (0.132)	-0.086 (0.075)	0.172 (0.109)	-0.047	-0.104
$(\ln x_m)^2$	0.057* (0.033)	0.108*** (0.021)	0.524*** (0.077)	0.237	0.111
$\ln x_k$ $\times \ln x_l$	-0.336*** (0.102)	0.094 (0.107)	-0.402*** (0.152)	0.139	0.287
$\ln x_l$ $\times \ln x_m$	-0.089 (0.062)	-0.225** (0.095)	0.129 (0.185)	-0.375	-0.406
$\ln x_m$ $\times \ln x_k$	-0.037 (0.103)	-0.183*** (0.058)	-0.832*** (0.132)	-0.285	-0.149

Notes: Stars indicates: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. parenthesis indicates standard errors. x_k , x_l and x_m are inputs; the capital, the number of employees and the COGS, respectively.

Table 3-5 shows the technical efficiency (TE) obtained from SFA for each group in the production and distribution industry, and the technical gap ratio (TGR) calculated from the MFA, and meta-frontier technical efficiency (TE*) which is the product of TE and TGR. TE, the technical efficiency of each group, showed the highest efficiency in the 2nd period after the launch of YouTube in the production industry, and the highest efficiency in the 3rd period after the launch of Netflix in the

distribution industry. However, because TE comparisons between groups using different frontier production functions are meaningless, it is necessary to look at TGR and TE^* to achieve the objectives of the study. Technical Gap Ratio (TGR), which is the ratio of frontier functions to meta-frontier functions by group, was the highest after Netflix in the production industry, and the highest after YouTube in the distribution industry.

Netflix enables the consumption of professionally produced contents such as movies and dramas worldwide. Accordingly, the TGR in the production industry seems to have been increased as the proportion of professionally produced contents rapidly increased after entering Netflix. On the other hand, the efficiency of the video content distribution industry has been the highest since the launch of YouTube, and the distribution of video contents had been actively performed. Since the launch of Netflix, the video content production has been active. One of the reasons for the increased efficiency of the video content distribution industry since the launch of YouTube, YouTube has become a good channel for advertising movie trailers and actually affects the revenue of Box Office (Vedular et al., 2017; Kuruca & Akyol, 2014; Oh et al., 2015). However, after the launch of Netflix, the efficiency of the distribution industry declined sharply. As mentioned by Aguiar and Waldfogel (2018) or Cunningham et al. (2010), there has been created similar domestic and international OTT platforms, including Netflix, which allow the file to be used anywhere, anytime. As a result, the role of the distribution industry is relatively reduced and it is believed that the efficiency improvements through technological innovation have not been seen.

The shift of the production function for each group to the meta-frontier was

confirmed by TGR, which means that the group frontier production function was closer to the meta-frontier production function than other groups. Differences (ie, whether the launch of YouTube or Netflix in this study) imply that companies have been moving up the frontier production functions through technological innovation (Lee, Kim, and Lee, 2017). If TE^* is low compared to high TGR, this means that there is greater growth potential than other groups (Lee, Kim, and Lee, 2017). A small number of outstanding creative innovators can raise the TGR as they move up the production function, while many others have lower TE values by being below the production function as they fail to imitate or innovate, and this lowers TE^* , the product of TGR and TE. Looking at the TE^* value of the production industry, the TGR value is the highest since Netflix, and the overall technical efficiency of the production industry is also increased since Netflix. Additionally, in the case of the TE^* value in distribution industry, it is also the highest since Netflix. This indicates that they have been radical innovations in the few companies after the launch of YouTube, while many of the distribution companies have innovated after the launch of Netflix. In the YouTube group, a small number of companies could grow, while Netflix has created an environment in which the entire distribution business can rise.

Table 3-5. Estimates of each group's average on technical efficiencies from SFA and MFA

A. TE

	Group	Mean	St. dev.	Minimum	Maximum
Production	Domestic	0.6505	0.0894	0.4339	0.9483
	YouTube	0.7796	0.1272	0.1234	0.9726
	Netflix	0.6710	0.0650	0.4999	0.9204
Distribution	Domestic	0.3842	0.2934	0.0785	0.9131
	YouTube	0.2247	0.2331	0.0327	0.8692
	Netflix	0.9292	0.0241	0.8893	0.9622

B. TGR

	Group	Mean(St.dev.)		Minimum		Maximum	
		LP	QP	LP	QP	LP	QP
Production	Domestic	0.6409 (0.1422)	0.6403 (0.1408)	0.1427	0.1468	0.9250	0.9199
	YouTube	0.5726 (0.0926)	0.5716 (0.0909)	0.0257	0.0266	1.0000	1.0000
	Netflix	0.9887 (0.0310)	0.9878 (0.0255)	0.6950	0.7426	1.0000	1.0000
Distribution	Domestic	0.4822 (0.2167)	0.3818 (0.2189)	0.0396	0.0284	1.0000	1.0000
	YouTube	0.7853 (0.2682)	0.6517 (0.2332)	0.0000	0.0911	1.0000	1.0000
	Netflix	0.2177 (0.2345)	0.1910 (0.2217)	0.0715	0.0521	1.0000	1.0000

C. TE*

	Group	Mean(St.dev.)		Minimum		Maximum	
		LP	QP	LP	QP	LP	QP
Production	Domestic	0.4182 (0.1110)	0.4178 (0.1103)	0.1066	0.1096	0.6829	0.6791
	YouTube	0.4457 (0.0994)	0.4449 (0.0984)	0.0233	0.0241	0.7644	0.7609
	Netflix	0.6633 (0.0653)	0.6627 (0.0646)	0.4166	0.4452	0.9110	0.9025

Distribution	Domestic	0.1656 (0.1332)	0.1256 (0.0999)	0.0111	0.0080	0.5562	0.0080
	YouTube	0.1581 (0.1624)	0.1269 (0.1149)	0.0000	0.0048	0.7207	0.4784
	Netflix	0.2026 (0.2200)	0.1777 (0.2072)	0.0684	0.0497	0.9416	0.9416

Notes: TE, TE*, and TGR indicate technical efficiency from the group frontier, technical efficiency from the meta-frontier, and technical gap ratio, respectively. St. dev. Indicates standard deviation of the value. LP and QP refer to the values estimated by linear program and quadratic program. See the notes in Table 1 for the group indicators.

In addition, after controlling for other factors affecting technical efficiency, I examined whether the difference in efficiency between groups was statistically significant. Table 3-6 lists the factors that influence the technology gap by production and distribution industry, including the year of establishment, the level of development of related technologies, the size of the company, after the launch of YouTube, and after the launch of Netflix. According to the existing researches, the history of the company is an important factor in reflecting the accumulated experience and knowledge of the company, and the size of the company is a factor that was mainly used in the innovation and efficiency of the company (Kumar & Saqib, 1996; Michelino et al., 2014). As the samples of this study uses the unbalanced panel data, it is considered that the degree of development of related technologies may have an effect on technology efficiency, and time trend variable is added. (Kim et al., 2016; Owens, 2005). As a results, in the case of production industry, there was little influence of the time trend, and the size of the company had a positive effect. The results of the regression analysis also contributed to a significant increase in the technology gap of production industry after the launch of Netflix and negatively affected the technology gap in the production industry after

YouTube. In the case of the distribution industry, the factors such as the launch of YouTube and Netflix were found to have a significant value to increase the technology gap. While the launch of YouTube played a role in increasing the technology gap in the distribution industry, the launch of Netflix could be interpreted as having a negative impact on increasing the technology gap in the distribution industry.

Table 3-6. Regression results related to factors on TGR_LP difference

<i>Variables</i>	<i>Production</i>	<i>Distribution</i>
	Coefficient(S.E.)	Coefficient(S.E.)
<i>est_year</i>	0.0001(0.0004)	0.0029(0.0022)
<i>timetrend</i>	0.0035***(0.0017)	-0.0119(0.0117)
<i>Log(sales)</i>	0.0261***(0.0023)	0.0111(0.0138)
<i>dum1</i>	-0.0816***(0.0084)	0.3116***(0.0572)
<i>dum2</i>	0.3299***(0.0094)	-0.2991***(0.0676)
<i>Constants</i>	-0.0108***(0.731)	-5.3681(4.4040)
<i>Log likelihood</i>	922.2653	-4.8385

Note: ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

3.5. Discussion and conclusion

The advent of the OTT platform has changed the telecommunications, broadcasting and media industries all over the world (Limbach, 2014; Grove & Baumann, 2012; Gimpel, 2015). This study aims to empirically analyze how the global OTT platform affects related industries when entering other countries. Among them, this study

looked at the video contents distributed through the OTT platform, and examined whether the domestic video contents sector was an opportunity for growth in the situation where overseas contents were freely distributed or whether the domestic video contents sector was eroded by overseas contents.

The result shows that YouTube increased the technical efficiency in the distribution industry, while Netflix has contributed to increase the technical efficiency in the production industry. YouTube has naturally spread advertising such as movies and drama trailers, which has greatly improved the efficiency of content distribution industry (Vedular et al., 2017; Kuruca & Akyol, 2014; Oh et al., 2015). In addition, YouTube was recognized for its focus on short, entertaining, and easily consumed consumer-involved contents, but it has grown to a stage that is back into the pay TV and terrestrial broadcast market by producing and investing professional original contents (Kim, 2012). After all, YouTube has created a momentum for the growth of the traditional broadcasting and media industries beyond the Internet channel. I found that YouTube initially created an environment where the content industry could be feely engaged by the general consumers, and it was an innovator to develop and distribute the professional contents.

Netflix has enabled content production, but has had a negative impact on the content distribution industry. Since Netflix, professional content producers have solved themselves from production to distribution by creating and distributing their own OTT platform, which has resulted in numerous competitors (Waterman, 2013; Cunningham, 2016). Eventually, as the research results of Aguiar and Waldfogel (2018), and Cunningham et al. (2010), there is a negative side that reduces the position of the existing content distribution industry, since Netflix has seen a surge

in the spread of contents via Internet channels.

Although the United States owns most of the global OTT platform and is expanding its influence, there is a difference in recognizing the global OTT platform depending on the situation of foreign countries (Cunningham & Craig, 2016). In the case of China, due to the strong protection measures of the domestic industry, the global OTT platform is unable to enter to China. China creates its own video and social media platforms and expands their platform ecosystem. China has created its own OTT platform (QQ video, YOUKU, iQIYI), which is similar as YouTube, and the media industry and mobile industry derived from it are growing rapidly. Turkey also negatively viewed and prevented the global platforms such as YouTube and Facebook that could affect political, religious and social disorder during national elections (Coldewey, 2016). Meanwhile, there is a perspective to see that the use of the global OTT platform not only contributed to the spread of global stars and cultures that were not well known until then, but also contributed as an advertising medium to enter the global market (Cunningham & Craig, 2016).

In Korea, which was the subject of this study, the average annual growth rate of the video contents industry in 2005~2007 is less than 5%^⑥. Korea's content industry has been protected by domestic laws such as screen quota system, and has grown in part due to the popularity of the Korean Wave. However, compared with other industries, there were many parts of stagnant or irregular growth, and some parts were not easily succeeded abroad (Kim, 2000; Lee & Bae, 2004; Shim, 2008). However, as a result of this study, the advent of a global OTT platform provided a

^⑥ Content Industry Statistics, 2018 (by Ministry of Culture, Sports and Tourism of Korea)

channel for expanding Korean content globally, and also influenced the growth of Korean content^⑦.

The advent of the global OTT platform has both good and bad points as a double-sided sword in the domestic market. However, as the results show, it can have a positive impact on both the domestic video content production and distribution industry, and provide the domestic companies with the opportunity to innovate, create new related companies and spread them all over the world. From the government's point of view, if the global OTT platform is hindering the growth of domestic industry or if there is a problem, measures and regulations must be in place to solve it. In addition, it is thought that it is in line with the trend of the times to provide an environment in which domestic industries can grow through them.

^⑦ https://www.koreatimes.co.kr/www/tech/2019/01/133_262635.html

Chapter 4. Perceived inconvenience of online video advertising

4.1. Introduction

The development of the Internet has made it easy for everyone to get information anytime, anywhere, and to get almost all information indefinitely. However, the biggest advantage is that all this information is for free. The key to providing free Internet information is the Internet platform. Most Internet platforms attract users by providing information for free, and make profits from advertisers by providing advertisements to the users. This free provision of Internet information has created a virtuous cycle in which the Internet can grow by making more information available to users.

The Internet advertising market is showing explosive growth, surpassing the revenues of traditional media broadcast advertising, such as TV and radio (eMarketer, 2019). In particular, the rapid growth of Internet advertising is due to the growth of global platforms, such as YouTube, Facebook, and Instagram. Based on the growth of these global platforms, text and image-oriented content consumption has shifted to video-oriented content consumption (eMarketer, 2019; DMC Report, 2018). The online video advertising is considered to be the fastest growing advertising format, because it is seen while playing online video content (Li & Lo, 2018; Krishnan & Sitaraman, 2013; Goodrich et al., 2015).

Advances in the Internet platform have allowed consumers to experience new products and services in a variety of ways. As a results, consumers have become

smarter and try to maximize their utility and minimize their inconvenience. Consumers search for and move to new products and services that can reduce their inconvenience. Conversely, companies need to focus on innovations that many consumers can choose by identifying and improving consumer inconvenience. Therefore, I believe that the OTT platform companies in this study could innovate by improving services if they identify consumers' inconvenience.

Recently, advertising has been flooded due to the indiscriminate advertising of platform operators, and consumers are spending more and more time on advertising, and consumers are increasingly tired of advertising. Consumers have a negative perception of advertising, so they get to avoid advertising or block it in serious case. If a platform can determine the factors that make consumers uncomfortable and can address those attributes that consumers prefer, it will increase its advertising efficiency and raise the consumers' perception of advertising. Kelly and Drennan (2010) and Pieters et al. (2007) emphasize that, to positively change the consumer's perception of advertising, various social and policy measures are required along with autonomous improvement in providing advertising. To do this, companies and governments must first understand the factors that cause consumer inconvenience.

Therefore, in this study, it is important to identify the inconvenience factors that To explain the factors affecting the degree of inconvenience of consumers, there are several related theories. Theory of reasoned action (TRA: Ajzen & Fishbein, 1980; Fishbenin & Ajzen, 1975), its extended theory of planned behavior (TBB: Ajzen, 1985, 1991), utility theory (UT:Tversky & Kahneman, 1991), and self-determination theory (SDT: Deci & Ryan, 1985; Ryan & Deci, 2000) are considered the best.

According to Pashkevish et al. (2012), Ducoff (1996), and Kim (2018), factors,

such as length, position, and frequency of advertising have a significant effect on consumer inconvenience, but according to Ducoffe (1995, 1996), Pasadeos (1990) and Greyser (1968), if advertising provide interesting or informative content, the inconvenience felt will be reduced. Therefore, I established a model using structural equation method (SEM) to examine the mediating effects of entertainment and information on perceived advertising inconvenience according to the length, position, and frequency of advertising.

