

## 온라인 커머스 서비스 혁신을 위한 비즈니스 생태계적 접근\*

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### A Business Ecosystem Approach for E-commerce Service Innovation\*

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#### ■ Abstract ■

At a time when the e-commerce market is experiencing accelerated growth, with advancements in information and communications technology (ICT), the problems of distribution of counterfeit products and consumer confusion caused by non-face-to-face purchases have increased. Hence, amid intensifying competition, it has become important for e-commerce companies deliver product information more efficiently, provide differentiated services, and secure credibility for consumers by reducing consumer damage from buying counterfeit products. However, even though consumer confusion and the inadvertent purchase of counterfeit products are intensifying in such a market scenario, there are no services that aim to solve such problems. This study examines the conventional e-commerce industry in South Korea through a political, economic, social, and technological (PEST) analysis, based on in-depth interviews with consumers, to derive the pain and gain points of the industry. As a result, the inherent problems of the e-commerce industry were revealed. Through a service value network perspective, services aimed at resolving such issues were derived, and the e-commerce business ecosystem needed to solve this problem was deduced. The findings revealed that the artificial intelligence - based service support platform has become a major driving force within the e-commerce innovation ecosystem by enabling a new way to create and secure value using ICT. This entails a new exchange mechanism and transaction architecture and a new organizational structure that breaks the barriers between industries.

Keyword : E-commerce, Innovation Ecosystem, Service Value Network, Artificial Intelligence, ICT

Submitted : March 31, 2021

1<sup>st</sup> Revision : June 16, 2021

Accepted : July 16, 2021

\* This study was supported by the Ministry of Trade, Industry and Energy and Korea Evaluation Institute of Industrial Technology(20000832).

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## 1. Introduction

With the recent rapid advancement of information and communications technology (ICT), the purchasing behavior of consumers has radically changed, moving to online purchasing through the Internet and smartphones. This change has improved consumer convenience by helping consumers to purchase goods regardless of time and space. Advancements in the Internet and ICTs have changed the range and depth of value provided to consumers, further accelerating the rapid growth of the e-commerce market (Nambisan, 2002; Prahalad and Ramaswamy, 2004; Sawhney et al., 2005).

E-commerce companies have acquired vast amounts of data through convergence with ICT-based systems and have provided various products and promotion channels tailored to consumer demand. With such trends, a problem has surfaced in that many e-commerce companies push excessive information to consumers to gain a competitive edge in the overheated competition in the e-commerce market (Lu et al., 2016). E-commerce users, therefore feel fatigued in the process of selecting and purchasing their desired products (Walsh, 2007). In other words, they are in a state of consumer confusion, similar to the Hamlet syndrome (Mitchell et al., 2005; Walsh et al., 2007; Walsh and Mitchell, 2010; Wang and Shukla, 2013).

Therefore, many e-commerce companies are focusing on designing strategies to meet the diversified demands of consumers and to effectively market their products and services to numerous consumers. The e-commerce industry is rapidly moving toward finding breakthrough innovations to build consumer perceptions about their

companies by providing new services incorporating ICT.

Subsequently, the growth in e-commerce has been accompanied by a credibility problem in non-face-to-face online purchasing (Jiang et al., 2008). For example, a distributor that supplies products to an e-commerce company may deceive consumers by distributing illegal counterfeit products. To tackle this problem, public institutions in the Republic of Korea such as the National Police Agency, the Supreme Prosecutors' Office, and the Fair Trade Commission has been operating various systems, including a reward scheme for reporting counterfeit products. However, this has limited effectiveness because it is an ex post system for damage control, coming into force after the consumers have bought counterfeit products. Services that can prevent consumers from purchasing counterfeit products are lacking.

Therefore, an integrated ecosystem is required, through cooperation between stakeholders, to address the aforementioned problems. To this end, the e-commerce market must be understood in greater detail. Such an integrated system can ensure that responsibilities are distributed and solutions can be found based on the creation of common value through coordination of activities among stakeholders (Prahalad and Ramaswamy, 2004; Cenamor et al., 2017).

Most of the existing e-commerce-related prior studies focused on maximizing purchasing convenience through ICT new technology application (Jeong and Kim, 2019), but it was hard to find research analyzing key stakeholders and dynamics to solve various problems faced by consumers in e-commerce. Compared to overseas e-commerce, this study lacks infrastructure and new technology applications to solve

various problems with e-commerce (Jeong and Kim, 2019) and started from problem consciousness and conducted this study.

Therefore, this study aims to develop service models to solve the problems of consumer confusion and the unknowing purchase of counterfeit products. It also conceptualizes an innovation ecosystem that is essential to provide such services.

To this end, first, a political, economic, social, and technological (PEST) analysis of the conventional e-commerce ecosystem is conducted. Second, through in-depth consumer interviews, the pain and gain points of the industry are identified. Third, a conceptual model of the actors in an ICT-based service ecosystem is derived (Basole and Rouse, 2008). with a focus on reducing decision-making complexity and consumer confusion. In this case, the service value network concept of Basole and Rouse was used to represent each stakeholder, and the two services to be proposed were approached such that they enable service innovation in the conventional e-commerce ecosystem, similar to the approach of Tiwana et al. (2010).

## 2. Theoretical Background

### 2.1 Value Chain and Value Network

The concept of value chain explains the production activities and value creation processes of manufacturing companies. It entails a series of processes for companies providing a product and presents a macroscopic system that describes the industry in the field of business management (Porter, 1985; 2008). The concept suitably describes the overall structure of manufacturing

companies. However, as the industry gradually evolved, the manufacturing companies transitioned to service-oriented companies, thereby creating a blind spot that could not be represented in the value chain (Basole and Rouse, 2008; Kaplinsky and Morris, 1999). In this scenario, companies need to ensure mutual cooperation to further improve the quality of their services and gain a competitive edge. The limitations of value chain include its inability to represent the relationship between various companies and stakeholders due to this shift in the industrial paradigm to a service-centered industry (Kaplinsky and Morris, 1999).

