Consumers acceptance model of IoT products

Nihon University College of Law

Usui Seminar 10th

TEAM 4K

Ayuna Kato

Sae Kogawa

Takuya Kataoka

Yuta Katsumata

Consumers acceptance model of IoT products

ABSTRACT

In recent years, the concept of IoT is a topic. Everyone also has heard the word "IoT" anywhere. IoT is a concept that things are connected to the Internet. The IoT market is growing, and among them IoT products for consumers are increasing the most. Previous studies have stated that IoT products can provide new value to consumers. However, it is unclear how these values are accepted by consumers. Our objective is to reveal the consumer's purchasing attitude of IoT products based on consumer behavior theory and diffusion of innovations. We follow three steps: (1) review previous studies; (2) qualitative data analysis; (3) quantitative data analysis—large-scale consumer questionnaire to verify hypotheses.

As a result, the factors affecting consumer's purchasing attitudes of IoT products were clarified. This result has become a useful proposition for companies already selling IoT products and companies trying to develop IoT products. This study is the frontier of IoT studies.

Keyword: IoT products, diffusion of innovations, consumer attitude

7798words

TABLE OF CONTENTS

1.BACKGROUND

1-1. What is IoT?

Recently, you often hear the word IoT in the news and articles. IoT is the Internet of Things, and when literally translated it means to convert things into the Internet. According to the Ministry of Internal Affairs and Communications (2016), because everything is connected to the Internet, areas intervened by people is substituted. Additionally, functions with high added value which we could not realize before will be provided. Also, the concepts of IoT is that all objects such as cars, home appliances, robots, agricultural machine, facilities and so on are connected to the Internet and they exchange information, progress of data conversion of products and automation based thereon progresses, creating new added value is there. Specifically, from previous studies and cases, it is said that there are mainly five points as IoT made new (Visualization of data ・Voice operation ・Remote operation ・Notification ・Update function).

1-2. Expansion IoT market

The growth of the IoT market has three main reasons. First, a policy "Industrie 4.0" tackling the advancement of the manufacturing industry in Germany. Second, the vision of "Industrial Internet" centered on GE. Third, innovation and the descend of sensor

price due to the popularization of smartphones. On June 2, 2016, the Japanese government decided the Cabinet on "Japan Reconstruction Strategy 2016" and set out its approach to IoT as an important measure. In 2025, McKinsey & Company anticipates the economic effects of $11.1 trillion on IoT.

The domestic IoT market is also in growth stage. According to the Ministry of Economy, Trade and Industry (2016), the economic effects of IoT is expected to be about 13 trillion yen. In addition, many companies including domestic and foreign companies such as IDC and Cisco are anticipating the potential of IoT. Gartner (2015) anticipates the number will increase to 250 billion pieces by 2020. Ultimately, it is said that most existing things will become connected to the Internet. Among them, IoT products for consumers account for about half of the total (130 billion pieces).

1-3. Categorizing previous studies: IoT

We reviewed previous studies on IoT to understand the current situation, and categorized it into three types.

(1)Technical type: This is mainly the study of building and security technologies of IoT platforms. It is necessary for developers and network managers to cooperate to cope with unauthorized access and large-scale cyber attacks (Inoue, 2017). In order to maintain

and improve products and services, it is necessary to analyze information in the cloud using sensing technology. (Koizumi, 2016).

⑵ Case studies on BtoB: This is a study on introducing success cases of the manufacturing industry and conversions of business models. In the manufacturing industry, it is possible to provide solution services related to effective specification methods. Optimize inventory management through supply chain. Forecasting appropriate timing of repair and replacement of products (Tokumasu,2017). Also, Matsumoto (2016) says that it will be possible get to know when and what each movement the factory facilities and products are connected to the Internet. It also states that you can learn how users are using their products.

By introducing IoT, it is possible to embed human experience and intuition into the company process. As a result, drastic improvement of productivity. Thereby making it possible to create added value (Morikawa,2016).

From these previous studies, we found that the manufacturing industry that introduced IoT can provide value to business customers. In addition, we understood that it solved social problems such as solving the labor shortage, reducing construction costs and labor costs, and improving efficiency.

⑶Case studies on BtoC: This is a study on IoT products for consumers. However, it is

only to mention the outlook. IoT products not only provide novel functionalities, but also may strengthen relationships with consumers (Herbert Dawid, Reinhold Decker et al 2016). According to White Paper on Information and Communication (2016), IoT products can create new value to consumers. In particular, it is possible to stimulate the potential demand of consumers. According to Ogiwara (2016), specifically, mentioned that IoT products bring consumers life convenience and quality, reduce time, effort and costs.

However, Morikawa (2016) said that the current IoT products are in the phase of exploration. Moreover, Shimizu (2017) mentions that consumers will not replace themselves with IoT products unless 'true value' is provided. That is to grasp what consumers expect from IoT products in everyday life in order to spread in earnest. And it is also an issue to provide products and services that can appreciate true value. According to, Shibata (2017) also mentioned that even with excellent innovation, it alone does not immediately lead to the creation of customer value. Technology creates customer value and stimulates demand must go beyond the bottleneck.

From these facts, it was found that there is a potential possibility of providing added value to consumers, but it is not clear whether it is true or not. Hence, after understanding the behavior of consumers, companies need to grasp the value that they

are seeking.

We discovered that for largest part of studies done on BtoB field. The reason is that the BtoB field is bringing new value to business customers extremely. For example, GE deploys sensors in its jet engines, turbines. By analyzing data in real time, GE saves time and money associated with preventive maintenance. Specifically, it provides customers with values such as forecasting engine trouble in advance, avoiding loss of profits of airlines due to flight cancellation, optimizing flight plans, improving fuel efficiency. From this fact, customer value in the BtoB field is clear.

However, in the BtoC field, most of the previous studies are limited to the suggestion of possibility on consumer IoT products. Therefore, there is no empirical study which reveals what functions the consumers feel value for IoT products. We have seen case studies and previous studies, but it is unclear whether it really provides value to consumers.

1-4. Problem

As we mentioned in section 1-2, the IoT market is expanding and the number of things connecting to the Internet is also increasing. However, there are no products which is explosively popular like a smartphone. Even more problematic, there are few empirical

previous studies on consumer IoT products (Search by the National Diet Library search engine "IoT product" "IoT consumer" and search a total of 34). Also, although our consumer life is premised on purchasing, why we will purchase IoT products, their purchasing attitudes have not been studied.

In addition, the definition of "IoT product" is not clarification at present. Concretely, we will describe the previous studies below. While some definitions for IoT Products exist, it is not possible to find an agreed upon, generally accepted, and well recognized definition of IoT Products in the literature (Garbajosa, 2014). IoT products may be perceived to be a radical change in the concept of the original product (Ram, 1987) due to three main characteristics: intelligence, ubiquity and autonomy (Heppelmann et al, 2014). Hoffman et al. (2015, p. 14) define IoT products as products that 'interact and communicate with themselves and each other – and with humans – on an ongoing basis by sending and receiving data through the Internet that is stored and organised in a database'. Hsu et al. (2016, p. 516) suggest the following definition: IoT products have: (1) 'sensors' that collect data about the environment; (2) 'actuators' that activate an action and are controlled by some other entity and (3) 'network connectivity' that can take several forms, including WiFi, Bluetooth or RFID. IoT products are new products equipped with technical options that differentiate them from other existing products

(Zied, M. et al, 2016).

