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Analysis of User Experience and Usage Behavior of Consumers Using Artificial Intelligence(AI) Devices

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인공지능(AI) 디바이스 이용 소비자의 사용행태 및 사용자 경험 분석

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Abstract Artificial intelligence (AI) devices are rapidly emerging as a core platform of next-generation information and communication technology (ICT), this study investigated consumer usage behavior and user experience through AI devices that are widely applied to consumers' daily lives. To this end, data was collected from 600 consumers with experience in using AI devices were derived to recognize the attributes and behavior of AI devices. The analysis results are as follows. First, music listening was the most used among various attributes and it was found that simple functions such as providing weather information were usefully recognized. Second, the main devices used by AI device users were identified as AI speakers, smartphone, PC and laptops. Third, associative images of AI devices appeared in the order of fun, useful, novel, smart, innovative, and friendly. Therefore, practical implications are suggested to contribute to provision of user services using AI devices in the future by analyzing usage behaviors that reflect the characteristics of AI devices.

Key Words : Artificial Intelligence, AI Devices, Usage Behavior, User Experience

요 약 본 연구는 인공지능(AI) 디바이스가 차세대 정보통신기술(ICT)의 핵심 플랫폼으로 급부상하고 있고, 소비자들의 일상에 널리 적용되고 있는 인공지능 디바이스를 통해 소비자의 사용행태 및 사용자 경험에 대해 살펴보았다. 이를 위해 AI 디바이스 사용 경험이 있는 국내 소비자 600명을 대상으로 AI 디바이스의 속성 인식과 사용행태를 도출하였다. 분석결과는 다음과 같다. 첫째, 다양한 속성 중 음악청취를 가장 많이 이용하였고, 날씨 정보제공과 같은 단순한 기능을 유용하게 인식하는 것으로 나타났다. 둘째, AI 디바이스 사용자의 주요 사용기기는 AI 스피커, 스마트폰, PC, 노트북 등으로 확인되었다. 셋째, AI 디바이스에 대한 연상 이미지는 재미있는, 유용한, 신기한, 똑똑한, 혁신적인, 친근한 순으로 나타났다. 따라서 본 연구는 AI 디바이스의 특성을 반영한 사용 행태를 분석함으로써 향후 AI 디바이스를 활용한 사용자의 서비스 제공에 기여할 수 있다는 실무적 시사점을 갖는다.

주제어 : 인공지능, AI 디바이스, 사용행태, 사용자 경험

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1. Introduction

“AI will allow us to make decisions faster than we have before, it will provide us with insights into problems we never thought we could solve before.”

Bob Lord – Chief Digital Officer, IBM

Artificial intelligence (AI) is one of the innovative technologies that will lead the next 10 years. The principle of rule-based AI is a system that can distinguish only objects learned in an effort to explain the world to machines. This is virtually impossible to express completely on a particular object. However, deep learning, machine learning and recognizable neural networks have added inference capabilities to AI. Therefore, currently AI technology will be able to infer patterns as well as pattern recognition, which will increase the field of technology utilization as a general AI that can make decisions on its own. AI technology is being applied to music services and daily necessities ordering services. Information and communication technology (ICT) companies are making efforts to identify individual consumers' tendencies through deep learning. IBM actually tries to sell their products more actively when the emotional part of the user is overcome through the Trusted AI project[1]. Based on IBM's findings (FactSheets for AI Services), it continues to produce products that narrow users' psychological distance from AI programs[2].

The recent COVID-19 crisis has shaken the world, and companies are experiencing tremendous changes, and this change is becoming a new normal. A huge wave of change is approaching from the daily lives of individuals to the economic, social and global order. This is also helping people who have been out less due to social distancing since COVID-19, overcome depression and alienation. AI devices make us anticipate the infinite evolution of AI technology. Therefore, it can be confirmed once again that consumer needs and social conditions are important for certain technologies to spread.

According to STEPI's report on ‘Intelligent Personal Assistant (IPA) market trends and industrial impact in Korea', the global market is expected to grow by 34.9% annually by 2024, reaching nearly $11 billion[3]. In addition, the speaker-type intelligent personal assistant device market is expected to grow 42% annually from $3.6 billion in 2015 to reach $2.1 billion in 2020[4]. However, despite the various features provided by IPA, market research firm Statista found that 61% of smartphone users, a typical IPA-equipped device, have never used IPA services[5]. In addition, most users with experience using IPA use simple function-oriented services such as information retrieval, entertainment, and navigation. This may be the result of insufficient information about IPA and the lack of knowledge of how to use it, but may be due to the fact that the benefits users feel about IPA are only recognized for functions such as user task efficiency or providing entertainment services. If it develops into AI that greatly improves its functionality, its impact on corporate strategy and application will be very large and wide.

