"Am I Getting It or Not?" The Practices Involved in 'Trying to Consume a New Technology

Paschalina (Lilia) Ziamou
Zicklin School of Business
Baruch College, The City University of New York

Stephen Gould
Zicklin School of Business
Baruch College, The City University of New York

Alladi Venkatesh
CRITO (Center for Research on Information Technology)
University of California
Irvine CA 92697
email avenkate@uci.edu
http://www.crito.uci.edu/noah

February 2010

(Forthcoming ***Journal of Product Innovation Management***)

"Am I Getting It or Not?" The Practices Involved in 'Trying to Consume a New Technology

ABSTRACT

In recent years, high rates of failure of technology-based products have spurred interest in understanding the psychological and sociological barriers to consumer learning of technological innovations. We conducted a real-time study of consumers' initial interactions with a new technology using verbal protocols in order to understand consumers' learning experience. We identified three major factors that hinder the consumer's learning process: (a) interface and functionality practices, (b) social influence, and (3) causal attributions. The results show how each factor hinders the learning process and suggest how managers can influence consumer learning of technological innovations.

The consumption of technological innovations is an increasingly important area of consumer research (e.g., Hoeffler 2003; Rijsdijk and Hultink 2009). In the process of 'trying to consume' or to use a new technology-based product, a consumer may go through a series of trial steps with uncertain outcomes (Bagozzi, Davis, and Warshaw 1992). As a result, consumers' interaction with technological innovations is very complex, and this complexity is likely to impact their adoption decision (e.g., Hill, Smith, and Mann 1987; Rogers 1995). Other research suggests that high levels of complexity often frustrate the user (e.g., Mick and Fournier 1998; Thompson, Hamilton, and Rust 2005), and are likely to affect the rate of use (Shih and Venkatesh 2004) or lead to purchase delay (Wood and Moreau 2006).

The importance to understanding consumers' interactions with technological innovations in order to design products that are intuitive and easy to use has also been an important priority for major firms. Companies are increasingly involved in 'activity-focused' research methodologies, such as observations of user interactions and interviews (Veryzer and Borja de Mozota 2005). Intel, for example, created the People and Practices research group that focuses on understanding how people live and work with technology, and develops valuable insights for new products that offer new ways to interact and enhance consumers' experience (www.intel.com). In a similar vein, Nokia Design consists of a group of 250 multidisciplinary researchers worldwide who study consumers' interactions with technology-based products around the world (Hempel, 2007).

Although the role of complexity in consumers' response to technological innovations has been recognized by both researchers and major firms, relatively little is

known about the different dimensions of this complexity. Existing research on consumer learning of technological innovations focused primarily on consumers' response to verbal descriptions of new products, although such descriptions do not allow consumers to fully or accurately anticipate their actual experience with the new product (Hoch and Deighton 1989). Furthermore, prior research has primarily focused on treating learning as a single point as opposed to an ongoing process. Recent researchers, however, highlight the need for process-tracing approaches when studying consumer interactions with new technologies (Hoeffler 2003; Mittal and Sawhney 2001).

In this research, we focus on consumers' initial interactions with a technology-based product in real time, in order to understand the consumer's learning experience as it unfolds. Our goal is to investigate how consumers cope with high levels of complexity during their initial interactions with a technology-based product and how their coping strategies may hinder the learning process. Focusing on this early stage of the learning process is critical since learning cost is particularly high at the early stages of consumers' interaction with a technological innovation (Murray and Haubl 2007). Specifically, we use verbal protocol measures in order to understand the consumer's learning process as s/he interacts with a technology-based product in real-time. Our approach is consistent with recent calls for process-tracing approaches (Hoeffler 2003; Mittal and Sawhney 2001). In this regard, process-tracing is the accessing and following of a learning task from some beginning point to some end point such as a response (Todd and Benbasat 1987), and verbal protocol analysis is the most comprehensive method for understanding the process of consumer learning when they

first encounter a technological innovation (Krahmer and Ummelen, 2004; Carroll, et al. 1987).

The remainder of the article is organized as follows: The first section selectively discusses prior research on consumer learning and technology acceptance that is relevant to the purpose of our study. Following an approach similar to the one taken by Mick and Fournier (1998), we lay out the framework of our research that allows us to organize the literature while setting the stage for reporting the emerging study findings. The second section describes the methodology used in this study. In the findings section we describe three themes that emerged from the analysis of our data. We conclude with a summary of our findings and their contribution to our understanding of consumers' response to technological innovations.