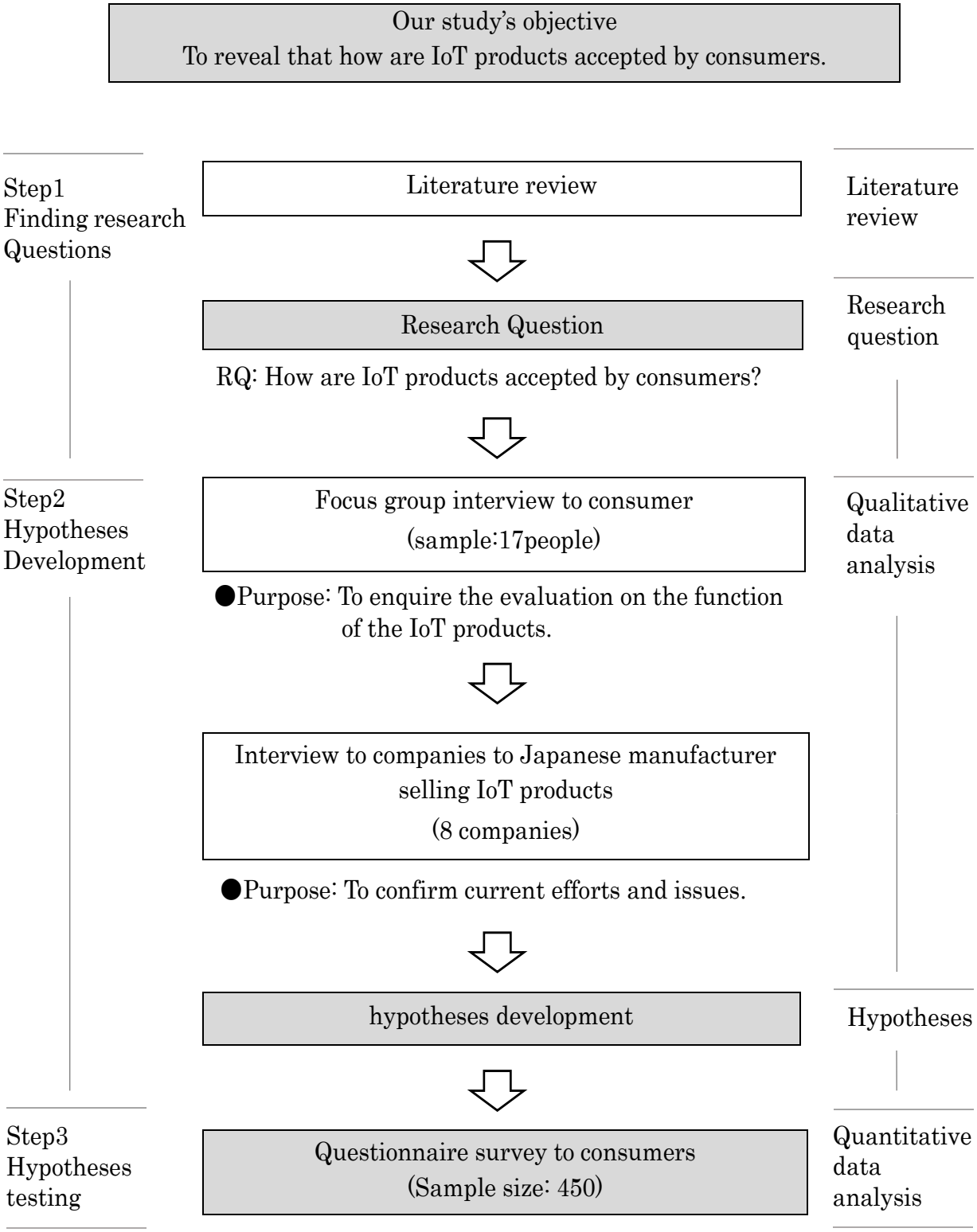
Based on previous studies we discussed above, we defined the IoT products excluding smartphones that consumers use. For example, smart watch and smart speaker, smart consumer electronics.

1-5. Objective

The previous studies have fully discussed, the merits of the company side such as much of data collection, however, study from consumer side who buys and uses IoT products has not been discussed enough. Therefore, we focus on that revealing factors how IoT products are accepted by consumers from the perspective of consumer behavior theory and diffusion of innovations.

The flow of our study is summarized in figure 1 below. Our study is characterized by both quantitative and qualitative survey.

Figure 1: Our study flow



Source: authors

2. THEORETICAL BACKGROUND

In this study used consumer behavior theory and diffusion of innovations. First, our study objective is to elucidate how consumers accept IoT products. The definition of consumer behavior is a various of activities including decision making when consumers acquire, consume and dispose of products. Moreover, Consumers make decisions in various situations. Decision-making is to pick something from many choices (Aoki et al, 2014). However, consumers don't have information on innovative products, they also become complicated in decision making. Consumers may not adopt products if they become complicated.

According to Rogers (2007), stated consumer product adoption and purchase decisions are important for the success of innovative products. Nonetheless, study that conforms to the IoT product theoretically has not been done in the past. Therefore, using these two theories, we need to verify whether the IoT product is acceptable for consumers. The reason is that even though the innovative product provide extensive benefits and improved functionalities, researchers have found that consumers often convey less than enthusiastic response to a number of new products (Gold et al, 1981). Moreover, IoT products are new products equipped with technical options that differentiate them from other existing products. (Zied, M. et al, 2016). Considering this, consumers perceived

these products as technological innovation and may resist it. Therefore, it can be said that the innovative products are a great need for study from the consumer point of view. Specifically, consumer hesitate to innovation is reaction towards an innovation, either because it creates potential changes from a satisfactory status quo or because it is in conflict with their belief structure (Ram et al, 1989). Zaltman et al. (1977) defined this as “any conduct that serves to maintain the status quo in the face of pressure to alter the status quo”. In other words, Consumers are less likely to recognize problems in situations where existing products are very convenient. That is, the consumer meets the needs. This "problem recognition" can be replaced by the initial stage of the purchasing decision-making process in the consumer behavior theory. In order for consumers to accept innovative products, this "problem recognition" should be considered firstly.

Hence, these two theories (diffusion of innovations, consumer behavior theory) are suitable for verifying whether IoT products are acceptable to consumers. At the same time, we need to use these theories.

2-1. Consumer behavior theory

To elucidate our study objective that how consumers accepts IoT products, we reviewed about purchasing decision-making process and attitude among consumer behavior theory.

We focused on purchasing decisions on consumer behavior theory, because Aoki (2014) mentions that the "purchasing decision-making process" is repeatedly performed by consumers in many product categories. Furthermore, within such repetitive rational decision making, consumers can accumulate relevant information and reduce the complexity in purchasing situations.

The decision-making process considers consumer's decision as "problem solving". In other words, consumer decision making is guided by goals and is considered a process of solving problems (Peter et al, 2002). The process has five stages which are: (1) problem recognition; (2) information gathering; (3) choosing from alternatives; (4) selecting or purchasing from alternatives; (5) revaluation after purchasing (Aoki et al, 2014). The purchasing process begins with need recognition. Having recognized a need, consumers searches for information about products that might satisfy the need. Having gathered information, consumers will then evaluate the alternatives, and make a purchase decision. Following purchase will be some form of post-purchase feeling / behavior, when the decision is assessed (Kotler, 1997). The consumer purchase is actually response to a problem. Consumer Decision Making pertains to making decisions regarding product and service offerings. While decision making is defined as the selection of an alternative to solve a problem, the time and effort required to complete the process varies across

purchasing situations (Ram, 2014). It is essential that the selection process be understood. Engle et al. In relation to the new product development process, the “need recognition” and pre-purchase alternative evaluation stages are crucial. Within these stages, the consumer formulates a desire for a new product and selects from among alternatives. Products innovations are one source of stimulating “need recognition” (Engle et al, 1995). The consumer decision-making process as problem solving begins with consumers noticing their problems and needs. Such problem cognition occurs when a difference between the state in which it is placed and the ideal state or some desire is recognized. Consumers decide to buy their own problems by judging whether their products can be solved or not, so it is important as a first step in the decision-making process to notice that their needs are present (Blackwell et al, 2001).

From these literature of consumer behavior theory, We focused on "problem recognition" in the first stage. Consumers do not purchase products unless they can solve consumer problems. In other words, we thought that we should make products in consideration of "problem recognition" at the initial stage.

There are two kinds of problem recognition. It is "needs" and "opportunity" Bruner, Gordon C. and Richard J. Pamazal (1988), ⑴An opportunity occurs when an individual perceives that his or her desired state is rising while the actual state remains relatively

stable. During problem recognition, the ideal state is unrealized or unattained. (If it were realized, it would, by definition, be the actual state of affairs). Therefore, a rising desired state represents consumers' perceptions that they may improve their current states of affairs by realizing something better. ⑵In contrast, needs occur when consumers' actual states decline while their desired states remain relatively constant. Prior to the need occurring, a consumer's desired and actual states would be fairly close together, indicating that no problem existed at that moment. The process begins when a consumer recognizes that he or she faces a problem that a purchase might solve. A consumer problem simply refers to the "difference between a consumer's desired state of affairs and their. A consumer problem simply refers to the "difference between a consumer's desired state of affairs actual state of affairs" （Bruner, Gordon C. and Richard J. Pamazal ,1988）.

That is, the difference between the actual state and the desired state is related to the magnitude of recognition of the problem for the existing product by the consumer. From the above, when innovative products are adopted by consumers, it is very important to focus on "problem recognition" of this process. Therefore, we asked the subjects about "problem recognition" for existing products in a group interview of 3-1-3.

As mentioned above, it is the final goal that consumers purchase products. However, in

this study, we elucidate consumer purchasing attitudes toward IoT products. The reason is that in IoT products, attitudes up to purchasing behavior are not clarified.

Consumer with strong favorable attitude toward existing products will resist innovative products and will continue using their existing products until they fail to function (Wang et al., 2008). It has been found that consumers who are not satisfied with the existing products are more likely to adopt change and go for new products, on the other hand, consumers who are satisfied with the existing products will keep up using the same (Karjaluoto et al, 2002). Moriguchi and Takemura (2012) mentions that attitude is an evaluation for various things. That is, it is a psychological tendency with a degree of favor or dislikes. Furthermore, attitudes affect purchasing behavior. Also, Kato (2002) mentions that purchasing behavior begins by having a purchasing intention, and the attitude that directly affects purchasing intention is the regulating factor of purchasing behavior. According to Aoki (2014), attitude is a preparatory behavior for action to various things. It also states that buying behavior can be explained and predicted by attitude.

From the above, these definitions as equal to purchasing attitude. And consumers accepting IoT products and positive attitudes regard equal. Namely, to elucidate that consumer's attitude of IoT products, which is our final goals.

2-2. Diffusion of innovations

In this section, we reviewed the notion of diffusion of innovations, because IoT products is innovative things that are new to the market. We focused on Relative advantage, Compatibility, Complexity, Trialability in this theory. Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. Previous studies indicates that these five qualities are the most important characteristics of innovations in explaining the rate of adoption. As Rogers (2007) work represents a compilation of the majority of the previous diffusion of innovations study, this model could be helpful in studying any type of innovation.