Further, in the previous studies, although perceived advertising inconvenience of the consumer might vary according to the characteristics of the consumers, consumer specific studies have not been conducted (Edwards et al., 2002; Goodrich et al., 2015). Therefore, this study attempts to add new implications to the existing studies by classifying clusters. By using K-means clustering method, it compares the preferences of consumers with different consumption patterns and places a value on suggestions for constructing a better Internet environment.

4.2. Literature review

Advertising is a major driver of the Internet platform economy (Evans, 2009). Internet platform, a representative two-sided market, can be an intermediary that connect the advertising provided by advertiser and consumers who consume them. Internet advertising is regarded as the most effective medium to attract consumers' attention. Compared to traditional media such as radio, television, and magazines, Internet advertising is less regulated in terms of number, time, range, etc., and is most ideally evaluated because it can be exposed to consumers anytime, anywhere. In fact,

Internet advertising is exploding. In order for an advertising to attract the consumer's attention, there must be some benefit to the consumer, such as providing information or having fun (Benjamin & Wigand, 1995; Burke, 1997; Ducoffe 1996). Internet advertising can provide high value of information because it is immediately accessible, repeatable, and can be provided at the timing required by consumers (Ducoffe, 1996). In addition, Internet advertising is more enjoyable, pleasant and efficient because it can be combined with various characters, stories, and advanced technologies, and can be customized to consumers (Ducoffe, 1996; Eighmey et al., 1998; Bruner et al., 2000).

However, the ad clutter also has increased due to the low entry barriers, various combinations, repeatable play, and the possibility of providing them in any location. As the ad clutter has increase, it has become more difficult to receive the attention of advertising from consumers, and at the same time, the act of blocking the advertising is spreading (Redondo & Aznar, 2018).

Companies need to make efforts to identify and resolve the movements that consumers feel uncomfortable with the products or services, and that consumers try to reject or avoid them. IT industry is an area where companies enter and exit the market quickly, and it is not easy to survive the competition unless a differentiated growth strategy is established. Previous studies on company innovation has emphasized that companies must be familiar with consumers in order to succeed (Christensen, 1997; Von Hippel, 1986, 2005; Gamble et al., 2016; Berthon et al., 2007). Regarding listening to consumers, efforts to improve the voice of non-major customers or new customers are also critical to the company's success in innovation (Christensen, 1997; Von Hippel, 1986, 2005; Gamble et al., 2016; Berthon et al.,

2007).

The level of advertising inconvenience on the OTT platform is well known (Vratonjic et al., 2013; Market charts, 2017^⑧). Consumers avoid or block advertising on their own, and some companies offer the paid services without advertising. If the OTT platform is able to figure out what parts consumers are uncomfortable with advertisements and if there is a way to reduce the inconveniences, it will be possible to earn revenue for advertising while reducing the inconvenience for consumers.

According to utility theory (Tversky & Kahneman, 1991; Haile & Altmann, 2015, 2016), consumers using OTT platforms will choose to trade if the consumer's expected utility of consuming a content is greater than not consuming. When a consumer spends a certain amount of time on advertising while consuming free content, consumers will make another choice if the inconvenience to the advertising is greater than the content consumption utility. In addition, according to the self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000), there are two main types of motives for consumers. The internal motives are chosen by consumers themselves to enjoy the process itself, while the external motives are often chosen to avoid the punishment or to be rewarded. The inconvenience of the advertisement corresponds to the former, and may cause an action of avoiding or blocking the advertisements or not selecting the related content service in order to avoid the inconvenience of the advertisement. From the theory of reasoned action (TRA, Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), it can predict the behavior by looking at the impact of attitudes on behavioral intentions. In this study, it was thought that

^⑧ <https://www.marketingcharts.com/digital-76377>

identifying the degree of inconvenience in advertising could infer the actual ad-blocking behavior or moving to other platforms. However, the subjective norms mentioned by the TRA were not considered to be applicable in this study. The extended theory of TRA, theory of planned behavior (TBB, Ajzen, 1985, 1991), added the perceived behavioral control as an influence on behavioral intention. The perception of behavioral control is the level of perception that behavior is easy or difficult to carry out an action, and the degree to which one believes that the execution of the action is under one's own voluntary control. In this study, I considered that the perceived behavioral control is the consumer's own judgement whether advertising has the pleasure benefits or the informational benefits.

There are studies using K-Means Clustering to analyze behavioral differences according to the characteristics of consumers. K-Means clustering algorithm proposed by MacQueen is an unsupervised learning analysis technique that measures the similarity and distance between objects with only specific data without prior information and assign it to the nearest cluster (MacQueen, 1967). There is a study to improve the efficiency of advertising through behavioral targeting based on K-Means Clustering method (Yan et al., 2009), and there is also studies using K-Means Clustering to identify the main objectives of using specific search engines (Karthuria et al., 2010). Thus, if the cluster can be analyzed based on the similarity of the characteristics of consumers and the propensity to consume, it would be possible to reduce the degree of inconvenience for each group.

Therefore, this study aims to analyze factors that consumers feel inconvenience in online video advertising using mediating effect by SEM. In addition, by using the K-Means Clustering method, it try to compare the preferences of consumers by

comparing the groups with different consumption patterns of Internet video contents, and put a value on suggestions for constructing a better Internet environment.

4.3. Research model

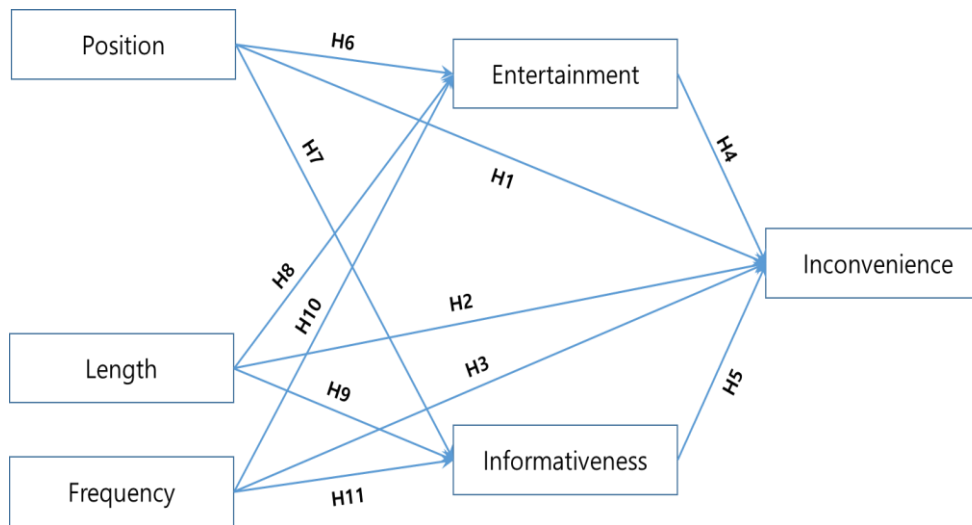
This study is basically intended to analyze the relationship between the attributes of advertising and the degree of inconvenience of consumers. In measuring the degree of inconvenience of the advertising, it assumed the position of the advertising, the length of the advertising and the frequency of the advertising as the independent variables, the degree of inconvenience as the dependent variable, the entertainment and informativeness of the advertising as the mediator variables. Table 4-1 describes the variables based on the related theory and literatures.

Additionally, it was also considered that the degree of inconvenience of perceived advertising differs according to the consumers' content consumption patterns and the degree of Internet usage. Therefore, this study considered variables such as the devices used mainly, the amount of content consumed on an average day, the type of platform used mainly, the attitude toward advertising, and the relationship between advertising and consumption habits. I will analyze the clustering of consumers through the K-Means Clustering method and look at the classification of consumers. In addition, advertising functions such as position, length, and frequency directly increase the degree of inconvenience for the consumers, but if the advertising is interesting or profitable and the consumer benefits from the advertising, the degree of consumer's inconvenience will be reduced.

Table 4-1. Description of variables

Constructs	Variables	Description
Perceived Behavioral Control (Ajzen, 1985, 1991)	Perceived entertainment of advertisements (Ducoffe, 1995 ,1996; Edwards at al., 2002; Pasadeos, 1990; Gao & Koufaris, 2006; Jung at al., 2016)	Personal belief that advertisements provide the entertainment
	Perceived informativeness of advertisements (Ducoffe, 1995 ,1996; Edwards at al., 2002; Pasadeos, 1990; Gao & Koufaris, 2006; Jung at al., 2016)	Personal belief that advertisements provide the informativeness
Attitude (Ajzen & Fishbein, 1975, 1980;)	Perceived position of advertisements (McCoy et al., 2007; Hegner et al., 2016; Li & Lo, 2015; Mei et al., 2010)	The perceived degree of position about advertisements
	Perceived length of advertisements (Goodrich et al., 2015; Newell & Henderson, 1998; Schmidt & Eisend, 2015),	The perceived degree of length about advertisements
	Perceived frequency of advertisements (Kim, 2018; Lee & Cho, 2010; Schmidt & Eisend, 2015)	The perceived degree of frequent repetition about advertisements
Behavioral Intention (Ajzen & Fishbein, 1975,1980; Deci & Ryan, 1985, 2000; Tversky & Kahnemear, 1991)	Perceived inconvenience of advertisements (Pashkevich, et al.2012; Smit, et al., 2006; Dube-Rioux, 1989; Voorveld et al., 2018)	The degree of inconvenience that consumers feel about advertisements

Figure 4-1. Research model



When a video advertising appears before, during, and after video content, it must be watched for a few seconds, and when it appears as a pop-up advertising that obscures the necessary screens, it can interfere with consumer behavior (Ducoffe, 1996; Edwards, et al., 2002). If it offers free contents on online video platform like YouTube, you'll be obliged to watch at least 5 seconds advertising, and the long advertising without skip buttons, X buttons, etc. will be relatively more inconvenient (Pashkevich, et al. 2012; Smit, et al. 2006; Dube-Rioux, 1989). In addition, if similar or identical advertising are repeatedly displayed, the degree of inconvenience to consumers will be increased (Kim, 2018; Kreshel, et al. 1985; Krugman, 1972; Lancaster, et al. 1986). However, if the content of the advertising provides interesting or a useful piece of information, the inconvenience for the advertising will be reduced (Greyser, 1968; Ducoffe, 1995, 1996; Edwards et al, 2002; Pasadeos, 1990).

Therefore, in this study, when consumers watch the online video

advertisements, it is considered as the behavioral intention of consumers to grasp the degree of inconvenience perceived by the consumer, and the length, position, and frequent repetition function of the advertising were recognized as the perceived attitude of the consumer that affected the behavioral intention of the consumer. Also, it was considered as the perceived behavioral control as the degree of inconvenience of advertisement varies depending on the level of perceived information or pleasure. Table 4-1 attempts to explain the relationship with variables based on existing theories.

Hypothesis 1 (H1) The degree of inconvenience in the position of the video advertising will have a positive effect (+) on the degree of video advertising inconvenience.

Hypothesis 2 (H2) The degree of inconvenience in the length of the video advertising will have a positive effect(+) on the degree of video advertising inconvenience.

Hypothesis 3 (H3) The degree of inconvenience in the frequency of the video advertising will have a positive effect(+) on the degree of video advertising inconvenience.

Hypothesis 4 (H4) Interesting video advertising will have a negative effect (-) on the degree of video advertising inconvenience.

Hypothesis 5 (H5) Informative video advertising will have a negative effect (-) on the degree of video advertising inconvenience.

Functional factors to increase the advertising efficiency, such as when the advertising occupies the entire screen, when it is located to interferes with behavior,

when it is long, when it is played repeatedly, may cause consumers to perceive the advertising negatively (McCoy et al., 2007; Pashkevish et al., 2012; Ducoff, 1996; Kim, 2018). Regarding to the proper video length, there is a study that consumers' interest is maintained in the first two minutes, while consumer avoidance starts after two minutes (WISTIA, 2016). On the other hand, there is also a study that consumers don't just like only short videos, but consumers would like the videos depending on the contents (Grec Jarboe, 2012). Therefore, if the content of advertising is interesting or informative, it can be positively evaluated by the consumer, but the functional aspect of excessive advertising such as position, length, and frequency of advertising will have a negative effect on the advertising.

- | | |
|---------------------|---|
| Hypothesis 6 (H6) | The position of video advertising will have a negative effect (-) on the interesting video advertising. |
| Hypothesis 7 (H7) | The position of video advertising will have a negative effect(-) on the informative video advertising. |
| Hypothesis 8 (H8) | The length of video advertising will have a negative effect(-) on the interesting video advertising. |
| Hypothesis 9 (H9) | The length of video advertising will have a negative effect(-) on the informative video advertising. |
| Hypothesis 10 (H10) | The frequency of video advertising will have a negative effect(-) on the interesting video advertising. |
| Hypothesis 11 (H11) | The frequency of video advertising will have a negative effect(-) on the informative video advertising. |

4.4. Methodology

4.4.1 Survey and data

The questionnaire of this study was conducted online for 300 people (20~50 years old or older) residing in Korea during 2019.5 ~2019. 5.14 period. Before entering this questionnaire, it conducted a pilot test of more than three ordinary citizens of each age group in the 20s~60s. The questionnaire was revised to reflect the results. The respondents were those who had at least once watched online video advertising and online video contents (PC, smartphone, tablet, etc.) within the past week. Demographic characteristics and video content consumption patterns of respondents responding to the survey are shown in table 4-2.

Table 4-2. Demographic characteristics of the respondents (n=300)

		Respondents(#)	Rate(%)
Total		300	100
Gender	Male	150	50.0
	Female	150	50.0
Age (years)	20~29	73	24.3
	30~39	75	25.0
	40~49	76	25.3
	Over 50	76	25.3
Average monthly telecommunication fee (10,000 KRW) ^⑨	Under KRW 1	3	3.0
	KRW 1~3	102	34.0
	KRW 4~6	136	45.3
	KRW 7~9	46	15.3
	Over KRW 10	13	4.3
Unlimited Data Services	Subscription	125	41.7

^⑨ USD 1 equaled KRW(Korean Won) 1171 in July, 2019.

	None	175	58.3
	Middle school and less	0	0
	High school	35	11.7
Education level	University attending	28	9.3
	University graduation	204	68.0
	Graduate school and higher	33	11.0

A total of six potential variables were used in the questionnaire, and the observation variables for each latent variable were verified through reliability and feasibility analysis. The final 36 items were used in the analysis of this study, except for items lacking validity. The position, the length and the frequency of the advertising were used as the independent variables, entertainment and informativeness of advertising were used as mediator variables, and the degree of advertising inconvenience was used as a dependent variable. In addition, Pearson correlation analysis was performed to find the correlation between the major variables, and it was judged that there was no multi-collinearity problem because the correlation coefficients were less than 0.9.

