EVIDENCE AGAINST A CORRELATION BETWEEN EASE OF USE AND ACTUAL USE OF A DEVICE IN A WALK-IN VIRTUAL ENVIRONMENT

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Abstract: *Technology acceptance and its use are assumed to be based on the perceived usefulness and ease of use of the technology. We studied one aspect of that by focusing on a possible correlation between the actual use of a device and its perceived ease of use. For studying technology that is new to users, we investigated the use of a locomotion control device in a walk-in virtual environment. We organized a user test in which participants browsed virtual shopping items by walking or by controlling locomotion with a device. Data were gathered in two ways: First, we observed their actual device use, and second, we asked users to evaluate the ease of use of the device. The analysis illustrates that there is no correlation between the actual use and ease of use of the device.*

Keywords: *virtual environment, virtual reality, technology acceptance, ease of use, empirical study.*

INTRODUCTION

Nowadays, people anticipate that technology will be user friendly and employable with little or no special training. In addition, users often are expected to adopt new technological devices immediately. This also applies to visits to a cave-like, walk-in virtual environment (VE), where users are expected to be active. Activeness in this context refers to active manipulation of technical devices by the user, as is assumed in many VE studies (e.g., Plancher, Nicolas, & Piolino, 2008; Pugnetti et al., 1998; Särkelä, Takatalo, May, Laakso, & Nyman, 2009). However, we contend that rapid adoption of new technical devices by the users happens only if they accept the device.

Technology acceptance in information system (IS) research also underscores ease of use as a significant factor. When inexperienced users are taken to a VE and given unfamiliar tools, the most important feature of the ease of use in this situation is learnability; in other words, the ease in which users are able to accomplish basic tasks the first time they encounter the device (Nielsen, 1993). Learnability can be supported by making things (i.e., objects, actions, and options) visible; exploiting the powers of constraint; and designing for error (Norman, 1988). In the case of VEs, this means making it easy to perceive how to operate the device and what can be done with it, as well as supporting intuitive application in circumstances where the operation will be successful, since some tasks can be carried out only in certain situations. Furthermore, when a user learns by trial and error, they make many errors from which recovery must be simple.

IS researchers commonly study the adoption of a novel technological artifact using the technology acceptance model (TAM; Benbasat & Barki, 2007; Lee, Kozar, & Larsen, 2003). TAM states that IS and/or information technology adoption depends on users' attitudes towards these technologies and on the perceived usefulness and ease of use (F. D. Davis, 1989). More recently, the unified theory of acceptance and use of technology (UTAUT; Venkatesh, Morris, G. B. Davis, & Davis, 2003) was developed based on several existing models. Both TAM and UTAUT include an abundance of elements because many variables affect technology acceptance. These kinds of details make the theories credible, but they also cause complications in seeing the whole entity, as well as in applying the theories to practical design cases.

The TAM model was developed in the 1990s (see F. D. Davis, 1989, for the first related publication), when computers were mostly in organizational use. At the time when IS user acceptance was in the early stages of study, the subject of investigation included also a new technological device: the home computer. In later studies, once users had domesticated the computer, the objective was to find out whether they accept new applications. In our study, we return to the original quest by studying a case in which the technological environment is somehow new for its users. We chose to study users in a walk-in VE, a technological environment of which most people know something, but very few have actually experienced. In this VE, we study whether there is a correlation between users' evaluation of the ease of use of technology and their actual use of the device.

We begin this paper by outlining the ideas of TAM and UTAUT and connect both to our study. Then we describe how we conducted our empirical study involving a small walk-in virtual shopping center, with data gathered by way of observation of participants' use of both their body and a device to manage locomotion within the virtual space and a completed questionnaire on their perceptions of ease of use of the device. Finally, we discuss our contribution to TAM and UTAUT research and to technology acceptance theories in general.

TECHNOLOGY ACCEPTANCE IN INFORMATION SYSTEM STUDIES

Many IS studies employ two well-known theories about user acceptance of IT: TAM (F. D. Davis, 1989; F. D. Davis, Bagozzi, & Warshaw, 1989) and UTAUT (Venkatesh et al., 2003). One element these models share is ease of technology use. In this section, we outline briefly TAM and UTAUT and their approach to ease of use.

TAM (Figure 1) describes the properties that affect users' technology acceptance. According to TAM, individuals' IS acceptance, as well as their IS use, is determined by two major variables: perceived usefulness and perceived ease of use (Venkatesh & F. D. Davis, 1996). During the last two decades, TAM has been applied to various technologies (e.g., word processors, e-mail, and hospital information systems) in multiple contexts (e.g., in historical situations involving the novelty of IT and in organizational culture). Furthermore, according to Lee et al. (2003), studies have involved various types of participants (e.g., undergraduate students, business graduate students, and knowledge workers) with different control factors (e.g., gender, organizational type, and organizational size).