The theory of adoption and diffusion of innovations is a useful systemic framework to describe either adoption or non-adoption of new technology (Jason MacVaugh, 2010). Rogers (2007) identifies important characteristics of innovations as perceived by individuals. In other words, this theory is suitable for clarifying how IoT products can be accepted by consumers. And, diffusion of innovations refers to the spread of abstract ideas and concepts, technical information, and actual practices within a social system (Steven Kelly, 2012).

From these above, spreading means not only being adopted by a particular consumer individual but also spreading throughout society as a whole. As mentioned at the

beginning, there are five requirements for the product to become popular.

Rogers (2007) identifies important characteristics of innovations as perceived by individuals. These are important as they are constructed as to the way in which potential adopters may view the innovation. The characteristics, which forms the basis for what is regarded as perceived attributes theory, (1) Relative advantage: the degree in which an advantage is perceived as better than the idea it supersedes. (2) Compatibility: the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters. (3) Complexity: the degree to which an innovation is perceived as difficult to understand and use. (4) Trialability: is the degree to which an innovation may be experimented with on a limited basis. (5) Observability: the degree to which the results of an innovation are viable to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.

From these above, Innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, and observability and less complexity will be adopted more rapidly than other innovations. Additionally, Rogers（2007）found relative advantage to be an important factor in determining adoption of innovations, affecting consumers‟ resistance negatively. Agarwal and Prasad (1997) found relative

advantage as the dominant factor that predicts consumers‟ intention to adopt or hesitate innovation. In general, perceived relative advantage of an innovation is positively related to its rate of adoption (Rogers, 2007), and negatively related to consumers' resistance (Dunphy et al, 1995). Moreover, relative advantage is positively related to compatibility and negatively related to complexity (Holak et al, 1990) as compatible product can be utilized effectively and may increase its relative advantage, but relative advantage may decrease if the new product is complex and consumers are unable to utilize it effectively (W. Robert, 1998).

From these, literature, five elements are necessary for dissemination. Furthermore, it was found that these two factors (Relative advantage, Compatibility) are more indispensable. These elements would be helpful in formulating questions for potential adopters in better understanding what factors make adoption possible or desirable（Cyril Kesten , 2003）. This is necessary to propose which factor of extension is appropriate in IoT products.

As mentioned above, these theories did not discuss IoT products. Based on this theory, we considered how IoT products are adopted by consumers. Therefore, group interviews were conducted exploratory. Next, we interviewed companies based on the results.

3. HYPOTHESES FORMATION

In this section, we conducted fieldwork to analyze the present condition at first. Concretely, as a qualitative survey, we conducted group interview with consumers and interview with companies based on previous studies, consumer behavior theory and diffusion of innovations. Second, we constructed six hypotheses based our data. Finally, as a quantitative data analysis, we conducted large-scale consumer questionnaire to prove hypotheses. And, the factors affecting consumer purchasing attitudes of IoT products.

3-1. Field work

In this section, as a qualitative survey, we conducted group interview with consumers and interview with companies. First, there are two main objectives of group interview with consumers. The first objectives are as follows. In the previous studies, there was no survey hearing to consumers' opinions to IoT products, so we had to investigate themselves about consumer purchasing attitude of IoT products. The second purpose is to develop question items in a large-scale consumer questionnaire. IoT products are not yet in the diffusion stage. In addition, innovative products that consumers have not seen ever, such as IoT products, do not know what kind of questions are most suitable even if

we try to question consumers. Therefore, it is necessary to reflect consumer's real opinions in group interview with consumers. The purpose of the interview with companies is to hear to current practices and issues on the practical side. Specifically, enquire the companies whether they understand the current situation that existing IoT products are not enough hit, and whether they feel that it is a problem. These qualitative surveys are indispensable for our hypotheses constructing.

Selection of a population in this study was done in three steps:(1) Using Google's search engine, the keywords “IoT product”, “IoT consumer”, “IoT btoc” and “IoT cases” (143 companies); (2) Japanese companies which sells IoT products in their countries (63 companies); (3) Company that sells products from more than two companies from the same product category, because it can be regarded as a prospective product. Based on these criterions, finally, we set 26 companies as a population.

3-1-1. Voice of consumers: Group interview with consumers

In this section, we conducted the group interview with consumers to hear the purchasing attitude of IoT products. Group interview with consumers are different from quantitative questionnaires and include an element of discussion. The advantages of the group interview are:(1) to gather comprehensive data through the group interactions:(2)

to cause a chain reaction by discussing with other people:(3) to gather frank opinions by a comfortable atmosphere of the group. From these factors, we can know the idea that people have potential. Therefore, a group interview with consumers is appropriate in exploring investigations and the early stage of a study (Sharon Vaughn et al,1999).

The target was 18-22 years old, because they are digital native who is familiar with the internet by nature and most IoT products are in collaboration with smartphones. The number of samples is 17. We divided into 3 to 4 people and conducted five times for 90 minutes. The main question contents are (1) Are you dissatisfied with the current products?: (2) How do you feel about the functions of IoT products?

Details of a group interview with consumers are shown in figure 2.

Figure 2: A group interview with consumers

	Group Interview1	Group Interview2	Group Interview3	Group Interview4	Group Interview5
Date	Aug. 16th, 2017	Aug.17th, 2017	Aug. 17th, 2017	Aug.18th, 2017	Aug. 18th, 2017
Time	2:00pm~3:30pm	11:00am~12:30pm	2:00pm~3:30pm	11:00am~12:30pm	2:00pm~3:30pm
Occupation	4students	3students	3students	2students 1office woker	4students
Visuallization of data	It is does not feel so necessary.	Things like money like air conditioning may be good.	Even if it is convenient It is not inconvenient	It is convenient, but it does not necessary in everyday life.	There is no need for a function.
Notification fonction	It is convenient but don't know when to use it.		It is convenient if only necessary notification comes.	It is convenient to be able to check the message on the spot, but it may not be seen much.	Smart phone is enough.
Voice operation	It is convenient when can't use both hands	It is very convenient.	It is very convenient to be able to find out if you put it in your mind when you think.	It is convenient to stay inside the house, but it's public.	It is very good to use at home.
Remote operation	It is convenient but insecure about safety	Air conditioning is nice, but others are scary.	It is very convenient for troublesome work.	It is convenient because I forget to turn off the air conditioner often.	It is good because it does the troublesome thing.
Update function	It is good because one thing can be used for a long time.	It is better not to replace it.	It seems to regret when the former is better.	It is very convenient as it doesn't need to be replaced.	It is good if the functionality is improved.

Source: authors

In the relaxing atmosphere, subjects were able to discuss a topic deeply, so we got the qualitative data. We revealed the following. Consumers said that it was convenient for the function of IoT products, however, they do not desire to purchase them. There are three reasons for this reason. (1)Interviewees felt IoT products are too complicated to understand it's value and usage. (2) Interviewees hesitated to purchase them because IoT products differ greatly from conventional product usage. (3) Interviewees want to try out before purchasing IoT products. This is because since they don't have any information about the product to assess. Through the group interview with consumers, we found that the consumer isn't to evaluate the function itself of IoT products until there. We interview to ask what the companies think about this result.

3-1-2. Voice of practitioners: Interview with companies

The consumers evaluate of IoT products were revealed from 3-1-1. Hence, we found that consumers do not feel dissatisfaction in the current state and they feel the IoT products are convenient, but they are not thinking about purchasing from the group interview. How do companies think that consumer's attitude be formed by IoT products? It lacks the reliability by secondary data, so we conducted the interview with companies.

Figure 3: The interview with companies

No	compay's name/variable	Time and Date	Interviewee	Consept of smart products	Reasons for making smart products	Benefit for consumer	Product complexity (Company's side)	Product compatibility (Company's side)
1	CASIO Co. Ltd	Sep. 20, 2017 3:00pm～4:30pm	Communication control dept.	Wearable device to replace smartphone.	To adapt to the current.	hands free. (by voice recognition mainly.)	From now on, the main body is simple.	Recognize that it can fit society.
2	FOX Inc.	Sep.19, 2017 2:30pm～4:00pm	Executive Vice President	Offering a new experience	Products that everyone thinks interesting	To make life easier	Easy operation.	Familiar
3	MITSUBIS ELECTRIC Co. Ltd	Oct. 3, 2017 4:00pm～5:30pm	Cooking equipment technology dept.	Reliable, safe and comfortable products.	To make existing home appliances easy to use.	Provide solutions suited to each individual.	Easy operation.	Recognize that it can fit society.
4	NAIN Inc.	Sep. 13, 2017 11:00am～12:30pm	Representative Director and CEO	Living without seeing the screen.	In order to be able to communicate even during busy commute to school.	hands free. (by voice recognition mainly.)	Seeking stage.	Seeking stage.
5	NESTLE JAPAN Co.Ltd	Sep. 2017 mail	Marketing / Marketing service department	To make it easier and smarter for consumers to enjoy coffee	To make it easier and smarter for consumers to enjoy coffee.	Taste cafe feeling at home	Seeking stage.	Seeking stage
6	SHARP Co. Ltd	Sep. 15, 2017 1:30pm～3:00pm	Innovation planning dept.	Cuddle up to consumers.(AIoT)	To make appliances attractive.	Provide solutions suited to each individual.	Seeking stage.	Fit to the current.
7	SMEDIO Inc.	Sep.13, 2017 2:00pm～3:30pm	Director Embedded/Cloud Service Business Planning Dept	Solve consumer problems	to develop business in new field	can live a more comfortable life	A little complicated	Seeking stage
8	TELEPATHY JAPAN Inc.	Sep. 8 ,2017 1:00pm～2:30pm	Product planning technical Support Expert	People communicate with each other on the device.	To build a platform.	hands free. (by voice recognition mainly.)	Easy operation.	Seeking stage.

