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Identifying Key Drivers and Bottlenecks in the Adoption of E-book Readers in Korea

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Identifying Key Drivers and Bottlenecks in the Adoption of E-Book Readers in Korea

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Abstract: This study seeks to describe the dynamic effects of innovation characteristics and consumer innovativeness as conditioned by consumer decision making in the Korean E-book reader market. Dedicated Korean E-book readers have received little research attention over the last few years, as consumers' interest in E-book readers has not been as high as was expected. This study identifies the barriers and bottlenecks impacting Korean consumers' adoption of dedicated E-book readers based on the theories of innovation adoption and consumer behavior. Our estimation results indicate that complexity was the main bottleneck blocking the adoption of dedicated E-book readers in every decision-making stage (cognitive – affective - behavioral), whereas observability was the driver stimulating adoption in every stage. Moreover, the relative advantage of dedicated E-book readers is significant only in the affective stage, while compatibility is meaningful only in the behavioral stage. The results of this study provide useful guidelines to help marketers and engineers design dedicated e-book readers and promote them in Korea.

Keywords: Innovation Adoption Theory; Hierarchy of Effects Model; Innovativeness; Multivariate Probit Model; E-Book reader; South Korea.

JEL Classification Numbers: C11, C31, C83, D12, D85, O32, O33, M31, M37.

1. Introduction

As Internet-capable mobile and smart devices continue to be diffused throughout the market, the number of advanced devices equipped with multiple functionalities quickly increases (Gebregiorgis and Altmann, 2015; Haile and Altmann, 2016a; Haile and Altmann, 2016b; Reeves et al., 1999). This breakthrough technology allows users to read text across a variety of devices, such as tablet PCs, smartphones, and dedicated electronic book readers ("E-book readers" hereafter). An E-book reader (often also called an "E-book device" or "'E-reader") is a dedicated electronic device designed primarily for reading digital books and periodicals. It uses e-ink technology to display content (Burk, 2001). This E-book technology emerged in the early 1990s with the expectation that it would pose a serious threat to the traditional print publishing industry (Catenazzi, 1997; Shin, 2011).

In the wake of the successful introduction of Kindle (the Amazon E-book reader and E-book reader application for multi-purpose devices), the PWC (2013) reported an increase in global sales of E-book content of almost 33.6 percent in 2013 over the previous year. Reflecting this trend, the proportion of E-books available in U.S. libraries increased almost twofold, from 38.3 percent in 2007 to 67.2 percent in 2011, according to the American Library Association's public Library Funding and Technology Access Study (American Library Association, 2012). This increase in the demand for E-book content paralleled the skyrocketing sales of new reading devices in the U.S.

However, the market for E-book readers in Korea has not yet taken off. In fact, E-book readers such as SAM, Paper, Crema, and Papyrus (released by Kyobo/iRiver, Ridibooks, Yes24, and Samsung, respectively) have failed to gain popularity in Korea. Samsung Electronics even withdrew from the E-book reader market completely. Experts have argued that Korea, where growth in smart devices has been high, is entering an era in which users read E-books on non-dedicated devices directly without having passed through an era, as in the U.S., in which users read from dedicated E-book readers (Sim, 2011). 1 Korean E-book readers have received little research attention, as consumers' interest in E-book readers has not been as high as was expected. Experts in the Korean publishing industry speculate that the E-book reader market is small due to a complex function of the difficulty-of-use and a low familiarity with the readers. Given the low adoption of E-book readers in Korea relative to that in the U.S., we pose the following research question: What makes Korean consumers hesitate to adopt E-book readers?

The purchase of an E-book reader can be described in terms of the sequential stages of the decision-making process, but only a few attempts have been made to identify the bottlenecks or drivers in the stages of the adoption process. For instance, a consumer may be aware of E-book readers (e.g., their functionalities) but may not be interested in them. Other consumers may be interested in them but unwilling to buy one. Thus, consumers can get stuck in any of the decision-making stages. Following a similar line of research, Jung et al. (2012) empirically tried to identify the factors affecting E-book reader awareness, interest, and intention to use, but they overlooked the fact that innovation adoption is a sequential decision-making process (Lavidge and Steiner,

[1] "E-book craze hits S.Korea," *The Hankyoreh.*

1961) and were thus unable to reliably describe the impact of the independent variables in their empirical model.

Consumers perceive different benefits and drawbacks of E-book readers as they follow the stages of adoption decision making. Furthermore, consumers with different motivations and who perceive different innovation characteristics are likely to show different adoption behaviors. Little is known about what factors lead to the use of E-book readers or make users hesitate to adopt them during the decision making process. To fill this gap, we propose a framework for capturing the relationship between the factors (e.g., innovation characteristics, consumer innovativeness, and message characteristics) that affect E-book adoption and consumer's cognitive, affective, and behavioral reactions. Furthermore, in estimating the proposed framework, we identify the bottlenecks and drivers of E-book reader adoption in the Korean market during the decision-making stage. This appears to be the first study to empirically model the dynamic impact of consumer and innovation characteristics on consumers' sequential decision-making stages.

The rest of this paper is organized as follows. Section 2 reviews the literature on established theories of innovation adoption factors and purchase decision making. Section 3 presents our research design and methodology, covering the proposed research framework, the data used, and details about the analysis methodology. Section 4 shows the empirical analysis results. Finally, Section 5 concludes the paper with a discussion of its implications and some concluding remarks.