Recently, some studies have shown that AI can be satisfied if it recognizes people's emotions well[6]. but AI is still only a role of recognizing and assisting and it is still an area where people can do better, such as comprehensively grasping the context or empathizing and sympathizing with others. In the case of software used by an entity at a cost, it is more likely that AI with higher IQ will be adopted than areas with higher EQ, because the effectiveness or performance of the software must be verified. Therefore, it is the current situation that AI is applied from a more effective area. However, the fourth industrial revolution will lead to AI technology as a key driver and everything will be connected and intelligent throughout the production, distribution

and consumption of products and services. In addition, global IT companies have begun to take full advantage of the IPA market.

As such, the business and marketing environment are changing more complexly than the rapidly changing social environment. In other words, dynamic capability, which emphasizes that companies' core competencies must evolve dynamically in line with changes in the environment, is an important era. In particular, research on AI devices is essential because they play a pivotal role in leading a new internet ecosystem, in combination with internet of things (IoT). Therefore, this research has marketing practical implications that the user experience reflecting the characteristics of AI devices can help establish strategies and provide services by utilizing AI devices in the future.

2. Related Works

2.1 AI Device Market

Recently, global IT companies are moving in earnest to preoccupy the IPA market[3]. AI voice-assistant is an AI engine and voice recognition-based voice recognition that collects and provides customized information to users, including sending email, scheduling, and restaurant reservations according to the user's voice commands. IPA is installed on various devices such as AI speakers, smartphone, smart TV, and smart refrigerators and plays the role of above. There are many different types of devices equipped with IPA, but commonly, devices equipped with IPA provide various services to users through communication with people and other objects. The capabilities of these IPAs are responsible for the role of IoT hubs or IoT gateways mentioned in many IoT studies, which controls connectivity with other devices and manages data[7].

Studies on IoT hubs or gateways mainly refer to the functional elements that the device or system that plays the role should have. The IoT gateway states that it should be powered on for a long time to detect changes in its surroundings, input and perform user commands, and that it should have the ability to intuitively understand commands in easy-to-control locations and output responses directly[8].

IPA refers to software that communicates with users and provides customized information or services[3]. AI assistant service includes Amazon's Echo, SK Telecom's Nugu and KT's Giga Genie, which combines AI speakers and internet TV, which have enhanced Alexa's technology. In particular, not only domestic IT companies but also many companies around the world are jumping into the market or preparing for AI terminals in the form of speakers. In Korea, Naver's Clova and Kakao Mini have already introduced their products. Overseas, Baidu, a Chinese IT company, developed its own AI robot, Xiaodu, and Xiaomi released Mi AI speakers. Apple has released its own AI platform, HomePod and Facebook is also developing products. Samsung Electronics' Harman Kardon also released Invoke, an AI speaker that collaborated with Microsoft. There are still technical problems such as speaker and voice recognition technology, but if these problems are solved, there will be an era in which AI assistant service act as channel agents. Although they are similar in form of software or hardware devices, each company is seeking to maximize profits by linking its core businesses with IPA[3]. Therefore, for devices equipped with AI technology, it should be considered that the main factor is that the user's continued use is determined by how much the device has reached its level of perception as a social object.

2.2 AI Device Research Trend

Recently, research on AI devices has become active in various ways. But prior research focuses

on functions of AI devices such as measuring accuracy and effectiveness of speech recognition technology. In other words, there is an active study of how accurately a person's speech commands are recognized. In addition, most of the research on speech recognition design and technology trends through literature research rather than empirical research is conducted[9].

In particular, research has been conducted on the technical side of AI devices. There have been studies focusing on the characteristics of AI built into smart speakers. A study was conducted to find out the satisfaction and continuous use of users according to the characteristics of AI voice-assistant[10] and the gender of AI voice-assistant[11].

It was also confirmed through experimental studies that anthropomorphism of AI speakers encourages human intimacy and increases reliability[12] and that non-humanized AI speakers show higher continuous use than mistakes[13]. The technological trends of AI speakers were studied through case study techniques to move forward in combination with visual interfaces to overcome the inherent limitations of speech recognition-based smart speakers[14]. Research has also been conducted on the user experience of AI speakers argued that the user experience of smart speakers is AI voice-assistant built into smart speakers. It finds that the presence or absence of AI voice-assistant affects the user experience, and mentions the need for AI attribute management[15].