In the process of confirming the fitness index of the model shown in Fig.4-1, the research model was revised to connect the error terms with Modification Indices (MI) in the order of high. As a result, the fitness indices of CMIN/DF, RMR, NFI and CFI from Table 4-4 were found to be good and the fitness of the final model could be judged.

Table 4-4. Fit indices of the research model

Fit index (Recommended value)	Results of research model
CMIN/DF(≤ 2)	1.942
RMR(≤ 0.05)	0.038
NFI(≥ 0.90)	0.88
CFI(≥ 0.90)	0.937

Table 4-3. Convergent validity about the latent variables

Latent variables	Items	Standardized estimates	C.R.	AVE	Construct reliability	Cronbach's α
Perceived entertainment of advertisements	Entertainment 1	0.729	-	0.694	0.932	0.920
	Entertainment 2	0.8	17.418			
	Entertainment 3	0.825	14.179			
	Entertainment 4	0.848	14.602			
	Entertainment 5	0.82	14.101			
	Entertainment 6	0.815	14.004			
Perceived informativeness of advertisements	Informativeness 1	0.734	-	0.698	0.920	0.909
	Informativeness 2	0.815	14.134			
	Informativeness 3	0.862	14.995			
	Informativeness 4	0.848	14.736			
	Informativeness 5	0.818	14.184			
Perceived position of advertisements	Position 1	0.806	-	0.628	0.910	0.899
	Position 2	0.74	13.778			
	Position 3	0.787	14.887			
	Position 4	0.823	13.893			
	Position 5	0.803	15.275			
	Position 6	0.711	13.12			
Perceived length of advertisements	Length 1	0.762	-	0.615	0.712	0.900
	Length 2	0.75	13.347			
	Length 3	0.785	14.081			
	Length 4	0.749	13.34			
	Length 5	0.745	13.257			

	Length 6	0.746	13.28			
Perceived frequency of video advertisements	Frequency 1	0.752	-			
	Frequency 2	0.824	18.036			
	Frequency 3	0.881	15.913	0.734	0.933	0.918
	Frequency 4	0.868	15.65			
	Frequency 5	0.818	14.633			
Perceived inconvenience of advertisements	Inconvenience 1	0.803	-			
	Inconvenience 2	0.79	16.904			
	Inconvenience 3	0.775	15.781			
	Inconvenience 4	0.811	16.206	0.733	0.956	0.942
	Inconvenience 5	0.833	16.680			
	Inconvenience 6	0.853	17.661			
	Inconvenience 7	0.838	16.075			
	Inconvenience 8	0.842	16.598			

4.4.2 Estimation results

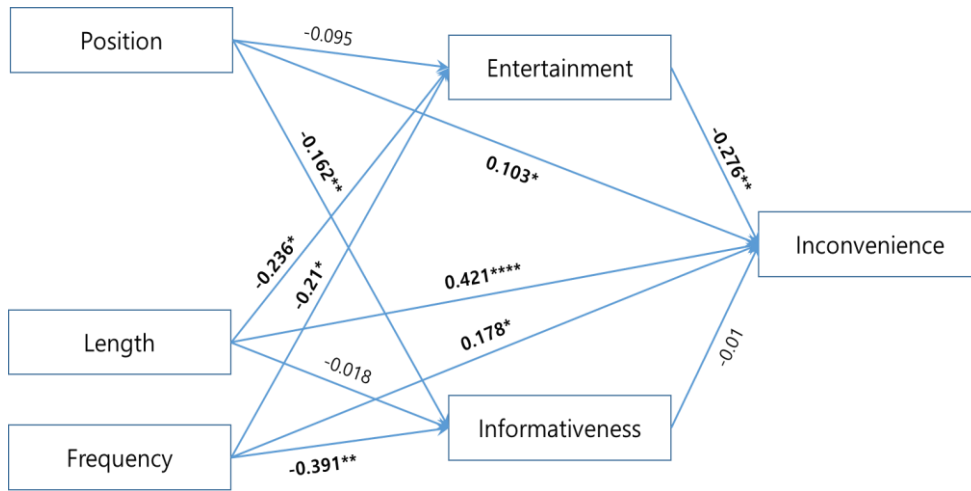
After the model verification process, the path coefficient was calculated as shown in Table 4-5, and the hypothesis was verified. First, the factors affecting the direct effect on the degree of the inconvenience of the advertising are entertainment (H4), informativeness (H5), position (H1), length (H2), frequency (H3) of advertising, and significant results were obtained except the informativeness of advertising (H5). The entertainment of advertising has a significantly negative effect on the degree of advertising inconvenience, and the position, the length, the frequency of the advertising has a positive effect on the degree of advertising inconvenience.

Table 4-5. Evaluation of the structural model hypotheses

	Hypothesized relationships	Estimate	S.E	Results
H1	Position → Inconvenience	0.103*	0.053	Adopt
H2	Length → Inconvenience	0.421****	0.098	Adopt
H3	Frequency → Inconvenience	0.178*	0.097	Adopt
H4	Entertainment → Inconvenience	-0.276**	0.109	Adopt
H5	Informativeness → Inconvenience	-0.01	0.109	Reject
H6	Position → Entertainment	-0.095	0.071	Reject
H7	Position → Informativeness	-0.162**	0.072	Adopt
H8	Length → Entertainment	-0.236*	0.124	Adopt
H9	Length → Informativeness	-0.018	0.122	Reject
H10	Frequency → Entertainment	-0.21*	0.127	Adopt
H11	Frequency → Informativeness	-0.391**	0.129	Adopt

Note: *p<0.1; **p<0.05; ***p<0.01, ****p<0.001

Figure 4-2. Estimation results



4.4.3 Significance analysis of indirect effect

According to the Baron & Kenny (1986) method, four conditions must be satisfied to verify indirect effects using mediator variables; i) Independent variables should have a significant impact on dependent variables, ii) Independent variables should have a significant impact on the mediator variables, iii) Mediator variables should have a significant impact on the dependent variables, iv) Significant impacts of independent variables disappear or decrease after the mediator variables control. The model used in this study is a multiple mediators model using two mediator variables and it uses the phantom variables to identify the path through each mediator variable. By generating the phantom variables, the indirect effect in the form of a product is expressed as a single coefficient, and bootstrapping is applied. As a result, two places satisfying the above conditions were found to have significant effect on ‘Length →

Entertainment→Inconvenience’ and ‘Frequency →Entertainment→Inconvenience’. When ‘Length’ is an independent variable, considering ‘Entertainment’ as a mediator variable, the estimate value is 0.065(=-0.236*x-0.276**), which is lower than the estimate value of direct effect, 0.421 in ‘Length → Inconvenience’. In addition, when ‘Frequency’ is an independent variable, considering ‘Entertainment’ as a mediator variable, the estimate value is 0.065(=-0.21*x-0.276**), which is lower than the estimate value of direct effect, 0.178* in ‘Frequency → Inconvenience’.

Table 4-6. Indirect effect verification through bootstrap method

Indirect effect	Estimate	S.E	90% CI	
			Lower Bound	Upper Bound
Position → Entertainment→Inconvenience	0.026	0.028	-0.004	0.093
Length → Entertainment→Inconvenience	0.065	0.049	0.010	0.184
Frequency → Entertainment→Inconvenience	0.058	0.048	0.002	0.169
Position → Informativeness → Inconvenience	0.002	0.023	-0.033	0.044
Length → Informativeness → Inconvenience	0.000	0.017	-0.024	0.030
Frequency → Informativeness → Inconvenience	0.004	0.051	-0.074	0.089

*Bootstrap sampling 2,000 times, estimates are non-standardized.

4.4.4 Clustering analysis of the advertising inconvenience factors

The degree of inconvenience in advertising was expected to be different according to consumer clusters with similar tendencies. Table 4-7 lists the variables used to

cluster. I mainly selected video contents and internet shopping variables, etc. that seem to be closely related to advertising. First of all, I considered that there will be device differences in video contents consumption (Phan et al., 2012). While there is a convenience that a smartphone can be used anytime, anywhere, there are problems that it is not possible to multitask and to operate a small screen is relatively difficult. In addition, based on the average monthly telecommunication fee and unlimited data subscription service, I tried to determine if the consumers would be distinguished by the amount of smartphone they use. I considered that the average daily viewing and spending time of online video contents is closely related to the number of times that they've been exposed to video advertising. I also wanted to see whether the advertising is effectively perceived by consumers by watching the advertising to the end, or seeing the advertising and leading to the purchase of goods. I tried to find out how often consumers usually shop on the Internet, how much time they spend on Internet sites in one purchase, and how much it costs to shop online. In addition, the platform that can consume online video contents is divided into portal, SNS, and OTT. Consumption of video contents through the portal is represented by Naver TV and Kakao TV in Korea, and SNS platform is considered Facebook, Instagram, and OTT platform for YouTube, Netflix, etc. Seven platform combinations used mainly by consumers were used as variables.

Table 4-7. Variables used in K-Means Clustering

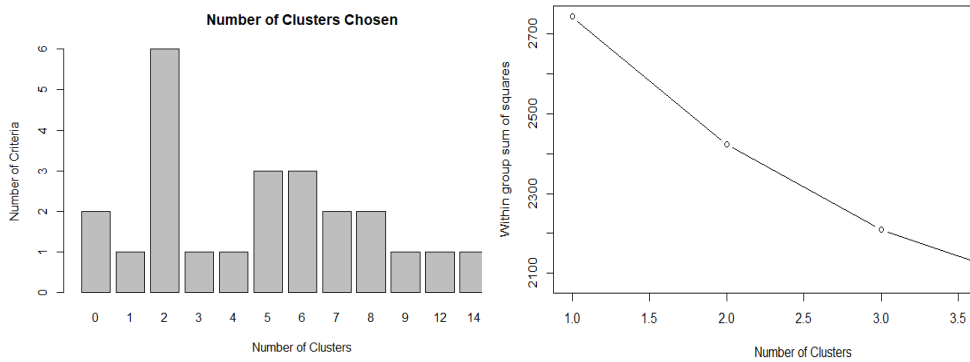
		Respondents (#)	Rate(%)
Total		300	100
Online Video Contents Viewing Device	PC/laptop	74	24.7
	smartphone	218	72.7

(Rank 1)	tablet	8	2.7
Average monthly telecommunication fee (10,000 KRW)	0~3	105	34.5
	4~6	136	45.6
	7~9	46	15.4
	Over 10	13	4.3
Subscription to unlimited data service	Subscription(1)	125	41.7
	Unsubscription(2)	175	58.3
Preferred Platform for Internet Access (Rank 1, 2, 3)	portal	31	10.5
	SNS	5	1.69
	OTT	2	0.6
	Portal + SNS	66	22.3
	Portal + OTT	70	23.6
	SNS + OTT	21	7.1
	Portal+ SNS + OTT	101	34.12
Preferred Platform for Online Video Contents (Rank 1, 2, 3)	Portal	90	30.0
	SNS	2	0.7
	OTT	3	1
	Portal + SNS	77	25.7
	Portal + OTT	97	32.3
	SNS + OTT	3	1
	Portal+ SNS + OTT	28	9.3
Average Video Contents Viewing Per Day (average #: 6)	Under 2	69	23.0
	3~5	159	53.0
	6~10	67	22.3
	Over 11	5	1.7
Average Video Contents Viewing Time Per Day (average 37.5 mins)	Under 20 mins	46	11.4
	21~40 mins	83	20.5
	41~60 mins	104	25.7
	41~99 mins	109	27.0
	Over 100 mins	62	15.3
Whether to watch online video ads to the end	Yes (1)	54	18.0
	No (2)	246	82.0
Purchase through online video ads	Purchase	251	83.7
	Middle	43	14.3
	No purchase	6	2.0
Average time spent per an Internet shopping	0~10 mins	22	9.0
	11~20 mins	68	28.0
	21~30 mins	85	35.0
	31~90 mins	68	28.0
Average number of Internet shopping per month	0~5	215	71.7
	6~10	65	21.7
	11~15	20	6.7
Average Internet shopping cost per month (10,000 KRW)	Under 10	174	58.0
	11~20	62	20.7
	21~70	64	21.3

In this study, clusters were classified through K-Means Clustering method. Cluster analysis is a method of unsupervised learning, which is classified into homogeneous groups based on correlation (Anderberg, 2014). Clustering analysis is divided into hierarchical clustering and non-hierarchical clustering. K-means cluster analysis is a non-hierarchical cluster analysis that divides into K groups with similar characteristics. Each cluster has a centroid, each object is assigned to the nearest center, and individuals assigned to the same center are grouped into one cluster (Hartigan and Wong, 1979). The determination of seeds, which is the center of K clusters, has an important influence on the formation of clusters. Inadequate initial values take a long time to generate clusters and affect the performance of cluster analysis

In the non-hierarchical method, K-Means Clustering method, the user must determine the number of clusters (K) before executing the algorithm. To determine the initial optimal K value, I used the 'NbClust' package of the R program (Charrad et al., 2014). The NbClust function provides 30 methods for recommending the number of clusters, and uses the most recommended number of clusters among the method. In this study, as shown in Figure 4-3, nine methods recommended two clusters; KL (Krzanowski & Lai, 1988), CH (Calinski & Harabasz, 1974), CCC (Warren & Sarle, 1983), Silhouette (Rousseeuw, 1987), Duda (Duda & Hart, 1973), PseudoT2 (Duda & Hart, 1973), Beale (Beale, 1969), McClain (McClain & Rao, 1975), Dunn (Dunn, 1974). In addition, when looking at the graph of the sum of squares (within-group sum of squares) according to the number of clusters, it can be seen that the error sum of squares in cluster number, 2 is greatly reduced.

Figure 4-3. Clustering results



The Euclidean distance is used as a basic for measuring the distance between two

observations.
$$d_{ij} = \sqrt{\sum_{p=1}^p (x_{ip} - x_{jp})^2}$$

In the above equation, i, j are observations and p is a variable number.

Table 4-8 shows the characteristics of the clusters. Comparing the average per factor, there is the big differences about the consumption of online video contents, and the characteristics of online shopping habits. Cluster 2 is significantly higher in the number and the time of viewing the online video contents. Also, the average time, number and cost of internet shopping was higher than cluster 1. But, in case of cluster 1, they are relatively more careful when they spend the time for internet shopping and less active for watching the contents. Since cluster 1 is a more prudent consumer of content consumption and online shopping, cluster 1 would be more sensitive about the inconvenience of advertising. Therefore, it can be interpreted that cluster 2 is an active watching & shopping group, and cluster 1 is an active searching & careful considering group.