The industrial structure has experienced rapid change and increased in complexity in recent years due to advancements in ICT. In this environment, where most companies have already shifted their focus toward the service industry, the growth of ICT is accelerating the process of vertically and horizontally integrating and reorganizing the services and values provided by various companies, and this has driven the shift in paradigm (Nambisan, 2002; Prahalad and Ramaswamy, 2004; Sawhney et al., 2005). The concept of value network was devised to effectively represent a series of processes of diversified actors who provide services and create value until services and values are provided to consumers according to this trend (Peppard and Rylander, 2006).

The value network is a system that represents the flow of services and values through the relationship between nodes and links. Companies are represented as nodes as they become individual actors that provide services and values to consumers in the value network, and the flow of interests and interactions between companies

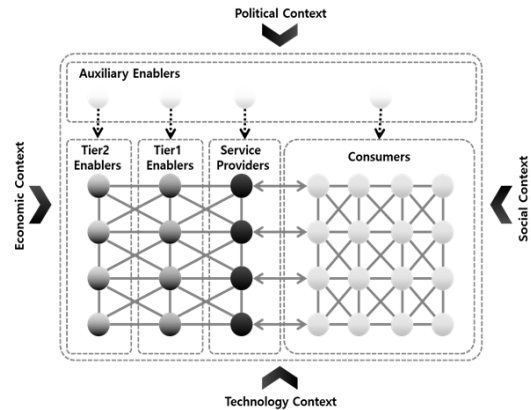
are represented as the links connecting each node (Peppard and Rylander, 2006). This representation of the value network was influenced by the value theory of Nalebuff and Brandenburger (1997), who portrayed the value system as follows : the ability of a company to produce value and deliver it to consumers is influenced by its suppliers, consumers, competitors, partners, and other organizations. When complex and diversified modern industries are represented as a value network, cooperation, complementary relations, and competition within a specific industry can be represented as a single system a value creation system or an industrial ecosystem.

## 2.2 Service Value Network

The existing literature has extensively discussed the notion that “everything is a service” and that a service and its value are indistinguishable (Levitt, 1972). Basole and Rouse (2008), who first introduced the concept of a service value network, suggested that services and products are inseparable, and hence, the service value network is a system that encompasses both services and products. In addition, to represent the service value network, the actors were categorized into consumers, service providers (who provides services by directly contacting the consumer), and enablers (who provide services and products to the service provider) (Basole and Rouse, 2008). The enablers were divided into Tier 1, which provides products and services directly to the service provider, and Tier 2, which provides products and services to Tier 1.

Basole and Rouse (2008) also explained that an auxiliary enabler, which affects all industries and the society, as the base of all industries, also

needs to be represented as an actor in the system. They found that contextual influences need to be considered to identify each node, including the auxiliary. The role of each actor (node) in the value network, representing the service value network, is summarized in <Table 1>, and the nodes and links representing the service value network are depicted in [Figure 1]. The trends in previous studies that use the service value network to represent the ecosystem of a specific industry are shown in <Table 2>.



[Figure 1] Conceptual Model of Service Value Network (Basole and Rouse, 2008)

The process of representing the service value network examined the process of network value creation in which each actor cooperates to increase value. Such a process resulted in a new perspective that could improve the core competencies of each actor and compensate for the insufficient competencies (Basole and Rouse, 2008). Moreover, this new perspective influenced subsequent studies on service-dominant logic : “all actors will exchange resources with other actors and move forward as a co-value creator that establishes one network” (Karpen et al., 2012; Lusch and Nambisan, 2015).

〈Table 1〉 Roles and Descriptions of Each Value Network Actor(node)

Classification		Description
Consumer		<ul style="list-style-type: none"> <li>- Services produced by service providers and multiple enablers are realized as value and consumed at the consumer level (actors of value realization and consumption)</li> <li>- Modern consumers want to quickly receive high-quality tailored services and are actively engaged in value networks</li> <li>- Service providers benefit only when consumers are satisfied</li> </ul>
Service Provider		<ul style="list-style-type: none"> <li>- Provides services through direct contact with consumers</li> <li>- There is always at least one actor in the network</li> <li>- An actor that produces services through interactions with enablers and builds relationships in service value networks by interacting with consumers</li> </ul>
Enablers	Tier 1	- Provides goods and services directly to a service provider (producer, manufacturer, another service provider)
	Tier 2	- Provides services and products to a Tier 1 enabler (material suppliers, parts suppliers, etc.)
	Auxiliary	- Functions that are not limited to specific industries and are the basis for the entire society (government agencies, financial institutions, infrastructure providers, etc.)
Contextual Influences		- Social, cultural, economic, and political contexts are indispensable factors that influence the behavior of the service ecosystem.