Several studies question the overall effects of perceived ease of use in TAM (Gefen & Straub, 2000; Keil, Beranek, & Konsynski, 1995; Lee et al., 2003). The contradictory findings have been explained by gender differences in user behavior. Men's technology use was strongly influenced by their perceptions of usefulness. Women were more strongly influenced by perceptions of ease of use and other subjective norms, although the effect of subjective norms has diminished over time (Gefen & Straub, 1997; Venkatesh & Morris, 2000).

The other acknowledged technology acceptance theory, UTAUT, aims to reach a unified understanding of user acceptance of technology by combining the results of other theories about technology acceptance. In addition to TAM, UTAUT encompasses the model of PC utilization (Thompson, Higgins, & Howell, 1991) and the innovation diffusion theory (Moore & Benbasat, 1991; Rogers, 1995). UTAUT (Figure 2) holds four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) that are direct determinants of usage intention and behavior. Gender, age, experience, and the voluntariness of use are indicated as mediating the impact of the four key constructs on usage intention and behavior (Venkatesh et al., 2003).

The elements connected to the ease of technology use represent part of the effort expectancy. This construct draws together ease of use from TAM (F. D. Davis, 1989; F. D. Davis et al., 1989), the innovation diffusion theory within the IS field (Moore & Benbasat, 1991), and complexity—as the opposite of ease of use—from the model of PC utilization (Thompson et al., 1991). UTAUT also includes gender differences, indicating that the effect of ease of use on technology adoption is stronger for women than for men. Even stronger than gender, however, are the differences associated with increased age and limited technical experience (Venkatesh et al., 2003).

A common view states that users easily accept user-friendly technology. Theories of user acceptance give some support to this view, at least when the users are female. We focus on this issue by investigating whether a relationship exists between perceived ease of use and the
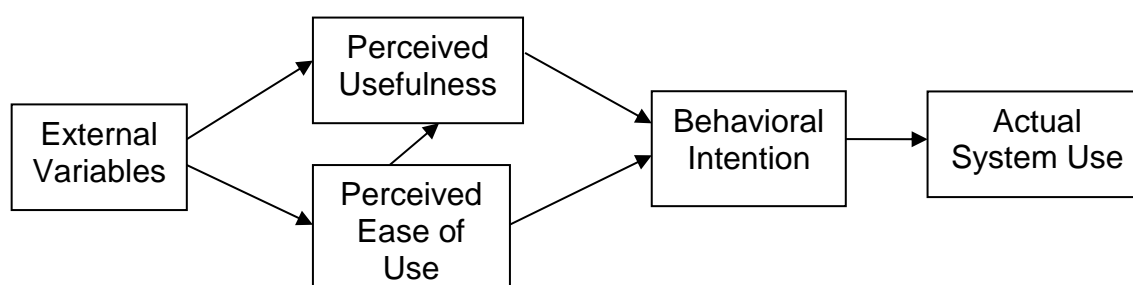

Figure 1. TAM (Venkatesh & F. D. Davis, 1996, p. 453).
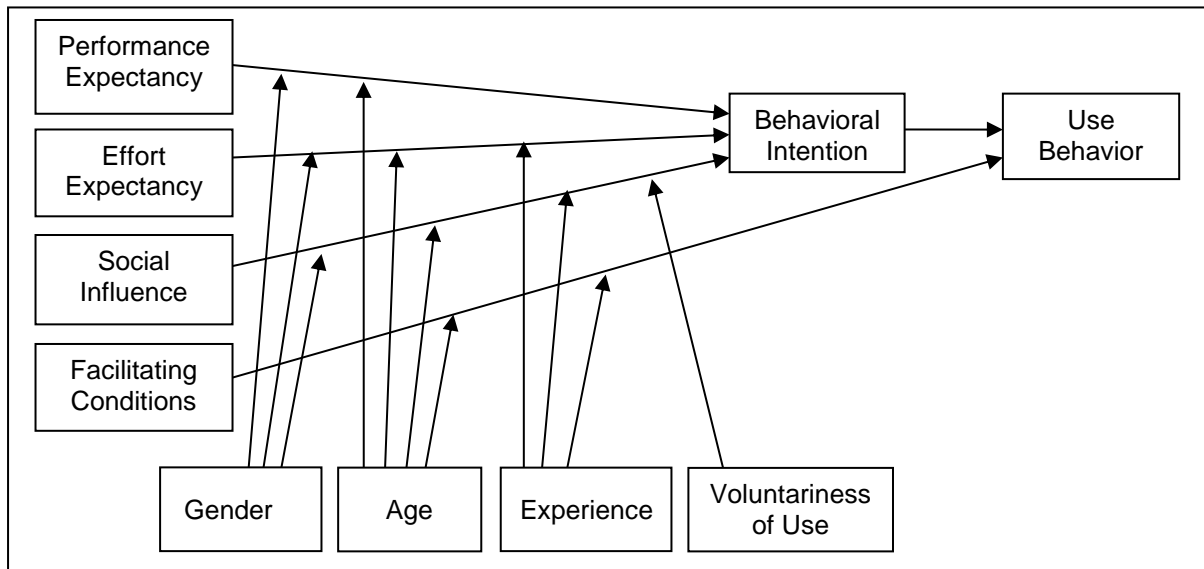Copyright © 2007, John Wiley and Sons; reprinted with permission.

