The Effect of Simplicity and Perceived Control on Perceived Ease of Use

Dongwon Lee
Information and Communications University

Junghoon Moon
Information and Communications University

Yong Jin Kim

Follow this and additional works at: http://aisel.aisnet.org/amcis2007

Recommended Citation
http://aisel.aisnet.org/amcis2007/71

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2007 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.
The Effect of Simplicity and Perceived Control On Perceived Ease of Use

Dongwon Lee
Information and Communications University
jester21@icu.ac.kr

Junghoon Moon
Information and Communications University
jmoon@icu.ac.kr

Yong Jin Kim
Sogang University
yongjkim@sogang.ac.kr

Abstract
As the complexity dramatically increases with technological development, the ease of use of technology has been regarded as a critical factor to adopt. This study extends existing Technology Acceptance Model (TAM) proposed by Moon and Kim (2001) by introducing simplicity and perceived control. Simplicity has recently been suggested as an important concept for a successful user interface design by John Maeda (2004; 2006) of the MIT Media Lab. The concept of simplicity not only refers to a simple layout, as stated in previous studies, but also embraces interface organization, functionality, structure, workflow and framework. From the literature review, we define simplicity as the antecedent to perceived ease of use and classify it into four sub-dimensions: Reduction, Organization, Integration, and Prioritizing. In addition to simplicity, we also bring in control as an important antecedent to perceived ease of use. Control theory explains that control is conceptually related to the direct manipulation of an object and also related to users’ psychological status when they use the object. In this study we demonstrate the role of simplicity and perceived control in the existing TAM. We then apply the extended TAM to the blog service. A survey was conducted for a pilot test (n=59). The results indicate that both perceived control and simplicity influence ease of use in the TAM. This finding asserts the importance of the simplicity and

1 Corresponding Author
Introduction

IT adoption and use is a key area of information systems research. Research in this area has resulted in several theoretical models, with roots in information systems, psychology, and sociology that explain more than 40 percent of the variance in individual intention to use technology (Davis 1989; Taylor and Todd 1995; Venkatesh and Davis 2000).

Previous studies have shown the validity of the Technology Acceptance Model (TAM) across a wide variety of ITs. TAM’s fundamental constructs do not fully reflect the variety of use task environments (Dishaw and Strong 1999). Therefore, it is necessary to further research this idea by demonstrating specific influences of technological and usage-context factors that may alter the user’s acceptance to increase the external validity of TAM. We focused on the web, especially on blog services, for this study. This study extends the existing TAM proposed by Moon and Kim (2001), who considered perceived playfulness as a necessary construct in the TAM for the web context.

The recent generation of web applications and web sites has been considered to be fundamentally different from the early web. The generation is known as “Web 2.0,” including blogs which are online journals or diaries hosted on a web site and often distributed to other sites or readers. McKinsey survey on Internet technologies (McKinsey 2007) revealed that blog leads Web 2.0 trends in the are of business. Technorati were tracking more than 50 million blogs in 2006, and about 175,000 blogs were created daily (Li et al. 2007). This fact indicates that the number of blog doubles every six months. In this sense, because of the importance of blogging these days, the blog is selected as the target service for this study.

In this study, we extended TAM from the perspective of human-computer interaction by employing two theories: simplicity theory and control theory. Simplicity is a new concept recently suggested by John Maeda of the MIT Media Lab. He stressed the importance of simplicity for successful design, technology, business, and life (Maeda 2006). Through a literature review, we posit that simplicity influences ease of use in many applications (Maeda 2006; Nielsen 1999; Tilson et al. 1998; Tischler 2005). It has been well-recognized that ease of use is a crucial concept in determining technology acceptance (Davis 1989). Also, based on control theory, we suggest that perceived control is conceptually related to direct manipulation of an object, as well as related to users’ psychological status when they use the object (Heckhausen and Schulz 1995; Pierce et al. 2001; Pierce et al. 2003; Rothbaum et al. 1982). Thus, we consider perceived control, along with simplicity, as new constructs associated with “ease of use” in the TAM.

The main goal of this study is to investigate the effect of simplicity and perceived control on perceived ease of use along with the extended TAM proposed by Moon and Kim (2001). We will demonstrate the role of simplicity and perceived control in the context the blog service. Finally, the finding of this study will shed light on the role of, simplicity and perceived control in designing blog interface.
TAM was conceived to explain and predict the individuals acceptance of IT (Davis 1989). TAM suggests that “Perceived Usefulness” and “Perceived Ease of Use” of IT are major determinants of its usage. Davis (1989) defined “Perceived Usefulness” as “the degree of which a person believes that using a particular system would enhance his or her job performance” and “Perceived Ease of Use” as “the degree of which a person believes that using a particular system would be free of effort” (Davis 1989). Behavioral intentions to use are determined by attitudes toward using the system. Finally, behavioral intentions to use lead to actual system use. Previous research has demonstrated the validity of this model across a wide variety of applications.