2. Theoretical Background and Literature Review

2.1. Hierarchy of Decision-Making Process

Consumers in the real world do not immediately decide whether to purchase a new product after obtaining information about it. Rather, they experience a series of hierarchical and sequential stages before reaching a decision (e.g., to purchase). The Hierarchy of Effects Model was developed to explain these sequential stages. This theoretical model, proposed by Lavidge and Steiner (1961), is used to describe the accumulated effect of advertising on consumer purchase decision making. The model involves sequential stages, beginning with the product's arrival in the target customers' awareness, passing through purchase intention, and terminating in the actual purchase. The term "hierarchy" denotes the sequence of steps a consumer follows from the initial exposure to a product (or advertisement) to the purchase decision.

Innovation researchers have developed a similar model—the innovation decision process model—to explain the relative impact of the knowledge–persuasion–decision components (Rogers, 2003). The validity of the hierarchical decision-making model for the innovation decision process was first proved by an Iowa study (Beal and Rogers, 1960), in which most respondents recognized that they had passed through a series of stages, from awareness and knowledge to an adoption decision. Figure 1 describes the hierarchy of effect model.

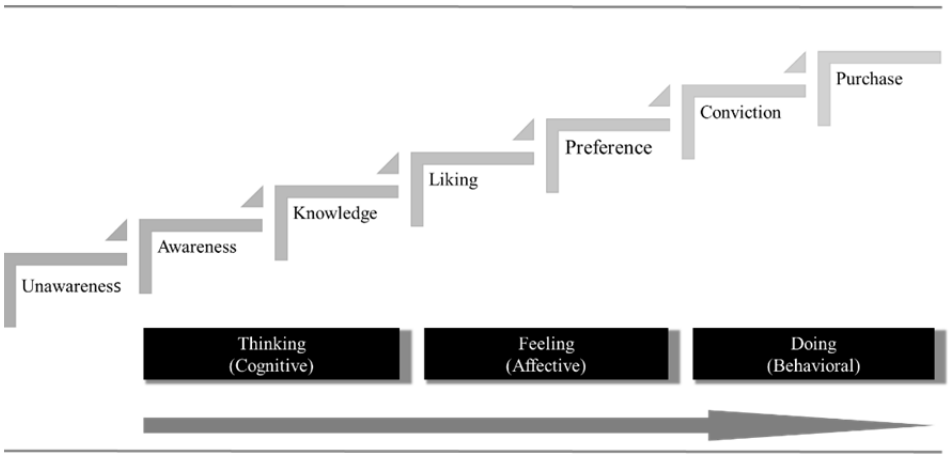

Figure 1. Hierarchy of effect model based on Lavidge and Steiner (1961).

According to the hierarchy of effect model and innovation decision process model (see Figure 1), consumers at the cognitive stage form beliefs about a product by accumulating knowledge about its attributes (i.e., knowledge stage). Next, in the affective stage, consumers evaluate these beliefs and form a feeling about the new product (i.e., persuasion stage). Later, in the behavioral stage, consumers engage in behavior such as product adoption or rejection based on their evaluation (i.e., decision stage) (Ray et al., 1973). This theoretical background on the hierarchical stages of innovation adoption shows that the drivers or bottlenecks affecting the intention to adopt an innovation differ across the stages.

Despite the theoretical and empirical evidence that consumer decision making occurs in stages and that consumers' reactions to innovation adoption can change at any stage due to drivers or hurdles, most studies ignore this hierarchical and sequential process while identifying the factors affecting adoption. For example, (Chan-Olmsted and Chang, 2006) studied digital television adoption, comparing the factors affecting awareness with those affecting the intention to adopt digital television. They found significant differences between the factors' influences on adoption and intention to use. (Jung et al., 2012) attempted to identify the predictors of E-book reader diffusion in terms of consumer awareness, interest, and intention to use. Although they evaluated the impact of the meaningful predictors of E-book reader adoption depending on different consumer reactions, they failed to capture the hierarchical process of consumer decision making as described by Lavidge and Steiner (1961) in their empirical model structure and estimation.

In innovation adoption studies, then, capturing the hierarchical decision-making process and empirically estimating the model are essential; otherwise, a model will produce biased empirical results. However, the overwhelming majority of studies have neglected this process in their analyses. Therefore, we develop a theoretical and empirical framework that explicitly describes consumers' sequential decision making for E-book reader adoption.

2.2. Factors Affecting Innovation Adoption

Several theoretical models have been suggested in the area of innovation adoption including technology acceptance model: TAM (Davis, 1989), its intension model: TAM2 (Venkatesh and Davis, 2000) and unified theory of acceptance and use of technology: UTAUT (Venkatesh et al., 2003). Among them, Innovation Diffusion Theory (IDT) of Rogers has been frequently citied since the 1960s in the research of a variety of innovation adoption contexts (Rogers, 2003). Various factors inherent to IDT have been applied in empirical studies, and they have proven to provide reliable frameworks for examining innovation adoption. These factors affecting individual's innovation adoption behavior comprise perceived attributes of innovation, adopter's characteristics, and message characteristics. Hereafter, we will review these factors and will examine how such factors influence adoption behavior in detail by focusing on the theoretical concept and existing empirical findings.