Figure 2. UTAUT.
From V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), p. 447.
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actual use of a technical device. We concentrate on the first use of a new device. For that, we selected a locomotion control device in a walk-in VE, and, for participants, we selected persons who had never been in a VE. The only other technology that somewhat resembles VE is the 3D computer game. Nevertheless, previous studies prove that playing computer games does not affect the VE experience (Alsina-Jurnet & Gutiérrez-Maldonado, 2010; Kuusisto, Ellman, Kaapu, & Tiainen, 2011).

EXPERIMENTAL METHODOLOGY

Our aim was to discover whether individuals who find a technical device easy to use will use it more often than those who find it difficult. In other words, we analyzed whether a correlation exists between perceived ease of use and actual use. Our venue was a walk-in VE and our test involved user movements that could be accomplished either by use of Wanda, a technical device, or by the actual body movements of the participant.

We conducted a laboratory test in a VE with 40 participants from various backgrounds. The test included a guided tour of the VE, followed by the participants completing a navigational task within the environment. In this section, we describe the participants first, and then the test situation in more detail by focusing on the VE (its physical and technical elements, the application used, and the virtual shopping center), and continue with describing the testing process and data analysis.

Participants

The user test comprised 40 voluntary participants' visits to a virtual shopping center. Such a large number of subjects is rare in VE user studies because each VE test takes a long time. The participants need to be taken through the test individually, and a person new to VEs often needs some guidance and practice.

Volunteers were sought by sending an invitation to several e-mail distribution lists, such as a local academic information list that reaches individuals within a local university (students, faculty, and staff), businesses, and the community. One common attribute of all participants was that they were familiar enough with ICTs to read the e-mail invitation and fill in an Internet form to show their willingness to participate in the test. The other common attribute was that they had never before visited any VE.

The average age of the participants was 36, ranging from 18 to 72 years, and the group consisted of more males (26) than females (14). All were native speakers of Finnish, the language used in data gathering. Table 1 shows the detailed demographic information on the test subjects.

The participants were healthy adults who participated in the test voluntarily and were aware that they could, at any time, drop out of the experiment. Furthermore, the participants knew that data were gathered for research purposes. Therefore, for example, a written consent for videotaping during the experiment and interview was obtained. In the analysis and results presentation, the participants remained anonymous. Finally, the data used in the research process will not be available for use by other researchers.

Table 1. Demographic Information of Participants.

Participants' age	Males	Females	Total
Between 18 – 25	10	2	**12**
Between 26 – 39	9	6	**15**
40 and over	7	6	**13**
Total	**26**	**14**	**40**

Test Environment: Small Shopping Center in VE

The technical environment of our test was an immersive walk-in VE, in which an artificial, visual 3D world is generated by a computer through five rear-projection surfaces: three walls, a floor, and a ceiling (see Figure 3). The VE had a floor space of 3 x 3 m and was 2.4 m high. The user wore a pair of liquid crystal glasses that transformed the projected images into active stereo images. The user's view was rendered according to his/her position, with orientation determined by a magnetic tracking system via a wired sensor located within the user's glasses. For the virtual movements, we used an ordinary Wanda input device (Figure 4) that we programmed so that the on/off button toggled between simulating walking at a normal pace and standing still. The user controlled the direction of movement by pointing Wanda in the desired direction.

For this test, we created a model of a small shopping center (Figure 5) using 3D Studio Max software, and we brought it to life with the VR4Max application running on Windows XP. The model included a corridor and three rooms: (a) a product presentation room that provided a table
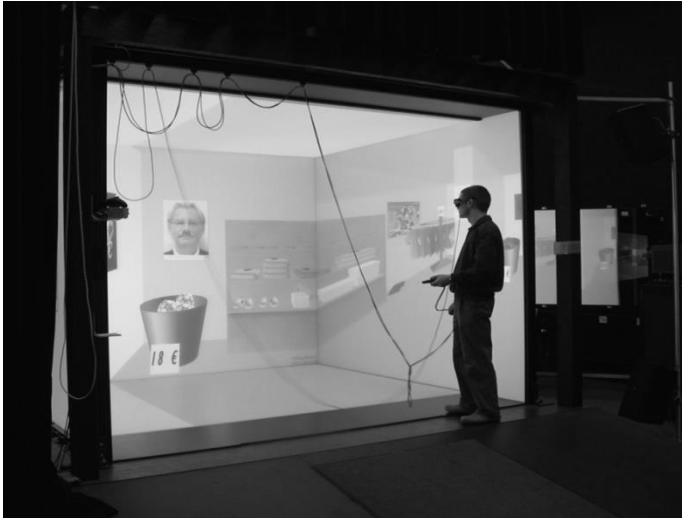
Figure 3. Virtual environment displaying a shop in the virtual shopping mall.