Many previous studies use TAM to predict Internet usage in the Internet environment (Liaw 2002; Moon and Kim 2001; Teo et al. 1999). However, most of these studies used broad questions, only adapted from conventional IS success studies in the context of application software, in their surveys. Kim et al. (2005) argued that the structure of success factors of web-based systems must be different from traditional IS success models because of the completely different environment of the Internet.

Most of technology acceptance studies have focused on the extrinsic motivation perspective (e.g. perceived usefulness). However, Davis et al. (1992) investigated the relative effects of extrinsic and intrinsic motivation on the acceptance of technology in the workplace. They defined perceived usefulness as an extrinsic motivation and perceived enjoyment as an intrinsic motivation. Finally, they found that perceived enjoyment and perceived usefulness mediated the effect of perceived ease of use on intention to use. Igbaria et al. (1994) found that system usage is affected by both extrinsic motivation (perceived usefulness) and intrinsic motivation (perceived fun). Also, Teo et al. (1999) found that the use of Internet affected by both extrinsic motivation(perceived usefulness) and intrinsic motivation(perceived enjoyment). In addition, Chen et al. (2002) pointed out that “playfulness is an important factor to motivate users to utilize a system.”

![Figure 1. The Extended TAM (Moon and Kim 2001)]

Figure 1 describes Moon and Kim (2001)’s extended TAM, including an intrinsic motivation factor in the context of web-based systems. They defined “Perceived Playfulness” as “The extent to which the individual perceives that his or her attention is focused on the interaction with the World Wide Web, is curious during the interaction, and finds the interaction intrinsically enjoyable or interesting.” They found that “Perceived Playfulness” had a significant positive relationship with “Attitude Toward Use”. They concluded that it is important for developers to include intrinsic and extrinsic motivational factors in user interface design, thus helping to improve usability. From those reasons, this study extends Moon and Kim (2001)’s TAM using simplicity and perceived control.
“Simplicity” is the key issue of designing products that are easy to use and many companies implement “Simplicity” in their products and interface design (Maeda 2004; Maeda 2006; Tischler 2005). In this study, we introduce “Simplicity” as a new construct for the area of Information Systems. The concept of “Simplicity” not only includes the concept of “simple layout” as in previous studies, but also interface organization, functionality, structure, work flow and framework (Maeda 2006). From the literature review, we classified “Simplicity” into four sub-constructs, including “reduction”, “organization”, “integration”, and “prioritizing” (Maeda 2006; SAP 2004). Then, we propose a simplicity model as illustrated in Figure 2.

As shown in Figure 2, through the literature review, this study posits that the concept of “simplicity” is a second-order formative factor to “reduction,” “organization,” “integration,” and “prioritizing.” We set “simplicity” as a formative factor rather than a reflective one based on Arnett et al. (2003)’s elucidation. Sub-constructs of simplicity represent specific aspects of the construct and as a whole form the “simplicity”. Accordingly, changes in any of sub-constructs would cause a change in the “simplicity” and changes in one of the sub-constructs are not necessarily accompanied by changes in any of other sub-constructs.

In the Figure 2, reduction refers to the aspect of simplicity in that an application is reduced to its essentials (Maeda 2006; SAP 2004). Reduction can be applied to all aspects of application design: to reduce the functionality (goals), the structural and navigational complexity, and the interface (screen) complexity (SAP 2004).

Organization refers to the extent to which a application’s structure, functionality, and navigation are organized. Organizing and structuring an application is similar to being the architect of a building. The SAP Design Guide (2004) noted, "Human memory is large amount of knowledge structure that is organized according to principles that we are not aware of. But we do know that human performance depends on an efficient organization of facts and procedures. User’s performance is better if an application’s overall structure, navigation, functionality, and screens are well organized.” An efficient organization also simplifies an application, which has an additional positive impact on performance. The task of organizing and structuring an application relates to: the general application structure (screens, pages, and so on), the navigational structure, the structure of the functionality and the screen or page layout (Maeda 2006; SAP 2004).

Integration denotes the aspect of simplicity that puts fragmented components of application into a coherent framework. According to the SAP Design Guide (2004), “Simplification can lead to the creation of many simple, isolated task, and thus applications. It is necessary to integrate these tasks in order to make them accessible to users. Integration is
often provided through a huge menu tree, leaving the users alone in a maze of functionality. Abstract integration using trees or net structures does not conform to human mental habits and is often a very inefficient way to organize tasks. The principle of integration is the importance of integrating simple, elementary tasks into a coherent framework.”

Prioritizing means that applications should focus on the essential tasks and not try to serve a multitude of diverse goals (SAP 2004). This includes optimization with respect to the important aspects of a task (Maeda 2006; SAP 2004).

Tilson et al. (1998), in the IBM Ease of Use Group, provides UI design principles which include “Simplicity” for usability. Nielsen (1999) suggested that simplicity is a key factor behind creating a usable design, indicating that “simplicity” means “users on the web are able to get what they came for.” Also, users are extremely goal driven on the web, and will not compromise anything between themselves and their goals.