2.2.1 Perceived Attributes of Innovation

One of the most influential models describing the perceived attributes of innovation to illustrate customers' adoption of innovation is based on Rogers' framework (Rogers, 2003), according to which five characteristics influence a customer's potential adoption of a new innovation: relative advantage, compatibility, complexity, observability, and trialability. Relative advantage refers to the degree to which potential customers perceive a new product as superior to existing substitutes. Compatibility refers to the degree to which potential consumers feel that a new product is consistent with their needs, values, and practices. Complexity refers to the degree to which a new product is difficult to understand or use. Observability refers to the ease with which a product's benefits or attributes can be observed, imaged, or described to potential customers. Finally, trialability refers to the degree to which a new product has been tried on a limited basis by potential consumers. The greater the opportunity to try a new product, the easier it is for consumers to evaluate it and ultimately adopt it. It is widely accepted among researchers that these five product characteristics account for much of the rate and speed of adoption. Table 1 summarizes these five innovation characteristics and provides the related attributes.

Numerous studies have applied Rogers' framework to explain consumer innovation adoption (Tornatzky and Klein, 1982), but they have not captured the dynamic effects of the innovation attributes on the decision-making process despite the empirical evidence that the impacts of innovation characteristics differ across stages. For example, consumers employ different evaluation criteria at each stage of their decision making, and these characteristics have different impacts at each stage (Gardial et al., 1994; Karahanna et al., 1999; Mittal et al., 1999; Wilton and Pessemier, 1981). Therefore, we propose a framework to capture the dynamic effects of the perceived innovation characteristics of E-book readers on the cognitive, affective, and behavioral stages of the E-book reader adoption process.

Table 1. Overview of the conceptual basis for the five perceived innovation characteristics (Rogers, 2003).

Innovation Characteristics	Definition	Example
Relative advantage	The perceived benefit of adopting innovation.	Speed; reliability
Compatibility	The extent to which adopting and using the innovation is based on existing ways of doing things and on cultural norms.	Complementary goods (e.g., charging stations and electric cars)
Complexity	The difficulty involved in using innovative products.	Quality of a user interface
Observability	The extent to which the benefits of the new product are observable to everyone.	Noticeable design; availability of information center
Trialability	The extent to which a new product can be tried at a limited basis by consumers.	Rental of product, beta test of software

Moreover, it is important to note that the perceived product characteristics influencing innovation adoption may differ across countries. For instance, (Craig Van et al., 2005) compared the perception of electronic commerce among U.S. and Indian consumers and found that relative advantage, complexity, and compatibility differed between the two countries. This result suggests that the perceived innovation characteristics of E-book readers might also hold an importance for Korean consumers different from that held by consumers in other countries where E-book readers are very popular. Our research framework therefore estimates the dynamic effects of perceived innovation characteristics on cognitive, affective, and behavioral reactions in the adoption process for the Korean E-book reader market.

2.2.2 Consumer Innovativeness

Consumer innovativeness has been used in innovation adoption studies as an explanatory variable predicting the diffusion of innovation. Consumers' innate innovativeness refers to the "predisposition to buy new and different products and brands rather than remain with previous choices and consumer patterns" (Steenkamp et al., 1999a). Based on this definition, consumer innovativeness, as a force that leads to innovative behavior, has often been adopted in research on the adoption of innovation (Roehrich, 2004). For example, (Im et al., 2003) empirically proved that a high level of consumer innovativeness increases the intention to use and accelerates the adoption process for new products. These researchers argued that the measurement of the "innate innovativeness" construct could be applied to any domain and used in surveys on innovation.

Nonetheless, researchers have also reported that this way of measuring innovativeness cannot statistically explain consumers' adoption behaviors. For example, researchers demonstrated that no significant correlation existed between consumer innovativeness and new product adoption behavior (Foxall, 1988; Varma Citrin et al.,

2000). Other researchers found a significantly positive relationship with an explanatory power that accounted for less than 10 percent of the variance in behavior (Cotte and Wood, 2004). Due to this concern, different theoretical conceptualizations of innovativeness have been developed. For example, (Goldsmith and Hofacker, 1991) argued that domain-specific innovativeness along with Internet usage directly influenced consumers' adoption behavior in Internet shopping. (Foxall, 1995) showed that the relationship between consumer innovativeness and new product adoption behavior was contingent on the level of involvement in the product category. (Vandecasteele and Geuens, 2010) acknowledged the importance of different motivations for innovativeness. They found that a multi-dimensional scale concerning motivation had better predictive power than other models and that multi-dimensional motivation played a key role in new product development and marketing communication. This approach incorporates various motivations into a multi-dimensional innovativeness scale to better account for consumer and product relationships.

Following the seminal (Vandecasteele and Geuens, 2010) paper on motivated innovativeness, our research framework includes the conceptual basis for the four dimensions of motivated innovativeness: hedonic innovativeness, functional innovativeness, social innovativeness, and cognitive innovativeness. Hedonic innovativeness is defined as the "drive to adopt innovations for hedonic reasons, such as to enjoy the newness of the product" (Chesson, 2002; Steenkamp et al., 1999b). Functional innovativeness emphasizes the "utilitarian reasons for buying products" as opposed to the hedonic or affective reasons (Hirschman, 1980, 1984; Venkatraman, 1991). Social innovativeness refers to the "degree to which consumers build certain identity such as social reward or social differentiation through the possession of innovative products" (Tian et al., 2001; Tian and McKenzie, 2001). Finally, cognitive innovativeness is defined as the "desire for new experiences with the objective of stimulating the mind" (Venkatraman and Price, 1990). Table 2 lists the definitions and related academic concepts concerning the four dimensions of motivated consumer innovativeness as proposed by (Vandecasteele and Geuens, 2010).