Figure 4. Wanda input device.

with products on it; (b) a sports shop with racks, shelves, and bins of sportswear and equipment; and (c) a clothing shop with wall posters, two mannequins, and racks and shelves of clothing.

The perceived spaces of the virtual shops were larger than the VE physical space (3 x 3 m): The dimensions of the sports shop were 4.3 x 4 m and those of the clothing shop were 4 x 3 m. Because our aim was to study the use of a locomotion control device, we ensured that the users needed to change their position during the testing in the VE. This was achieved by placing virtual walls in the shops to prevent the user from seeing everything from any one position, thereby making the user's movement essential. However, this solution made locomotion more cumbersome. Simple collision detection made it impossible to walk through the virtual walls, although it was possible to walk through other items within the shops (e.g., clothing racks).

Figures 3 and 5 illustrate the test situation. Figure 3 shows the physical test environment, set with the VE sports store, and the tools (i.e., Wanda, the glasses, and cables). Figure 5 provides an overhead view of the virtual shop premises: the corridor and the three rooms.

Test Process

Three members of the research group conducted the actual user tests: an operator responsible for the VE equipment, a research assistant to guide the participants, and a researcher who observed the participants' behaviors. Prior to initiating the user tests, in order to ensure a smooth and well-managed test environment, the three research group members practiced the test procedure by performing two pilot tests. Two doctoral students with no experience in a VE served as the pilot participants.

The participants were taken individually into the VE. At first, the assistant led each participant to the product presentation room, a small virtual room in which the participant could practice taking some steps to adjust their field of view. After some minutes of practice, the assistant supported the participant, as needed, in navigating to the first shop, which was randomly assigned to be either the clothing or sports shop. The assistant asked the participant to
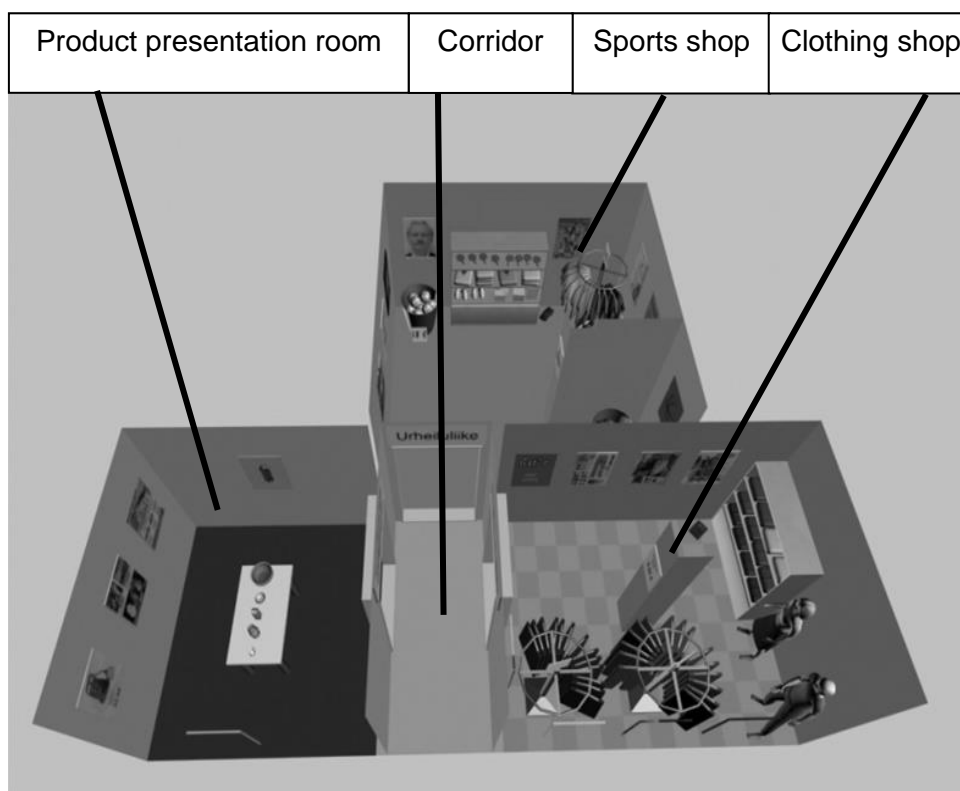
| Product presentation room | Corridor | Sports shop | Clothing shop |

Figure 5. The 3D floor plan of the small virtual shopping center used in the test.

think aloud about whether there would be something interesting available. The participant was asked to focus on the virtual products. Although we guided the participants' focus for their verbal commentary, some of them commented on the VE technology or their own feelings, as well as challenges and concerns.