AI is now recognized to consumers as not just a high-tech technology that makes life convenient, but an entity that can understand what consumers want and share emotional communication through interaction. Technologies and devices that recognize, interpret, process, and imitate human emotions, or related research continues. It was first proposed by Rosalind Picard(1997), also known as emotional AI[16]. It includes not only reading emotions from a person's facial expressions and utterances, but also implementing emotions so that robots can speak naturally when they talk to a person.

3. Research Method

In order to investigate the use of AI devices and related perceptions, the purposive quota sammpling was conducted online through Macromill Embrain, a leading company specialized in online research. The sample included adults aged 19-59 in Korea who have used AI devices such as smartphone. The survey period is November 1-14, 2019. A descriptive statistical analysis of the survey data of 600 people collected in this survey was conducted. Statistical processing for survey analysis used the SPSS 24.0 program. The demographic analysis is shown in Table 1.

Table 1. Demographics Information of Respondents

Variables		Percentage(%)
Gender	Male	55.8
	Female	44.2
Age	20-29	13.3
	30-39	20.5
	40-49	28.0
	Over 50	38.2
Academic level	High school	10.5
	University	74.8
	Graduate school	14.7
Job	Student	4.3
	Office Worker	51.0
	Self - employed	11.3
	Housewife	10.7
	Specialist	7.3
	Managerial level	2.7
	Government officers	3.7
	Running a business	2.5
	Freelancer	6.5
Marital status	Married	73.7
	Single	26.3
AI device usage period	Less than 1 month	2.5
	1-6 month	16.3
	6-12 month	32.2
	More than 1 year	49.0
AI device days of use	Less than 30 minutes	40.7
	30-60 minutes	33.3
	1-3 hour	21.2
	More than 3 hour	4.8

4. Results

Although it has yet to be said that AI devices are using voice command functions and AI voice assistant services in the public, it seems that more and more people are using them. The results of the study are summarized as follows. First, a survey of consumers' general use experience on AI devices shows that consumers perceive speech recognition as the most important of the various attributes of AI devices, and recognize simple functions such as listening to music and providing weather information. Also, devices that are mostly used in AI devices have been shown as AI speakers, smartphones, PC, laptops, and navigation. Second, a survey of the perception of associative images of AI devices showed that consumers became interesting, useful, novel, smart, innovative, friendly, talkative, among the characteristics of AI devices.

AI conversation function is to instill social functions into existing products and services. At this point, the value of the product increases. A dull machine that only carries out orders is transformed into a social being that knows my mood and needs and gives a friendly conversation. It can be given the role of secretary to hard speakers or mirrors, and can be placed as a friendly guide wherever people come and go. It can also act as a conversation friend for a lonely person. This soft function will be an important alternative in an era when human intimacy is gradually disappearing due to the increase in single-person households, the tendency of individualism, and aging.

Emphasizing dual creation of value for consumers as well as firms, the course will deal

Table 2. Mainly used digital devices according to gender and age

Response	Total	Gender		Age			
		Male	Female	20-29	30-39	40-49	Over 50
Base for %	(600)	(335)	(265)	(80)	(123)	(168)	(229)
Artificial intelligence speaker	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Smartphone	97.0	97.0	97.0	98.8	95.9	98.8	95.6
PC(Desktop)	94.7	95.2	94.0	93.8	94.3	94.0	95.6
Laptop	93.0	93.4	92.5	92.5	92.7	92.9	93.4
Navigation	86.2	89.3	82.3	76.3	86.2	88.1	88.2
Bluetooth speaker	84.2	84.8	83.4	87.5	87.0	88.7	78.2
Bluetooth earphone/headset	79.8	82.7	76.2	80.0	81.3	84.5	75.5
Tablet pc	78.8	81.8	75.1	86.3	80.5	79.2	75.1
Smart TV	63.3	67.2	58.5	47.5	65.9	64.3	66.8
Smart watch(Gear etc)	39.3	47.8	28.7	37.5	35.8	44.6	38.0
Smart band/Health band	29.0	32.8	24.2	28.8	37.4	30.4	23.6
Home CCTV	26.0	27.8	23.8	20.0	25.2	28.0	27.1
Smart(IoT) air purifier	22.3	24.5	19.6	23.8	26.0	26.2	17.0
Smart(IoT) switch(lighting)	19.7	21.8	17.0	23.8	16.3	20.2	19.7
Smart(IoT) Robot Cleaner	19.3	20.9	17.4	21.3	19.5	17.3	20.1
Smart(IoT) Air Conditioner	18.8	19.7	17.7	20.0	19.5	17.3	19.2
Smart car	18.2	20.3	15.5	20.0	16.3	14.9	21.0
Smart(IoT) door lock	15.7	14.0	17.7	18.8	14.6	16.1	14.8
Smart(IoT) refrigerator	12.7	13.7	11.3	12.5	12.2	13.1	12.7
Smart(IoT) washing machine	10.7	10.1	11.3	8.8	13.8	11.9	8.7
Smart(IoT) pressure cooker	8.3	7.5	9.4	7.5	7.3	8.3	9.2
Smart(IoT) water purifier	8.2	9.3	6.8	10.0	9.8	8.9	6.1