Therefore, our research framework takes into account the four different motivational dimensions proposed by (Vandecasteele and Geuens, 2010) and identifies the types of motivational innovativeness that stimulate consumers' cognitive, affective, and behavioral reactions in E-book reader adoption.

Table 2. Overview of the concept of the four motivated consumer innovativeness dimensions.

Dimension	Definition	Related Concepts	Examples of Motivation
Functional innovativeness	Self-reported consumer innovativeness motivated by the functional performance of innovation and focus on task management and accomplishment improvement.	- Utilitarian - Attraction to useful products	- Usefulness - Handiness - Quality - Ease - Reliability
Hedonic innovativeness	Self-reported consumer innovativeness motivated by affective or sensory stimulation and gratification.	-Sensory innovativeness	- Pleasure - Fun - Excitement - Tension
Social innovativeness	Self-reported consumer innovativeness motivated by the self-assertive social need for differentiation.	- Identity building - Social reward	- Being different and unique - Status - Prestige
Cognitive innovativeness	Self-reported consumer innovativeness motivated by the need for mental stimulation.	- Mental stimulation	- Knowledge - Information - Logical thinking

* This is the shortened version of (Vandecasteele and Geuens, 2010) Table 1.

2.2.3 Communication and Message Characteristics

Research has shown that communication channels for new products play a critical role in determining the rate of innovation adoption (Rogers, 2003). The marketing literature has also suggested that a marketing communication strategy in support of product launch is an essential factor and can explain new product adoption behavior. From this perspective, all information on and efforts towards product attribute exposure and strong persuasion influence the decision to adopt a new product (Crawford and Di Benedetto, 2003). However, most innovation studies have focused on the types of communication channels (e.g., whether a consumer gains information from mess media or word of mouth) and how they affect adoption behavior. Little attention has been paid to specific message characteristics, even though the features and credibility of the messages are also important.

We consider four determinants of the message characteristics influencing decision making. In principle, any message disseminated to consumers possesses a dual nature through rational and emotional elements (Johar and Sirgy, 1991; Liebermann and Flint-Goor, 1996). The rational element comprises the informational message, which includes factual and meaningful descriptions of the product. The emotional element comprises the transformational message, which conveys affect-based content such as about the experience of using a new product with psychological characteristics. (Chen

et al., 2007) found that an informational message was positively linked to effective communication and sales of new products in the high-tech industry.

Source credibility is also an important characteristic influencing decision making (Buda and Zhang, 2000; Ratneshwar and Chaiken, 1991). A highly credible source is perceived to be useful and reliable and thereby facilitates the transfer between decision making stages. If a message delivered by a sender is considered credible, it is likely to influence the receiver's perception of the new product. When the source is respected by the intended audience, the message is likely to be believed and is much more likely to influence the adoption of new products. Conversely, a message from an untrustworthy or unreliable source is likely to be received with skepticism and probably rejected. Theoretically, source credibility is defined as the extent to which an information source is perceived to be believable and trustworthy by information recipients (Buda and Zhang, 2000). (Ratneshwar and Chaiken, 1991) showed that a credible source could be particularly persuasive if the consumer had not yet learned much about a product or formed an opinion about it.

Other researchers found that expertise (basically, the knowledge and competence of the sender) and trustworthiness were the two most significant components of credibility (Cheung et al., 2008). (McGinnies and Ward, 1980) found that communicators frequently conveyed a mixed impression between expertise and trustworthiness. The source of a message may lack trustworthiness but be reputed for expertise; it may also be viewed as trustworthy but not particularly competent. McGinnies and Ward (1980) demonstrated that expertise and trustworthiness were exclusive factors explaining source credibility.

Therefore, our research framework explicitly considers not only the nature of a message but also its source credibility, consisting of expertise and trustworthiness. Table 3 describes the two dimensions of messages and their characteristics in the innovation adoption context.

Table 3. Summary of innovation message dimensions and characteristics.

Dimension	Characteristics	Operational definition
Nature of message (Chen et al., 2007)	Informational message	Message conveys information about the identity of a new product logically.
	Transformational message	Message conveys experimental and sentimental information about using a new product.
Credibility of message (Buda and Zhang, 2000) (Cheung et al., 2008)	Expertise	Source, which conveys messages, has knowledge for evaluating a new product.
	Trustworthiness	Source, which conveys message, is reliable.

3. Research Design and Methodology

3.1. Proposed Framework

This study identifies the factors affecting E-book reader adoption by considering the hierarchical stages of the decision-making process. We suggest an empirical framework for capturing how perceived innovation characteristics, consumer innovativeness, and message characteristics sequentially drive consumers' cognitive, affective and behavioral reactions. In addition, based on the bottlenecks and barriers we identify, we discuss the implications for the Korean E-book reader market and the publishing industry.

The adoption process for E-book readers is described in Figure 2. The essence of the process is that consumers pass through three sequential stages, starting with a product's attracting the target customers' awareness, through the creation of purchase intention, to making the purchase. The consumer's adoption process consists of cognitive, affective, and behavioral reactions. After the initial exposure to E-book readers, where people are unaware of them, consumers experience several stages. Their reactions in each stage are influenced by various factors affecting innovation adoption.