Before proceeding to the second shop, the research assistant provided additional practical advice on how to use the Wanda device to navigate in the VE. The assistant then encouraged the participants to explore the entire shop. If the participants encountered thwarting problems (e.g., if the participant found themselves "inside" a virtual prop), the assistant aided in solving the challenge. However, the participant could choose how to move within the second shop—either by using Wanda for changing their position and field of view or by taking physical steps and/or using body movements. While in the second virtual shop, participants were again encouraged to think aloud.

In summary, visits to the presentation room and the first shop were for demonstrating to participants the possible ways of locomotion. Physical movements were used in the product presentation room. When the participants were taken to the first shop, the assistant presented how locomotion was controlled with the Wanda device, and the participant practiced. Finally, the second shop experience focused on the participants' own actions for controlling their locomotion.

The participants had 3 minutes to move around each shop unassisted. A short visit was deemed sufficient because the virtual shop resembled a traditional "bricks-and-mortar" shop.

Data Gathering

We gathered data in two ways. First, data related to actual use were captured on video during each test; as such, the data consisted of the actual locomotion by participants. However, only the video recordings of the second shop visits, when participants made their own decisions on how to navigate, were used in the analysis.

Second, because determining the VE users' perceived ease of use requires asking the participants, we used a written questionnaire following the VE visit. The questionnaire focused on the participants' own evaluation of the locomotion control (see the Appendix), which corresponds to perceived ease of use in the terminology of TAM. Based on VE literature and our prior VE research projects, we formulated eight statements. They dealt with the participants' experience of using Wanda and of the virtual space and products. Because prior VE studies have focused on VE technology use, we followed that technology centricity in formulating the statements.

We observed that many participants moved their own body actively for controlling locomotion (i.e., moving forward and/or turning). Therefore, for this study, we selected only the three statements connected to the ease of use of the locomotion control device for analysis. The selected statements, translated to English by the research team, were

> S1: It was easy to learn how to use Wanda for locomotion.
>
> S2: I found the locomotion control unit easy [to use].
>
> S3: When I was controlling locomotion [via Wanda], it was sometimes hard to achieve the direction I wanted.

The participants were asked whether they agreed or disagreed with the statements. We employed an evaluation scale of five units (totally agree, partly agree, cannot say, partly disagree, and totally disagree). The researchers coded the answers to numeric values ranging from 0 to 4. The positive statements, S1 and S2, were coded so that the answer totally agree was given a 4, partly agree a 3, and so forth. For the negative statement, S3, the coding was reversed, with a 4 for totally disagree and a 0 for totally agree.

Analysis of the Data

Of the 40 participants, four males, 22, 23, 43, and 47 years of age, were eliminated from the analysis due to technical problems during in the VE testing or videotaping. Two of these males belonged to the youngest group and two to the oldest (see Table 1).

For the analysis, the data sets (actual Wanda use via video and perceived ease of use via the questionnaire) were first analyzed separately. The combined sets then underwent an additional analysis.

The actual Wanda use data (hereafter *Wanda use*) were extracted by viewing the VE sessions videotapes. We counted how often each participant moved by use of Wanda, the locomotion control device. The participants used Wanda to turn on a few occasions, but, by far, Wanda was used for zooming in and out (i.e., moving the virtual products closer or further away). In addition, the participants used Wanda in very distinct ways. For example, to arrive at the desired location, some participants moved in one continuous motion, while others did so in small increments until

reaching their destination. The latter method resulted in a much higher Wanda-use count for those participants. Nevertheless, all those assessed as actively using Wanda for locomotion exhibited a greater amount of Wanda use than those who were assessed not active.

Perceived-ease-of-use data were calculated from the participants' own evaluation of the three selected statements from the questionnaire. The expression used for the calculation was

Ease of use = Answer to S1 + answer to S2 + answer to S3.

As described in the previous section, statements S1 (i.e., easy to learn) and S2 (i.e., easy to use) depict participants' positive experiences, while statement S3 outlines the opposite feeling (i.e., hard to control). Statement S3 was reverse coded, thus all 3 statements yield a high result for a favorable experience.

RESULTS OF WANDA USE AND EASE OF USE

The participants' Wanda use varied from 1 to 93 times, with a median of 25. Also dramatic was their opinions of Wanda's ease of use, which varied from 0 to 12 with a median of 6. We analyzed the relationship between the actual use of Wanda and its perceived ease of use in three ways. First, we calculated the correlation between them to be 0.22, which is rather low to be significant. By removing the outlier values of 93 (24 higher than the second highest of 69), and 1 (the second lowest was 5), the adjusted correlation was only 0.17, which expresses no significant correlation. Therefore, our first analysis of the data does not support a relationship between the actual use of Wanda and its perceived ease of use.