〈Table 2〉 Research Trends of Service Value Networks in Other Industries

Industry	Researcher	Description
Mobile applications	Wang et al., 2015	<ul style="list-style-type: none"> <li>- Analyzed the feedback structure generated based on system dynamics (SD), set network goals and represented network actors by using the service value network, and identified interactions between actors</li> <li>- The results of the study are useful for managers understand complex interactions and for feedback of the service system to create a common value for mobile application services in Taiwan</li> </ul>
Energy management	Kwon et al., 2020	- Presented an integrated perspective for service innovation through a service value network, along with the use of smart grid technology to implement a household energy management system
Health care	Rouse and Basole, 2010	- Evaluated the complexity of healthcare and medical service domains by introducing an information theory model to calculate the complexity of the value delivery network
Mobile application store	Basole and Karla, 2012	- Used service value networks to investigate the transformative role and impact of the actors of the mobile service ecosystem to explore how mobile application stores are shaping value production

### 3. Analysis of the E-commerce Ecosystem

#### 3.1 Review of E-commerce Industry : A Political, Economic, Social and Technological (PEST) Analysis

To develop innovative ecosystems and services that can solve the problems of the conventional e-commerce industry, a PEST analysis

is a pertinent first step. All actors of the service ecosystem operate in social, cultural, economic, and political contexts, and economic activities within the ecosystem cannot be performed by other actors or outside of the context (Granovetter, 1985). Therefore, the current e-commerce industry in South Korea was examined using a PEST analysis, based on which the problems of the e-commerce industry were identified.

First, the political analysis revealed that the government is politically aware of the increase in the number of transactions within e-commerce, and also that the opportunities that the e-commerce industry can create added economic value in the future. This was evident in its announcement of a policy to support the development of e-commerce technology. Furthermore, the related mobile payment system was deregulated, and support for service development for diversification of the authentication system was increased, as the government recognized the growth of the e-commerce industry. The government is also developing an active policy and legal support system for overseas expansion of the domestic e-commerce market. Moreover, as the e-commerce market grows, there is increasing support for the establishment of a legal protection system and a cooperative system to ensure the protection of personal information and credibility in distributing products.

Second, the economic analysis revealed that the possibility that various mobile payment systems and payment services can create economic value is significantly increased, as the demand for mobile payment systems increases along with the growth of the e-commerce market. In addition, many advertisements and promotional content were produced through competition among domestic e-commerce companies. E-commerce was found to have a high possibility of creating economic derivative value of the service of reducing the boundary with other industries as a new service group was deduced through cooperation between the e-commerce and the content industries. However, the scale of distribution of deceptive counterfeit products due to the growth of the e-commerce market continues to increase,

and the damage to consumers is intensifying. Furthermore, the problem of tax loss and the enormous economic loss of consumers in connection with these problems are intensifying.

Third, the social analysis revealed that opportunities for the e-commerce industry through non-face-to-face business are continuously expanding during the COVID-19 pandemic. This emphasizes the importance of three aspects : (1) the need to construct a system capable of responding quickly to changes in the rapidly changing market as well as to reinforce a platform to improve shopping convenience; (2) the need to provide personalized customer service to give companies a competitive edge; and (3) the need to reinforce counterfeit product screening measures and relevant legal systems to protect the rights and interests of consumers, given the increase in the number and distribution of counterfeit products.

Finally, the technological analysis revealed that e-commerce is expanding distribution channels and platforms to informative and search channels with all the conveniences. Innovative technologies such as augmented reality (AR), virtual reality (VR), and Internet of Things (IoT) are being introduced into e-commerce. Similarly, technologies for transforming conventional consumer data into a new form of data by using bulk and high-speed data, AI technology for analyzing images, and technology to prevent the distribution of counterfeit products were being developed.

In summary, it was found that the content business derived from the e-commerce industry is growing in parallel to the growth of the e-commerce industry and that the role of e-commerce is diversifying. Further, services provided

to consumers in e-commerce are diversifying, and competition within the e-commerce industry is intensifying due to the introduction of the Fourth Industrial Revolution technologies. Furthermore, consumers' economic losses as well as social tax revenue losses continued to deepen with the increase in the distribution of counterfeit products. Lastly, e-commerce will continue to expand in the future as a non-face-to-face consumption increases due to the expansion of contactless consumption patterns caused by COVID-19.

### 3.2 Identifying Pain and Gain Points Through Customer Interviews and Problem Definition

In-depth customer interviews were conducted to help model the innovative ecosystem as well

as the two services. The questionnaire was developed based on the PEST analysis findings and keywords, and the in-depth interviews were conducted among 10 consumers. These consumers were in their 20s and 30s and had ample online shopping experience. Subsequently, the problems of the current ecosystem of the e-commerce industry were defined and their causes were analyzed based on this process.

Keywords derived from the PEST analysis were a new experience, convenience of use, product information, change in consumption pattern, contactless consumption, SNS, and concern about counterfeit products. The interview questionnaire, developed based on these keywords, is shown in <Table 3>. Consequently, the pain and gain points were derived. The results are summarized in <Table 4>.

<Table 3> Questionnaire for Customer Interview Developed based on the Derived Keywords

NO.	In-depth interview questionnaire for e-commerce consumers
1	- Which e-commerce service/platform do you usually use?
2	- Was there any inconvenience when searching for products?
3	- Was there any inconvenience when comparing prices?
4	- Is there anything you require or wish to improve on getting information about the product?
5	- Which product group do you think suffers most from a credibility problem (whether the product is genuine or counterfeit)? Also, do you trust that it is genuine when purchasing a product through e-commerce?
6	- Which channel do you mainly use to pay?
7	- While using e-commerce, is there any service that you were impressed with or would like to recommend to others?
8	- Is there any service you wish will be improved or supplemented for the convenience of use of e-commerce in the future?
9	- Is there any service or advertisement that you found interesting while using e-commerce?
10	- What kind of mobile payment service do you use?
11	- Have you ever hesitated to buy or decided not to buy due to security issues while using e-commerce?
12	- Have you ever used an after-sales compensation system or service for counterfeit products while using e-commerce? (Have you ever experienced purchasing deceptive counterfeit products?)
13	- Do you use overnight delivery service? If so, why do you use it?
14	- Have you ever experienced secondhand market service or secondhand transactions using e-commerce?
15	- Do you actively reflect consumer review on purchasing decisions while using e-commerce?
16	- Do you often use e-commerce brand special event services?