Table 4-8. Characteristics of Clusters

Clusters	cluster1 (n=124)	cluster2 (n=176)
Device	1.71	1.91
Monthly Fee	4.18	5.67
Number of Video Contents	3.68	6.41
Watching Time of Video Contents	47.69	82.24
Subscription of unlimited data	1.67	1.42
Internet site	4.89	5.36
Video site	4.91	4.94
Whether to watch the ads to the end	1.79	1.88
Buy through ads	1.72	1.65
Avg. time spent per an Internet shopping	21.56	37.15
Avg. number of Internet shopping	3.23	8.02
Avg. Internet shopping cost	8.97	25.74

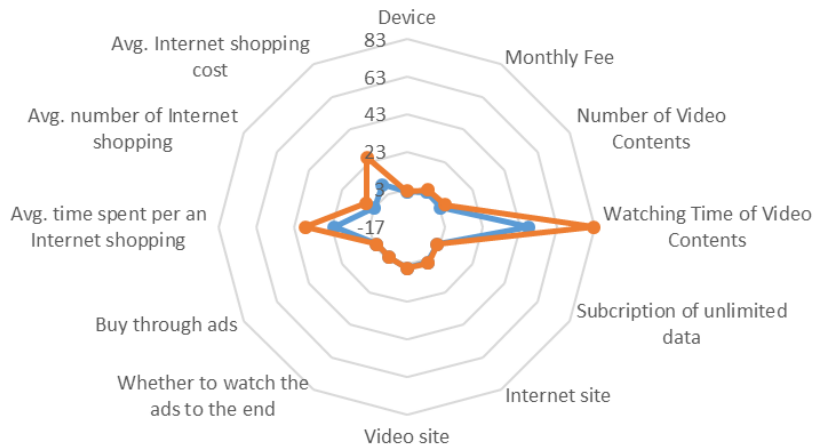


Table 4-9 and figure 4-4 examine whether there are differences in inconvenience factors for advertising by cluster 1 and cluster 2, and table 4-10 shows that the fit indices of research model is significant. In case of cluster 1, video content consumption is relatively low and thus, the number of exposure to online video advertising is small. At the frequent repetition of similar advertising, cluster 1 feels

the inconvenience of the advertising. But if the frequent advertising is interesting, there was a complete mediating effect^⑩ that reduce the inconvenience of the advertising. In addition, the direct effect of advertising inconvenience only appeared for long advertising. In the case of cluster 2, as the consumption of video content is high, the number of exposure to online video advertising is high. They showed that the position, length, and frequency of advertising all increased the degree of inconvenience. When comparing the standardized regression weights, the inconvenience level was found to be great in the order of length, position, and frequency of advertising. In addition, when the long advertising is interesting, the indirect effect of reducing the inconvenience of advertising appeared, and the partial mediation effect^⑪ appeared. Therefore, advertisers should pay close attention to the length of the advertising, because either the consumers who exposed or not exposed to many contents and advertising are most sensitive to the length of the advertising. If consumers are exposed to a lot of advertising, they have negative responses to the most of advertising. But only if advertising is interesting, the inconvenience to the length was reduced. Most consumers have the biggest inconvenience at the length of advertising and the other advertising techniques only increased the inconvenience of advertising to the consumers.

In order to prove the significance of the indirect effects of each path, Table 4-11 was derived by using the phantom variables. Indirect effects were not observed in cluster 1, and if the long advertising is interesting, it was found to decrease the

^⑩ Mediating effect when independent variable cannot affect to the dependent variable, if they don't have mediator variables.

^⑪ Mediation effect when independent variable can affect to the dependent variable, if they don't have mediator variables.

inconvenience of advertising in cluster 2. Therefore, advertisers should focus on the short length of advertising and the interesting advertising.

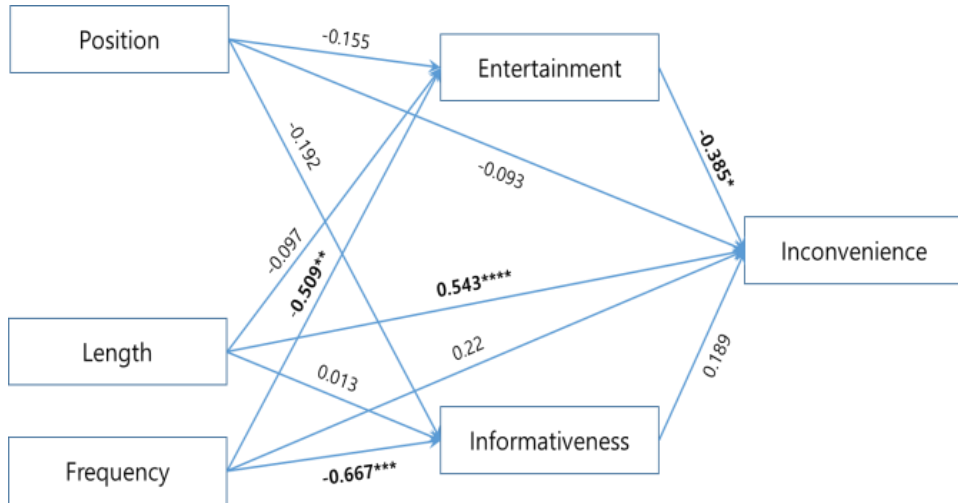
Table 4-9. Evaluation of the hypotheses by cluster

Hypotheses	Hypothesized relationships		Cluster 1(n=124)		Cluster 2(n=176)	
			Estimate	S.E	Estimate	S.E
H1	Position Inconvenience	→	-0.093	0.085	0.224****	0.067
H2	Length Inconvenience	→	0.543****	0.149	0.299**	0.125
H3	Frequency Inconvenience	→	0.22	0.164	0.216*	0.12
H4	Entertainment Inconvenience	→	-0.385*	0.217	-0.28*	0.137
H5	Informativeness Inconvenience	→	0.189	0.223	-0.084	0.134
H6	Position Entertainment	→	-0.155	0.133	-0.064	0.081
H7	Position Informativeness	→	-0.192	0.129	-0.144*	0.083
H8	Length Entertainment	→	-0.097	0.213	-0.333**	0.148
H9	Length Informativeness	→	0.013	0.207	-0.077	0.145
H10	Frequency Entertainment	→	-0.509**	0.243	-0.041	0.776
H11	Frequency Informativeness	→	-0.667****	0.241	-0.24	0.103

Note: *p<0.1; **p<0.05; ***p<0.01, ****p<0.001

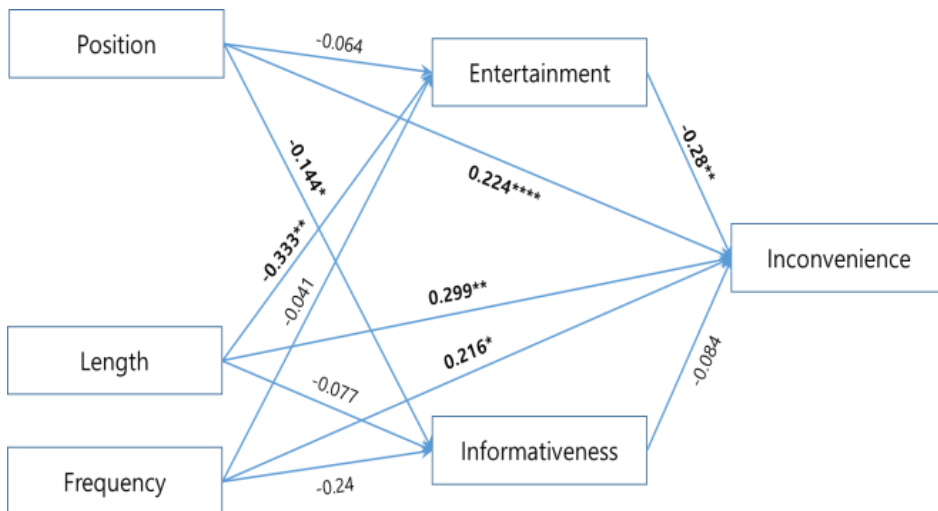
Figure 4-4. Estimation results by cluster analysis

<Cluster 1 results>



Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; **** $p > 0.001$

<Cluster 2 results>



Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; **** $p > 0.001$

Table 4-10. Fit indices of the research model by cluster analysis

Fit index (Recommended value)	Results of research model	
	Cluster 1	Cluster 2
CMIN/DF(≤ 2)	1.56	1.91
RMR(≤ 0.05 , 0.05~0.08 acceptability)	0.067	0.072
CFI(≥ 0.90)	0.91	0.90

Table 4-11. Cluster 2_ Indirect effect verification through bootstrap method

Effect	Estimate	S.E	90% CI	
			Lower bound	Upper bound
Position → Informativeness → Inconvenience	0.012	0.027	-0.012	0.078
Length → Informativeness → Inconvenience	0.006	0.033	-0.019	0.092
Frequency → Informativeness → Inconvenience	0.020	0.050	-0.021	0.141
Position → Entertainment → Inconvenience	0.018	0.029	-0.011	0.089
Length → Entertainment → Inconvenience	0.093	0.079	0.010	0.263
Frequency → Entertainment → Inconvenience	0.011	0.048	-0.043	0.123

*Bootstrap sampling 2,000 times, estimates are non-standardized.

4.5. Discussion

This study started from the dual phenomenon that the number of consumers who block advertising, or subscribe to the paid service without advertising increase, although the consumption of online video contents is increasing and profitability of online video advertising is increasing. Also, among the online advertising, the video advertising is considered to be a big inconvenience for consumers because consumer can be consumed the contents only if they watch the video adverting for a certain amount of time. Therefore, this study was to examine the inconvenience factors

perceived by consumers for online video advertising.

According to the research results, the common results across the all and cluster 1 and cluster 2 is that advertising should be fun to reduce inconvenience, and even if it provides information, it cannot reduce inconvenience for consumers. It is because that consumers tend to be more inclined to spend time on the advertising than to get information or to get help with advertising, and the expectations of advertising appear to be low. Existing studies have also shown that consumers avoid the advertising as their negative experiences accumulates (Cho & Cheon, 2004; Kelly et al., 2010), and it was judged that many people viewed it negatively about the information from the advertising, as the negative experiences with the information from advertisings. Instead, for fun advertising, consumers can easily consume the advertisings, so that consumers have the ability to enhance their utility with pleasure in video advertising and have a positive attitude toward the advertisings.

On the other hand, according to the existing researches, consumers have a desire to consume contents as easily as ‘snack’ for a limited time, and there is a research results that they want relatively comfortable, intuitive understanding and pleasure through contents (Wolf, 1999; Shao, 2009; Rafaeli, 1984). The reason that consumers prefer the video contents is that they can easily consumer the contents on a small smartphone screen anytime and anywhere. YouTube’s most popular video category, the world’s leading video site, is attested by comedy, music and entertainment/pop culture¹². In the video advertising provided by most video

¹² <https://www.thinkwithgoogle.com/data/top-content-categories-youtube/>

contents, consumers didn't expect to get information, and they showed a significant response to the relatively entertaining advertising. Speck & Elliot (1997) looked at the differences in advertising avoidance by media, and the highest level of advertising avoidance was TV, followed by magazines, newspapers, and radio. Consumers' inconvenience was high in the video contents. In addition, in the previous studies, there were many positive papers on the effect of the medium and internet advertising (Chen & Wells, 1999; Li et al., 2002), but the study from Cho & Cheon (2004) found that Internet advertising avoidance was higher than that of newspapers and TV due to the increased congestion of advertising on the Internet.

Consumers differed in the inconvenience level of advertising in the order of length, position, and frequency of the video advertising. In addition, only when there is the inconvenience in the length of the advertising, there was a mediating effect that the degree of inconvenience for the advertising is reduced when the advertising is interesting. I could know that consumers tend to focus on or perceive advertising contents when the advertising provides only basic functionality, and that if the advertising is repeated many times or plays in multiple positions, consumers will see a sharp drop in interest and not focus on the advertising contents. Rather, excessive advertising techniques can have a reverse effect, such as causing consumers to have a negative image of the product (Speck & Elliott, 1997).

4.6. Conclusion

Previous researches have shown that people who block the advertising are more sensitive to the inconvenience of advertisements, so advertisers can increase the number

of advertisings for consumers who do not block the advertisings (Anderson & Gans, 2011; Tag, 2009). However, as ad-blocking programs that can be easily used by consumers are spreading, and the paid programs, platforms without advertising are growing, it is important to examine the causes of changes, and changes of consumers.

In this study, consumers could reduce the degree of inconvenience only when watching a pleasant video advertising, and the inconvenience was increased at the advertising functions such as the length, frequency, and position to increase the efficiency of the advertising. In addition, the degree of inconvenience at the length of the advertising decreased if it was interesting, but there was no mediating effect that could reduce the inconvenience from the frequency and position of the advertising. As a result, consumers was increased the degree of advertising inconvenience advertising at the additional functions to improve advertising efficiency, and I inferred that ultimately it was the cause of avowing advertising. In particular, cluster 2, which consumes a lot of video contents and has a lot of online activities, is well characterized, whereas in cluster 1, they only increase the inconvenience at the frequent repetition of advertisings and long advertising. These results may have been a problem because of the limited number of samples in the study.

Based on the results of this study, I expect that platform providers to more effectively consider the consumer efficiency when creating advertisings. The flooding of advertisings created a situation in which the value of advertising was not evaluated. Proper advertisings can be a good resource for both providers and consumers. Advertising allows more consumers to consume contents for free, but if advertising is blocked and not used because of inconvenience, there will be limits to

consumer's Internet usage and platform growth. If we are interested in consumer's inconveniences, the platform will have a synergy that enables the virtuous cycle of the Internet ecosystem.

Chapter 5. Inconvenience costs of online video advertising

5.1. Introduction

Consumers are getting smarter. Smarter consumers are choosing new products for more convenient, more efficient products. Companies are also trying to launch competitive products or services to satisfy their customers and to attract new customers. Among them, the OTT platform is the fastest growing industry in the world in the last few years, and it is also an area that can immediately check the latest market trend and consumer's response. Among the myriad OTT platforms, the companies that are growing remarkably have differentiated business models such as having popular contents, providing free contents, or providing unlimited services without advertisements. They have been chosen by many consumers and are achieving innovative success in the industry. Among them, this study focuses on companies that provide contents without advertisements.

One of the keys to the success of OTT platform is that consumers respond positively when platforms offer content without advertisements, despite having to pay for it (Anderson & Gans, 2011; Johnson, 2013). This phenomenon is caused by that consumers are perceived as a flood of annoying advertisements, due to overheating competition among advertisers and indiscriminate permissions that platform companies provide to advertisers (Anderson & Gans, 2011; Choi, 2015; Tag, 2009). In the PC environment, it is possible for consumers to consume other contents even while video advertisements are playing. In the mobile environment, however, consumers are unable to consume other contents while video

advertisements are being served, so the inconvenience suffered by consumers in mobile environment is greater than in the PC environment. As a result, consumers endeavor to reduce the inconvenience of advertising using ad-blocking programs such as Adblock Plus that can be easily downloaded from the Internet (Anderson & Gans, 2011; Redondo & Aznar, 2018; Vratonjic et al., 2013). It is true that the development of the Internet environment and the proliferation of smart devices have increased the opportunities for consumers to access the Internet and consume content without time and space constraints. However, the increasing number of consumers using ad-blocking programs on smartphones and PCs illustrates problems with the current Internet environment, which is dominated by free content and excessive advertisements (Iqbal et al., 2017; Vallade, 2008).