CONCEPTUAL BACKGROUND

Technological innovations often involve novel interfaces that are critical to how people interact with a new product to obtain its intended benefits (Hoque and Lohse 1999). By interface we refer here to the specific means by which a consumer interacts with a product to obtain a particular functionality (e.g., keyboards that are used for word processing, screens that are used for reading the words, voice-activated software) (Hackos and Redish 1998). New interfaces imply novel tasks for the consumer. For example, when interacting with a new handheld wireless device that uses handwriting recognition technology as its interface, consumers need to perform a novel task (i.e., write in a manner that will be understood by the device) to obtain the benefits of the product (e.g., write memos). Engaging in novel tasks implies significant learning cost for the consumer and it is likely to hinder the learning process (Murray and Haubl 2007).

Learning cost refers here to the “cognitive effort required to accumulate the knowledge necessary for effective usage”, that is to say, the time, effort, and energy that are required to learn how to use the product (Mukherjee and Hoyer 2000, 463).

In the marketing literature, researchers have traditionally adapted Rogers’ (1995) innovation adoption framework, which lists various factors that influence consumers’ decision to adopt a new product. For example, Rogers identifies various innovation characteristics that are likely to influence adoption. Among these, compatibility, trialability, and complexity are closely related to the learning process. Underlying the notion of compatibility is whether the consumer understands the essential elements of the product and is in a position to make the initial judgment about its potential usefulness for his or her needs. Trialability refers to whether the consumer has the required knowledge associated with the successful use of the new product. Complexity is related to trialability in the sense that if the product is too complex, the consumer has to undergo some level of learning before gaining the requisite knowledge of how to use the product effectively. In addition to the innovation characteristics, Rogers’ framework also incorporates the effect of social influence, which is another important factor of consumer acceptance of innovations. This factor refers to the fact that certain individuals can influence consumers’ learning about a new product by spreading information.

In previous studies, consumers’ intention to adopt a new product and their perception of these factors are typically assessed by responses to a set of scales, after reading verbal descriptions of the new product. While this approach is important and is still valid, it represents a static model and does not reveal the consumer’s learning

process when interacting with a new and unfamiliar product for the first time. Thus in prior research that follows Rogers' framework, the actual learning process remains a black box. Our research attempts to fill this gap by examining consumers' initial interactions with a new technology-based product, in real-time as the learning unfolds. We use consumers' verbal protocols in order to capture and understand further the process of learning about a new product in actual use situation. Our goal is to investigate consumers' coping strategies during initial interactions with technological innovations and how these coping strategies may hinder the learning process. In the remainder of this section, we identify three coping strategies that are extracted from prior research and are the focus of this study.

Interface and Functional Practices

Research on knowledge transfer suggests that when consumers are confronted with a new product, they attempt to understand it by relating it to an existing product category. That is to say, consumers attempt to transfer knowledge from an existing product category to the new product. For example, when consumers encounter WebTV for the first time, they may refer back to their knowledge of video games because set-top boxes for Web TV and video games are similar in appearance (e.g., Feiereisen, Wong, and Broderick 2008; Gregan-Paxton and Roedder John 1997). Furthermore, research on technology-based products suggests that when consumers encounter a new product, they encode information on both the interface and the functionality (Young 1983; Ziamou and Ratneshwar 2003). That is to say, when interacting with technological innovations, consumers access information on prior interface and

functional practices. Our goal here is to gain insights on how consumers' prior knowledge of interface and functional practices serves as an anchor during their initial interactions with a technology-based product, and how these prior practices are likely to impact the learning process.

Social Influence

The next factor in our framework is social influence, a factor related to Rogers' (1995) concept of social communication. Rogers' framework and prior research focused primarily on how external social influence (e.g., expert opinions, media) and interpersonal social influence (e.g., word of mouth) affect adoption (see Gatignon and Robertson 1991 for a review), and the evolution of product markets from a socio-cognitive perspective (Rosa et al. 1999). Recent research in the field of human-computer interaction, however, suggests another aspect of social influence, that of social learning, is likely to be linked to technology use and acceptance (Mayes and Fowler 1999). This conceptualization comes from the idea that people learn about a given object by observing other people acting on the object (Bandura 1977). In this research, our goal is to understand how in addition to prior knowledge of interface and functionality practices, consumers use their observations of others interacting with a new technology-based product and how these observations may impact the learning process.