〈Table 4〉 Identifying the Pain and Gain Points : Keywords from Consumers' Perspectives

Factor	Pain Point	Gain Point
Description	Lack of detailed product information	Point earnings and high discount rate
	Inaccurate search and product recommendation services	Convenient price comparison
	No interesting content in e-commerce	Possible to consider reviews from other consumers
	Personal information security issues during payment	Convenient search due to categorization
	Low trust in product quality	Interesting review content of influencers
	Concern about purchasing counterfeit products	Convenient purchase through mobile payment
	Insufficient compensation system for counterfeit products	Convenient overnight delivery and auto delivery

〈Table 5〉 Five Problems in e-commerce and Related Causes

Problems	Cause
Lack of product search attributes and inaccurate search functions	Low expertise in hashtag search function
	Low product recommendation service credibility
	Lack of product attributes
	Lack or insufficient product information provided
	Inaccurate search services such as Bixby
Low credibility of product information for transactions	Uncertainty of counterfeited luxury goods
	Lack of detailed information on the product information page
	Low credibility when there are not enough product reviews
Insecure e-commerce security system	Problem of advanced e-commerce site hacking
	Concern about using the mobile payment system related to personal information
No prevention and after-sales management system for counterfeit products	Complicated compensation process when reporting counterfeit products
	System centered on after-sales management
	No counterfeit product screening service
	Not enough after-sales management and compensation system for the purchase of counterfeit products
No interesting content	Negative consumer perception of excessive exposure to commercial advertisement
	Monotonous e-commerce advertisements and contents

Based on the points summarized in <Table 4>, five problems and their causes were analyzed. These deduced problems and the potential causes are shown in <Table 5>. During this process, this study focused on the services that need to be introduced to solve the credibility problem in purchasing products in e-commerce and ensure that consumers continue to use e-commerce.

### 3.3 Service Listing and Service Deduction for E-commerce Ecosystem Innovation

The third step in the analysis to help solve the problems of the conventional e-commerce industry is "Service Listing and Service Deduction." Business-to-business (B2B) services to deal with counterfeit products and business-to-customer (B2C) services involving product



〈Table 6〉 Deduced services

Area	Service name	Service description
B2B	Watermark technology-linked dual security service	- A service that provides dual security for e-commerce by identifying whether a product is a counterfeit using counterfeit product screening technology and adding a watermark with specific information on the image of the product or in product information.
	Counterfeit product screening service	- A service that comprehensively manages seller data (seller, company name, operation information, etc.) and product data (image, price, seller, company name, etc.) to be sold on a B2B website (accessible only to genuine sellers and e-commerce officials), screens counterfeit products using AI algorithms, and prevents its distribution in e-commerce.
	Counterfeit product information service	- A service to construct a counterfeit product screening database by bulk/high-speed processing of counterfeit product database, established through the counterfeit product screening service, and to provide it to genuine sellers (targeting high-end brands)
B2C	Product exposure intelligence service	- A service that effectively releases personalized products to members on the integrated e-commerce page/application by comprehensively analyzing product data and consumer data based on AI algorithms when consumers search for products
	Personalized curation service	- A service that internally recommends personalized products to customers before they search for products by adding a personalized curation page to the menu page at the top of the e-commerce integrated homepage/application; a service that completely removes the presentation of promotional products and reveals only personalized products according to consumer segmentation by category
	Search service for product in video	- A service that provides product information based on AI image analysis technology for products in the video paused by consumers and that provides shopping experience value to ensure that consumers can consider various product groups by recommending similar products and purchased products related to the products selected by consumers
	Review video recommendation service	- A service that provides additional information differentiated from other e-commerce platforms to consumers who are contemplating the purchase of certain products by providing recommendations of review videos of similar products along with similar products recommended based on AI image analysis technology

curation were deduced based on the aforementioned findings. These services are described in 〈Table 6〉.

## 4. Innovation Ecosystem

### 4.1 Counterfeit Product Screening Ecosystem

#### 4.1.1 Counterfeit Product Screening Service Innovation

A service that provides new value to consumers evolves through cooperation among consumers, providers, and partners in the value network, rather than through changes in the service itself (Witell and Löfgren, 2013). The services presented in this study were deduced in

light of the internal and external trends of e-commerce, as well as the ecosystem-based cooperation system verified in existing studies.

A total of three services for screening counterfeit products targeting the B2B domain were proposed to solve the problem of distributing counterfeit products in e-commerce (see 〈Table 6〉).

First, the watermark technology-linked dual security service uses a counterfeit product screening technology to identify whether a product is genuine, and then records and adds image information of the counterfeit product to the watermark. In this way, the service provides a security layer that can double-check counterfeit products when supplying products to e-commerce

companies. This service prevents e-commerce companies from buying products from illegal distributors in advance, since the distribution problem of counterfeit products undermine the overall image of the e-commerce industry and the credibility of the company. With the introduction of this service, not only can e-commerce companies secure social credibility that it is safe from deceptive counterfeit products, but illegal distributors can also be expected to gradually disappear.

The core actors of the watermark technology-linked dual security service are the AI-based service support platform, genuine distributors, and e-commerce companies. The AI-based service support platform develops a dual security system using AI to add a watermark with specific information about the image of a product that has been identified as counterfeit. This technology support platform provides dual security services to genuine distributors and e-commerce firms and provides these services for mutual trust transactions even in transactions between genuine distributors and e-commerce firms based on the established watermark dual security system. In addition, genuine distributors and e-commerce firms do not simply receive double security services but provide information on the collected counterfeit products to the AI service support platform when counterfeit products are identified, which will lead to innovations that can gradually enhance the watermark technology-linked dual security service through organic cooperation between each actor.