Source: authors

Findings are：(1)They are developing IoT products without considering consumer problem recognition at the initial stage of the purchasing process. Specifically, MITSUBIS ELECTRIC and SHARP said that “We want to make appliances more attractive”. NAIN and TELEPATHY JAPAN said that “We want to make consumer communication better”

From this fact, each company wants to find a value of plus α for consumer's daily life through IoT products. (2) They think that product complexity is low. Specifically, it is trying to minimize the design of product buttons and so on. NAIN and MITSUBISHI ELECTRIC said “Employees also use IoT products on a daily basis, they do not feel complicated” (3)They think that IoT products of compatibility is high. Specifically, CASIO and SHARP said “There is no problem for consumers to use IoT products. Because consumers not hesitate to digital equipment by the spreads of smartphones”.

Through the company interviews, we found that each company are developing and improving IoT products based on consumer feedbacks from a long-term perspective. This is because the factors that IoT products are acceptable to consumers are unclear. According to Kotler (1967), marketing is a social and administrative process that individuals and groups satisfy their needs and wants through creation and exchange of products and values. Alderson (1981) also mentioned that regardless of how useful the

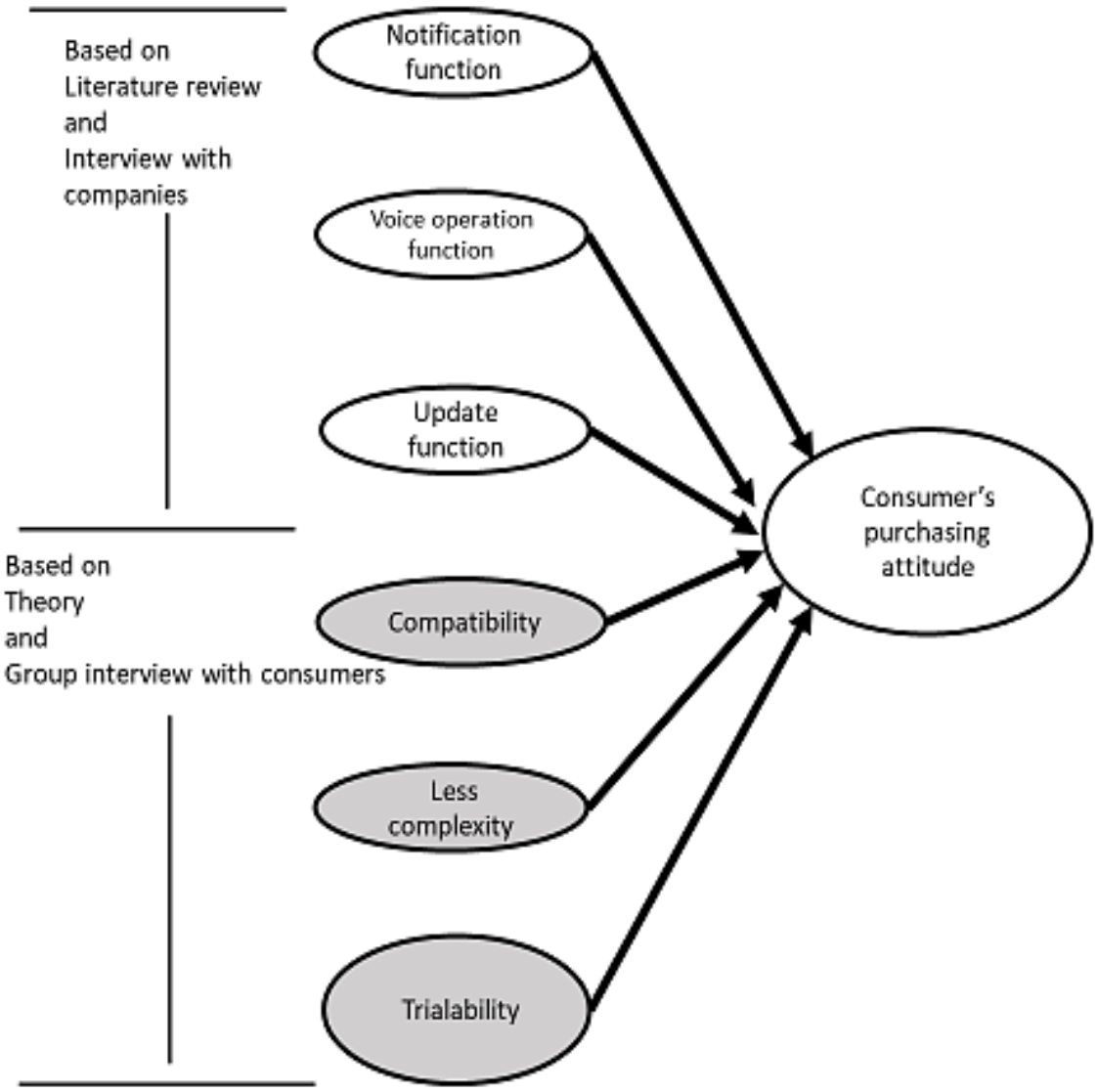
product is, what is essential is marketing efforts.

Based on the above, companies should make IoT products that meet the needs of consumers, not to a way that IoT products selling by trial and error. .

3-2. Hypotheses Development

In this section, we constructed six hypotheses based on the findings from our data. In this study, purchasing attitude was set as a dependent variable and six independent variables were set.

Figure 4: Conceptual framework for consumer acceptance of IoT products



Source: authors

H1 to 3 were constructed from the beneficial functions of IoT products, which we have discovered in literature review and our interview with companies. H4 to 6 were constructed from group interview with consumers and the based diffusion of innovations.

First, we constructed the following three hypotheses (H1 to 3) to measure purchasing attitude of new values (Visualization of data · Voice operation · Remote operation · Notification function · Update function) by IoT which is said from previous studies and cases, interview with companies.

H1: "Notification function" positively related to consumer's purchasing attitude.

H2: "Voice operation function" positively related to consumer's purchasing attitude.

H3: "Update function" positively related to consumer's purchasing attitude.

There are five values and functions according to previous studies, case of studies and interview with companies, but we eliminated the remote operation and the visualization of data. The reason is that the former function was not featured on the products we targeted, and the latter function's merit belongs on the company side, according to the interviews with companies.

Next, we developed three hypotheses (H4 to 6) to measure purchasing attitude by factors which is extracted from diffusion theory and group interview with consumers. The reason for constructing three hypotheses is the evaluation on the beneficial functions of IoT products was low from group interview with consumers. In other words, Interviewees did not feel much value. And, the functions and values of IoT products which is said from previous studies and companies, which is not enough relative advantage. So, we thought that adding something factors to the existing IoT products would have a positive impact on consumer attitudes.

From the diffusion of innovations, it is better for the complexity to be lower. Also, from the results of the group interview with consumers, it seems that the complexity is higher. The reason is the usage of IoT products seemed to be difficult and they can't master it because too many functions.

From the above considerations, we developed H4.

H4: "Less Complexity" positively related to consumer's purchasing attitude.

From the diffusion of innovations, it is better to have high compatibility. Also, the result of group interview with consumers, most consumers tended to hesitate on functions of

IoT products.

For example, about voice operation, interviewees have never had a custom of manipulating by voice in public. That is, the compatibility is considered low at present. It should not differ significantly from existing products.

Also, relative advantage and compatibility are important factors for speeding up diffusion from diffusion of innovations.

From the above considerations, we developed H5.

H5: "High of Compatibility" positively related to consumer's purchasing attitude.

From the diffusion of innovations, it is better to have high trialability.

Also, from the results of the group interview with consumers, there was a tendency that they want to try because IoT products seems to be complicated and difficult to understand it's benefits. We thought that it is necessary to raise the trialability because there are only few places where provide opportunities for consumers to try IoT products at present. From the above considerations, we constructed H6.

H6: "High of Trialability" positively related to consumer's purchasing attitude.

The reason for excluding the observability is because it is an element of the diffusion

result from diffusion of innovations.

4. METHDOLOGY

In this section, we conduct consumer questionnaire. This study is conducted extensively, because we need quantified data for verifying the hypotheses.

4-1. Procedure and Sampling

We conducted the questionnaire survey of consumers to verify the hypotheses obtained from the previous studies and field work. The target of the questionnaire survey was Japanese who fulfill two criterions. First was people who have smartphone. The reason is that Tuda (2015) mentions smartphones are an important hub to use every IoT product. Second was 18 years old to 29 years old. Including up to 29 years old in the survey. Because smartphones are the most owned in their 20's(94.1%). It was revealed that young people (18 years old to 29 years) accounted for the overwhelming majority (Ministry of Public Management,2014). The questionnaire was administrated both offline (paper copy) and online (using google-forms). The first one, our questionnaire was spread among our acquaintances, and we requested them to distribute its URL to their acquaintances by online social networks (Facebook, Twitter, LINE, ...). The second one,

we directly distributed questionnaire to students in the university and got responses from them. It was conducted during the period from October 16, 2017 to October 24, 2017. As a result, we collected a total of 508 answers and the number of valid responses was 450. Among them,198(44%)were female and 252(56%) were male. In terms of age, 63(14%)respondents were in the 18-19 age group, 333(74%)respondents were in the 20-24 age group, and 54(12%)respondents were in the 25-29 age group. However, we have some concerns about our samples: 74 percent of the respondents were 20 to 24 years old. There is a gender gap.