In September 2004, Philips launched a brand promise of “Sense and Simplicity” (Maeda 2006). They said that “simplicity” refers to their ability to provide easy access to those meaningful benefits (Philips 2004a). Philips websites noted that “Around 30% of home networking products are returned because people can’t get them to work and 48% of people have put off buying a digital camera because they see them as too complicated” (Philips 2004b). Through global consumer research in January 2003, it was found that people around the world (regardless of where they live) want the benefits of technology without the hassles. In other words, the world is already complicated enough and consumers want simplicity (Maeda 2006; Philips 2004b).

Maeda (2006) noted that “the simplest way to achieve simplicity is through thoughtful reduction.” The easiest and most extreme way to simplify a system is to remove its diverse functionality. However, the balance between simplicity and functionality that frequently causes complexity should be considered. Also, through the concept of organization, as presented in Figure 2, the complexity of a system can be lessened (Maeda 2006).

SAP Design Guild (SAP 2004) stresses the importance of “Simplifying for Usability” and it sets out to help software developers by proposing a number of “simplification principles” that can be used as guidelines for achieving simple and easy to use applications. Also, they noted that “these guidelines are not specific to a certain technology and can be applied to any user interface design” (SAP 2004). From the users’ point of view, an application should be simple in the sense that it does not build up a barrier between them and their tasks. SAP Design Guild divided “Simplicity” into four sub-constructs, which are “Reduction,” “Organization,” “Integration,” and “Prioritizing.”

In conclusion, from the previous studies related to simplicity, we found that “Reduction”, “Organization”, “Integration”, and “Prioritizing” form the latent construct “Simplicity”.

**Perceived Control**

[Diagram: Perceived Control Model]

Skinner (1995) defined “Perceived Control” as a “naive causal model of how the world works: about the likely
causes of desired and undesired events, about their own role in successes and failures, about the responsiveness of other people, institutions, and social systems.”

There are a number of definitions of control, including Skinner’s (1995), but the most frequently referred to is Rothbaum et al.’s (1982) two-process model of perceived control. They take the view that “Perceived Control” can be divided into “Primary Control” and “Secondary Control.” They define “Primary Control” as attempts to change the world so that it fits in with the self’s needs. “Secondary Control” is defined as attempts to fit in with the world and to “flow with the current.” The processes of “Secondary Control” include positive reappraisal, positive thinking, cognitive restructuring, acceptance, distraction, downward comparison, attributional bias, and goal disengagement (Heckhausen and Schulz 1995; Wrosch et al. 2000).

Heckhausen and Schulz (1995) define “Primary Control” as bringing the environment (object) into line with one’s wishes, and “Secondary Control” as bringing oneself in line with the environment, implying that action is directed outward to the external world in “Primary Control” and inward toward the individual in “Secondary Control”. In other words, the process of “Primary Control” involves direct action on the environment, whereas “Secondary Control” processes are primarily cognitive. Thus, “Primary Control” targets the external world and attempts to achieve effects in the immediate environment external to individual, whereas “Secondary Control” targets the self and attempts to achieve changes directly within the individual. The major function of “Secondary Control” is to minimize losses in, maintain, and expand existing levels of “Primary Control.” Since these two types of control are closely interconnected, they have been theoretically distinguished but it is difficult to obviously separate them.

When an individual finds it difficult to make the object part of the extended self, or fails to directly control it, he might invest in the target, or need more time to get to know it intimately. This behavior is typical of “Secondary Control.” “Secondary Control” not only helps in dealing with failures, but also promotes primary control directly by managing its selectivity. Through “Secondary Control,” the individual can gain better “Primary Control over the target.” In this regard, behaviors of “investing the self into the target” and “getting to know it more intimately”, as suggested by Pierce et al. (2001; 2003), can be explained by “Secondary Control.”

In sum, “Primary Control” and “Secondary Control” are highly correlated to constitute “Perceived Control”, although they are slightly different in the focus of controlling action. Therefore, “Perceived Control” can be modeled as a second order construct of, “Primary Control” and “Secondary Control”. We establish a conceptual model of “Perceived Control,” as shown in Figure 3 (Arnett et al. 2003).

**Research Model and Hypotheses**

This study develops a research model based on simplicity theory and control theory in the context of TAM. It includes eight hypotheses, as illustrated in Figure 4.
The model for this study is an extension of the TAM based on “Simplicity” and “Perceived Control.” “Simplicity” and “Perceived Control” are the constructs of interest in this study, and the questionnaire items are operationalized, asking how they affect the individual’s acceptance of blog services.

In this study, we apply our research model to the blog services, since blogging services require blog users to control and manipulate diverse web feature on the interface. Also, many internet users are now using blog services, and the most of them tend to use one particular blog service for a long time. For these reasons, it is believed that the blog is adequate to demonstrate our research model.

The established model is empirically examined through survey research. Each hypothesis on the path will be estimated through Partial Least Squares (PLS).