Adblock Plus is a representative ad-blocking program that was developed in 2009 and has grown into the most popular ad-blocking program in the world. Ad-blocking programs leverage the right of consumers to block annoying advertisements, but are perceived as a problem by content providers because they block all advertisements, not only annoying advertisements. Internet platform companies that generate profits by relying on advertisements based on user traffic may encounter difficulties due to the proliferation of ad-blocking programs. In the end, the Internet ecosystem will require a new value chain structure. To ensure stable revenue, platform companies will charge for services and provide them only to subscribed users. While a closed Internet environment can sustain certain levels of quality and stable growth, it will prevent content and services from being shared and used freely, which will hinder the innovative growth of the content industry (Lee et al., 2015). In

particular, for platform companies that grow through network externality effects, a closed environment may reduce the amount of information and opportunities for user participation, which will lead to decreases in Internet traffic. Ultimately, these factors will have negative impacts on the Internet ecosystem (Arthur, 1989; Hagiu, 2006; Katz & Shapiro, 1994).

Providing an optimal level of advertising should reduce inconvenience to consumers and be a good strategy for companies looking to succeed in the market. At the same time, identifying optimal advertising levels will be an important foundation for virtuous cycle structures in the Internet market. According to previous studies, the overflowing nature of advertising in the Internet platform environment is quite serious, problems are ongoing, and consumers use ad-blocking services without hesitation (Anderson & Gans, 2011; Tag, 2009). Some previous studies examined inconvenient attributes of advertisements, but failed to deduce the economic value of such attributes (Baek & Morimoto, 2012; Cho & Cheon, 2004; Elliott & Speck, 1998). In this study, I identify aspects of advertising that are most inconvenient to consumers and assess how inconvenient they are. In particular, this study aims to derive the inconvenience costs of online video advertising, for which the growth rate is fast and advertisement efficiency is high. Additionally, I analyze changes in platform market share according to consumer preferences when new companies enter the competitive video platform market, or when existing companies change the characteristic factors of their advertising. The results of this study can be used to formulate hypothetical strategies to satisfy the utility needs of consumers and increase market share through advertising, which is an important source of income

for online platform companies.

5.2. Literature review and research background

Netflix was a latecomer in the digital versatile disc (DVD) rental market, but it is now a leading innovator in the media content and online platform industries (Anthony, et al., 2008; Bozic & Dunlap, 2013). *Netflix*'s business model is considered successful because *Netflix* produces its own content, broadcasts over the Internet without advertising, and introduced the paid subscription model to the over-the-top (OTT) service market (Matrix, 2014; McCord, 2014; McDonald & Smith-Rowsey, 2016). Most other Internet platforms are characterized by a two-sided model consisting of advertisers that pay to advertise on the platform and consumers that consume content, including advertisements, for free. However, *Netflix*'s subscription services lack advertising, showing the potential of such a business model. *Netflix* mainly focuses on providing professional content such as movies and dramas. In comparison, *YouTube* mainly offers user-generated content in a competitive context (Baluja, et al., 2008; Dias et al., 2019). Recently, *YouTube* also began to provide premium services for paid subscribers, offering subscribers benefits such as ad-free content, offline storage, and unlimited music listening. The paid services provided by global video platforms also affect other platform companies that have recently entered the market (i.e., *Disney+*, *AT&T*, *Apple*) or are already competing with each other (i.e., *Hulu*, *Amazon*). After all, innovation on one side has a positive spillover effects on the entire ecosystem, leading to the spread of innovation (Acs et al., 2009; Han et al., 2012)

The increasing number of consumers using ad-blocking programs is explained by consumer desire to avoid unnecessarily consuming consumer resources (attention) and rational behavior by consumers attempting to find positive satisfaction and profit using their own attention and time (Davenport & Beck, 2001; Goldhaber, 1997; Vallade, 2008). The attention economy model proposed by Goldhaber (1997) interprets the value of information as an economic concept. The fact that some information is valuable means that people consume information by “paying attention,” and on the contrary, some information is useless when not attracted to people. Humans have limited time, thought, and sensory organs to devote to paying attention, and feel increasingly tired and bored as the duration of attention increases. Therefore, the quality of attention paid will fall (Terranova, 2012). In other words, as advertisement-related information increases, consumers become less and less able to accept new information and become more easily worn out, and more likely to avoid or to refuse to view advertisements, rather than finding value in advertisements.

Some people consume advertisements without discomfort, and some people feel that advertisements interfere with their behavior and are unnecessary. This is because there are individual differences in the standards used to determine profit and loss associated with online advertisements, and the sensitivity of each individual to inconvenience is different (Kahneman & Tversky, 2013). It is not easy to express the psychological costs of individual consumers as a single economic unit, because they are latent costs that are not revealed unless individuals directly express them. Therefore, it is necessary to estimate the inconvenience costs of advertisements

according to individual consumers' tendencies. It may be possible to improve the Internet platform environment by better understanding whether advertisements are over-provisioned, and identifying advertisements or advertising techniques that are highly discomforting to consumers.

Previous research addressed the competitive relationships between consumers and advertisers in the platform industry in the context of two-sided markets. Rysman (2004) examined Yellow Pages advertisements, Kaiser and Wright (2006) studied magazine advertisements, and Wilbur (2008) analyzed television advertisements. Choi (2015), Anderson and Gans (2011), and Tag (2009) analyzed the effects of ad-blocking on the platform ecosystem. According to Anderson and Gans (2011) and Tag (2009), the proliferation of ad-blocking programs means that more consumers are becoming sensitive to advertisements, but also that advertisers are likely to increase the number of advertisements and increase profits based on those consumers who are less sensitive to advertisements. However, in the end, increases in advertisements will increase the number of consumers who feel uncomfortable with advertisements, and the proliferation of ad-blocking programs will reduce platform profits and lower platform quality (Anderson & Gans, 2011; Tag, 2009). Ad-blocking programs will proliferate when platform content quality is reduced, consumer rejection of advertisements increases, and advertiser profits fall. Paradoxically, ad-blocking programs can increase the number of advertisements and advertising revenue. On the other hand, Choi (2015) performed an empirical analysis of Korean Internet portals and showed that as the number of people blocking advertisements increases, the value of consumers who do view advertisements

increases, and the amount of advertisements decreases. Therefore, previous research focused on finding the balance point of ecosystems by examining changes in the number and effect of advertisements, under the assumption that ad-blocking programs will spread. However, they did not take into account the reasons that consumers opted to use ad-blocking programs, and the inconvenience experienced by individual consumers, which are among causes of change in consumption patterns. In addition, previous studies are affected by limitations, such as a failure to estimate inconvenient attributes according to economic value, and to prospect platform market share according to advertising strategy.

Among previous online advertising studies, many seek to identify factors that have significant effects on the efficiency of advertisements. Some studies analyzed the inconvenience of advertisements using consumer personal information (Awad & Krishnan, 2006; Hoofnagle et al., 2012; Phelps & Ferrell, 2000; Tucker, 2012). Others investigated the inconvenience caused by repeated playback of similar advertisements (Kim, 2018; Lee & Cho, 2010; Schmidt & Eisend, 2015), the effectiveness of advertisements according to length (Goodrich et al., 2015; Newell & Henderson, 1998; Schmidt & Eisend, 2015), preferences for advertisements that consumers can skip (Belanche et al., 2017; Joa et al., 2018; Vallade, 2008), and the effectiveness of advertisements according to location (Henger et al., 2016; Li & Lo, 2015; Mei et al., 2010). Previous studies also analyzed factors affecting online video advertising, which has grown rapidly since 2010 (Hsieh et al., 2012; Lee & Lee, 2011; Lee et al., 2013), and ways to increase the efficiency of online video advertising (Mei et al., 2007; Zhang, et al., 2017).

Online advertising is developing and expanding, but can be interpreted as a problem in society due to inconvenience to consumers. In this study, we examined problems associated with the impact of advertising on consumers and society by referring to previous research that investigated inconvenience associated with online advertisements (Baek & Morimoto, 2012; Cho & Cheon, 2004; Elliott & Speck, 1998) and that estimated the social costs of spam email (Kim, et al., 2006; Yoo, et al., 2006).

5.3. Methodology

In this study, I chose to apply a mixed logit model from among discrete choice models (McFadden, 1974; Train, 2003). Commonly used discrete choice models such as logit and probit models assume that all consumers have the same preference for a particular good or service. On the other hand, in mixed logit models, consumers may have heterogeneous preferences, and the researcher can set different distributions for the coefficients of each attribute. Discrete choice models are widely used to analyze consumer preferences for information and communication technology (ICT) products or services (Shin et al., 2014; Lee, et al., 2015; Shin et al., 2016). In discrete choice models, it is assumed that each consumer i has a utility function related to each product or service j in the choice set t (McFadden, 1973; Train, 2009). The utility function is expressed as equation (1).

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} = \sum_k \beta'_{ik} X_{jkt} + \varepsilon_{ijt} \quad \text{Eq.(1)}$$

U_{ijt} represents the indirect utility when respondent i chooses alternative j of the t^{th} alternative set, where utility consists of deterministic utility, V_{ijt} and stochastic utility, ε_{ijt} . The deterministic utility part consists of a vector X_{jkt} comprising attributes related to product j in alternative set t and a vector β_{ik} representing the coefficient of each attribute k . β_{ik} is a multivariate normal distribution with mean b and covariance matrix W , and ε_{ijt} is defined as an I-type extreme value distribution. In this utility structure, the consumer chooses an alternative that maximizes utility. The probability that consumer n chooses product i in set t is given by equation (2).

$$\begin{aligned} P_{int} &= \int \Pr(U_{nit} > U_{njt}, \forall j \neq i) f(\beta) d\beta \\ &= \int \Pr(V_{nit} + \varepsilon_{nit} > V_{njt} + \varepsilon_{njt}, \forall j \neq i) f(\beta) d\beta \\ &= \int \Pr(\varepsilon_{nit} - \varepsilon_{njt} < V_{nit} - V_{njt}, \forall j \neq i) f(\beta) d\beta \\ &= \int \frac{e^{V_{int}(\beta)}}{\sum_j e^{V_{njt}(\beta)}} f(\beta) d\beta \end{aligned} \quad \text{Eq.(2)}$$

The selection probability of the mixed logit model as shown in equation (2)

should be approximated through sufficient simulation (Train, 2009). The maximum likelihood estimation (MLE) method is used to estimate the parameter β of the multinomial logit model, while the mixed logit model requires simulated maximum likelihood estimation (SMLE) (Train, 2003; McFadden & Train, 2000). An approximate value can be obtained by arbitrarily extracting the S number of beta values $\beta (= \beta^{(s)})$, and the log likelihood function ($\ln SL$), equation (3) can be obtained through simulation.

$$\ln SL = \sum_{i=1}^N \sum_{j=1}^J Y_{ij} \ln \left\{ \frac{1}{S} \sum_{s=1}^S \frac{\exp[\beta^{(s)'} Z_{ij}]}{\sum_{k \in C_i} \exp[\beta^{(s)'} Z_{ik}]} \right\} \quad \text{Eq.(3)}$$

where N is the total number of respondents and the selection result for optional alternative j of the individual respondent i is 1 if selected and 0 if not selected. In this study, applying the SMLE method to equation (3) yields estimates of the required parameters. The parametric estimation method used in the SMLE method is the same as the MLE of the multinomial logit model, but differs in that it uses the simulation selection probability and is asymptotically efficient with consistency and follows the normal distribution asymptotically (McFadden & Train, 2000).

The bias of the SMLE decreases in proportion to the variance of the simulation that computes the selection probability. Therefore, if the number of simulations is increased, the variance of the simulation selection probability decreases, and accordingly the bias of the SMLE is also reduced. According to previous studies, the bias is negligible when the number of simulations is about 250

(Brownstone & Train, 1998), and in this study I used 500 repetitions with reference to previous research.

The coefficient values obtained through estimation represent the marginal contribution of each attribute with arbitrary units to utility, so it is difficult to compare the effects of each attribute. Therefore, it is necessary to calculate the marginal willingness-to-pay (MWTP) for each attribute from the estimation results. In order to analyze the economic values of individual attributes, the MWTP for each attribute k can be derived as equation (4). The MWTP is called the compensation value in microeconomics, and is the amount that can be offset by changing the unit 1 of the attribute k , and can be interpreted as a change in the compensated surplus of the consumer when the attribute is changed. Relative importance (RI) of the individual attribute k can be derived from the samples derived in the simulation process. The RI for each attribute may be analyzed as part-worth. The part-worth of the attribute k can be calculated by multiplying the difference between the maximum level and minimum level of the attribute k by the estimated coefficient value β_k . In the N derived samples, the average RI can be calculated as equation (5).

$$\text{Median } MWTP_k = \text{Median}_i \left[-\frac{\frac{\partial U_i}{\partial x_i}}{\frac{\partial U_i}{\partial p_i}} \right] = \text{Median}_i \left[-\frac{\beta_{ik}}{\beta_{i(price)}} \right] \quad \text{Eq.(4)}$$

(Average Relative Importance Percent of Attribute k)

$$= \frac{1}{N} \sum_{n=1}^N \left(\frac{part - worth_{nk}}{\sum_k part - worth_{nk}} \times 100 \right) \quad \text{Eq.(5)}$$

where, $part - worth_{nk}$

$$= (interval \ of \ attribute \ k's \ level) \times \beta_{nk}$$

Forecasts of future market share due to changes in the strategies of online video platform companies can be calculated based on the coefficient β_i derived from estimation. If consumer i averages the probability of choosing alternative j by all consumers N , the average selection probability of each alternative j can be obtained as in equation (6).

$$S_j = \left[\int \frac{\exp(\beta'_i x_j)}{\sum_i \exp(\beta'_i x_j)} f(\beta) d\beta \right] / N \quad \text{Eq.(6)}$$

5.4. Survey and data

Pilot tests were conducted in advance of the questionnaire used in this research. I identified 117 valid samples during the period from December 25 to December 31, 2018. Based on a result of the pilot analysis, I revised the questionnaires and used them in our main survey. The main survey was conducted online by a specialized survey company among 500 ordinary consumers (20-59 years old) residing in 17 different regions including special cities, metropolitan cities, special self-governing cities, provinces, and special self-provinces in South Korea from January 13 to

February 14, 2019. The survey was aimed at users of platforms that offer free content with advertisements.

The demographic characteristics of respondents to the questionnaire are shown in Table 5-1.