In a second attempt to expose a possible relationship between Wanda use and perceived ease of use, we drew a two-dimensional figure with these two data sets. Figure 6 presents all users plotted against these two dimensions. The figure reveals that most of those who found it hard to use Wanda (ease of use value from 0 to 2) used Wanda the average number of times or fewer. Those who found the use of Wanda easy (value 10 or more) were evenly split above and below the median in regard to frequency of use. Among those users whose Wanda use exceeded the median value (i.e., 25 times), slightly more found the use of Wanda easy. Moreover, considerable variation existed within the perceived ease of use, ranging across the entire scale from 0 to 11.

Our third analysis of a potential relationship was by comparing opposite groups. For this, we created two separate categorizations. The first was based on the frequency of Wanda use.

Group A contained those users whose Wanda usage exceeded the median and Group B those with usage below the median (Table 2). The separation of the two groups was verified with two-tailed t-tests. The two groups did not differ significantly on their evaluation of the ease of use, $t(10) = 0.87$, $p = 0.2$. The result was the same from the opposite perspective, in which the categorization was based on the perceived ease of use of Wanda. Group C comprised users who found Wanda easy to use and Group D those who did not (Table 2). These groups did not differ significantly in respect to the frequency of Wanda use, $t(91) = 1.2$, $p = 0.1$.

Because both TAM and UTAUT point to gender differences, we analyzed and found in both of our categories a gender bias. Of the 14 women in the study, only four were in the High Use group, as compared to 10 in the Low Use group, while five were in the Easy to Use group as compared to nine in the Not Easy to Use group (Table 2). However, statistical analysis gives
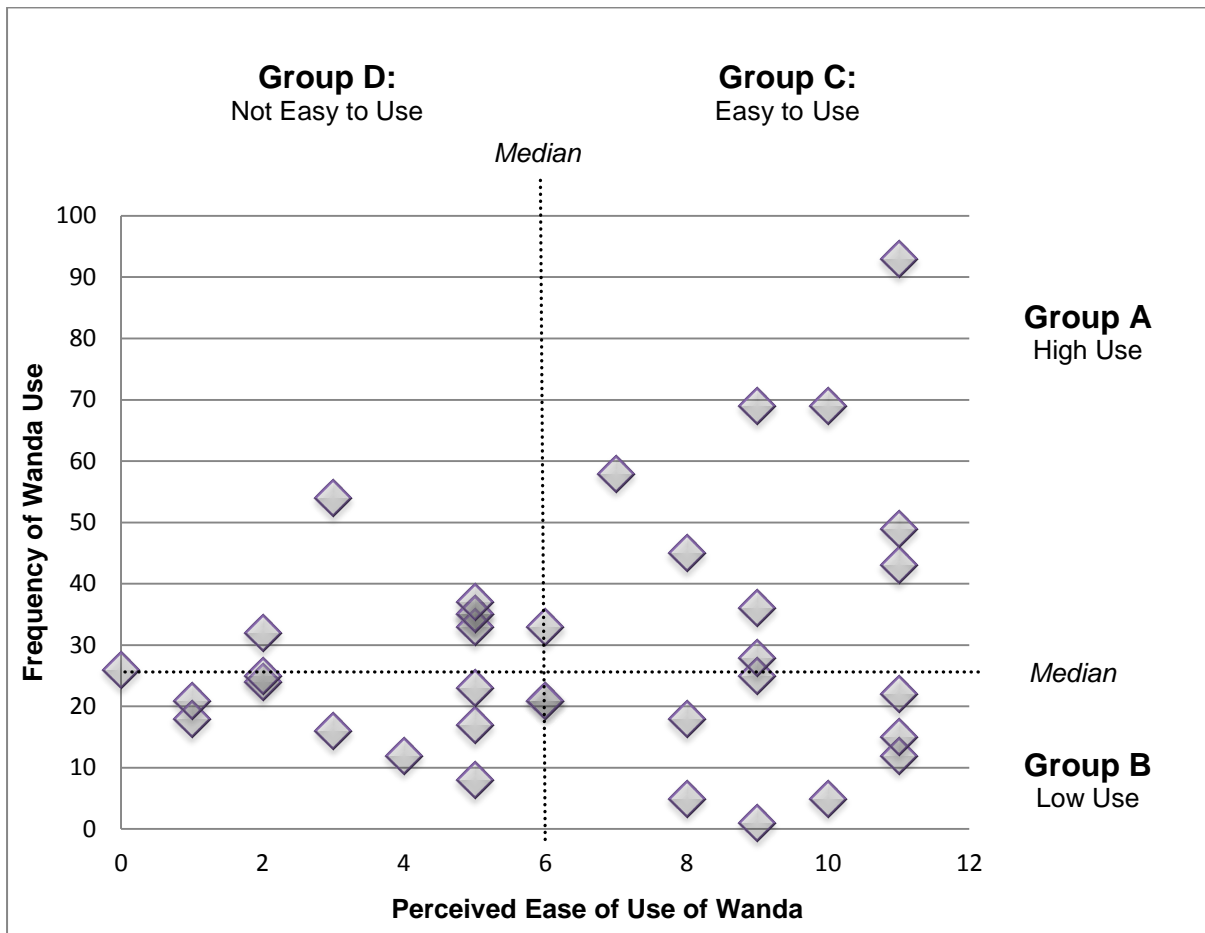
Figure 6. A graph of the perceived ease of use plotted against actual use of Wanda.