The first hypothesis examines the link between the user’s beliefs about “Perceived Ease of Use” and “Simplicity.” From the literature review (Maeda 2006; Nielsen 1999; Tilson et al. 1998; Tischler 2005), “Simplicity” is expected to have a positive influence on a user’s perception of “Perceived Ease of Use” in their interaction with blog services. Tischler(2005) argued that many companies implement “Simplicity” to increase “Ease of Use” and “Ease of Experience” through interviews and case studies. Tilson et al.(1998), in the IBM Ease of Use Group, provides UI design principles which include “Simplicity” for usability. Also, IBM Ease of Use Group addressed, “Simplicity” is the value of “Ease of Use.” Also, the Simplicity project is a European Union program, which lasted 26 months, improving “Ease of Use” and personalization of ICT devices (Bartolomeo et al. 2006). “Simplicity” is the key factor of design aesthetics (Karvonen 2000). Tractinsky(1997) found that UI is considered aesthetically pleasing in the beginning of use, users are likely to perceived it more easy to use, also after using it for some time. Dianne et al.(2006) suggests specific antecedents of TAM related to design aesthetics. They found the design aesthetics of a mobile site positively influences “Perceived Ease of Use.” Therefore, “Simplicity” is expected to have positive influences on user’s perception of ease of use in their interaction with the blog services.

Hypothesis 1. There is a positive relationship between “Simplicity” and “Perceived Ease of Use” in using blog services.
Based on control theory, we found that control is conceptually related to direct manipulation of an object, as well as related to users’ psychological status when they first use the object (Heckausen and Schulz 1995; Pierce et al. 2001; Pierce et al. 2003; Rothbaum et al. 1982). In both perceiving and visually representing the natural organization of objects, we are supported by the mind’s powerful ability to detect and form patterns (Maeda 2006). With matters of the visual mind, Gestalt psychology is particularly relevant. The principle of Gestalt seeks the most appropriate conceptual fit; it is a key of the discipline of design.

Maeda (2006) explained “Simplicity” with the gestalt of the iPod interface. Thus, “Simplicity” is expected to be associated with increased “Perceived Control” to use the blog services.

**Hypothesis 2.** There is a positive relationship between “Simplicity” and “Perceived Control” in using blog services.

Taylor and Todd (1995), found that “Perceived Control” was a significant determinant of intention. However, the effect of control on intention is rarely known what is explained by the TAM constructs of perceived ease of use and perceived usefulness. Venkatesh(2000) found that internal and external control would be important for the formation of early system-specific “Perceived Ease of Use. Kieran et al.(2001) found that “Perceived Control” was related to “Perceived Ease of Use” with a weak link to “Perceived Usefulness.” Thus, “Perceived Control” is expected to have a positive influence on user’s perception of ease of use in their interaction with the blog services.

**Hypothesis 3.** There is a positive relationship between “Perceived Control” and “Perceived Ease of Use” in using blog services.

The rest of the hypotheses (H4 to H8) follows Moon and Kim’s (2001) extended TAM and, we verify the hypotheses in the context of the use of blog services.

**Instrument Development and Data Collection**

This study uses a cross sectional design via a survey questionnaire composed of measures based on a literature review. This study operationalizes latent variables from Figure 4 based on the literature review. Most measures were taken directly or adapted from Moon and Kim’s (2001) extended TAM, Maeda’s (2006) “The Laws of Simplicity,” the SAP Design Guide’s (2004) “Simplifying for Usability,” and Pierce et al.’s (2001; 2003) “Perceived Control.” The survey questionnaire items are provided in Appendix A.

Data was collected using a paper-based survey, and a total of 59 usable responses were collected. All participants were residents of South Korea, and all of them answered that they can use blog services well. 76.3% of subjects were using Cyworld. 74.6% of subjects were male (n=44), 23.7% were female (n=14) and one subject did not answer the part 2 questions. The average age was 25.97 years old.

**Methods**
Data analysis was performed using the PLS method, as well as several other statistical methods for the assessment of measurement models and structural models. The measurement model was tested using the composite reliability and Average Variance Extracted (AVE) for internal consistency. A cross-loading matrix and a correlation matrix with the square root of AVE were used to verify convergent and discriminate validity. Common method variance exists when a general factor accounts for the majority of the covariance among all constructs. This study employs “Outdoor Activity” as a marker variable to check out common method bias at the data collection stage. Measurement items for the marker variable were placed between the dependent variable and the independent variables to examine the common method variance artifact. After data collection, we found that there were quite low correlations between the marker variable and other variables (minimum value was -0.165) of which subtraction from the correlation between research variables does not affect the significance of the original correlations. This result indicates that the data collection was not contaminated by common method variance.

The composite reliability and AVE of each latent variable used in this study is provided in Table 1. All composite reliability’s are higher than 0.80 and AVE is higher than 0.50. These results support that the measurement model has strong convergent validity.