Second, the counterfeit product screening service can manage data related to sellers and the products in the store in an integrated manner on the website for B2B personnel, which can only be accessed by stores and e-commerce offi-

cial. This service provides a platform to prevent the distribution of counterfeit products in e-commerce firms by screening counterfeit products using AI algorithms. This service was devised considering the fact that there is a serious socio-economic cost for the existing service provided is centered on after-sales management. This service not only alleviates consumers' concerns about the purchase of counterfeit products and secures the credibility of e-commerce firms but also improves work efficiency through AI-based automation of quality assurance manager tasks of e-commerce companies. It also constructs a large database (DB) for domestic e-commerce companies and products.

The core actors of the counterfeit product screening service are the AI-based service support platform, genuine distributors, and e-commerce firms. This service can be provided between the transactions in which genuine distributors provide products to e-commerce firms and subsequently, the e-commerce firms pay the cost to the genuine distributors. The AI-based service support platform constructs a B2B website that can only be accessed by genuine sellers and e-commerce officials. The genuine distributor provides information on the seller, operational information, and company name to the technology support platform, while the technology support platform pays the cost for the DB of genuine distributors or induces a long-term partnership. The e-commerce firm, which is the main target of this service, pays a website fee for the use of the counterfeit product screening service to the technology support platform. The counterfeit product screening service can obtain a competitive edge through a long-term partnership because it is important that the genuine distributors quickly provide information

in a changing product distribution market to AI-based service support platforms for the innovation and technological advancement of the service.

Third, the counterfeit product information service develops a counterfeit product screening DB via high-speed processing of the DB related to counterfeit products, and it provides this to genuine distributors and sellers. The purpose of this service is to prevent the distribution of counterfeit products by acquiring advance information on illegal counterfeit products, considering that illegal distribution of counterfeit products not only damages the brand of genuine companies but also the image of the origin country. This service enables genuine manufacturers to quickly read the trends in the distribution of counterfeit products, helps companies find prompt responses to restore their image, and contributes to proactively preventing counterfeit product distribution in e-commerce.

The core actors of counterfeit product information services are AI-based service support platform, genuine distributors, and “high-end brand sellers.” This service targets high-end brands concerned about brand damage due to counterfeit products. The technology support platform develops a counterfeit product screening DB via high-speed processing of genuine data on sellers, operational information, and company names acquired by signing partnerships with genuine distributors or buying the DB. It then provides this to high-end brand sellers, who need to pay a service fee for browsing the counterfeit product screening DB. This service can contribute to fundamentally eradicating the distribution of counterfeit products in that it directly provides information on counterfeit products to high-end brand sellers.

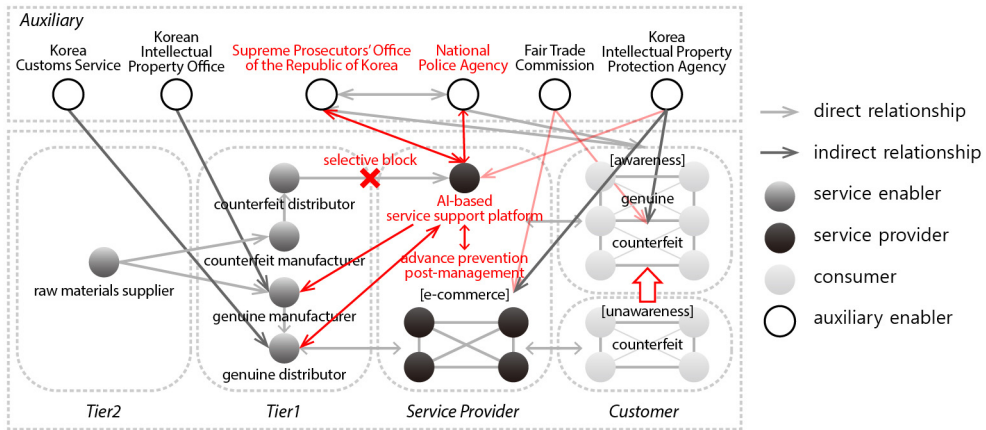
#### 4.1.2 Counterfeit Product Screening Innovation Ecosystem

According to the service-dominant logic, promptly mobilizing the resources of the actors is the most important problem (Lusch et al., 2010; Normann, 2001). From this perspective, the core aspect of an ecosystem is to establish a system to control the activities of various stakeholders surrounding the e-commerce industry and their agile cooperation.

Such an innovation ecosystem can be driven by changing the structure linking companies, partners, consumers, content, and the transaction system (Witell and Löfgren, 2013). In other words, innovation ecosystem can be considered as a self-adjusting system in which various actors can share their activities, create mutual common values, and coexist organically (Karpen et al., 2012; Lusch and Nambisan, 2015).

A series of processes was employed to deduce the three services that can solve the counterfeit product distribution problem, which has increased with the growth of e-commerce, and the consumer confusion problem, caused by information overload. The innovation ecosystem that provides the three services was deduced based on the framework of the aforementioned service value network of Basole and Rouse (Basole and Rouse, 2008), and the proposed innovation ecosystem was modeled based on the service value network model and the service value network actors (nodes) in this study. [Figure 2] shows the innovation ecosystem for screening counterfeit products. The counterfeit screening innovation ecosystem was represented by adding nodes and links that are actors of innovative services in the conventional counterfeit screening ecosystem developed based on the PEST analysis.