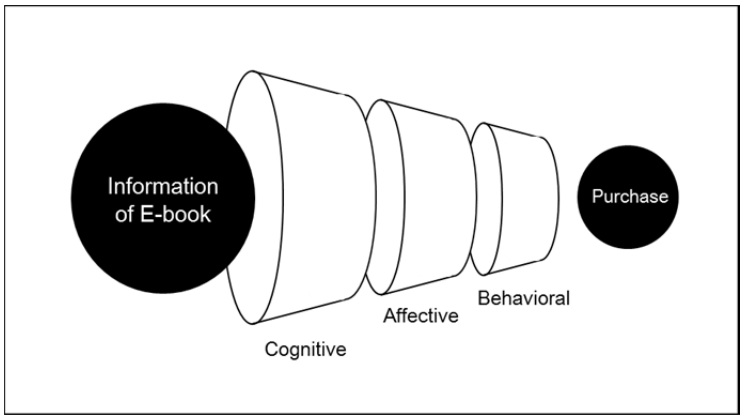

Figure 2. Adoption process for E-book readers.

Figure 3 describes the research framework, which examines the impact of various factors affecting E-book reader adoption. More importantly, it sheds light on the relationships between the key constructs used in innovation adoption studies and the hierarchical decision-making stages. Our proposed framework has advantages over previous frameworks in that it addresses the dynamic nature of E-book reader adoption by explicitly considering the stages during which people are aware of the readers and show affective and behavioral reactions to them rather than considering only the simple dichotomous alternatives of adoption or non-adoption.

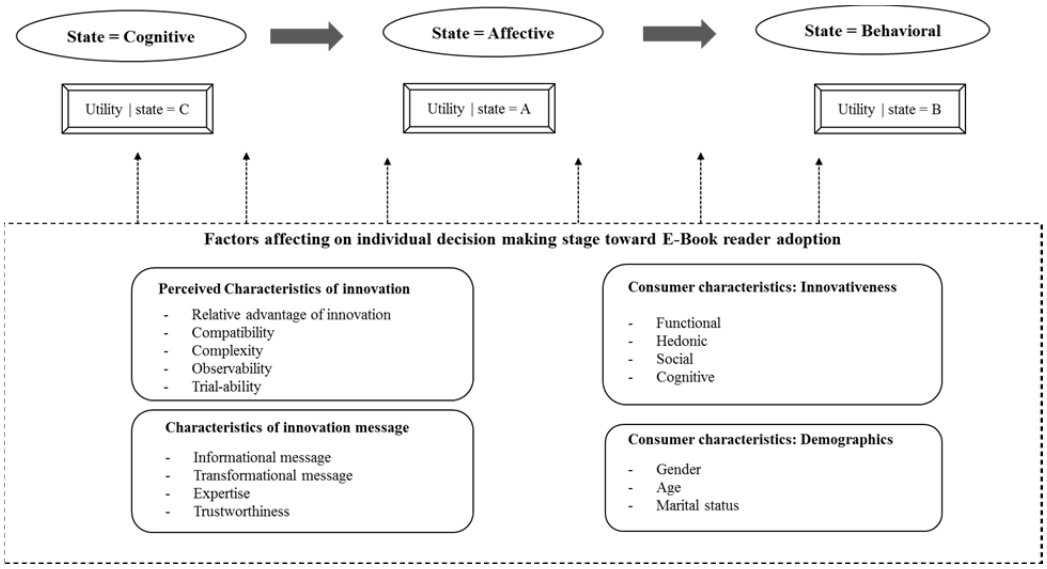

Figure 3. Proposed research framework.

3.2 Survey Procedure and Sampling

Data were collected through a structured survey questionnaire with a set of single-item and multi-attribute scales in order to populate the constructs of the proposed research framework. All innovativeness variables in the research framework were measured through multi-attribute scales. This composite scale approach allowed us to gauge psychological variables that otherwise could not be directly quantified. A 7-point Likert scale was used to measure the constructs. A value of 1 indicated that the respondent completely disagreed with the statement, and a value of 7 indicated that the respondent strongly agreed.

The survey was conducted using the Web-based EZ Survey, a professional survey company that maintains millions of potential participants. A sample from the EZ survey panel was asked to participate. Respondents were offered a small amount of electronic cash as payment for participating. The survey was completed by 536 respondents aged 20 years or older in September and October 2014.

The distribution of respondents according to their decision-making stage is shown in Table 4. Of the 536 respondents, 257 (47.94%) were unaware of the E-book reader; 110 (20.52%) knew of the use and functionality of E-book readers, and 62 (11.56%) were interested in E-book readers; 107 (19.96%) were willing to purchase an E-book reader.

Table 4. Distribution of respondents with respect to their decision making stage

Unawareness	Cognitive	Affective	Behavioral	Total
257	110	62	107	536

3.3 Data Quality

We measured Cronbach's alpha to check the internal consistency of the variables measured in multiple-item scales. All Cronbach's alpha values were greater than 0.7, and the lowest value was 0.713, for trialability (see Table 5). The alpha values for the four different types of innovativeness were over 0.9. Thus, we can conclude that all multi-scale items satisfied internal consistency.

Table 5. Variable measurement items and scale reliability.