Table 2. User Characteristics within Categorizations of Wanda Frequency of Use and Ease of Use.

	Categorization based on frequency of Wanda use		Categorization based on perceived ease of use	
	Group A High Use	**Group B** Low Use	**Group C** Easy to Use	**Group D** Not Easy to Use
Ease of use				
Average	6.9	6.0	9.3	3.6
Range	0 – 11	1 – 11	7 – 11	0 – 6
Frequency of use				
Average	45	16	34	26
Range	26 – 93	1 – 25	1 – 93	8 – 37
Users' age				
Average	34	39	30	42
Range	22 – 72	21 – 63	21 – 51	23 – 72
Gender				
Male	15	7	12	10
Female	4	10	5	9

some support to gender difference within the ease-of-use categories, $t(1) = 3.8$, $p = 0.1$, but no support within the Wanda use categories, $t(1) = 11.6$, $p = 0.4$ (see Table 3). The female participants used Wanda fewer times than the males and found it a bit more difficult. Although both Wanda use groups and both perceived ease of use groups exhibit gender separation, there is negligible connection between Wanda use and perceived ease of use. Among the male participants, the correlation was low ($r = 0.23$; moderate correlation limit is 0.2 and strong correlation 0.6), and was even lower among the females ($r = 0.10$).

Additionally, UTAUT indicates that age is a factor, in that the ease of use of technology is more important for older users. In our study, the older participants found Wanda more difficult to use than did the younger ones, but they used Wanda as frequently as their younger counterparts. This finding is shown by the users' average ages in Table 2. Similar findings are reached with the t-test. The values indicate that the two groups of Wanda use are not separated by users' age, $t(50) = 0.98$, $p = 0.2$. However, a statistically significant difference, $t(50) = 2.7$, $p < 0.005$, is found in users' age between the two perceived ease of use groups (Table 3). Although our test confirms that older participants found the use of Wanda more difficult than did younger participants, the age-related statement of UTAUT (i.e., ease of use has a greater effect on technology adoption by older users; Venkastesh et al., 2003), does not receive support from our data. In other words, if participants found the device easy to use, they were almost equally likely to use it regardless of their age.

Table 3. T-test Values for the Categorizations.

Groups' separation in	Groups A & B Categorization based on frequency of Wanda use:	Groups C & D Categorization based on Wanda's ease of use:
Wanda's ease of use	$t(10) = 0.87$, $p = 0.2$	-
Frequency of Wanda use	-	$t(91) = 1.2$, $p = 0.1$
User Age	$t(50) = 0.98$, $p = 0.2$	$t(50) = 2.7$, $p < 0.005$
User Gender	$t(1) = 11.6$, $p = 0.4$	$t(1) = 3.8$, $p = 0.1$

DISCUSSION

We studied whether a relationship exists between users' perceived ease of use and actual use in the case of controlling users' locomotion in a VE with the device called Wanda. To determine their actual device use, we observed how the participants navigated through the VE test situation and then surveyed them regarding their perceived ease of use of the device. Our study indicates a low correlation between users' evaluation of the ease of use and their frequency of use of the device. TAM and UTAUT state that gender and age are variables that explain the correlation; our study does not give support for that.

In our VE case, the participants' task was to move around a virtual shop. To determine whether the participants wanted to use the technical device, the test situation was set up so that Wanda's use was not compulsory in the final shop. The participants had two alternative ways of carrying out that task: They could either control locomotion with Wanda or move physically by taking steps. Before the participants became engaged in their task, both of the alternatives were presented to them. That optional use of the technology increases the

contribution of our findings. However, this line of research needs to be extended to discover how voluntarily use in technology is shaped. For example, we assumed that participants understood that they had alternatives for locomotion controlling in the final virtual shop because two ways were introduced to them. But it is not known how fully the participants understood the test use situation.

One possible explanation for our results is a phenomenon known as the negative cycle of technology adoption, in which similar prior technology use experiences negatively affect the use of a new technology (Lippert & Forman, 2005; Straub, 2009). In other words, more knowledge about technology is actually a detriment to learning a new technology. In our VE case, the individuals we selected as participants had used IT but had no prior experience in a VE. Nevertheless, it is conceivable that some might connect their earlier experiences of some other technology to the test use situation. A walk-in VE is a technology-oriented environment: In addition to the locomotion control device, the testing environment contained wall-size screens, crystal glasses, and a magnetic tracking system. Those technical elements also might have had some negative effect on the VE test use. The minimal age differences in our results indicate that although the younger participants evaluated Wanda easier to use, they did not use it more frequently than the older ones. This result can be explained with the negative cycle: The younger participants who likely had more IT experience were also more likely to have prior experience that complicated their learning a new technology.