4-2. Questionnaire

We enquired about smart watches and smart speakers. These products have three original functions of IoT. The list is shown in the figure 5. (The contents of the questionnaire are in the attached documents)

Figure 5: Definition of the question items of the questionnaire

Table of contents six functions of IoT products		
Notification function	Item1	Messages such as mail and line are notified by sound or vibration. That can be done without looking at smart phone.

	Item2	Call notification can be confirmed by sound or vibration. That can be done without looking at smart phone.
Voice operation function	Item3	It can send messages such as mail by talking to it. That can be without to operate a smartphone.
	Item4	By talking to it is possible to know real time information such as weather and delay information. That can be without to operate a smartphone.
Update function	Item5	They provide software that the company has modified when a problem occurs.
	Item6	It can be maintains or improve functionality by updating software.
Table of contents six situations based on diffusion of innovations		
High of Compatibility	Item1	It does not change greatly from conventional products. There is no need to remember how to use it.
	Item2	It is not necessary to replace other items according to the product.
Less Complexity	Item3	It is clearly presented what kind of scene it is used.
	Item4	New complicated setting is unnecessary. Easy to set up.
High of	Item5	There are many opportunities to try before purchasing.

Trial-able	Item6	Being able to obtain information about the product in advance by concerning the product.

Source: authors

Three functions were extracted from previous studies, cases and eight practitioners' interview. First, to verify H1, H2 and H3, we enquired each six items on smart watch and smart speaker "Do you think that this function is convenient?". Next, to verify H4, H5 and H6, we constructed six items based on diffusion of innovations. Items 1 to 12 are shown in Figure 5. We enquired consumers how are evaluate six items. Finally, to verify all hypotheses, we adopted a theory on purchasing attitude and constructed two questions. There are "When feeling favor that product, we evaluate the product as good and motivate to purchase it. (Moriguchi et al, 2012)". Based on this previous study, we constructed two questions: "Have you got positive image for this product?", "Did you think that willingness to try this product?".

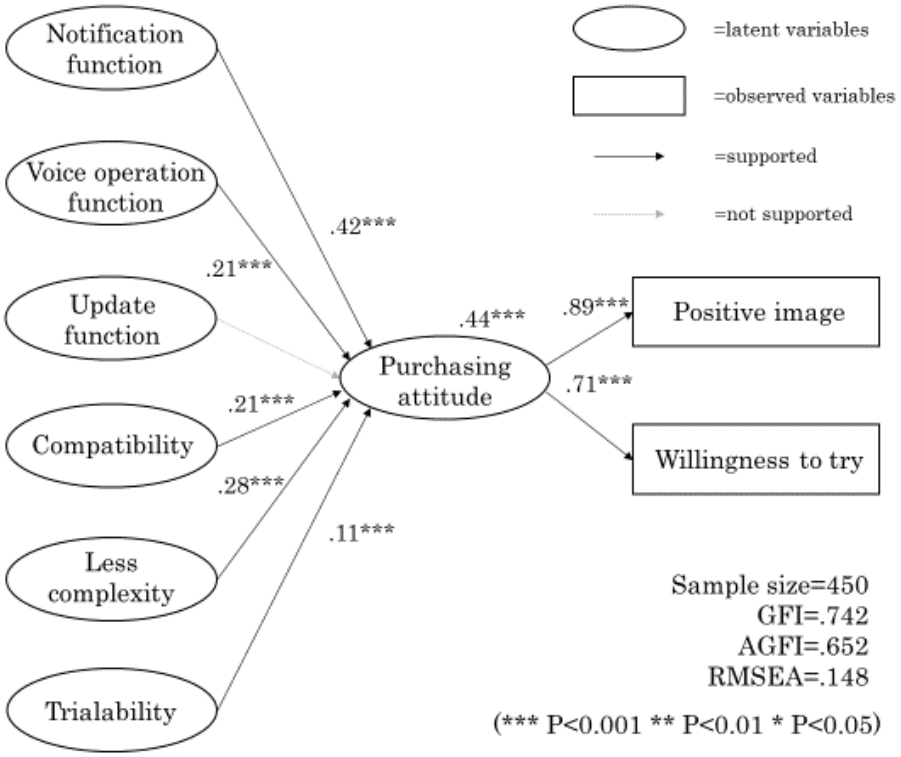
Responses to all 28 items were captured on 5-point Likert-type scales (strong disagreement=1; strong agreement=5). Moreover, some responses were excluded because of incomplete questionnaires.

4-3. Result

In this section, we analyzed the questionnaire with using a SEM of Amos. We

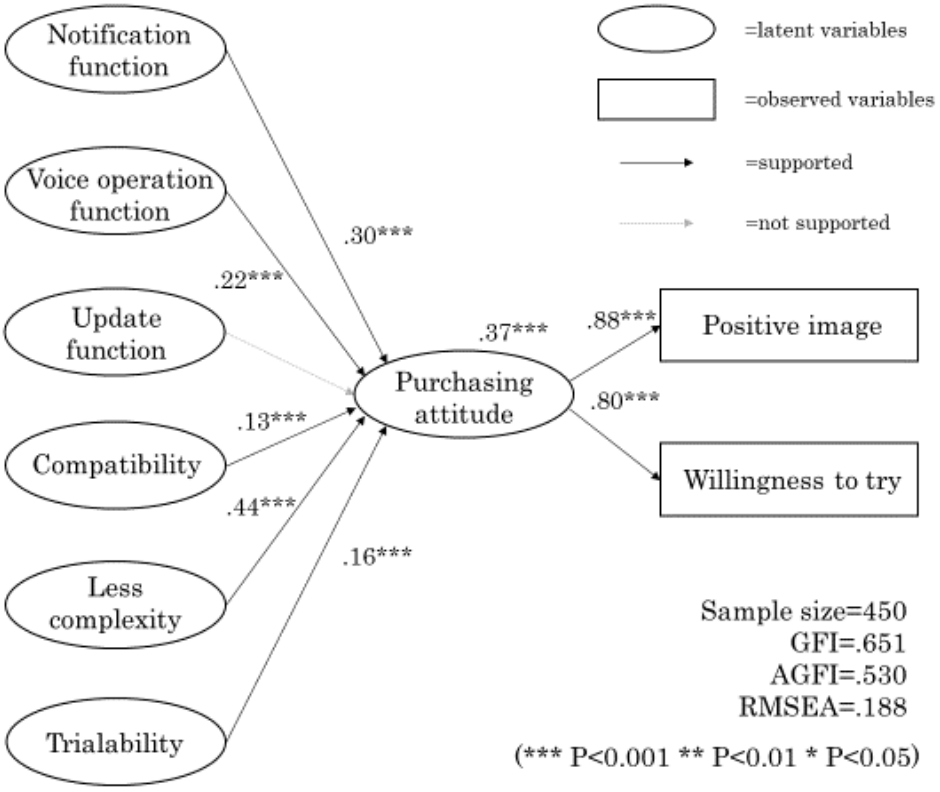
quantitatively analyze a causal relationship that the six independent variables influence dependent variables. Detail of the results are in the attached document. The following model-1, model-2 of figure 6 and 7 is analyzed results.

Figure 6: Model-1(Smart watches)



Source: authors

Figure 7: Model-2(Smart speaker)



Source: authors

The fitting of the model was seen. Model-1's GFI was 0.741, AGFI was 0.652, RMSEA was 0.148. Model-2's GFI was 0.651, AGFI was 0.530, RMSEA was 0.188. Next, Smart watch's and smart speaker's R-Squares, which six explanatory variables give to a dependent variable were 0.44 and 0.37, respectively. When standardization estimates were seen, the factor of "notification function" of smart watch and smart speaker gave 0.42, 0.30 respectively influences on purchasing attitude. The factor of "voice operation function" of smart watch and smart speaker gave 0.21, 0.22 respectively influences on purchasing attitude. The factor of "update function" of smart watch and smart speaker

gave 0.29, 0.01 respectively influence on purchasing attitude. The factor of "compatibility" of smart watch, smart speaker gave 0.21, 0.13 respectively influences on purchasing attitude. The factor of "less complexity" of smart watch and smart speaker gave 0.28, 0.44 respectively influences on purchasing attitude. The factor of "trialability" of smart watch and smart speaker gave 0.11, 0.16 respectively influences on purchasing attitude.

5.DISCUSSION

In this section, H1, H2, H4, H5 and H6 were supported and H3 was not supported. We discuss about the results of our studies. Firstly, "notification function" was supported. Especially, smart watch gave stronger influence on the purchasing attitude than other factors. Horikoshi (2014) mentioned that smartphones are taken out 125 pockets a day on average and smart watch can confirm notifications with your arms and the ability to access information is likely to be convenient. From the above, these consumers feel convenient for confirming notifications of e-mails, message applications, telephones on smart watch.