<table>
<thead>
<tr>
<th>Latent Variable</th>
<th>Composite Reliability</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)Reduce</td>
<td>0.828</td>
<td>0.547</td>
</tr>
<tr>
<td>(2)Organization</td>
<td>0.841</td>
<td>0.571</td>
</tr>
<tr>
<td>(3)Integration</td>
<td>0.826</td>
<td>0.617</td>
</tr>
<tr>
<td>(4)Priority</td>
<td>0.800</td>
<td>0.573</td>
</tr>
<tr>
<td>(5)Primary Control</td>
<td>0.867</td>
<td>0.685</td>
</tr>
<tr>
<td>(6)Secondary Control</td>
<td>0.920</td>
<td>0.794</td>
</tr>
<tr>
<td>(7)Perceived Ease of Use</td>
<td>0.937</td>
<td>0.832</td>
</tr>
<tr>
<td>(8)Perceived Usefulness</td>
<td>0.945</td>
<td>0.853</td>
</tr>
<tr>
<td>(9)Perceived Playfulness</td>
<td>0.945</td>
<td>0.852</td>
</tr>
<tr>
<td>(10)Outdoor Activity</td>
<td>0.978</td>
<td>0.957</td>
</tr>
<tr>
<td>(11)Attitude Toward Use</td>
<td>0.927</td>
<td>0.864</td>
</tr>
</tbody>
</table>

*Note: Outdoor Activity is a marker variable*

Next, cross-loadings of each item are explored and compared across all latent variables. The cross-loading matrix is provided in Appendix B, which indicates that both strong convergent validity and discriminate validity exist in the measurement model.

In addition, Table 2 examines the ratio of the square root of the AVE of each latent variable over the correlations of this variable with respect to all the other variables.

<table>
<thead>
<tr>
<th>Latent Variable</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)Reduce</td>
<td>(0.740)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)Organization</td>
<td>0.594</td>
<td>0.756</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The values in the table represent the ratio of the square root of the AVE over the correlation with other variables.*
<table>
<thead>
<tr>
<th>Construct</th>
<th>Correlation 1</th>
<th>Correlation 2</th>
<th>Correlation 3</th>
<th>Correlation 4</th>
<th>Correlation 5</th>
<th>Correlation 6</th>
<th>Correlation 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration (3)</td>
<td>0.329</td>
<td>0.399</td>
<td>(0.785)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority (4)</td>
<td>0.276</td>
<td>0.453</td>
<td>0.433</td>
<td>(0.757)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Control (5)</td>
<td>0.584</td>
<td>0.631</td>
<td>0.357</td>
<td>0.393</td>
<td>(0.828)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Control (6)</td>
<td>0.219</td>
<td>0.367</td>
<td>0.187</td>
<td>0.256</td>
<td>0.486</td>
<td>(0.891)</td>
<td></td>
</tr>
<tr>
<td>Perceived Ease of Use (7)</td>
<td>0.370</td>
<td>0.446</td>
<td>0.344</td>
<td>0.359</td>
<td>0.596</td>
<td>0.289</td>
<td>(0.912)</td>
</tr>
<tr>
<td>Perceived Usefulness (8)</td>
<td>0.459</td>
<td>0.374</td>
<td>0.292</td>
<td>0.289</td>
<td>0.512</td>
<td>0.317</td>
<td>0.419</td>
</tr>
<tr>
<td>Perceived Playfulness (9)</td>
<td>0.488</td>
<td>0.487</td>
<td>0.447</td>
<td>0.367</td>
<td>0.632</td>
<td>0.536</td>
<td>0.548</td>
</tr>
<tr>
<td>Outdoor Activity (10)</td>
<td>-0.158</td>
<td>0.073</td>
<td>-0.165</td>
<td>-0.037</td>
<td>0.078</td>
<td>0.004</td>
<td>0.063</td>
</tr>
<tr>
<td>Attitude Toward Use (11)</td>
<td>0.523</td>
<td>0.544</td>
<td>0.289</td>
<td>0.272</td>
<td>0.666</td>
<td>0.594</td>
<td>0.434</td>
</tr>
</tbody>
</table>

*Note: The number in parenthesis is the square root of AVE

In Table 2, diagonal elements in parenthesis are correlations of each construct with its measure, which is the square root of AVE. Off-diagonal elements are correlations between constructs. As shown in Table 2, each construct is more highly correlated with its own measure than with any other constructs. This indicates that strong discriminate validity exists among the constructs.

Results

Finally, Figure 5 illustrates the results of model testing.

As shown in Figure 5, all hypotheses, except for H6, are statistically significant at the p<0.05 level. 39.0% of the
Lee et al. / The Effect of Simplicity and Perceived Control on Perceived Ease of Use

variance of “Perceived Control” is accounted for by “Simplicity” (β=0.624); therefore, H2 is supported, and the path coefficient is significant at the p<0.001 level. 33% of the variance of “Perceived Ease of Use” is accounted for by “Simplicity” (β=0.328) and “Perceived Control” (β=0.309); therefore, H1 and H3 are supported, and path coefficients are significant at the p<0.05 level. Thus, there are positive relationship between “Simplicity” and “Perceived Control.” Also, “Simplicity” and “Perceived Control” are positively influenced on “Perceived Ease of Use”.

The path coefficient from “Perceived Ease of Use” to “Perceived Playfulness” (β=0.554), and to “Perceived Usefulness” (β=0.431), is significant at the p<0.001 level; H4 and H5 are supported. However, the path coefficient from “Perceived Ease of Use” to “Attitude Toward Use” is 0.011 and its t-value is 0.0977, which is not significant, even at the p<0.1 level; H6 is not supported. To some degree, this finding is consistent with many previous studies of technology acceptance including Venkatesh et al. (2003). Venkatesh et al. (2003) revealed that ease of use is less important, for experienced users than novices, and that “Perceived Ease of Use” is indirectly related to “Attitude Toward Use” via intrinsic, “Perceived Playfulness,” and extrinsic motivational factor, “Perceived Usefulness”.