Table 5-1. Demographic characteristics of the respondents

		# of respondents	Ratio (%)
Total		500	100
Gender	Male	248	49.6
	Female	252	50.4
Age (years)	20-29	128	25.6
	30-39	128	25.6
	40-49	128	25.6
	50-59	116	23.2
Average monthly telecommunication fee (10,000 KRW) ¹³	1-3	164	32.8
	4-6	201	40.2
	7-9	82	16.4
	10-20	50	10
	Over 20	3	0.6
Unlimited data services	Subscription	231	46.2
	None	269	53.8
Average video content viewing per day (average #: 6)	Under 2	101	20.2
	3-5	237	47.4
	6-10	120	24
	Over 10	42	8.4

¹³ 1 USD is 1,178.5 KRW (Korean Won) as of July 24, 2019.

	Under 10	51	10.2
	11-20	63	12.6
Average video	21-30	93	18.6
content viewing time	31-40	36	7.2
per day	41-50	36	7.2
(average, 58.9	51-60	100	20
minutes)	61 -99	36	7.2
	Over 100	85	17

The questionnaire consisted of two parts. The first included questions about current Internet usage, video content consumption behavior, and demographic information such as gender, age, and occupation. The second part included responses regarding consumers' preferences about detailed functions of ad-blocking services targeting a conjoint card, composed of a conjoint analysis method. Respondents included individuals who consumed video content more than once per week. I determined that respondents consumed 6 videos per day on average and spent 58 minutes a day viewing content on average.

Conjoint analysis is a way of collecting information about consumer preferences for virtual goods composed of various attributes (Green & Srinivasan, 1978, 1990). Conjoint analysis has been widely used for demand analysis in marketing (Green & Srinivasan, 1978, 1990; Huber & Train, 2001), to study traffic demand (Calfee et al, 2001; Shin et al., 2012, 2015), and to study new information and communication technology (ICT) product (Batt & Katz, 1998; Kim et al., 2006; Shin et al., 2014, 2016). Previous studies also estimated inconvenience costs for

consumers using preference statements addressing the degree of inconvenience associated with services or products and the cost of conversion (e.g. Kim et al., 2015; Lee, et al. 2006; Lee et al., 2017). Conjoint analysis is a method in which a consumer chooses the most desirable combination of attribute cards to maximize utility given a limited budget. Selected products always have higher utility than non-selected products. It is also possible to analyze the preferences of consumers in advance by analyzing attributes of new products or services to be released under the assumption of actual market conditions (Green & Srinivasan, 1978, 1990).

Based on previous conjoint analysis research, in this study I estimated the effects of inconvenient factors constituting online video advertisements and analyzed economic value based on the results of estimating each attribute. Therefore, I could estimate the inconvenience costs that consumers feel as a result of advertising.

Table 5-2. Attributes and attribute levels of online video ad-blocking services

Attribute	Explanation and level
Behavioral ad-blocking	Behavioral ad-blocking function according to the degree of personal information utilization
	① Block behavioral ads with high privacy
	② Block behavioral ads with low privacy
	③ Block all behavioral ads
	④ Do not use
Repeated ad-blocking	Repeated ad-blocking function
	① Use
	② Do not use
Ad-blocking by length	Ad-blocking function by ad length

	① Block ads longer than 5 seconds ② Block ads longer than 10 seconds ③ Block ads longer than 15 seconds
Ad-blocking by location	Ad-blocking function by ad location; ads can be inserted before, middle, and after video content playback ① Block “before” ads ② Block “before” and “middle” ads ③ Block “before” “middle” and “after” ads ④ Do not use
Ad-blocking by skippability	Ad-blocking function according to skip button generation ① Block skippable ads ② Block non-skippable ads ③ Do not use
Monthly fee (1,000 KRW)	Monthly cost of an ad-blocking service ① 2 ② 4 ③ 6 ④ 8

Table 5-2 shows a virtual online video ad-blocking service composed of six attributes used to estimate the inconvenience costs caused by online video advertising. As the number of attributes increases, respondents may find it difficult to choose, and therefore I limited the number of attributes to six. I assumed that other features such as platform, quality of service, and service-enabled devices were identical in effect.

Advertisements in traditional media, such as TV and radio, are mostly mass marketing tools. With the development of the Internet, one-to-one marketing has become possible based on information collected about individual characteristics and behaviors. Online behavioral advertising can be useful or convenient, but privacy infringement is a problem inherent to collecting, analyzing, and utilizing behavioral information about individuals in real time. Depending on the degree of use of personal information, there may be customized advertisements involving high utilization of personal information that requires prior consent to collect, such as location information and personal identification information. Even if online behavioral information is collected, the degree of personal information exposure is low and can be denied by do not track (DNT) settings as post regulation. Therefore, consumer preferences addressing the inconvenience of online video advertising will vary depending on the degree of personal information utilization. The virtual service attributes of this study are set to block behavioral advertisements using high levels of personal information, block behavioral advertisements using low levels of personal information, and block all behavioral advertisements using personal information (Boerman et al., 2017; Chen & Stallaert, 2010; Goldfarb & Tucker, 2011). Advertising also attempts to attract consumer attention through repetition. However, consumers will be more likely to feel uncomfortable as unwanted similar advertisements repeat (Kim, 2018; Lee & Cho, 2010; Schmidt & Eisend, 2015). In order to analyze this, the repeat ad-blocking function was inserted in the virtual service attributes.

Online video advertisements can be located before, in the middle, or after

video playback. These advertisements provide information regarding the default watching time for consumers and can also include a skip button to avoid advertising. Since there are various advertisement lengths, the length of the advertisements included in the study were based on existing research, and the average advertisement length of representative platforms for market share 1 or 2 (Krishnan & Sitaraman, 2013; SociallySorted, 2018^⑭). I included attributes and levels to investigate the relative importance of each function constituting the ad-blocking service and determined how they affected the value that consumers perceive.

There are a total of 1,152 ($=4 \times 2 \times 3 \times 4 \times 3 \times 4$) configurable conjoint card combinations based on six attributes for each level. However, respondents are overburdened when they are asked to answer all cases. Therefore, each card needs to be configured so that the balance of attributes is well distributed and the correlations between the attributes are minimized. In this study, I used the optimal design method, D-efficiency, using the R program, so that the standard error between each attribute is minimized. Among the balanced designs with a D-efficiency of 1, 48 alternative cards were selected and divided into 16 sets with no overlapping attributes. A choice set consisted of a total of four cards with three cards with a 'No choice' card. As a result, a total of 16 choice sets were created. The final 16 choice sets were divided into four combinations, so that one respondent could be randomly assigned 1 combination. Respondents can answer in their order of preference from the four options of choice and respond to a total of four choice sets. A sample card is shown in Table 5-3.

^⑭ <https://sociallysorted.com.au/ideal-video-length-social-video/>

Table 5-3. Sample alternative set

Attributes	Service A	Service B	Service C	Service D
	Block	Block		
Behavioral ad-blocking	behavioral ads with high privacy	behavioral ads with low privacy	Do not use	
Repeat ad-blocking	Use	Do not use	Do not use	
Ad-blocking by length	Block ads longer than 5 seconds	Block ads longer than 10 seconds	Block ads longer than 15 seconds	Do not use
Ad-blocking by location	Block “before” ads	Block “before” “middle” and “after” ads	Block “before” ads	
Ad-blocking by skippability	Block skippable ads	Block skippable ads	Block non-skippable ads	
Monthly fee (1,000 KRW)	6	2	4	
Choose one	A_____	B_____	C_____	D_____

5.5. Results

The analysis model used in this study is divided into two parts. The first part estimates the consumers’ preferences for attributes that constitute the video ad-blocking service, and analyze the MWTP and the RI. The second part predicts the changes of market share of each platform using computational experiments, 1) when the attributes of the video advertisements on the specific platform are changed based

on the derived consumer preferences, and 2) when new platform companies with different advertising strategies enter the market.

5.5.1 Consumer preferences for ad-blocking services

First, the attributes of “behavioral ad-blocking,” “repeat ad-blocking,” and “ad-blocking by skippability” were estimated with the “Do not use” attribute as a reference attribute. In addition, the attributes of “ad-blocking by length,” “ad-blocking by location,” and “monthly fee” were analyzed using continuous variables.

Table 5-4 shows the mean and variance of each attribute coefficient that determines the consumer’s preference. As a result of analysis, the mean of all the attributes was significant with a confidence interval of 5%. “Block all behavioral ads” was the highest coefficient, and “ad-blocking by length” was the lowest coefficient among the characteristics of the advertisements. In particular, the coefficients of the “ad-blocking by length” and “monthly fee” attributes are negative; that is, consumers prefer shorter advertisements and lower prices. In the case of the variance, the heterogeneity of all attributes except for “block all behavioral ads,” and “ad-blocking by length” were significant with a 5% confidence interval. The large variance of preference coefficients means that there is heterogeneity of preference among consumers, which supports the validity of the mixed logit model used in this study. In addition, based on the results, I examined the relative importance of calculating the consumer preference ratio to determine whether any attribute level is more favorable or indiscernible compared to the other attribute levels. The results show that consumers regard price as the most important attribute (the RI of the price

attribute is 49.489%). In addition, the behavioral ad-blocking function was the second most important attribute, meaning that consumers tended to dislike their own information being used in advertisements. The relative importance of ad length was the lowest at 2.751%, perhaps due to the large number of skippable advertisements. In the survey, only 78 respondents (15.6%) answered the question, “Do you watch the advertisement until the end?” with “I watch to the end.” On the other hand, 422 respondents (84.4%) answered “I don’t watch the advertisement until the end,” and I found that many people avoided advertisements in the middle.

In Table 5-4, MWTP is an economic measure of how much consumer utility increases or decreases when the level of each attribute changes, indicating how much the consumer is willing to pay additional costs. Consumers were willing to pay about 1,432 Korean Won (KRW) per month to block all behavioral advertisements, and to block advertisements that could not be skipped, they were willing to pay an additional 548 KRW per month. In the case blocking functions that operate according to advertisement length, as the length of an advertisement increases by 1 second, the payment by consumers decreases by about 30 KRW. That is, consumers are willing to pay about 30 KRW more as advertisement length is shortened by 1 second.

Table 5-4. Estimation results

Attribute	Coeff (SE)	SD (SE)	MWTP (KRW)	RI (%)
Block behavioral ads with high privacy	1.038* (0.140)	0.614* (0.242)	1136.321	9.034
Block behavioral ads with low privacy	0.766* (0.175)	1.136* (0.257)	841.842	6.931

Block all behavioral ads	1.307* (0.136)	0.080 (0.353)	1432.151	11.386
Repeat ad-blocking	0.337* (0.130)	1.322* (0.182)	352.106	5.066
Ad-blocking by length	-0.028* (0.014)	0.060 (0.040)	-29.907	2.751
Ad-blocking by location	0.151* (0.060)	0.590* (0.093)	171.205	7.499
Block skippable ads	0.328* (0.132)	0.483* (0.271)	362.595	2.983
Block non-skippable ads	0.519* (0.138)	0.930* (0.221)	548.203	4.860
Monthly fee	-0.899* (0.066)	0.752* (0.067)	-	49.489
# of observations		8,000		
Log likelihood		-1963.48		
Note: * means significant at the 5% level				

5.5.2 Market simulation analysis of ad-blocking services

Online video platforms are constantly competing and innovating to improve better market share. Advertising policy includes ad-length changes, ad-location additions, and new advertising function additions, and advertising policy is become more important as it becomes more difficult for consumers to avoid advertisements in the mobile environment. Therefore, based on estimations of consumer preference, in this study I forecast the market share of each platform by changing the advertising attributes of each platform. First, I made the assumptions shown in Table 5-5 for our market share analysis and Table 5-6 describes the simulation conditions (Haile & Altmann, 2016). The base scenario is that there is no function to block the physical characteristics of video advertising. Platform A provides free content with 5-second

advertisements, platform *B* provides free content with 15-second advertisements, and platform *C* provides paid content without advertisements. Platform *A* and *B* are modeled under the assumption that there is no behavioral ad-blocking function, repeat ad-blocking function, ad-blocking by length, ad-blocking by location, or ad-blocking by skippability. I also assumed that the content and service functions provided by each platform are the same other than advertising. The criteria used to divide platform *A* and platform *B* are based on *YouTube*'s advertising policies and the results of existing research. Currently, *YouTube* provides various advertising policies that take into consideration the utility of the creators, content providers, and consumers. *TrueView*, in-stream advertisements on *YouTube* allow consumers to skip ads after 5 seconds, and the advertiser pays only if the consumer watches for 5 seconds or longer. Non-skippable video advertisements on *YouTube* require viewing of all advertisements and are 15 or 20 seconds long depending on the geographical area. In addition, existing efficiency studies of video advertising have compared 15-second vs. 30-second advertisements, and 15 seconds is relatively efficient because consumers are more likely to recall the brands advertised (Martin-Santana et al., 2016; Newstead & Romaniuk, 2010; Wolf & Donato, 2019). Therefore, the durations of video advertising that are currently in use, 5 seconds and 5 seconds or more, it chooses the 15-second advertising platform, which is highly effective. When the advertisement length is increased, it is possible to compare how the inconvenience experienced by individual consumers differs. Since such analysis is possible in 1 second units, the representative advertisement length was used for the scenario analysis. Forecasts of future market share is based on equation (6) at chapter 5.3. The calculated choice probability refers to the average selection probability of consumer

i over alternative j , and the results can be interpreted as the market share of each alternative in the scenario situation. In order to calculate the estimated market share based on the choice probability, each reference scenario was selected as shown in table 5-6, considering the current market situation.

Table 5-5. Market scenarios of online video platforms

Scenarios	Market situations
Base scenario	<p>The status of advertisements for each platform is</p> <ul style="list-style-type: none"> - [Platform <i>A</i>] Free content for 15 seconds advertising - [Platform <i>B</i>] Free content for 5 seconds advertising - [Platform <i>C</i>] Paid content without advertising
Scenario 1	In a situation where platform <i>A</i> and <i>B</i> both exist in the market, platform <i>C</i> enters and changes prices
Scenario 2	In a situation where platforms <i>A</i> , <i>B</i> , and <i>C</i> exist in the market, platform <i>A</i> introduces paid behavioral ad-blocking service and changes prices
Scenario 3	In a situation where platforms <i>A</i> , <i>B</i> , and <i>C</i> exist in the market, platform <i>A</i> introduces paid all ad-blocking service and changes prices

In scenario 1, I examined how market share changes when platform *C*, which offers paid content without advertisements (or ad-blocking services), enters a market in which there is only platform *A* and platform *B*, and changes prices. As a result, before the price is greater than 5,000 KRW as shown in Figure 1, platform *C* occupies about 40-100% of the market, but platform *B*, which provides free content with 5-second advertisements, climbs to No. 1 and claims more than 40% of the market share when prices increase to 5,000 KRW, and platform *A*, which provides free content with 15-second advertisements then follows. If I assume that platform companies provide the same content and that advertisements on platform *A* are 10 seconds longer than those on platform *B*, platform *B*'s market share may be 14% higher than that of platform *A*. I also find that platform *C* services that block all advertisements are not a serious threat to the market shares of platforms *A* or *B*.