Secondly, although "voice operation function" didn't give a strong influence on purchasing attitude, this factor was supported. In the group interview with consumers, it was embarrassing to voice operation function outside, but there is no problem if inside

the house. However, the difference between the smart watch, which is supposed to be mainly used outside, and the numerical value of the smart speaker used mainly in the house, can be received as an error. In other words, it means that the convenience of voice operation function may have exceeded that of embarrassing negative emotion.

Thirdly, “update function” wasn’t supported. The effect on smart speakers' impact on purchasing attitude was 0.01 and it is considered to be a range of error and it was rejected. However, the interviewees of Mitsubishi Electric and SHARP said that products update can provide benefits to consumers. This means, consumers don’t feel convenient that values of the IoT products that thinking of companies.

Fourthly, “high of compatibility” was supported. High of compatibility of both products didn’t give a higher influence on purchasing attitude than less complexity and high of trialability. However, compatibility mentioned as the most important factor in diffusion of innovations theory as well as the relative advantage. In other words, compatibility is not most important factor in IoT products.

Fifth, “less complexity” was supported. In specific, smart speaker gave strong influences on purchasing attitude than other factors. Complexity was not considered to be more important than the relative advantage and compatibility in diffusion of innovations. However, IoT products gave influence on purchasing attitude more less complexity than

high of compatibility.

Sixth, although high of trialability was supported, this factor didn't give a strong influence on purchasing attitude. This factor is importance in diffusion of innovations. However, we may assume that consumers didn't understand that useful of these products. Therefore, it is not the stage to try these products yet.

Finally, we will discuss the fitness of the model. The GFI of two path diagrams was 0.74, 0.65 respectively, which was generally lower than the standard 0.9 that is a good indicator. On the other hand, even though the GFI is high, there are opinions that it is not always a good model (Oshio,2014). In addition, when many observation variables are incorporated in the model, its numerical value does not high (Toyoda,2007). Although there are such previous studies as mentioned above, we assume that there are three reasons why model conformity was low. The first reason is that the topics such as this study have not been enough discussed, so we couldn't quote the question items from the previous studies when creating the questionnaire. Therefore, since questions were created based on cases and qualitative surveys, each variable were explained by only two questions. As a result, there is a high possibility that question items of the questionnaire could not fully explain the variables. The second reason is that our question asked respondents to think deeply. Specifically, the evaluation of purchasing intention of new

products and services that consumers have not yet experienced is an example. In fact, the two products we used in the questionnaire have not spread yet. Therefore, it seems that most consumers responded without using the product. In such a case, it is sometimes required to conduct face-to-face quantitative surveys in order to increase the reliability of answers. (Miyao, 2015) However, we have conducted a large-scale Internet survey to secure a significant number of samples with a confidence level of 5%, so there is a possibility that many unreliable answers gathered.

The third reason is that because our study is a new field, there may are variables that influence purchasing attitude in addition to the six we used. Specifically, there are three of price, design, and brand. In the context of innovation resistance, the perceived price is related to the value of the new product. (Ram et al, 1989) Thus, the consumer might show resistance when the innovation does not offer a strong performance-to-price ratio and consumers may not adopt an innovation if the price is seen as too high (Rian & Yen, 2013). Next, about designs and brand images. According to Noro et al. (2008), a consumer makes a selection of products by synthesizing subjective likes and dislikes of the design, brand image and so forth as well as concrete products specification. In addition, we didn't information on the price of the products when creating the questionnaire. Therefore, there is a possibility that it differs depending on how much price range the consumer

imagined and answered. From these previous studies, there are possibilities that the above three variables may influence the purchasing attitude in addition to the six variables we used. We assume that the above three factors may influenced the low fit of the models of this study.

6. CONCLUSION

In this study, starting from the problem that it is unclear how the consumer accepts the value of the IoT product, which is said in the previous studies, we reveal that the factors affecting consumer purchasing attitudes of IoT products. As a method, we construct six hypotheses based on a previous study of IoT, an interview with companies, a group interview with consumers, diffusion of innovations theory, and conducted a quantitative investigation. We make implications of this study. The first one of academic implication is that we can explain purchasing attitude of IoT products by six factors. It is that we constructed consumer acceptance model of IoT products by six factors. Specifically, in previous studies, it is suggested that "IoT products can provide new value to consumers", but there is no empirical study on IoT products. Also, we mentioned consumer behavior theory and diffusion of innovations, but was not discussed on attitude of IoT products. Based on this fact, it can be said that the fact that we revealed the purchasing attitude

of IoT products by six factors has greatly contributed academically.

In addition, the second one of academic implication is that IoT products are not fully applicable to diffusion of innovations. Specifically, in diffusion of innovations, relative advantage and compatibility are said to be the most important factors. However, in IoT products, we reveal that relative advantage is not happened to be a more important element than complexity and trialability, that compatibility is also not a more important factor than complexity and trialability. Moreover, the practical implications are that we can suggest purchasing attitudes of IoT products to companies that sell products with trial and error according to our model. We also clarified which factors among the six influence consumer attitudes by this model. In addition, since the two products we examined in the questionnaire are products sold by many companies, the practical contribution is considered to be high. This study will be useful for companies planning and selling IoT products.

While there are academic contributions and practical contributions, there are also limitations of this study. The first is that there are only two products conducted by the questionnaire. It can’t be denied that consumers' purchasing attitudes change due to differences in products. The second is the questionnaire result of this study was that 20 to 24 years old represent more than 70 percent of all age groups. As purchasing power

may vary depending on age, purchasing attitudes towards products might also change. On the other hand, our study is a new field of study called consumer IoT products Furthermore, it is very likely that the age group that target of our study will come in the layer of purchasing IoT products in the future. For that reason, it may be meaningful to clarify the purchasing attitude of IoT products for young people at this stage.

Selected references

和文書籍

Everett M. Rogers（著)、三藤利雄（翻訳）(2007)『イノベーションの普及』遊泳社。

青木幸弘（2014)『消費者行動の知識』日本経済新聞出版社。

井上崇通（2012)『消費者行動論』同文舘出版。

萩原裕、白井和康（2016)『IoT ビジネス入門&実践講座』ソシム。

小塩真司 (2014)『はじめての共分散構造分析 (第 2 版) -Amos によるパス解析』東京図書。

酒井隆（2012)『アンケート調査の進め方 〈第 2 版〉』日本経済新聞出版社。

酒井隆 (2011)『図解 アンケート調査と統計解析がわかる本[新版] 』 日本能率協会マネジメントセンター。

佐藤郁哉（2008)『質的データ分析法―原理・方法・実践』新曜社。

田中洋（2008)『消費者行動論体系』株式会社中央経済社。

豊田秀樹（1998)『共分散構造分析入門編－構造方程式モデリング』朝倉書店。

豊田秀樹（2007)『共分散構造分析 Amos 編―構造方程式モデリング』 東京図書。

松江宏、村松幸廣(2014)『現代消費者行動論［第 4 版]』創世社。

松本隆明 (2016)「IoT 時代におけるシステムズエンジニアリングの重要性」『SEC journal』第 12 巻、4 号。1-9 頁。

三菱総合研究所(2015)「IoT まるわかり」日本経済新聞出版社。

三菱総合研究所(2016)「IoT 入門」日本経済新聞出版社。

宮尾大志（2015)『外資系コンサルのリサーチ技法：事象を観察し本質を見抜くスキル』東洋経済新報社。

守口剛、竹村和久(2012)『消費者行動論　－購買心理からニューロマーケティングまで－』八千代出版。

山田太郎(2016)「日本版インダストリー4.0 の教科書 IoT 時代のモノづくり戦略」日経 BP 社。

和論文・雑誌

阿部郁雄（2017)「IoT=モノのインターネットがマーケティングク戦略に与える影響の考察」『高千穂論叢』第 50 巻、4 号。1-34 頁。

清水誠(2016)「IoT を活用した具体的なサービス提案を目指して」『日経研月報』第 457 号。26-31 頁。

森川博之(2016)「IoT のテクノロジーと社会へのインパクト」『東京大学先端科学技術センター』第 40 回法とコンピュータ学会研究報告 17 頁-23 頁

柴田友厚(2016)「IoT を経済成長につなげるために」Nextroom　第 27 巻 4 頁-11 頁

総務省(2016)「ICT の利活用が経済成長を加速」『情報通信白書』

谷口和弘(2016)「イアラブルがウエアラブル端末の救世主になる日」『化学経済』第 63 巻、

13 号。25-29 頁。

田平由弘(2015)「IoT スタートアップの戦略」『日本経営システム学会全国大会講演論文集』第 54 号。104－107 頁。

野呂義人、片岡敏彦、高橋知樹、木村孝、木場正信、寺邉正大、老沼志朗、岡本創（2007）「消費者の商品選択行動に関する定量的分析モデルの構築ーDualStep モデルとその自動車選択行動分析への適用」 『三菱総研』第 48 号。4-28 頁。

堀越力(2013)「ウェアラブルデバイスの現状と将来」『湘南技術産業学会』 第 49 巻、第一号。66-68 頁。

吉岡佐和子(2015)「IoT 時代におけるウェアラブルデバイスの将来展望」『CIAJ journal』第 55 巻、10 号。11-15 頁。

英文書籍

Philip, Kotler. (1967) Marketing management: analysis, planning, implementation and control. Prentice Hall.

英論文

Agarwal, Prasad, J. (1997). “The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies.” Decision Sciences, Vol.8., No.9. pp557-582.

Bruner, G. C., & Kumar, A. (2005). “Acceptance of handheld internet devices.”Journal of Business Research. Vol.5, pp553–558.