Variable (# of items)	Mean (S.D.)	Question / Item	Alpha	Source
Perceived Innovation				
Relative advantage (1)	3.84 (1.10)	(1) Using E-BR makes reading books easier than paper-based books.	n.a.	(Moore and Benbasat, 1991)
Compatibility (2)	4.02 (1.21)	(1) Using E-BR is compatible with my lifestyle.	.769	
		(2) Using E-BR gives me the same pleasure as reading paper-based books.		
Complexity (2)	3.52 (0.99)	(1) Operation of E-BR is complex.	.812	
		(2) The process of purchasing E-BR content is not convenient.		
		(3) It is too difficult for me to use an E-BR.		
Observability (2)	3.43 (1.27)	(1) I have seen what others can do using E-BR.	.759	
		(2) I have seen E-BR demonstrations at stores.		
Trialability (2)	3.78 (1.19)	(1) I had an opportunity to try E-BR.	.713	
		(2) I was able to try it out at E-BR stores.		
Personal innovativeness				
Functional (4)	3.82 (1.17)	(1) If a new time-saving product is launched, I will buy it right away.	.917	(Vandecasteele and Geuens, 2010)
		(2) If a new product gives me more comfort than my current product, I would not hesitate to buy it.		
		(3) If an innovation is more functional, then I usually buy it.		
		(4) If I discover a new product in a more convenient size, I am very inclined to buy it.		
Hedonic (4)	4.84 (1.10)	(1) Using novelties gives me a sense of personal enjoyment.	.933	
		(2) It gives me a good feeling to acquire new products.		

		(3) Innovations make my life exciting and stimulating.		
		(4) Acquiring an innovation makes me happier.		
Social (4)	4.23 (1.21)	(1) I like to own a new product that distinguishes me from others, who do not own this new product.	.915	
		(2) I prefer to try new products, with which I can present myself to my friends and neighbors.		
		(3) I like to outperform others, and I prefer to do this by buying new products that my friends do not have.		
		(4) I deliberately buy novelties that are visible to others and command respect from others.		
Cognitive (4)	3.90 (1.17)	(1) I mostly buy those innovations that satisfy my analytical mind.	.919	
		(2) I find innovations that need a lot of thinking intellectually challenging and, therefore, I buy them instantly.		
		(3) I often buy new products that make me think logically.		
		(4) I often buy innovative products that challenge the strengths and weaknesses of my intellectual skills.		
Message Characteristics				
Informational (1)	4.44 (1.06)	(1) Communicated message emphasized the specification of the focused E-BR.	n.a.	(Chen et al., 2007)
Transformational (1)	4.30 (1.10)	(1) Communicated message emphasized experiences in using E-BR.	n.a.	(McGinnies and Ward, 1980)
Expertise (1)	4.24 (1.09)	(1) People, who left messages about E-BR, are knowledgeable in evaluating the quality of E-BR.	n.a.	
Trustworthy (2)	4.45 (0.93)	(1) People, who left messages about E-BR, are trustworthy.	.854	
		(2) People, who left messages about E-BR, are reliable.		

* n.a: the alpha value of a single item cannot be measured.

3.4 Methodology

We estimated the proposed research framework using the multivariate probit method (Albert and Chib, 1993; Chib and Greenberg, 1998; Edwards and Allenby, 2003), based on McFadden's random utility model (McFadden, 1980). The multivariate probit method allows the construction of sequential multiple stages as dependent variables, enabling us to describe the consumer's current stage at each decision-making point and

to estimate the impact of innovation characteristics, innovativeness, and message characteristics at each stage. In analyzing the consumer's cognitive, affective and behavioral reaction, it is assumed that reactions at each stage can be expressed by the latent utility and that the utilities are composed of two parts: a deterministic part and a random part. The latent utility Vij can be represented by assuming that consumers may remain in any one of the three stages:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \sum_k \beta_{jk}^{'} X_{ki} + \varepsilon_{ij}$$

$$y_{ij} = \begin{cases} 1 \ if \ U_{ij} > 0 \\ 0 \ if \ U_{ij} < 0 \end{cases} \quad for \ j = 1,2,3$$

where i stands for the ith individual, and j stands for the decision-making stage j, which can be either 1, 2, or 3. Finally, k stands for kth independent variable affecting the decision making stage. Therefore, X_{ki} denotes individual i's kth independent variable that affect the utility, and β_{jk} denotes their parameter vector in the decision making stage j. The distribution of random disturbance ε_{ij} captures the factors affecting the utility but are not included in the utility V_{ij}. Consumer i chooses alternative j (i.e., stays in stage j in our study) if and only if the utility obtained by choosing j is greater than the utility of not choosing it (i.e., y_{ij} = 1). To reflect the theoretical fact that decision making for innovation adoption is a sequential process in the empirical model, the response variables were constructed to identify respondents' current decision-making stage:

$$y_{i1} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, ? \begin{cases} 1 & if \ a \ person \ i \ is \ in \ cognitive \ stage \\ 0 & otherwise \end{cases}$$

$$y_{i2} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, ? \begin{cases} 1 & if \ a \ person \ i \ is \ in \ affective \ stage \\ 0 & otherwise \end{cases}$$

$$y_{i3} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, ? \begin{cases} 1 & if \ a \ person \ i \ is \ in \ behavioral \ stage \\ 0 & otherwise \end{cases}$$

It is assumed that the random disturbance vector $\varepsilon_i (\varepsilon_i = \{\varepsilon_{i1}, \varepsilon_{i2}, ..., \varepsilon_{iJ}\})$ has a multivariate normal distribution with zero mean and variance covariance matrix Σ:

$$\varepsilon_i \sim MVN[0, \Sigma], \quad \Sigma : \mathrm{J} \times \mathrm{J} \ \text{variance} - \text{covariance matrix}$$

$$\phi(\varepsilon_i) = \frac{1}{(2\pi)^{J/2} |\Sigma|^{1/2}} e^{-\frac{1}{2}\varepsilon_j^{'}\varepsilon_i}$$

The estimation procedure for Bayesian multivariate probit estimation in (Edwards and Allenby, 2003) was chosen for this study. Their methodology uses the Markov Chain Monte Carlo (MCMC) Gibbs sampling instead of the classical MLE approximation. The Gibbs sampling is the workhorse of the MCMC method (Jackman, 2000). The Bayesian multivariate probit with Gibbs sampling was used in our analysis

rather than the classical approach for several reasons. Above all, it avoided the complicated integration of the multivariate density function and overcame the initial point problem, as it does not require the maximization of any function. Furthermore, the result of a Bayesian estimation can be converted into a classical estimation result.