Table 5-6. Description of the simulation conditions

Attribute	Scenario1			Scenario2			Scenario3			References
Platform	A	B	C	A	B	C	A	B	C	
Block behavioral ads with high privacy	0	0	1	0	0	1	1	0	1	Assumption
Block behavioral ads with low privacy	0	0	1	0	0	1	1	0	1	Assumption
Block all behavioral ads	0	0	1	0	0	1	1	0	1	Assumption
Repeat ad-blocking	0	0	1	0	0	1	1	0	1	Assumption
Ad-blocking by length	15	5	0	15	5	0	0	5	0	Google Ads*
Ad-blocking by location	0	0	1	0	0	1	1	0	1	Google Ads*
Block skippable ads	0	0	1	0	0	1	1	0	1	Google Ads*
Block non-skippable ads	0	0	1	0	0	1	1	0	1	Google Ads*
Monthly fee (1,000 KRW)	0	0	1~7	1~7	0	7.9	0~7	0	9.7	YouTube Premium*, Netflix*

*Google Ads policy (<https://ads.google.com/intl/en/home/>), YouTube Premium(<https://www.youtube.com/premium/>), Netflix(<https://www.netflix.com/kr/>)

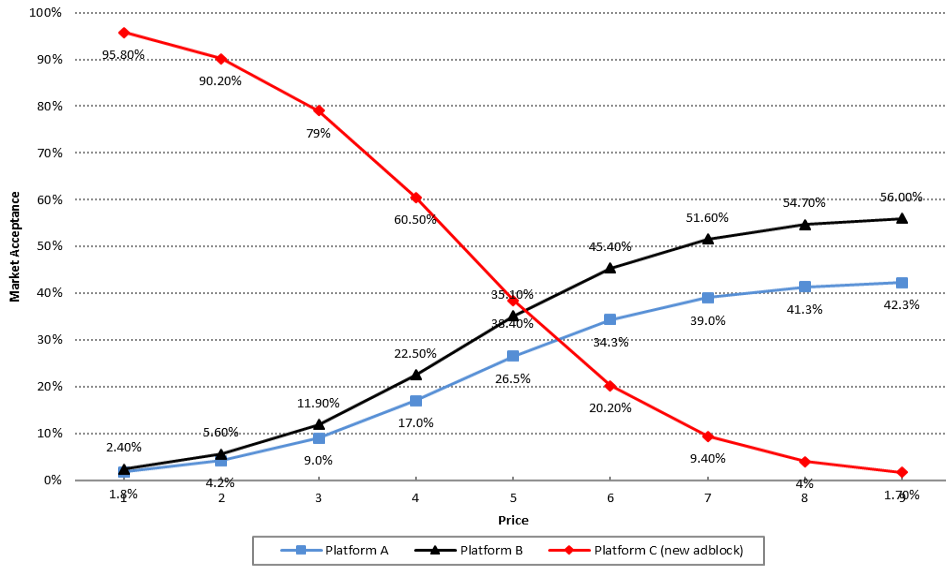


Figure 5-1. Market share when platform C changes prices (Scenario 1)

As shown in Table 5-4, the results of this study show that consumers are sensitive to use of their own personal information. In Scenario 2, I examine changes in market share when platform A changes prices while providing paid behavioral ad-blocking. Platform C provides paid content without advertisements. In this model, *YouTube Premium* provides paid service at 7,900 KRW per month in Korea. As shown in Figure 5-2, when platform A provides behavioral ad-blocking services for 1,000 KRW, it obtains a market share of 86.5%, and when the price is raised to about 3,000 KRW, the market share of platform A is overtaken by platform B.

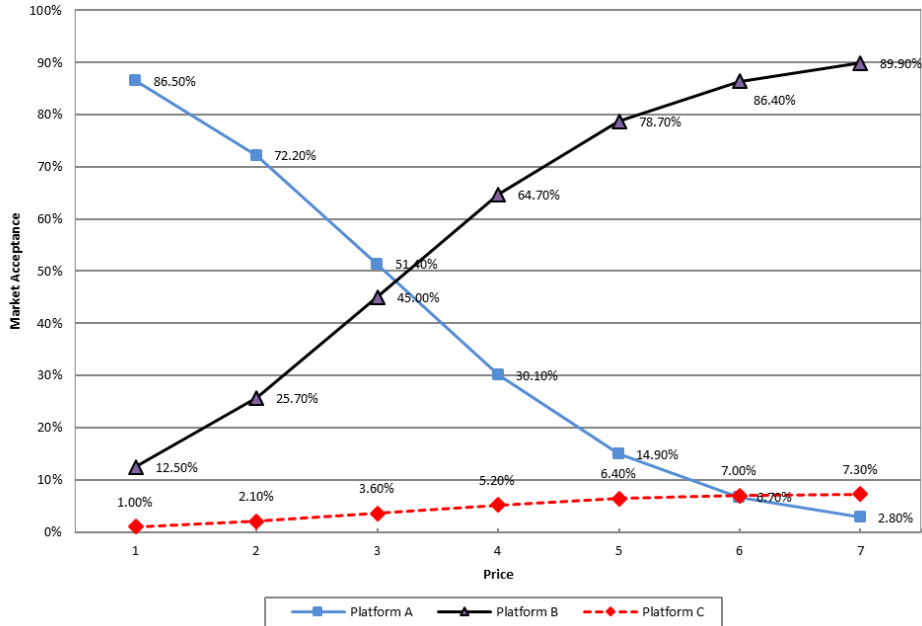


Figure 5-2. Market share when platform A introduces paid behavioral ad-blocking services and changes prices (Scenario 2)

Finally, in Scenario 3, platform A provides free content with 15-second advertisements and introduces a paid service that blocks all advertisements. I assumed that the price of platform C, which offers paid content without advertisements, is fixed at 9,700 KRW per month using *Netflix* domestic paid service as an example. I found that platform A occupies about 99% of market share when providing free online ad-blocking, and holds the same market share as platform B (which provides free content with 5-second advertisements) from a price of about 5,000 KRW. Based on these results, if platform A provides a paid service that blocks all advertising, it can achieve market share of 50% or more even if the price is raised to 5,000 KRW.

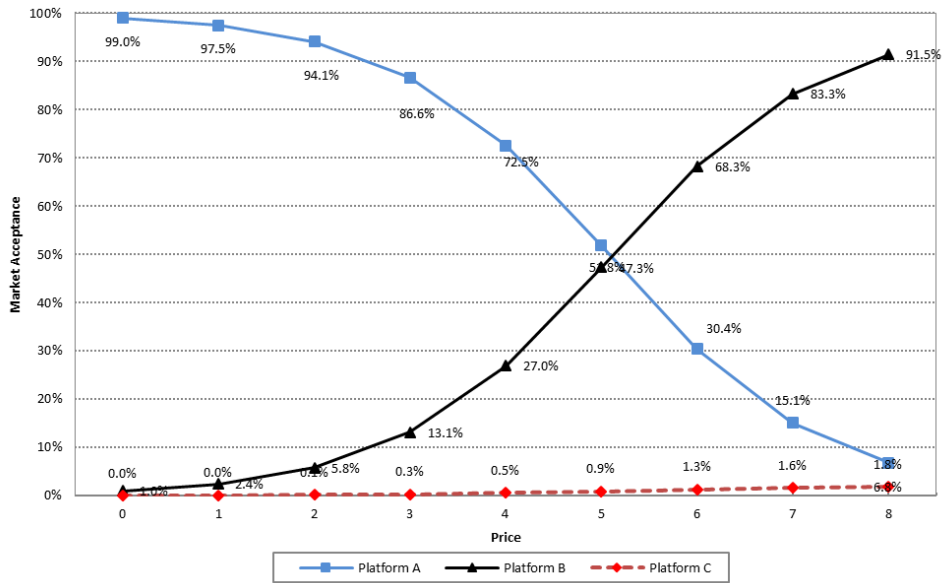


Figure 5-3. Market share when platform A introduces paid all ad-blocking services and changes prices (Scenario 3)

These results suggest that paid service without advertisements are attractive to consumers, but that the price attribute is the most important variable determining market share. In a comparison of market share for all ad-blocking services, the optimum estimated price is about 5,000 KRW and more expensive services are not attractive to consumers. In other words, even if ad-blocking services are convenient and effective, high price will deter users. Therefore, online video companies that want to introduce paid ad-blocking services should ensure appropriate pricing.

5.6. Discussion and concluding remarks

This study was inspired by the increasing number of consumers using online ad-blocking programs. In addition, I noted that consumers who use Internet content for free also positively view paid services such as ad-blocking. Ad-blocking is a phenomenon of advertisement avoidance that has become more actively applied since the development of the Internet, and specifically online video advertising. The fact that consumers want to block advertisements means that they experience inconvenience when watching advertisements, and that Internet platform companies need to understand and reflect consumer experiences about advertising. In addition, based on analyses of consumer preference, it was able to predict changes in market share when companies changed their advertising policies. This suggests that market share prediction is an important criterion in the platform market, where customers are free to switch platforms and companies are free to enter and exit. The online video platform was selected as the target of this research because it is suitable for measuring the inconvenience of advertisements. They cannot be easily avoided, and consumers have to watch advertisements for a minimum length of time to consume specific content. Consumers responded most sensitively to online behavioral advertising using their own information, while inconvenience had the lowest association with advertisement length. In the case of advertising through traditional media, the act of avoiding or blocking an advertisement is performed to cope with cognitive avoidance, through mechanical avoidance (switching the channel, etc.), physical avoidance (leaving the room, etc.) in a limited manner. For online advertisements, consumers are more positively and directly able to solve

inconvenience problems associated with variables like the length of advertisements by mechanical avoidance (skipping ads, turning off ads, and using ad-blocking programs) (Speck & Elliott, 1997).

I compared online video advertisements provided by platforms because different platforms have different policies even if their basic frameworks are similar. For example, when an advertisement must be watched before consuming video content, the length of the advertisement differs across platforms. In addition, company policies also vary for intermediate advertisements inserted in the middle of content and for post advertisements inserted after content. There are also differences in whether an advertisement must be watched for a certain period of time or whether similar advertisements are repeated, or whether advertisements use personal information. However, all of these conditions can be combined in a variety of ways, and content providers can choose whether to provide advertisements or not. Therefore, in this study I made assumptions about basic functions.

In an analysis of market share between platforms, I differentiated conditions according to the characteristics of advertisements, which constitute the main revenues earned by platform companies. Online video platforms that are competing in the market try to improve the satisfaction of consumers and content providers by changing their advertising policies. For example, in the case of *YouTube*, it is possible to quickly obtain profit by eliminating the skip button, or introducing intermediate advertisements and post advertisements. On the other hand, by providing a short video advertisement (bumper advertisement) of less than 6 seconds, the user is prompted to recognize the advertisement quickly and to reduce the

inconvenience experienced. In addition, *Netflix* has attempted to introduce intermediate advertisements, and is constantly changing and innovating its advertising policies. Therefore, I was able to analyze how the market shares of online video platforms may change due to changes in advertisement policies, and how the market shares of existing platforms may change when a platform with a different advertising policy enters the existing online video platform market.

The limitations of this study include the fact that I focused on advertising to understand consumer inconvenience, and did not examine differences based on the platform and content. In addition, our survey was conducted among only Korean domestic consumers. Therefore, there are limitations in generalizing our findings to global OTT platforms, such as *Hulu*, *Twitch*, *Vimeo*, and *DailyMotion*, which provide similar services.

There are the academic limitations in examining only six advertising characteristics that are the most influential and issues associated with various online video advertising configurations. New services and features emerging from video platforms and advertisements should be considered in future studies. In addition, I was able to grasp consumer preferences regarding inconvenience caused by online video advertising, but our ability to recognize and address these problems in the platform companies and advertisers' views is limited. In order to maintain a sound advertising ecosystem and to create an environment in which a large number of consumers can participate and utilize content, I need to understand the willingness and effort of advertisers and platform companies to improve their advertising. Platform companies and content providers who provide services will be able to use

the results of this research to develop advertising policies and strategies that can address consumer inconvenience.

This study was designed to estimate the inconvenience of consumers viewing online video advertising by conjoint analysis and calculate the value of this inconvenience as an economic unit. I found that consumers consider the most serious problem to be the use of personal information. This problem cannot be solved by simple avoidance, which was the biggest inconvenience associated with behavioral advertisements. Advertisers and platform companies attempt to provide behavioral advertisements that use personal information for more targeted advertising. However, the inconvenience of these advertisements was measured at about 3,409 KRW, making them more expensive than other attributes. In addition, consumers place a higher value on blocking non-skippable advertisements, because the consumer desire to avoid advertisements is stronger than the desire to watch them.

The desires of consumers to avoid and block advertisements are natural, but increases in advertising and a combination of various technologies might increase consumer inconvenience beyond the limits that consumers can tolerate. Currently, ad-blocking behavior is attributed primarily to a subset of sensitive consumers. However, if the inconvenience associated with advertising accelerates and ad-blocking behavior spreads, the Internet ecosystem itself, which is based on advertising, will face great difficulties. Advertisers and platform companies should provide appropriate levels of advertising and advertising functions, enable consumers to experience the positive effects of advertising, and establish an environment in which advertising can grow together with profits.

In addition, advertisement-based online video platform companies may experimentally predict how their advertising policies will change and how new market participants will affect market share when they enter the market. During the brief history of online platforms, platform companies have been actively entering and exiting the market. It will be necessary to establish optimal strategies and quick response, and remains important to predict the preferences of consumers and content providers (Farrell & Klemperer, 2007; Shankar & Bayus, 2003; Zhu & Iansiti, 2012).

The Internet is a space in which autonomous growth and development are presupposed. If platform companies are willing to lead the way in improving the advertising experience, the Internet ecosystem will grow robustly and consumers will remain actively engaged. We hope that this study will assist the autonomous efforts of Internet platform companies to improve the advertising environment rather than government regulations.

Chapter 6. Overall conclusion

6.1. Summary

The Internet platform economy has grown rapidly in the last decade and has now become the center of the global economy. Although the Internet platform originally emerged as an intermediary between sellers and consumers, the accumulated consumers and capital increased the Internet platform's own competitiveness. It has grown and evolved to a level where it can produce and sell products on its own. Additionally, innovation has led to the emergence of many new Internet platforms. To be a market leader, companies need to pay attention to consumer-centric innovation to discover and solve consumers' inconvenience. Therefore, to explain the Internet platform growth and consumer-centric innovation, I choose the OTT platform for study, which is receiving a lot of attention from consumers and industries globally.

OTT platforms began attracting consumer attention, starting with YouTube in 2005, and Netflix in 2016, and has been very active, affecting many industries and consumers. This dissertation compares the impact of the emergence of OTT platforms based on different business models to the related industries through technical efficiency analysis, and determines the inconveniences with advertising from using the OTT platform. It also calculates the degree of consumer advertising inconvenience as an economic value, and emphasizes the importance of establishing a strategy for companies to solve these problems.