Cesar Gtirerrez, Juan Garbajosa, Jessica Diaz, Agustin Yague. (2013) 2013 20th IEEE International Conference and Workshops on Engineering of Computer Based Systems “Providing a Consensus Definition for the Term “Smart Product””, pp. 203-211

Cyril Kesten（2003）”Innovation, Change Theory and the Acceptance of New Technologies” Alec Couros Vol.29,

Dunphy, S. & Herbig, P. A. (1995). “Acceptance of innovations: The customer is the key! The Journal of High Technology Management Research”, vol.6, pp193-209

Holak, S. & Lehmann, D. (1990). “Intentions and the Dimensions of Innovation:An Exploratory Model. Product Innovation Management.” Vol.34,

Jason MacVaugh, Francesco Schiavone（2010） “Limits to the diffusion of innovation」『European Journal of Innovation Managemen”, vol.5, pp. 197-221

Peter , Olson, (2002) “Consumer behavior and marketing strategy, Boston McGraw-Hill Irwin” vol,23

Steven Kelly（2012）”Diffusion of Innovations and Best Practice for Technology Transfer」『Health Analysis & Information For Action (HAIFA)”,pp. 2-22

Tan, M. & Teo, T. (2000). “Factors Influencing the Adoption of Internet Banking. Journal

of the Association for Information Systems" vol.4, .pp3-10

Ram, S. (1987). "Advances in Consumer Research." pp208-213.

Ram, S. & Sheth, N.J. (1989). "The marketing problem and its solution.『The Journal of Consumer Marketing" . pp5-14

Watson, R.T. Pitt, L.F. Berthon, P. and Zinkhan, G.M. (2002) "U-Commerce: Expanding the Universe of Marketing. Journ al of the Academy of Marketing Science"

Wang, G. Dou, W. & Zhou, N. (2008). "Consumption attitudes: a contingency approach. European Journal of Marketing", vol,42, pp238-254.

W. Robert, J. (1998). "Key factors affecting customer evaluation of discontinuous new products.」『The Journal of Product Innovation Management", vol.15, pp136-150.

Web データ

総務省「平成 27 年 センサー単価の推移」

http://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h27/html/nc254110.html

(2017 年 8 月 20 日アクセス)

Accompanying material 1: Consumer questionnaire

IoT 製品に関するアンケート

日本大学法学部臼井ゼミナール
4K 班：片岡拓哉、勝又勇太
加藤鮎奈、古川沙瑛

この度はアンケートにご協力頂き誠にありがとうございます。私たちは日本大学法学部臼井ゼミナールの 4K 班と申します。今回、ゼミナールの研究の一貫として 18 歳から 29 歳の方にアンケートのご協力をお願いしております。
アンケートの結果は研究の論文に利用いたします。ご回答いただいた内容は統計的に処理し、個人の回答内容が明らかになることはございません。ご多忙のところ恐縮ではございますが、何卒アンケートにご協力くださいますようお願いいたします。

【対象】・18～29 歳
・スマートフォンを所持している方

1．スマートウォッチについてお伺いします。

①スマートウォッチを知っていますか？
・はい　・いいえ

②スマートウォッチを使用したことがありますか？
・はい　・いいえ

ここからは、スマートウォッチの機能や使用する状況を想像してご回答ください。

以下の機能や状況について便利だと思いますか？
1．全くそう思わない 2．そう思わない 3．どちらでもない 4．そう思う 5．とてもそう思う

③スマホを見ずにメールや LINE の通知を確認できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

④スマホを見ずに電話の通知を確認できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑤話しかけることでメールや LINE のメッセージを送信できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑥話しかけることで天気や遅延情報などのリアルタイムな情報を聞くことができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑦ソフトウェアの更新によって不具合の修正ができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑧ソフトウェアの更新によって機能性の維持や向上ができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑨現在使用している製品と使い方が大きく変わる状況は不便(逆転項目)
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑩この製品が現在の生活習慣に馴染む状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑪新しく複雑な設定が不要な状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑫どのような場面で使用するべきか明確にされている状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑬購入を決める前に製品を試す機会が多くある状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑭購入を決める前に製品を試すことでこの製品の情報を多く得られる状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑮スマートウォッチに良いイメージを持った
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑯スマートウォッチを試したいと思う
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

2．スマートスピーカーについてお伺いします。

⑰スマートスピーカーを知っていますか？
・はい　・いいえ

⑱スマートスピーカーを利用したことがありますか？
・はい　・いいえ

ここからはスマートスピーカーの機能や使用する状況を想像してご回答ください

以下の機能や状況について便利だと思いますか？
1．全くそう思わない 2．そう思わない 3．どちらでもない 4．そう思う 5．とてもそう思う

⑲スマホを見ずにメールや LINE の通知を確認できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

⑳スマホを見ずに電話の通知を確認できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉑話しかけることでメールや LINE のメッセージを送信できる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉒話しかけることで天気や遅延情報などのリアルタイムな情報を聞くことができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉓ソフトウェアの更新によって不具合の修正ができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉔ソフトウェアの更新によって機能性の維持や向上ができる機能
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉕現在使用している製品と使い方が大きく変わる状況は不便(逆転項目)
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉖この製品が現在の生活習慣に馴染む状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉗新しく複雑な設定が不要な状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉘どのような場面で使用するべきか明確にされている状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉙購入を決める前に製品を試す機会が多くある状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉚購入を決める前に製品を試すことでこの製品の情報を多く得られる状況
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉛スマートスピーカーに良いイメージを持った
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

㉜スマートスピーカーを試したいと思う
全くそう思わない　1　・　2　・　3　・　4　・　5　とてもそう思う

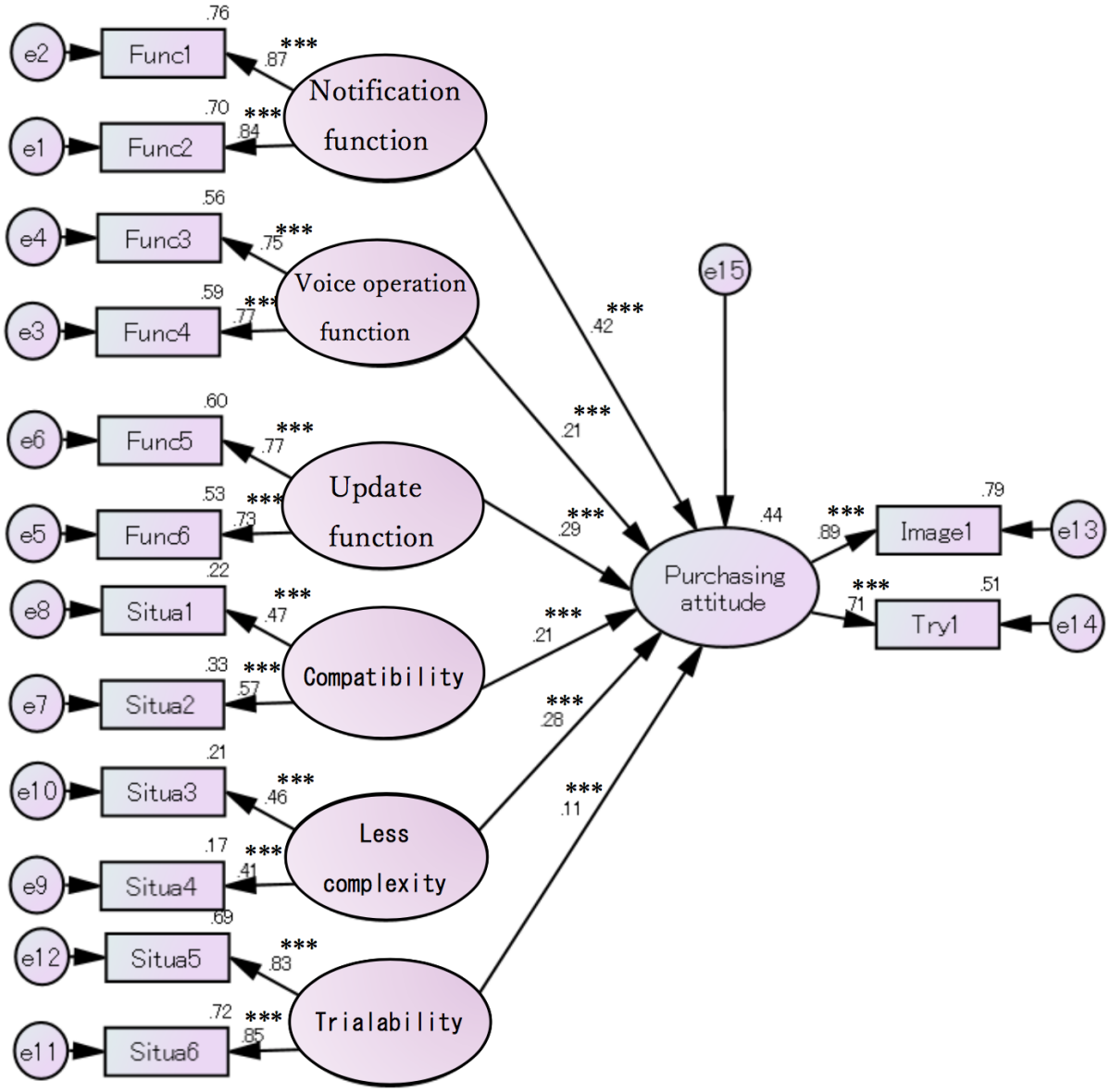
3．最後にあなた自身についてお伺いします。
㉝年齢
・18～19 歳　・20～24 歳　・25～29 歳