Basically, the Gibbs sampling method was adopted to estimate parameters, since a direct estimation of the full posterior density is not analytically tractable. Gibbs sampling is based on the idea that successive sampling from the posterior conditional distributions produces a Markov chain that converges in its distribution to a marginal posterior distribution (McCulloch and Rossi, 1994). Thus, it is possible to consider successive sampling from the posterior conditional distribution.

4. Analysis Result

To estimate the Bayesian multivariate probit model, we ran 20,000 draws from the conditional posterior distributions using the MCMC method; every 10th value was chosen from draws for parameter inference. The results of the multivariate probit estimation are shown in Table 6.

First, we found that the impact of perceived innovation characteristics on consumers' cognitive, affective, and behavioral reactions differs across stages. This finding is directly linked to the main research question of this study. Specifically, the relative advantage ($\beta = .130$ on affective) is the only statistically significant factor in the affective stage, whereas the variable is not significant in the cognitive or behavioral stage. Thus, the relative advantage of E-book readers drives consumers who are aware of the use of the device and are interested in it. The result also reveals that compatibility ($\beta = .102$ on behavioral) is significant in increasing behavioral intention, implying that low compatibility with alternative ways of reading a book can hinder the adoption of E-book readers. Accordingly, those who favor E-book readers may not have an intention to purchase them if they judge that reading an E-book with a dedicated E-book reader is incompatible with their reading habits. It is also notable that both complexity ($\beta = -.175$ on cognitive, $\beta = -.202$ on affective, $\beta = -.186$ on behavioral) and observability ($\beta = .273$ on cognitive, $\beta = .242$ on affective, $\beta = .146$ on behavioral) are statistically significant characteristics affecting every stage of decision making, while trialability is not significant at all.

Second, all innovativeness variables are significant but show differences depending on the stage. It is especially interesting that functional innovativeness ($\beta = .148$ on affective, $\beta = .148$ on behavioral) and cognitive innovativeness ($\beta = .126$ on affective, $\beta = .288$ on behavioral) are significantly positive in the affective and behavioral stages, whereas hedonic innovativeness ($\beta = -.137$ on affective, $\beta = -.259$ on behavioral) and social innovativeness ($\beta = -.147$ on affective, $\beta = -.151$ on behavioral) are significantly negative in the affective and behavioral stages. Given that the literature argues that innovativeness must be distinguished depending on its motivation (Vandecasteele and Geuens, 2010), our empirical result strongly supports the view that the impacts of different motivations or sources of innovativeness are much more related to innovation adoption behavior than is innate innovativeness. In particular, a high

hedonic innovativeness and social innovativeness, which are closely related to hedonic activities such as playing games and communication, reduce the possibility that consumers will experience affective and behavioral intention during E-book reader adoption. On the other hand, the result shows that consumers with a high cognitive and functional innovativeness are likely to react in the affective and behavioral stages of decision making, perhaps because reading a book is a kind of mental and intellectual activity. Therefore, people with a high cognitive and functional innovativeness are more likely to have an interest in and intention to purchase E-book readers. In other words, E-book readers are so closely related to paper-based books (unlike other smart devices with E-book applications as well as other uses such as viewing video clips, chatting, and playing games) that cognitive and functional innovativeness stimulates their adoption.

Table 6. Multivariate probit analysis result for E-book readers for cognitive, affective, and behavioral reactions.

Dependent variable / Independent variable	**Stage1**	**Stage 2**	**Stage 3**
	Cognitive	**Affective**	**Behavioral**
Demographics			
Gender	.156 (.111)	-.082 (.099)	**-.229* (.103)**
Age	**-.031* (.008)**	**-.038* (.006)**	**-.035* (.005)**
Single	**-.198* (.148)**	**-.401* (.136)**	**-.428* (.201)**
Perceived innovation characteristics			
Relative Advantage	.017 (.063)	**.130* (.061)**	.069 (.067)
Compatibility	-.019 (.063)	.042 (.046)	**.102* (.054)**
Complexity	**-.175* (.051)**	**-.202* (.056)**	**-.186* (.056)**
Observability	**.273*(.058)**	**.242* (.064)**	**.146* (0.066)**
Trialability	-.003 (.062)	.029 (.057)	.068 (0.060)
Innovativeness			
Functional	**.141* (.064)**	**.148* (.066)**	**.148* (.067)**
Hedonic	-.052 (.053)	**-.137* (.051)**	**-.259* (.056)**
Social	**-.156* (.071)**	**-.147* (.060)**	**-.151* (.065)**
Cognitive	.080 (.074)	**.126* (.072)**	**.288* (.084)**
Message characteristics			
Information	.059 (.069)	.019 (.067)	.022 (.067)
Transformation	.071 (.072)	.076 (.068)	.070 (.075)
Expertise	.005 (.079)	.046 (.089)	-.042 (.082)
Trustworthiness	.059 (.091)	-.112 (.079)	-.105 (.093)

Note 1) * represents a significance level < 0.1

Third, every variable related to message characteristics were found to be insignificant across all dependent variables. There was no apparent relationship between either the nature of a message and E-book reader-related cognitive, affective, and behavioral responses. Consequently, the message characteristics of E-book readers do not affect Korean consumers' adoption decisions. However, given that the message characteristics of innovation are especially influential and meaningful when a new product has been launched on the market, one possible explanation for our result could be that respondents might have been affected by the credibility and nature of the communication when E-book readers first appeared but that the effect disappeared over the years (E-book readers were released in the Korean market in 2010). Publishing companies recently released multiple new E-book readers on the market and promoted them through different communication strategies. Accordingly, message characteristics may influence consumers' decision making at the brand level but not at the product level.