The first study examines the impact of global OTT platforms on the growth of domestic related industries as they dominate the OTT market. Global OTT platforms, YouTube and Netflix are based on different business models, and I examine the

impact of strategic differences on efficiency. YouTube and Netflix are leading global OTT platforms with the highest growth rates and market shares. YouTube is a content sharing site based on advertising, while Netflix is a premium content site based on subscription. I look at the impact on the related video content industry as YouTube and Netflix entered the Korean market. The video content industry was largely divided into video production industry, production-related service industry, and distribution industry. However, due to the closure of many companies and problems of data collection, production-related service companies were excluded from this study. For the study, I divide them into three periods: before YouTube entered the Korean market, after YouTube entered the Korean market in 2008, and after Netflix entered the Korean market in 2016, and explore the effectiveness of their entry on the video content production and distribution industry in Korea. The technical efficiency of video content distribution industry in Korea has grown significantly since the entry of YouTube, while the technical efficiency of video content production industry in Korea has shown an increase since Netflix's entry. YouTube is a channel that can effectively deliver video content advertising and this stimulated the distribution and spread of content, while Netflix contributed to the efficiency of production either by creating content on its own or by investing in content production.

The second study looks at the inconvenience factors for online video advertising that consumers feel on the OTT platforms. It examines the perceived inconvenience with advertising in the OTT platforms, focusing on the length, repetition, and position of advertising, which are the typical factors in online video advertising. The mediating effects of the entertainment and information provided by the advertising were also examined. I also consider that the degree of inconvenience with advertising will be varied according to the consumer's characteristics, such as consumption of online video content and online shopping habits and perform cluster

analysis according to consumer's characteristics. The group is divided into a watching and shopping group (group2) and a searching and considering group (group1). In the case of group 2, long advertising, frequent repetitions, and interruptive position of advertising was found to directly increase the inconvenience, but the inconvenience is reduced if the long advertising is interesting. On the other hand, group 1 considered it inconvenient only for long advertising, and only partial mediation effect is found for repetition if the advertising was interesting. As a result, the degree of inconvenience with advertising is high in the group with high content consumption and online shopping. The technological functions that improve the efficiency of advertising, such as frequent repetition and the playback position of advertising do not reduce the degree of inconvenience despite providing entertainment and information in the advertising. However, in relation to the length of the advertising, inconvenience is reduced when the advertising is interesting.

Finally, the third study focuses on the phenomenon where consumers try to reduce their consumption of advertising by blocking them or subscribing to paid services. I measure the economic value of the consumer's feelings and derive the cost to pay for blocking the uncomfortable advertising. Assuming there is a virtual online ad-blocking program, this study conducted a conjoint analysis based on five factors of online video advertising (behavioral ads, repetitive ads, ad length, ad position, and skippable ads) and the available service charges. I find that consumers are willing to pay the highest cost for blocking advertising based on personal information and pay about KRW 30 as the length of an advertising is reduced by one second. In addition, based on the derived cost, I simulate the change in market shares by changing the composition of factors when platforms construct a virtual ad-blocking service. Therefore, this study will help to establish management strategies when changing the advertising strategy or entering a new market.

6.2. Managerial and policy implication

This dissertation investigates the Internet platform economy, especially, OTT platforms and focuses on industry efficiency and consumer inconvenience. I was able to derive some implications through this.

First, the Internet platforms should recognize the degree of advertising inconvenience and strive to improve it for consumers. The Internet platform generates a lot of revenue from advertising. With the growth of Internet platforms, Internet advertising also grows rapidly; not only quantitative advertising but also crafty technical advertising that increase the level of inconvenience. Online video advertising has to be watched before and after content consumption, so consumers are increasingly uncomfortable with advertising. Consumers avoid or block advertising because of its perceived inconvenience, which can ultimately become a major problem in securing revenue for the platform. Further, the platform could have problems retaining the consumers, as they can move to other platforms if they experience repeated inconvenience. The current regulations for online advertising are not as stringent as those for terrestrial broadcasting advertising. There are difficulties in keeping up with new types of advertising that appear and to determine if they are advertisements or not. However, as the number of advertisements and the technical functions of advertisements, such as use of personal information increases the degree of inconvenience, appropriated regulations are required. Previous studies have looked at how online advertising is different (Goldfarb, 2014), the problems of online advertising (Liang & Mackie, 2011), the effectiveness of regulations on advertising using personal information (Goldfarb & Tucker, 2011), and the

effectiveness of introduction of regulations on online advertising (Hacker, 2008). However, it is critical to observe the ever changing online advertising, identify its drawbacks, and understand its impact on consumers and society. Platforms and advertising industry should be able to grow together in an environment where consumers can actively participate and respond.

Second, not only related companies but countries should also strive to innovate so that industries can grow together in the global platform era. The Internet industry is an area without borders that can be easily entered and can spread and grow rapidly. Consequently, the problems are also spreading globally. The entry of foreign companies with superior technology and a large number of consumers widens the gap by preventing the growth of domestic companies, or eroding domestic industries. When new innovators emerge in the industry, those with adaptive capabilities can grow together through imitation. In an environment where the world competes and grows together, governments should back up their policies by ensuring there is no reverse discrimination among domestic companies and no difficulty in entering the overseas market (Bourreau et al., 2018; Bacache-Beauvallet & Bloch, 2018).

Governments should consider the environment where domestic industries can grow and compete in the global market.

6.3. Limitations and further research

This study focuses on the growth of the Internet platform economy, especially platforms and examines their impact on consumer utility and industry growth. The rapid growth of OTT platforms has been accompanied by the growth in online

advertising and an increase in consumers' inconvenience, leading to rejection or blocking of advertising. Therefore, I study its causes and calculate the degree of inconvenience as an economic cost. Further, the impact of OTT platforms' entry on related industries is examined through efficiency analysis.

For the first study, I consider the impact of the global OTT platforms on Korea's video content industry. However, I could not secure the financial data related to the global OTT platforms for certain countries. Although overseas OTT platforms have a lot of influence as they enter a country, there is no way to measure how much they actually invest in that market and the revenue generated, so governments in each country do not have the proper means to apply tax regulations and other policies to foreign platforms. In a follow-up study, if the data for each country is available, I hope to compare each country and analyze the efficiency of the industry involved.

In the second study, since it was conducted based on a questionnaire to confirm the perceived inconvenience, more could have been done for expanding, classifying, and analyzing the consumer groups if more consumers could be observed. Further, if consumers' platform usage patterns can be analyzed with raw data instead of the survey data, specific factors or methods for avoiding advertising could be identifiable. A well-organized observational experiment could also be a solution.

For the third study, I could not consider the different characteristics between the OTT platforms and only focused on the online advertising they provide. Moreover, the study could not take into account that consumer inconvenience for each platform could vary due to various reason, such as loyalty to a particular platform and the cost of switching to another platform. In this study, there were only a limited number of samples to consider platform specific differences and there were limits to equating

the environment except in advertising. A follow-up study could look at the inconvenience of consumers considering the platform differences.

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Abstract(Korean)

지난 십 여년 동안 IT기반 플랫폼 경제는, 세계의 경제를 이끄는 중심이 되었다. 플랫폼은 원래 판매자와 소비자간의 거래를 연결해주는 매개체로써 역할을 하였지만, 축적된 소비자 집단과 축적된 자본은 플랫폼 스스로의 경쟁력을 높였고, 상품을 직접 생산해서 판매할 수 있는 단계까지 성장, 진화하였다. 또한 끊임없이 새로운 플랫폼이 등장하는 환경 속에서 새로운 시장의 leader가 되기 위해서는, 차별적인 혁신, 그 중에서도 소비자 중심의 혁신이 뒷받침 되어야 함을 알 수 있었다. 따라서, 플랫폼 성장과 소비자 중심의 혁신을 설명하고자, 현재 전세계의 산업 및 소비자에게 많은 관심을 받고 있는 OTT 플랫폼을 연구대상으로 선택하였다. OTT 플랫폼은 2005년 탄생한 YouTube를 시작으로 소비자들의 관심을 받기 시작하였고, 2016년 Netflix의 등장 이후로 OTT 플랫폼 시장이 활성화되면서, 주변 산업 및 소비자에게 많은 영향을 미치고 있다. 서로 다른 비즈니스 모델을 가지고 있는 OTT 플랫폼의 등장이 주변 산업에 미치는 영향력을 시기별 효율성 분석을 통해 비교해보고자 하였으며, OTT 플랫폼을 사용함에 있어서 소비자가 느끼는 불편함은 무엇인지, 소비자의 불편 정도를 경제학적 가치로 환산해보고 이와 같은 문제를 해결함으로써 기업들이 성장할 수 있는 전략 수립이 중요함을 강조하고자 하였다.

첫번째 논문은 대표적인 글로벌 OTT 플랫폼이 전세계 OTT 시장을 장악하고 있는 상황에서, 글로벌 OTT 플랫폼의 진출이 국내 관련 산업의 성장에 어떤 영향을 미치는지를 살펴보고자 하였다. 특히, YouTube, Netflix는 서로 다른 비즈니스 모델을 추구하는 기업으로 전략적 차이가 효율성에 미치는 영향력이 존재하는지를 살펴보았다. YouTube는 소비자 참여를 기반으로 하는 광고 기반의 콘텐츠 공유 사이트인 반면, Netflix는 premium contents 기반의 가입자 대상의 콘텐츠 제공 사이트이다. 성향이 다르지만 현재 가장 높은 성장률과 점유율을 보이고 있는 대표적인 글로벌 OTT 플랫폼으로, YouTube와 Netflix가 한국 시장에 진출함에 따라, 관련 영상 콘텐츠 산업에 미치는 영향을 살펴보았다. 영상 콘텐츠 산업은 크게 영상 제작업, 제작관련 서비스업, 배급업으로 나뉘었으며, 서비스업 관련 기업들은 폐업하는 기업들이 많아지고 제대로 성장하지 못한 문제점으로 인해 이번 연구에서는 제외하기로 하였다. 한국 시장에 YouTube가 진출하기 전 국내 OTT플랫폼만이 존재하던 시기와 2008년 YouTube진출 이후, 2016년 Netflix진출 이후로 3기로 나누어서 한국의 영상 콘텐츠 제작업과 배급업의 효율성에 미친 영향을 살펴보았다. 그 결과, 한국의 영상 콘텐츠 배급업은 YouTube 이후에 기술적 효율성이 크게 성장하였고, 한국의 영상 콘텐츠 제작업은 Netflix 이후에 기술적 효율성이 증가한 것으로 나타났다. YouTube는 영상 콘텐츠 광고를 효과적으로 전달할 수 있는 하나의 채널로, 영상 콘텐츠가 배급,

확산함에 있어서 효율을 높였던 반면, Netflix는 프리미엄 콘텐츠를 유통함에 따라 자체적으로도 콘텐츠를 제작하거나, 콘텐츠 제작에 투자를 함으로써 제작업의 효율성 증진에 기여한 것을 알 수 있었다.

두번째 논문은 OTT 플랫폼 환경에서 소비자들이 느끼는 온라인 동영상 광고의 불편 요인들이 무엇인지, 온라인 동영상 광고의 대표적인 요인인 광고의 길이, 동일 광고의 반복, 광고의 재생 위치를 중심으로 소비자들의 인지된 광고의 불편 정도와의 관계를 살펴보았다. 또한, 광고가 제공하는 재미, 정보의 매개 효과가 광고의 불편 정도에 미치는 영향을 살펴보았다. 한편, 광고에 대한 불편 정도는 온라인 동영상 콘텐츠의 소비 정도 및 평소 온라인 쇼핑 습관 등의 소비자 성향에 따라 다를 것으로 보고, 소비자들의 특성에 따라 요인 분석을 실행하였다. 그 결과, 활발한 온라인 콘텐츠 소비 및 쇼핑 그룹(그룹2)과, 광고를 통한 쇼핑을 하는 그룹(그룹1)으로 구분되었으며, 그룹2의 경우, 길이가 긴 광고, 잦은 반복의 광고, 시청에 방해되는 광고의 위치가 광고의 불편 정도를 직접적으로 증가시키는 것으로 나타났지만, 길이가 긴 광고의 내용이 재미있을 경우는 불편 정도가 경감되는 것을 알 수 있었다. 반면, 그룹1은 광고에 대한 불편 정도가 길이가 긴 광고에서만 나타났고, 동일 광고가 반복될 때, 재미가 있다면, 광고의 불편 정도가 경감되는 부분 매개 효과(partial mediation)가 나타났다. 결국, 광고에 신중하게 반응하고, 광고를 통해 구매로 이어질 확률이 높은 그룹은 광고의 길이에서 불편 정도가 가장 높게 나타났으며, 광고의 불편 정도는

광고에 많이 노출되고, 콘텐츠 소비가 많은 그룹에서 전반적으로 높게 나타났다. 광고의 잦은 반복, 재생 위치 등 광고의 효율을 높이기 위한 기술적 기능들은 광고의 재미, 정보 등의 효과가 있을지라도 불편 정도를 경감시키지 못하였다. 다만, 광고의 기본적인 기능은 광고의 재생 길이에 대해서는 광고가 재미있다면 불편 정도가 줄어드는 효과가 나타남을 알 수 있었다.

마지막, 세번째 논문은 소비자들이 광고의 불편 정도가 증가함에 따라 광고를 차단하거나, 광고 없는 유료 서비스 가입을 통해 광고에 대한 소비를 줄이고자 하는 현상에 집중하였다. 소비자들이 느끼는 광고의 불편 요인들을 경제학적 가치로 측정해보고, 불편을 주는 광고를 차단함에 있어 지불하고자 하는 비용을 도출하고자 하였다. 이 연구는 가상의 온라인 광고 차단 프로그램이 존재한다는 가정아래, 대표적인 5개의 온라인 광고 요인(개인정보 활용 광고, 반복 광고, 광고 길이, 광고 위치, 건너뛰기 가능 광고)과 이를 이용하였을 때 가능한 서비스 이용료를 요인으로 잡고 컨조인트 분석을 하였다. 그 결과, 소비자는 개인 정보를 활용하는 광고를 차단하는 것에 가장 큰 비용을 지불하고자 하였으며, 광고 길이를 1초 줄임에 따라 약 30원을 지불할 의사가 있음을 알 수 있었다. 또한, 도출된 비용을 바탕으로 가상의 플랫폼 기업들이 광고 차단 서비스를 구성함에 있어서 요인별 구성을 달리함에 따라 시장 점유율이 어떻게 되는지를 시뮬레이션으로 비교해보았다. 이를 통해, 새롭게 광고 전략을 바꾸거나 신규 사업자가 시장에 진출할

때, 이 연구결과를 활용함으로써 경영 전략을 수립하는데 도움이 될 것으로 판단하였다.

주요어 : OTT 플랫폼, 소비자 중심 혁신, 광고 불편, 구조방정식, 혼합로짓모델, 메타프론티어

학 번 : 2017-38378