The main actors of service providers for the



[Figure 2] Counterfeit Product Screening Ecosystem based on AI Image Analysis Technology

innovation of the counterfeit screening ecosystem are the AI-based service support platform and e-commerce firms. The former has a modular structure (Lusch and Nambisan, 2015) that facilitates the interaction of resources of each e-commerce actor, thereby supporting counterfeit product identification services for preventive purposes through AI-based image analysis technology. In the case of e-commerce, a counterfeit product identification service provided through an AI-based service support platform can be implemented online to promote consumer shopping stability. In addition, it will facilitate the gradual enhancement of the services of the platform by providing information related to counterfeit products, when they are being purchased, to the AI-based service support platform. Therefore, it is desirable that the relationship between the AI-based service support platform and e-commerce leads to a two-way partnership based on information exchange rather than a one-way relationship between a service provider and receiver.

Second, actors who are Tier 1 enablers can be classified as genuine product manufacturers, genuine product distributors, counterfeit manufacturers, and counterfeit product distributors.

Genuine manufacturers are companies that produce high-quality products through their unique ideas and designs. Likewise, genuine distributors are companies that distribute the high-quality genuine products legally. By contrast, a counterfeit manufacturer is a company that makes illegal counterfeit products using unauthorized designs or trademarks. This problem needs to be eradicated as it violates social and economic rights. Companies that distribute such illegally produced counterfeit products are counterfeit distributors. It can be expected that the AI-based service support platform will be able to selectively prevent a counterfeit distributor from distributing a counterfeit product to e-commerce firms through the counterfeit product screening service discussed previously. Furthermore, it can be expected that genuine distributors will be able to contribute to the advancement of counterfeit product screening services by providing detailed information on genuine products to an AI-based service support platform. Therefore, the AI-based service support platform is expected to help genuine distributors solve problems related to damage to their brand caused by the distribution of counterfeit products thereby forming a win-win relationship.

Third, the actors in the auxiliary enabler category are Korea Customs Service, Korean Intellectual Property Office, Supreme Prosecutors' Office of the Republic of Korea, National Police Agency, Fair Trade Commission, and Korea Intellectual Property Protection Agency. The Korea Customs Service and the Korean Intellectual Property Office are national agencies that recognize exclusive rights for genuine brands and regulate and protect the import and export routes of counterfeit products. These two institutions recognize and support the rights to designs or products identified as being from genuine manufacturers and distributors. They also reduce the degree of damage through enforcing relevant laws in the event of damage to companies handling genuine products. The Supreme Prosecutors' Office of the Republic of Korea and the National Police Agency is national agencies that recognize the distribution of counterfeit products as criminal acts and conduct investigations based on consumer reports and screening data. These agencies enforce the relevant laws and regulations or sanctions, focusing on criminal activities between service providers and consumers. In the counterfeit product screening ecosystem proposed in this study, the Supreme Prosecutors' Office of the Republic of Korea and the National Police Agency share information with each other to attempt to eradicate crimes related to counterfeit products. Furthermore, these agencies will contribute to raising the conviction rate for companies that distribute and sell counterfeit products by sharing a database with AI-based service support platforms. The Fair Trade Commission is a national agency that inspects measures related to protection of consumer rights, investigates harm caused by counterfeit goods, and shares relevant data, which

is expected to contribute to enhancing the credibility of transactions between e-commerce companies and consumers. Lastly, the Korea Intellectual Property Protection Agency is a national agency that supports online and offline counterfeit product crackdown activities and shares related data, which can contribute to the screening of counterfeit products based on the AI service support platform.

Finally, it was found that the innovation of the counterfeit product screening ecosystem can be deduced through active DB sharing and mutual cooperation of an AI-based service support platform that provides major services, e-commerce firms, genuine distributors that are Tier 1 enablers, and auxiliary actors such as the Supreme Prosecutors' Office of the Republic of Korea and the National Police Agency. Eventually, consumers can trust e-commerce through the above innovation process in the counterfeit screening ecosystem and reduce concerns about purchasing counterfeit products, while preventing economic losses due to such purchases.

## 4.2 Product Curation Ecosystem

### 4.2.1 Product Curation Service Innovation

Four types of innovative product curation services were deduced to solve the consumer confusion problems of e-commerce (see <Table 6>).

First, the product exposure intelligence service effectively exposes customized products by comprehensively analyzing product data and consumer data based on AI algorithms when consumers search for products. At present, there is increasing consumer confusion due to indiscriminate product exposure, which is why this service was devised to ensure that consumers can

purchase products efficiently and reasonably, given the increasing importance of revealing only appropriate product information. This service solves the problem of consumer confusion arising from exposure to excessive product information in e-commerce platforms and improves shopping convenience for consumers. In addition, profit can be maximized by simultaneously recommending related and suitable products for consumers and maximizing product exposure efficiency in terms of e-commerce. Moreover, it facilitates a pattern analysis of consumption behavior by revealing product information that reflects consumer characteristics and increasing the time spent by consumers on e-commerce websites.

The core actors of product exposure intelligent service are AI-based service support platform, e-commerce firms, and e-commerce users. The technology support platform receives a product or consumer data, such as personal preferences or information provided by e-commerce users when they use these platforms. The technology support platform is developed on the e-commerce web pages or applications to provide product exposure intelligence services based on it. The product exposure intelligence service developed in this manner reaches consumers centering on e-commerce, and information about product selection attributes and images that reflect personal preferences is provided more favorably when consumers are satisfied with this service. It gradually improves the quality and accuracy of product curation services through organic cooperation between each actor in this process.