5. Implication and Conclusion

This study has identified the meaningful factors that influence the decision-making process for the adoption of E-book readers. This study represents pioneering research in terms of its research framework, which allowed us to capture the hierarchical decision-making stages described by Lavidge and Steiner (1961) and determine how the factors affect decision making at each stage. The results of our empirical analysis, based on the proposed framework, provide a few useful implications to marketers and product engineers of E-book readers.

First, complexity was a main bottleneck affecting all stages of the E-book reader adoption process in the Korean E-book market, consistent with the results of previous research (Hwang and Lim, 2015). The issue of complexity is especially important for the market acceptance of high-tech consumer products. Our result demonstrates that the fear of technological complexity acts as a barrier to acceptance and that Korean consumers' concerns about the difficulty of using E-book readers have a significant impact. Additionally, consumers may face a backlash from overly complex E-book readers. Therefore, product engineers need to design E-book readers in a way that guarantees ease of use, and marketers must then explain to consumers how easily the readers can be used.

Second, the results also showed that high observability is positively related to the cognitive, affective, and behavioral stages. From the marketer's perspective, then, enhancing the observability of E-book readers is an essential strategy in Korea, since increased observability makes consumers aware of, feel interested in, and have the intention to use E-book readers. For example, one practical strategy for increasing observability is to display and exhibit E-book readers in offline stores and on websites frequently, making them easily recognizable to visitors.

Third, issues of compatibility arise at the behavioral stage. Compatibility indicates how well the use of E-book readers fits with that of paper-based books. One possible explanation of this result is that people tend to think that they cannot read with an E-book reader as comfortably as they can with a paper-based book. The underlying cause may be that Korean consumers are unfamiliar with reading a book using electronic devices and therefore perceive it as something that requires learning. A strategic

implication of this observation is that product engineers have to make an effort to develop E-book readers that provide a seamless reading experience and one that is similar to reading a paper-based book. Marketers have to emphasize to potential consumers that there is no great difference between reading an E-book reader and a paper-based book. Marketers should also communicate that E-book readers do not require additional learning. Thus, marketers have to foster the perception in customers' minds that using E-book readers is as easy as using paper-based books.

Fourth, we found that the demand for E-book readers is segmented by kinds of innovativeness: functional and cognitive innovativeness have a positive effect on both affective and behavioral stages, while hedonic and social innovativeness have a negative effect on affective and behavioral responses, respectively. By identifying the motivated innovative consumers in the Korean E-book reader market, we offer insights different from the general consensus in the extant literature, which has indicated that innovativeness is usually innate and that motivations do not differ among innovative consumers. Our results indicate that consumers, who have different motivational innovativeness, should be targeted with effective marketing communications that address their specific motivation.

Despite its meaningful strategic implications, this study has a few limitations. It assumes that consumers experience cognitive, affective, and behavioral stages sequentially, based on the theory of traditional consumer behavior and the innovation adoption literature. However, some researchers have pointed out that consumers can follow different decision-making paths when purchasing new products (Ratchford, 1987). For example, in impulse purchasing situations, consumers first experience a behavioral intention to purchase and then follow the affective and cognitive stages. This research also implies that the order of the decision-making process might be different across individual customers; however, there seems to be no research that addresses individual heterogeneity in purchase decision-making order for the same product and connects it to innovation adoption factors. Thus, future research should determine what decision-making order consumers follow in the Korean E-book market and how the effects of perceived innovation characteristics depend on that order.

Lastly, as dedicated E-book readers and contents (i.e., E-books) can also be bundled, firms may consider a promotional strategy that is especially based on a price strategy. Considering Amazon's sales strategy of Amazon Kindle, for example, there are indications that Amazon-Kindle is not sold as a profit-generating product but rather as an element in Amazon's promotional strategy for E-books and video. In other words, the Kindle is a loss-leader promoted at a price that is lower than its cost, in order to attract consumers' adoption of revenue-generating items such as e-books. Due to this reason, it is conceivable that people's adoption of dedicated e-book readers can be influenced by promotional strategies that bundle device and contents into one product. In this case, the sales of the bundle (i.e., device and contents) are more important than the sales of the single device. Thus, our future research may include an in-depth investigation concerning how low-price promotional strategy influences consumer's adoption of E-book readers and, furthermore, the net sales of E-book readers and E-books.

Nonetheless, this study reveals that people make decisions in three sequential steps rather than in a simple dichotomous way (i.e., adoption vs. non-adoption). From a

theoretical perspective, our research framework makes it possible to address the hierarchical decision-making stages and how innovation characteristics, consumer innovativeness, and message characteristics affect each one. In the management domain, our empirical results provide useful implications to marketers and product engineers.

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