Finally, about 60% (R²=0.601) of the variance of “Attitude Toward Use” in the sample can be accounted for by “Perceived Playfulness” and “Perceived Usefulness”; therefore, H7 and H8 are supported. The path coefficients are 0.593 and 0.244, respectively.

From these results, it is concluded that the main path to “Attitude Toward Use” in this TAM is from “Simplicity” via “Perceived Control,” “Perceived Ease of Use,” and “Perceived Playfulness.” This finding means that the intrinsic motivational factor, “Perceived Playfulness”, have more powerful effect than extrinsic factor, “Perceived Usefulness” to build positive attitude.

Conclusion

The main goal of this study was to investigate the role of “Simplicity” and “Perceived Control” in the TAM. We found that these two constructs significantly influence users’ technology acceptance behavior. The results indicate that simplicity plays an important role in explaining perceived ease of use and perceived control, in addition to affecting, through ease of use, the user’s attitude toward the use.

This study is not free from limitations. First of all, sample for this study was rather experienced users. The survey participants were current users of the existing blogs. In addition to sampling bias, sample size (n=59) was enough for pilot test using PLS, but it was small to get reliable results. In the future, a larger sample size will collected and it will provide more reliable results.

This study has meaningful contributions to the area of technology adoption research where many studies have tested the role of ease of use and usefulness in explaining adoption behavior without paying much attention to the direct properties of IT artifacts, such as perceived control and simplicity, as presented in this study. Previous studies with the extended TAM focused on social-psychological constructs. However, this study approaches technology acceptance from the perspective of human-computer interaction, especially from usability aspects focusing on the technological properties of the system. In addition to consider “Perceived Playfulness,” this study empirically examines both intrinsic and extrinsic factors with “Simplicity” and “Perceived Control”. In this regard, this study extended and empirically validated TAM.

There are not many services and applications that are developed by applying the concepts of simplicity and control to their user interface. The four sub-constructs of simplicity and two dimensions of control identified in this study would best serve as guidelines for developing more usable services and applications. Although we understand that it is hard to find a
balance between complexity and simplicity, focusing on simplified and controllable systems will better serve to add value for users. The result of this study can be applied to user interface design of many applications, including blog services.

“Simplicity” is the key issue for design, especially in web design and digital interface design, and usability engineering area. However, there has been no empirical validation of the “Simplicity” so far. From that point, this study provides meaningful findings to support “Simplicity.” Ease of use on the web interface will be improved by considering “Simplicity.” Also, stronger feeling of “Control” over interface stems from “Simplicity” will help users feel easy to use the web services, including blog services, and applications, which provide a new competitive advantages for practitioners. The simplicity approach gives the aesthetically beautiful and usable results.

We are planning to collect additional data in order to increase the reliability of the results of this study. Furthermore, in the future, the target systems of this study will be extended from blog services to other applications and services such as mobile applications and e-commerce services.

References


Li, B., Xu, S., and Zhang, J. "Enhancing clustering blog documents by utilizing author/reader comments " *Proceedings of the 45th annual southeast regional conference ACM-SE 45 ) 2007, pp 94 - 99*

Liaw, S. "Understanding user perceptions of World Wide Web environments," *Journal of Computer Assisted Learning* (18)


Philips "Our Brand Promise "sense and simplicity"," Philips Electronics 2004a.


Appendix A. Questionnaires Items

Section 1. Simplicity

Section 1.1. Reduction

(1) The blog has unnecessary steps to post an article
(2) The blog has difficult steps to post a picture.
(3) The blog offers complicated stages to change the design.
(4) The blog offers unnecessary functions.

Section 1.2. Organization

(1) The blog offers systematically management of categories.
(2) The blog offers systematically management of contents (article/picture/movie clip/file).
(3) The blog is designed to offer coherent functions.
(4) The blog is well structured and systematic.

Section 1.3. Integration

(1) The blog groups similar objects in same category.
(2) The blog offers one-step function to edit and post an article.
(3) The blog offers one-step functions to edit and post a picture.

Section 1.4. Prioritizing

(1) The blog displays the most recent article on the top.
(2) The blog displays the frequently used functions on the first screen.
(3) The blog let the user run the inactive objects with ease.

Section 2. Perceived Control

Section 2.1. Primary Control

(1) I know how to use the blog efficiently.
(2) I can manage the blog in my manner.
(3) I generally manage the blog well.

Section 2.2. Secondary Control

(1) I spend many times to manage the blog.
(2) I spend many efforts to manage the blog.
(3) I frequently visit the blog to manage.
Section 3. Perceived Playfulness

(1) I enjoy using the blog.
(2) I become delighted to use the blog.
(3) I feel satisfied to use the blog.

Section 4. Perceived Ease of Use

(1) It is easy to learn to manage the blog.
(2) I can proficiently use the blog.
(3) I can easily remember how to use the blog.