Another possible explanation for the difference in testing behavior could be social influence, which is used in UTAUT. It is defined as the degree to which an individual perceives that others assume he or she should use the new system (Venkatesh et al., 2003). In an empirical study of UTAUT, the participants were asked to evaluate several explicit statements such as "people who are important to me think that I should use the system" (Venkatesh et al., 2003).

In some cases, other people's expectations are known. For example, work situations typically explicitly state what IS and technical tools the staff members will use. In other situations, the expectations are not explicitly stated but exist as norms that are assumed to be known and followed by all community members. One such example provided by Rogers (1995) as a failure of technology diffusion was a campaign in Los Molinas, Peru, encouraging water boiling as a means toward improved health and overall wellness. The campaign did not succeed because the local population linked boiled water to something that only the "sick" or "unwell" consume, and thus the idea of healthy residents boiling their water prior to consumption was frowned upon (Rogers, 1995). So the norms or predispositions of the community can prevent the acceptance of even low-tech innovations.

Sometimes, identification as a community member is seen in a negative light and, as a consequence, technology and other artifacts linked to that community are avoided. For example, Hartmann & Klimmt (2006) found that many girls regarded playing video games unfeminine behavior. However, sometimes norms work in the opposite way, that is, promoting innovation diffusion. One extreme example is that of seeing hackers as heroes who pioneer the use and learning of computer technology (Levy, 1984). However, that works only for those who value hackers highly, so much so that they may join that technology-oriented, innovative community, although some parts of it focus on criminal actions.

When innovations and technology use are linked to a particular community, a person's decisions concerning the use of the product or technology are not just based on usefulness and ease of use but on social issues as well. The effect can be positive or negative. In addition to the

social issues described above, users' personal characteristics also have been found to influence their acceptance of innovations and technical artifacts. One such characteristic, attitude, is defined as a person's predisposition to think, feel, or behave in certain ways towards certain defined targets (Arnold, Cooper, & Robertson, 1998). The defined targets of attitudes may be anything that exists for the individual: tangible objects (e.g., a Wanda device), virtual objects (e.g., a virtual football), people (e.g., an operator), and/or the environment (e.g., a dark room and a virtual shop). In regard to our study, we could surmise that it was not just a question about how participants accept a technical device, but also a larger question regarding the test situation and the participants' attitude toward any or all of its elements.

Predispositions are like a window that allows us to see alternatives but that, at the same time, restricts our view (Kuosa & Basden, 2000). When pondering the reasons for differences among people in accepting or starting to use new technical devices, both social features and personal characteristics need to be analyzed. UTAUT includes both elements, but within a narrow perspective: Social influence involves only other people's expectations on user behavior, and personal characteristics encompass only gender, age, experience, and voluntariness of use (Venkatesh et al., 2003). However, those features do not explain the differences in our case. Instead, we propose that to identify reasons for the differences, participants' predispositions need to be analyzed. That can be done by focusing on the social norms of the participants' communities and the participants' attitudes towards all the elements of the use situation.

CONCLUSION

We studied correlation between the ease of use and the actual use of a device. The idea for studying this correlation is based on TAM, which states that individuals' IS acceptance is determined by perceived usefulness and perceived ease of use (F. D. Davis, 1989). We studied the use of a locomotion control device in a VE. This context was chosen because the technology involved in a VE is as unfamiliar for non-ICT-professional users today as computer technology was at the time of TAM creation. We gathered the data in two ways: participants' were asked via a questionnaire for their evaluation of the ease of use, and the actual use of the device was determined through viewing video recordings of the participants' test use. The analysis indicates no correlation between perceived ease of use and the actual use of the device by the users.

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Appendix

This survey was provided to participants following their experiment within the virtual environment. The instrument was conducted in Finnish for native Finnish-speaking participants and has been translated into English here by the researchers.

Please, evaluate the following statements
(totally agree, partly agree, cannot say, partly disagree, totally disagree)

S1: It was easy to learn how to use Wanda for locomotion.

S2: I found the locomotion control unit easy [to use].

S3: When I was controlling locomotion [via Wanda], it was sometimes hard to achieve the direction I wanted.

S4: In the first shop, when the assistant used Wanda, I was able to get a good look at the products.

S5: When I used Wanda, I could concentrate on the products that I found most interesting.

S6: I found the virtual space felt more like a real shop when I controlled the locomotion using Wanda.

S7: With the help of the assistant I could focus just on those products that I wanted to look at.

S8: I was not taught well enough how to use Wanda.