㉞性別
・男性　・女性

㉟職業
・学生　・社会人　・その他

質問は以上です。ご協力ありがとうございました。

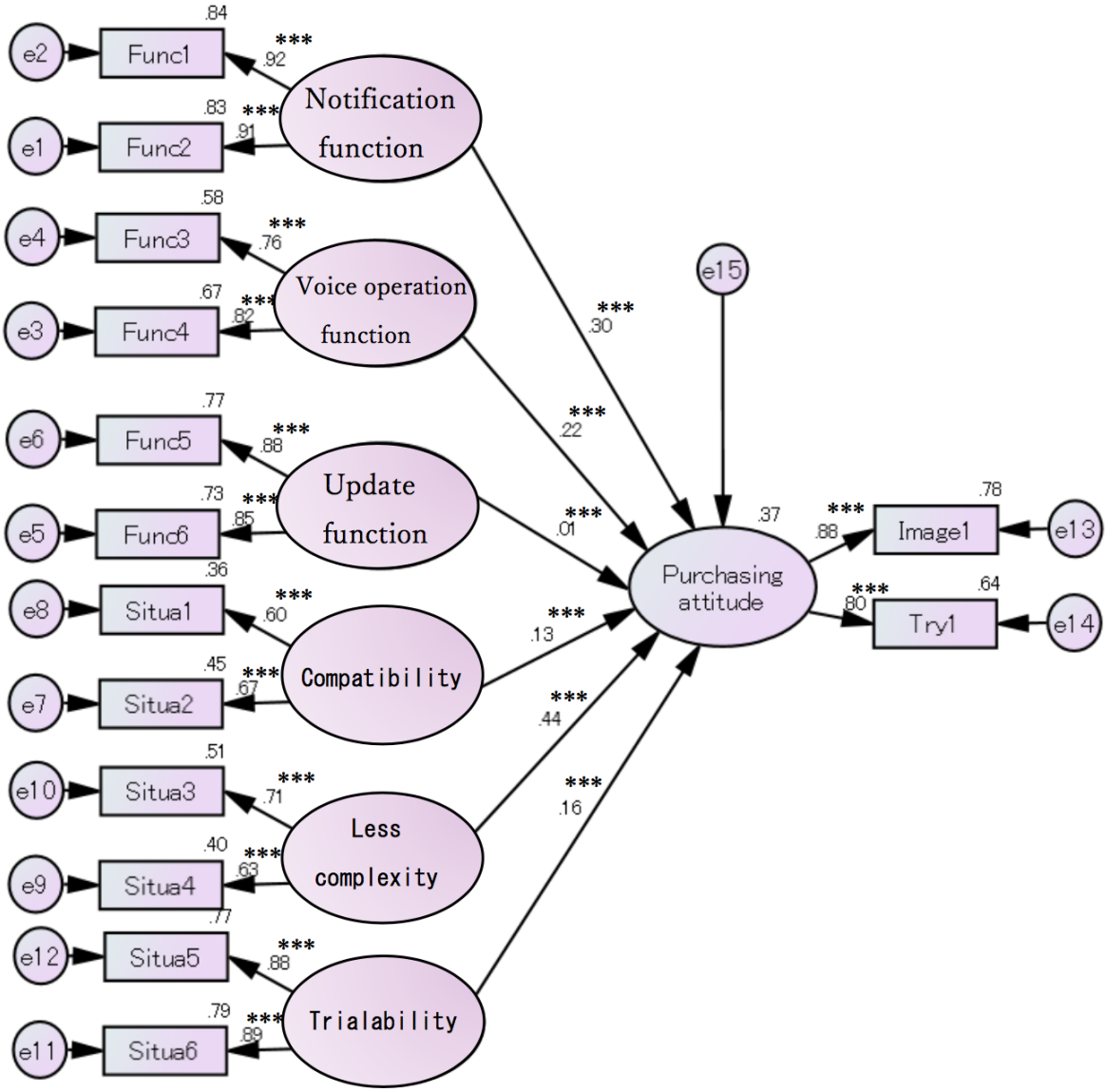
Accompanying material 2. Analysis results



			推定値
Purchasing attitude	<---	Update function	.286
Purchasing attitude	<---	Compatibility	.209
Purchasing attitude	<---	Less Complexity	.279
Purchasing attitude	<---	Voice operation function	.214
Purchasing attitude	<---	Trialability	.111
Purchasing attitude	<---	Notification function	.421
Func2	<---	Notification function	.839
Func1	<---	Notification function	.870
Func4	<---	Voice_operation function	.767
Func3	<---	Voice_operation function	.745
Func6	<---	Update function	.731
Func5	<---	Update function	.772
Situa2	<---	Compatibility	.574
Situa1	<---	Compatibility	.472
Situa4	<---	Less complexity	.414
Situa3	<---	Less complexity	.462
Situa6	<---	Trialability	.850
Situa5	<---	Trialability	.831
Image1	<---	Purchasing attitude	.891
Try1	<---	Purchasing attitude	.715

	推定値
Purchasing attitude	.439
Try1	.511
Image1	.794
Situa5	.691
Situa6	.722
Situa3	.214
Situa4	.172
Situa1	.223
Situa2	.329
Func5	.597
Func6	.534
Func3	.556
Func4	.588
Func1	.757
Func2	.704

	推定値	標準誤差	検定統計量	確率	ﾗﾍﾞﾙ
Notification function	1.162	.093	12.499	***	
Voice_operation function	.915	.087	10.519	***	
Update function	.692	.066	10.418	***	
Compatibility	.269	.049	5.539	***	
Less complexity	.257	.064	3.990	***	
Trialability	.626	.051	12.225	***	
e15	.381	.053	7.148	***	
e1	.489	.058	8.480	***	
e2	.372	.054	6.944	***	
e3	.640	.074	8.610	***	
e4	.732	.078	9.378	***	
e5	.605	.061	9.844	***	
e6	.468	.056	8.378	***	
e7	.549	.058	9.495	***	
e8	.939	.077	12.201	***	
e9	1.238	.103	12.040	***	
e10	.944	.088	10.746	***	
e11	.241	.034	7.177	***	
e12	.280	.035	8.035	***	
e13	.176	.036	4.934	***	
e14	.651	.055	11.843	***	


e2
Func1
.84
***
.92
Notification function
e1
Func2
.83
***
.91
e4
Func3
.58
***
.76
Voice operation function
e3
Func4
.67
***
.82
e6
Func5
.77
***
.88
Update function
e5
Func6
.73
***
.85
e8
Situa1
.36
***
.60
Compatibility
e7
Situa2
.45
***
.67
e10
Situa3
.51
***
.71
Less complexity
e9
Situa4
.40
***
.63
e12
Situa5
.77
***
.88
Trialability
e11
Situa6
.79
***
.89
e15
***
.30
***
.22
***
.01
***
.13
***
.44
***
.16
Purchasing attitude
.37
***
.88
Image1
.78
e13
***
.80
Try1
.64
e14

			推定値
Purchasing attitude	<---	Update function	.006
Purchasing attitude	<---	Compatibility	.126
Purchasing attitude	<---	Less complexity	.441
Purchasing attitude	<---	Voice operation function	.219
Purchasing attitude	<---	Trialability	.162
Purchasing attitude	<---	Notification function	.298
Func2	<---	Notification function	.912
Func1	<---	Notification function	.917
Func4	<---	Voice operation function	.821
Func3	<---	Voice_operation function	.759
Func6	<---	Update function	.853
Func5	<---	Update function	.879
Situa2	<---	Compatibility	.672
Situa1	<---	Compatibility	.599
Situa4	<---	Less complexity	.631
Situa3	<---	Less complexity	.711
Situa6	<---	Trialability	.891
Situa5	<---	Trialability	.878
Image1	<---	Purchasing attitude	.884
Try1	<---	Purchasing attitude	.799

	推定値
Purchasing attitude	.374
Try1	.638
Image1	.781
Situa5	.771
Situa6	.793
Situa3	.505
Situa4	.398
Situa1	.358
Situa2	.452
Func5	.772
Func6	.728
Func3	.576
Func4	.673
Func1	.841
Func2	.832

	推定値	標準誤差	検定統計量	確率	ﾗﾍﾞﾙ
Notification function	1.380	.101	13.597	***	
Voice operation function	.973	.087	11.203	***	
Update function	.864	.068	12.710	***	
Compatibility	.460	.058	7.911	***	
Less complexity	.537	.062	8.687	***	
Trialability	.733	.056	13.052	***	
e15	.468	.051	9.241	***	
e1	.279	.045	6.213	***	
e2	.260	.044	5.854	***	
e3	.472	.065	7.289	***	
e4	.718	.074	9.678	***	
e5	.323	.042	7.694	***	
e6	.255	.040	6.411	***	
e7	.558	.062	9.048	***	
e8	.825	.074	11.172	***	
e9	.811	.072	11.269	***	
e10	.526	.059	8.917	***	
e11	.191	.030	6.355	***	
e12	.218	.031	7.059	***	
e13	.209	.034	6.149	***	
e14	.424	.042	10.087	***	

Source: Based on an analysis result of Amos