Section 5. Perceived Usefulness

(1) I gain useful information through the blog.
(2) I can approach to the new information through the blog.
(3) I can access to many information through the blog.

Section 6. Outdoor Activity

(1) I prefer being outside to staying at home.
(2) I prefer going outside in free time.

Section 7. Attitude Toward Use

(1) I am willing to use the blog frequently.
(2) I recommend the others to use the blog.
## Appendix B. Cross Loadings for the Measurement Model

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED2</td>
<td>0.710</td>
<td>0.252</td>
<td>0.200</td>
<td>0.192</td>
<td>0.318</td>
<td>0.106</td>
<td>0.153</td>
<td>0.276</td>
<td>0.303</td>
<td>0.311</td>
</tr>
<tr>
<td>RED3</td>
<td>0.776</td>
<td>0.418</td>
<td>0.338</td>
<td>0.058</td>
<td>0.401</td>
<td>0.143</td>
<td>0.306</td>
<td>0.357</td>
<td>0.392</td>
<td>0.363</td>
</tr>
<tr>
<td>RED5</td>
<td>0.706</td>
<td>0.566</td>
<td>0.180</td>
<td>0.289</td>
<td>0.495</td>
<td>0.050</td>
<td>0.218</td>
<td>0.177</td>
<td>0.225</td>
<td>0.287</td>
</tr>
<tr>
<td>RED6</td>
<td>0.765</td>
<td>0.519</td>
<td>0.247</td>
<td>0.286</td>
<td>0.513</td>
<td>0.336</td>
<td>0.404</td>
<td>0.531</td>
<td>0.509</td>
<td>0.575</td>
</tr>
<tr>
<td>ORG1</td>
<td>0.570</td>
<td>0.865</td>
<td>0.231</td>
<td>0.320</td>
<td>0.514</td>
<td>0.332</td>
<td>0.479</td>
<td>0.382</td>
<td>0.454</td>
<td>0.509</td>
</tr>
<tr>
<td>ORG2</td>
<td>0.492</td>
<td>0.734</td>
<td>0.330</td>
<td>0.086</td>
<td>0.397</td>
<td>0.167</td>
<td>0.258</td>
<td>0.232</td>
<td>0.391</td>
<td>0.373</td>
</tr>
<tr>
<td>ORG4</td>
<td>0.246</td>
<td>0.650</td>
<td>0.273</td>
<td>0.448</td>
<td>0.382</td>
<td>0.191</td>
<td>0.214</td>
<td>0.067</td>
<td>0.150</td>
<td>0.245</td>
</tr>
<tr>
<td>ORG5</td>
<td>0.451</td>
<td>0.758</td>
<td>0.384</td>
<td>0.532</td>
<td>0.602</td>
<td>0.400</td>
<td>0.363</td>
<td>0.409</td>
<td>0.443</td>
<td>0.485</td>
</tr>
<tr>
<td>INT1</td>
<td>0.434</td>
<td>0.554</td>
<td>0.760</td>
<td>0.483</td>
<td>0.411</td>
<td>0.298</td>
<td>0.302</td>
<td>0.251</td>
<td>0.496</td>
<td>0.368</td>
</tr>
<tr>
<td>INT2</td>
<td>0.270</td>
<td>0.272</td>
<td>0.906</td>
<td>0.396</td>
<td>0.321</td>
<td>0.160</td>
<td>0.310</td>
<td>0.234</td>
<td>0.351</td>
<td>0.210</td>
</tr>
<tr>
<td>INT3</td>
<td>0.052</td>
<td>0.105</td>
<td>0.672</td>
<td>0.111</td>
<td>0.085</td>
<td>-0.037</td>
<td>0.185</td>
<td>0.205</td>
<td>0.197</td>
<td>0.097</td>
</tr>
<tr>
<td>PRI2</td>
<td>0.120</td>
<td>0.281</td>
<td>0.411</td>
<td>0.763</td>
<td>0.201</td>
<td>0.313</td>
<td>0.340</td>
<td>0.146</td>
<td>0.377</td>
<td>0.294</td>
</tr>
<tr>
<td>PRI3</td>
<td>0.185</td>
<td>0.391</td>
<td>0.243</td>
<td>0.672</td>
<td>0.211</td>
<td>-0.050</td>
<td>0.032</td>
<td>0.255</td>
<td>0.137</td>
<td>0.032</td>
</tr>
<tr>
<td>PRI4</td>
<td>0.311</td>
<td>0.364</td>
<td>0.323</td>
<td>0.828</td>
<td>0.459</td>
<td>0.285</td>
<td>0.406</td>
<td>0.258</td>
<td>0.340</td>
<td>0.268</td>
</tr>
<tr>
<td>PCT4</td>
<td>0.402</td>
<td>0.408</td>
<td>0.341</td>
<td>0.242</td>
<td>0.824</td>
<td>0.298</td>
<td>0.503</td>
<td>0.327</td>