Second, a personalized curation service helps consumers to receive internal recommendations for customized products without separately searching for products by adding a curation page

tailored to the characteristics of individual consumers to the integrated e-commerce website. The service completely removes exposure to promotional products other than personalized product recommendations and exposes only products tailored to the characteristics of consumers by category. This service has been developed because of the need to improve efficiency of shopping by reflecting the recent consumption trends of consumers who feel pressured not to spend a long time on shopping due to their busy schedule. This service can be expected to not only improve the efficiency of shopping, since it exposes only the personalized products to consumers by category, but also increase the website's traffic inflow rate of consumers for e-commerce companies. It would also increase the purchase conversion rate by gaining a competitive edge over other e-commerce firms. In addition, technical sophistication can be expected since information on consumer consumption behavior is accumulated as personalized products are recommended to consumers, resulting in a higher number of purchases.

The core actors of personalized curation services are AI-based service support platform, e-commerce firms, and e-commerce users. This service helps consumers to receive internal customized product recommendations in advance without searching for products. It achieves this by developing a platform for the AI-based service support platform to create an integrated homepage or application page for e-commerce companies, who in turn provide information on products and consumer preference data to an AI-based service support platform; an AI-based service support platform pays the cost for DB purchases to e-commerce firms or induces part-

nership. The value of consumer experience is maximized in that e-commerce users, who are the main targets of this service, experience the value of being able to be recommended with personalized products through this service without a separate product search. Further, only products tailored to individual preferences can be recommended by category, completely free from exposure to promotional products.

Third, the search service for product in video acquires product information through AI image analysis technology when consumers are curious about information regarding products exposed in the video and connects to an e-commerce platform that sells that product or similar products. The consumers are exposed to various video clips as video-sharing platforms continue to expand. This service was devised to solve this problem since it is inconvenient to pause the video and search using other media and browsers to acquire information on the products of interest while continuing to watch the videos. This service enables easy information acquisition and enhances purchase convenience for consumers, while e-commerce can expect an increase in the number of potential consumers through video clips. In addition, companies that distribute products to e-commerce firms can expect to build their brand image and increase sales through natural product exposure and video advertisements.

The core actors of search services of product in the video are AI-based service support platform, e-commerce, video-sharing platform, and video-sharing platform consumer. This service aims to provide product information based on AI image analysis technology for the products that are in the video. It provides a valuable shopping experience for the consumers by recommending

similar products and previously purchased products related to the products selected by the consumers. This service has the advantage of being able to immediately provide information on a variety of products to consumers based on various platforms, and it can offer a new way of shopping in that it can induce consumers to make prompt purchases by being connected to e-commerce that sells the product and similar products without a separate search process.

Fourth, the review video recommendation service additionally recommends a product review video by linking information on similar products and related purchases products recommended based on AI image analysis technology to a video-sharing platform after a product is searched. This service was devised based on the increased demand from consumers for a more detailed and accurate information about products sold online as contactless consumption increased rapidly. This service can increase the credibility of e-commerce and products as consumers can acquire detailed information on the products of interest.

The core actors of the review video recommendation service are AI-based service support platform, e-commerce firms, video-sharing platform, and e-commerce consumer. This service provides additional information differentiated from other companies to consumers who are contemplating the purchase by providing recommendations for review videos of similar products along with similar products recommended based on the image analysis technology implemented in the AI-based service support platform. Although the review video recommendation service is operated similarly in connection with the personalized curation service, it is a required service to provide detailed information through reviews

of various influencers to consumers who want detailed and more information about the product. It can contribute to mitigating the credibility problems of online product purchases as consumers can receive recommendations for products tailored to their personal preferences. Furthermore, they can contemplate the purchase by receiving actual reviews and information from various consumers before purchasing the product through this service.

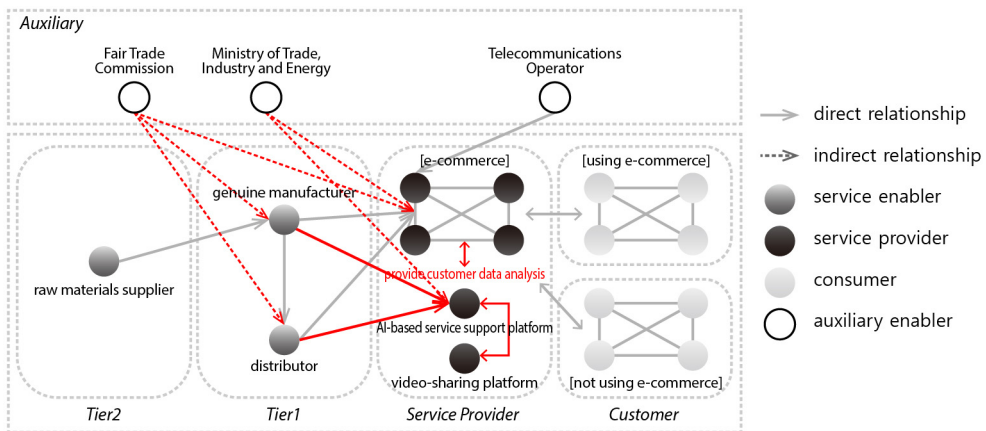
#### 4.2.2 Product Curation Innovation Ecosystem

A product curation ecosystem, as shown in [Figure 3], was deduced similar to the flow of the counterfeit product screening ecosystem based on the framework of the service value network of Basole and Rouse (Basole and Rouse, 2008).