with situation analyses including function, technology and emotion and implementation in an integrative way. As shown in Table 2, the most commonly used digital devices were AI speakers, smartphone, PC, notebooks, and navigation. On the other hand, smart air purifiers showed a higher main usage rate for the younger age group. Also, respondents in their 20s and 30s have high rates of use of earphones and tablet PCs, and those in their 40s and 50s have relatively higher rates of use of navigation.

As shown in Table 3, KT's Giga Genie, SK Nugu, Naver Clover, and Kakao Mini were the most frequently used AI assistant. This seems to be a major effect of advertising exposure as AI voice-assistant that are currently popular with consumers or have high relevant cognitive rates.

Digital technology consists of digital devices and digital platforms, such as PC, smartphone, tablet PC, and IoT. As devices expand from online to mobile, companies are also providing services on mobile.

As shown in Table 4, the functions and frequency of utilization provided by AI devices are mainly used for practical functions such as "listening and managing music", "providing weather information" and "notifying questions". Recently, AI engines have been equipped with voice command functions to perform various tasks such as personal schedule management, e-mail transmission, and restaurant reservation, and AI voice-assistant service, which provides

Table 3. AI assistant usage status

Response	Total	Gender		Age			
		Male	Female	20-29	30-39	40-49	Over 50
Base for %	(600)	(335)	(265)	(80)	(123)	(168)	(229)
KT GiGa Genie	36.0	33.4	39.2	40.0	30.1	28.0	43.7
SK NUGU	29.8	34.6	23.8	17.5	27.6	32.7	33.2
Naver Clova	16.7	15.2	18.5	23.8	20.3	18.5	10.9
Kakao Mini	10.2	8.7	12.1	10.0	15.4	9.5	7.9
Google Home	6.2	6.9	5.3	7.5	4.1	10.1	3.9
Amazon Echo	1.2	1.2	1.1	1.3	2.4	1.2	.4

Table 4. Mainly used functions of AI devices according to gender and age

	Total	Gender		Age			
		Male	Female	20-29	30-39	40-49	Over 50
Base for %	(600)	(335)	(265)	(80)	(123)	(168)	(229)
Listening and managing music	34.8	35.2	34.3	41.3	34.1	36.3	31.9
Providing weather information	29.0	31.3	26.0	18.8	32.5	31.5	28.8
Telling us what you are curious about	12.5	9.6	16.2	11.3	13.8	9.5	14.4
IoT control	6.0	6.0	6.0	11.3	6.5	4.2	5.2
Have a daily conversation (chat)	4.5	3.9	5.3	5.0	4.1	3.0	5.7
Service execution with specific app	4.5	5.1	3.8	8.8	2.4	6.5	2.6
Personal schedule management	3.0	3.0	3.0	0	2.4	3.0	4.4
Shopping	1.5	1.2	1.9	0	.8	1.2	2.6
Social service management	1.0	1.2	.8	1.3	.8	1.2	.9
Sports event reminder	0.8	1.2	.4	1.3	.8	1.2	.4
Provision of travel information	0.7	.3	1.1	1.3	0	.6	.9
Foreign language translation	0.7	.9	.4	0	.8	1.2	.4
Messenger management	0.5	.3	.8	0	0	.6	.9
Email management	0.5	.9	0	0	.8	0	.9