<td>0.407</td>
<td>0.418</td>
</tr>
<tr>
<td>PCT5</td>
<td>0.457</td>
<td>0.562</td>
<td>0.288</td>
<td>0.422</td>
<td>0.878</td>
<td>0.356</td>
<td>0.442</td>
<td>0.491</td>
<td>0.574</td>
<td>0.610</td>
</tr>
<tr>
<td>PCT6</td>
<td>0.610</td>
<td>0.599</td>
<td>0.255</td>
<td>0.307</td>
<td>0.779</td>
<td>0.565</td>
<td>0.545</td>
<td>0.451</td>
<td>0.599</td>
<td>0.632</td>
</tr>
<tr>
<td>PCT1</td>
<td>0.130</td>
<td>0.319</td>
<td>0.078</td>
<td>0.178</td>
<td>0.451</td>
<td>0.900</td>
<td>0.290</td>
<td>0.199</td>
<td>0.454</td>
<td>0.498</td>
</tr>
<tr>
<td>PCT2</td>
<td>0.192</td>
<td>0.286</td>
<td>0.170</td>
<td>0.253</td>
<td>0.444</td>
<td>0.928</td>
<td>0.188</td>
<td>0.292</td>
<td>0.479</td>
<td>0.507</td>
</tr>
<tr>
<td>PCT3</td>
<td>0.269</td>
<td>0.383</td>
<td>0.258</td>
<td>0.257</td>
<td>0.407</td>
<td>0.848</td>
<td>0.303</td>
<td>0.361</td>
<td>0.513</td>
<td>0.596</td>
</tr>
<tr>
<td>PEU1</td>
<td>0.227</td>
<td>0.314</td>
<td>0.292</td>
<td>0.399</td>
<td>0.437</td>
<td>0.285</td>
<td>0.875</td>
<td>0.300</td>
<td>0.405</td>
<td>0.279</td>
</tr>
<tr>
<td>PEU3</td>
<td>0.402</td>
<td>0.448</td>
<td>0.380</td>
<td>0.325</td>
<td>0.584</td>
<td>0.245</td>
<td>0.945</td>
<td>0.383</td>
<td>0.539</td>
<td>0.423</td>
</tr>
<tr>
<td>PEU4</td>
<td>0.377</td>
<td>0.452</td>
<td>0.266</td>
<td>0.262</td>
<td>0.605</td>
<td>0.263</td>
<td>0.916</td>
<td>0.461</td>
<td>0.551</td>
<td>0.481</td>
</tr>
<tr>
<td>PUS1</td>
<td>0.355</td>
<td>0.347</td>
<td>0.193</td>
<td>0.258</td>
<td>0.463</td>
<td>0.284</td>
<td>0.323</td>
<td>0.917</td>
<td>0.594</td>
<td>0.570</td>
</tr>
<tr>
<td>PUS2</td>
<td>0.451</td>
<td>0.268</td>
<td>0.272</td>
<td>0.286</td>
<td>0.423</td>
<td>0.284</td>
<td>0.366</td>
<td>0.928</td>
<td>0.543</td>
<td>0.495</td>
</tr>
<tr>
<td>PUS3</td>
<td>0.464</td>
<td>0.423</td>
<td>0.344</td>
<td>0.255</td>
<td>0.533</td>
<td>0.310</td>
<td>0.472</td>
<td>0.926</td>
<td>0.583</td>
<td>0.623</td>
</tr>
<tr>
<td>PPL1</td>
<td>0.445</td>
<td>0.456</td>
<td>0.404</td>
<td>0.284</td>
<td>0.581</td>
<td>0.473</td>
<td>0.487</td>
<td>0.525</td>
<td>0.916</td>
<td>0.715</td>
</tr>
<tr>
<td>PPL2</td>
<td>0.501</td>
<td>0.476</td>
<td>0.435</td>
<td>0.327</td>
<td>0.609</td>
<td>0.474</td>
<td>0.512</td>
<td>0.563</td>
<td>0.946</td>
<td>0.684</td>
</tr>
<tr>
<td>PPL3</td>
<td>0.403</td>
<td>0.416</td>
<td>0.399</td>
<td>0.408</td>
<td>0.559</td>
<td>0.538</td>
<td>0.520</td>
<td>0.633</td>
<td>0.906</td>
<td>0.670</td>
</tr>
<tr>
<td>IUS1</td>
<td>0.484</td>
<td>0.533</td>
<td>0.292</td>
<td>0.355</td>
<td>0.681</td>
<td>0.637</td>
<td>0.435</td>
<td>0.614</td>
<td>0.744</td>
<td>0.930</td>
</tr>
<tr>
<td>IUS2</td>
<td>0.489</td>
<td>0.478</td>
<td>0.245</td>
<td>0.151</td>
<td>0.556</td>
<td>0.468</td>
<td>0.372</td>
<td>0.519</td>
<td>0.645</td>
<td>0.930</td>
</tr>
</tbody>
</table>

Each number was used as an index for each latent variable: (1) Reduction, (2) Organization, (3) Integration, (4) Prioritizing, (5) Primary Control, (6) Secondary Control, (7) Perceived Ease of Use, (8) Perceived Usefulness, (9) Perceived Playfulness, and (10) Attitude Toward Use.