First, the actors of service providers can be classified as e-commerce, AI-based service support platform, and video-sharing platform. E-commerce categorizes consumers depending on their consumption data or sales volume and curates and sells products accordingly. The AI-based service support platform improves shopping convenience for e-commerce consumers

through AI image analysis and big data analysis technologies, while supporting curation services that can solve the problem of “confusion in choice caused by information overload.” E-commerce and AI-based service support platforms are expected to share data analysis information about consumers and develop a partnership wherein they can enhance the services. Likewise, in the case of video-sharing platforms, the AI-based service support platform is expected to directly affect the curation services provided to e-commerce by providing review videos of the product or videos with product exposure. In other words, the video-sharing platform will be in a complex mutual win-win relationship by having a direct influential relationship with the AI-based service support platform and indirect influential relationship with e-commerce firms.

Second, the actors who are Tier 1 enablers are genuine manufacturers and product distributors. Genuine manufacturers are companies that manufacture and supply products of certified brands. Product distributors are companies that legally distribute the branded products of the aforementioned genuine manufacturers to e-commerce.



[Figure 3] Product Curation Ecosystem based on AI Image Analysis Technology



These genuine manufacturers and product distributors are actors that support the services under the Act on the Consumer Protection in Electronic Commerce of Fair Trade Commission in the curation ecosystem. In addition, genuine manufacturers and distributors can contribute to promoting the advancement of curation services in the AI-based service support platform by providing detailed information on genuine products to the AI-based service support platform.

Third, the auxiliary enablers are the Fair Trade Commission, the Ministry of Trade, Industry and Energy, and the telecommunications operator. The Fair Trade Commission is a government department that enforces laws to protect consumers in e-commerce and is responsible for monitoring transactions related to genuine manufacturers, distributors, and e-commerce firms to protect the rights and interests of consumers. The Ministry of Trade, Industry and Energy is a government department that aims to promote industry through e-commerce infrastructure construction, manpower training, institutional support, and funding, which supports the development of new types of services, such as curation services, intended to be provided by e-commerce firms and AI-based services. Finally, telecommunications operators can partner with e-commerce to analyze consumer data from telecommunications operators and provide better discounts and benefits to consumers.

Lastly, the innovation of the product curation ecosystem was deduced through active DB sharing and mutual cooperation of an AI-based service support platform, e-commerce firms, genuine manufacturers, and product distributors that are Tier 1 enablers, and auxiliary actors such as the Fair Trade Commission and the Ministry

of Trade, Industry and Energy. Ultimately, consumer confusion due to excessive exposure to product information can be reduced, and the convenience and efficiency of shopping through product exposure tailored to individual characteristics can be increased through the aforementioned innovation process of the product curation ecosystem. Furthermore, consumers can easily acquire information on products of interest or on new products without a separate search process, and a sense of trust can be built into products and e-commerce companies by providing information through professional review videos.

## 5. Conclusions

Recently, online purchases by consumers have been increasing due to the rapid growth of ICTs. However, a system to establish a solution to the problem of credibility of non-face-to-face purchases and the problem of consumer confusion caused by information overload has failed to keep up with the growth rate of ICT. Cooperation between stakeholders in the e-commerce industry ecosystem is being emphasized every day to help tackle the phenomenon. An integrated perspective is adopted in this study to help solve fundamental problems by understanding the overall e-commerce ecosystem. Therefore, seven services were proposed to solve the problem of consumer confusion and the purchase of counterfeit products through e-commerce. Each innovation ecosystem that needs to be specifically developed to provide these services was also derived.

As a result of conceptualizing the services and the corresponding innovation ecosystem to solve the problems in e-commerce, it was revealed

that, as a major actor within the ecosystem that uses ICT, the AI-based service support platform supports the relationship between consumers and companies, as shown by Basole and Rouse (Basole and Rouse, 2008). It was also found that the AI-based service support platform improves the quality of services to transform conventional services into innovative services by using DBs in conventional e-commerce. It also has the potential to accelerate the implementation of these services. The AI-based service support platform influences the overall process of purchasing and searching for products and services suitable for consumer needs by acquiring information, and this process is different from the value network of the conventional e-commerce industry. It was confirmed that this influence of the AI-based service support platform can improve both the advancement of personalized services for consumers and the sophistication and efficiency of the counterfeit product screening service in e-commerce. The importance of establishing a cooperation system and active support of public institutions such as the National Police Agency, the Prosecutors' Office, and the Intellectual Property Protection Agency, which are auxiliary actors in the e-commerce ecosystem, was also derived.

This work has theoretical contributions to extend the existing e-commerce-related prior research framework by deriving a service value network-based innovation ecosystem, identifying each value generation step, and identifying the role of key players to solve the problems of e-commerce.

As a practical distribution, this research confirmed that the AI-based service support platform within the e-commerce ecosystem can be a major driving force of the innovation eco-

system by enabling a new method of creating and securing value using ICT, which is a new exchange mechanism, a transaction architecture, and a new organizational form that breaks the barriers between industries. Future research should focus on establishing governance to mediate interactions between ecosystem actors and create a mutually beneficial cooperative environment.

On the other hand, this study has a limitation that limited research results may have been derived due to its limited scope in the domestic market environment. Therefore, in order to establish an e-commerce innovation ecosystem in the future, it is believed that the process of upgrading this research will be necessary through comparative research with leading overseas cases. Furthermore, future studies will require quantitative analysis of the strength and connectivity of stakeholder-specific forces based on this study to present advanced service models and establish a virtuous cycle innovation ecosystem.

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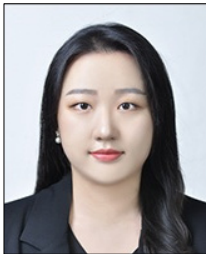
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중앙대학교에서 공학사와 공학석사를 취득하고, 프랑스 파리 6대학에서 통신공학 박사를 취득하였으며, 현재 중앙대학교 경영학부 교수로 재직 중이다. 주요 연구분야는 산업 생태계, 서비스 모델, 비즈니스 모델이다.



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