Table 5. AI device association image results

Response	Total	Gender		Age			
		Male	Female	20-29	30-39	40-49	Over 50
Base for %	(600)	(335)	(265)	(80)	(123)	(168)	(229)
Funny	51.7	55.5	46.8	42.5	43.9	54.8	56.8
Useful	51.2	49.6	53.2	51.3	50.4	50.6	52.0
Interesting	41.3	42.4	40.0	53.8	40.7	39.3	38.9
Smart	35.3	36.1	34.3	37.5	36.6	34.5	34.5
Innovatory	32.5	34.3	30.2	32.5	30.9	35.7	31.0
Friendly	30.7	30.7	30.6	23.8	29.3	31.5	33.2
Companionship	30.2	32.2	27.5	26.3	24.4	32.7	32.8
Robotic	28.3	23.9	34.0	36.3	28.5	27.4	26.2
Waiting for me	26.5	30.1	21.9	33.8	25.2	23.8	26.6
Like being with someone	24.0	23.6	24.5	17.5	18.7	22.0	30.6
I want to touch	18.5	20.0	16.6	16.3	22.0	20.8	15.7
Not lonely	17.3	19.4	14.7	8.8	13.8	16.7	22.7
Curious	16.2	15.5	17.0	12.5	8.1	19.6	19.2
Looks like	15.5	17.3	13.2	26.3	22.8	12.5	10.0
Reliable	9.7	10.4	8.7	6.3	10.6	7.1	12.2
Not very new	7.5	7.5	7.5	8.8	8.9	6.5	7.0
Not interested	5.8	3.9	8.3	10.0	5.7	3.0	6.6
Like a real person	5.5	5.7	5.3	7.5	3.3	4.8	6.6
Unnecessary	5.3	4.2	6.8	8.8	6.5	3.0	5.2
Difficult to use	5.2	5.7	4.5	8.8	8.9	3.0	3.5
Luxurious	4.7	6.6	2.3	7.5	4.9	3.0	4.8
Watched	4.5	4.2	4.9	7.5	4.1	3.0	4.8
Somehow uneasy	2.5	3.0	1.9	2.5	.8	2.4	3.5
Bothersome	2.3	1.8	3.0	2.5	5.7	1.2	1.3
Scary	.5	.3	.8	0	.8	.6	.4

customized information to users, has been receiving public attention. IoT-related functions are generally mentioned as expected functions in terms of future usefulness and popularity. However, it was found that the frequency of use of the "conversation function in everyday life", which is mainly introduced recently, is not high.

As shown in Table 5, images of AI devices are mainly positive, such as being funny, useful, novel, smart, innovative, friendly, and talkative. On the other hand, it is noteworthy that the proportion of high-aged people is relatively higher than that of low-aged people, which reminds them of the image of being with someone. In the future, AI devices will be more prominent in terms of emotional exchanges for middle-aged people in their 50s and older.

5. Conclusion

This study contributes to expanding related research by promoting consumer experience in use and understanding of responses to AI devices, and expects to provide useful marketing implications for industries that utilize innovative technologies such as AI. In 1999, Nike announced, "the rivals are Nintendo, Sony and Apple, not Adidas". The problem is consumers who are not interested in workout. What Nike did was not to make better goods than Adidas but to make consumers run, make them

enthusiastic for sports. Only different perspective makes difference. It explains why many businesses fail in marketing strategies and suggests solutions with abundant examples. Most companies are not free from this temptation.

Therefore, AI device is a tool for problem solving, and an approach that can effectively solve problems regardless of methodology is important. The most important task is to define the problem specifically and to secure data to solve the problem. Therefore, AI technology is still developing rapidly, and efforts are needed to understand and apply the latest technology. Already, companies are competitively launching IPA to expand their service and platform base, and are accelerating the establishment of an ecosystem by partnering with other companies and disclosing development support tools.

Thus, it is necessary to establish countermeasures to revitalize related industries in Korea in anticipation of the market ripple effect of IPA, which is emerging as a representative AI-based service. For example, the decision making of the most optimized AI device is interactive. Therefore, AI should be able to voluntarily control its own execution and be able to predict and recognize what consumers should do next. This implies that AI and consumers should communicate emotionally with each other and apply customized services as well as personalized services to communicate the value that consumers truly want.

AI devices are a point of contact between consumers and AI technology. In the future, AI technology will be expanded to more diverse fields. In particular, it was confirmed that AI devices have important device characteristics in terms of user sensitivity, fun, immersion, and play due to their characteristics in the era when emotional is important as the result of the survey. Therefore, the use of device technology enables more effective targeting by collecting and utilizing information on the consumer's purchase motivation, lifestyle, and habits. In order to realize these implications, companies must manage data collected through device devices in an integrated manner.

Particularly, the general view is that emotional management of AI devices is important to create corporate value through consumer satisfaction while fully responding to the ever-changing needs of customers[6]. The core keyword of technology in the fourth industrial revolution is connection. In other words, using network communication networks in the internet-based, people and devices, devices and devices are organically connected to each other, information is exchanged between them in real time, and new environments are implemented. Therefore, it is also necessary to verify the value of consumers by considering not only frequency information but also the meaning of words, the structure of sentences and context in future studies.

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