Causal Attributions

The use or prior knowledge of interface and functionality practices and social influence impact learning of a novel interface and subsequently may lead to disengaging depending upon the nature of consumers' causal attributions. Causal attributions are essential to our understanding of the consumer's learning process (Bettman 1979) and prior research has identified several dimensions (Folkes 1984, Weiner 2000). The most important dimension from the present study's point of view is the dimension of locus: whether the cause of a product's failure to meet expectations is attributed to the consumer or to the manufacturer (Folkes 1984). Several studies have demonstrated a self-serving bias in explanations for success or failure (Ross and Fletcher 1985). Consumers tend to attribute success to their own abilities and their failures to external factors such as task difficulty. Research in psychology also suggests that causal attributions are often made based on information stored in memory and concerning past experiences of similar situations (Frieze and Weiner 1971). When individuals' actions are consistently perceived as not leading to positive outcomes, self-serving attributions are hard to sustain, and they tend to assume personal responsibility for failures (Standing et al. 2006). This can lead to feelings of helplessness and resignation for fear of being implicated further in failure (Cutrona, Russell, and Jones 1985). For example, when consumers interact with a technological innovation, a failure to learn is likely to activate the challenges and frustration of past experiences with new technologies, stored in memory, and consumers are more likely to attribute failure to themselves (Frieze and Weiner 1971). Our goal here is to investigate how consumers

arrive at causal attributions in the early stages of the learning process and how these attributions may hinder exercising greater effort in learning.

Figure 1 presents a schematic diagram of our framework.

Insert figure 1 about here

METHOD

Previous research on human-computer interaction suggests that the best understanding of how users learn to use a new technology comes from talking with them about the task they are performing while they are doing it (Hackos and Redish 1998). Their experience, called the "user experience" by Norman (1998), is thought to privilege real-time action rather than the mediation of conscious thought or rationalization after the experience (Nielsen 1993). Based on these findings, this research uses verbal protocols recorded in real time during consumers' initial interactions with a new technology-based product. This method involves having the participant use a device for a given set of tasks while being asked to say out loud what s/he is thinking in carrying out a task (Preece et al. 1994). The strength of this method is that it shows how and why users are interacting with the interface *while* they are doing it, in order to avoid later rationalizations (Nielsen 1993; Rubin 1994). Ericsson and Simon (1984) suggest that probing based on the immediacy of concurrent or close-in-time retrospective reports is very likely to allow participants to achieve considerable insight into their cognitive processes. Ericsson and Simon are especially critical of

asking people about behaviors, such as learning, sometime after the process is completed and applying researcher-based criteria to the very different understandings of these people. They point out that the concurrency of thinking aloud with an activity is critical to our understanding of the learning process. Moreover, this technique enables the researcher to record participants' emotional reactions such as confusion or frustration (Rubin 1994). Participants in the present study were asked to think aloud while performing the task of learning to use a novel interface: handwriting recognition incorporated in a Personal Digital Assistant. Researcher involvement was minimized to the degree possible to avoid contaminating the consumer's own thought processes (Olshavsky and Spreng 1996).

Procedure and Sample

The data collection procedure involved individual sessions of about 30 minutes with neophyte consumers who were instructed to think aloud while interacting with the product for the first time. There were 37 participants in the study, a subject pool of undergraduate business school students drawn from a marketing department at a major urban university in North America. The participants ranged in age from 19 to 42. Twenty-one were female and 16 were male. Pseudonyms were assigned to protect the participants' anonymity.

The Personal Digital Assistant (PDA) with handwriting recognition as its interface was chosen for this study because it incorporated an interface that was novel to many in our population of students. The main task for the participants was to learn how to use *Graffiti* writing – i.e., the product's handwriting recognition software. Participants were

screened for prior use of PDAs, and only those who were not prior users were included. Participants were informed that the purpose of the study was to understand how consumers learn to use a new product. Furthermore, they were told that they would have to think aloud while performing certain tasks and that their thoughts would be recorded for further analysis. The interviewer also explained that she would not provide any help, but would occasionally prompt the participant. Next, the interviewer used a warm-up exercise to make sure that the participants understood the procedure. After that, the interviewer introduced the PDA and described the task. Specifically, participants were asked to turn the device on and go to the "Welcome" icon, which appears as soon as the device is turned on. This icon would lead participants to "*Graffiti* writing." The participants were also given the product manual and were told they could use it as often as they desired. Such instructions and manuals are a rarely encountered topic in consumer research, but, according to Killingsworth and Gilbertson (1992), they help to explain and encourage use of a new technological device. When the participants came to the point where they were prompted by the PDA's introductory screen whether they wanted to learn *Graffiti* writing, they were told by the interviewer to proceed with this task. They were also instructed to think aloud about that task and some prompts were given. Their thoughts were recorded and later transcribed for further analysis by the researchers. At the end of the exercise, a few summary and semi-structured questions concerning the PDA and the participants' experience with it were asked to gain further insights.

Next, we proceeded to a thematic analysis in which interpretations were generated by the researchers going back and forth between the transcribed texts, the

developing interpretation, the new interface itself, and also relevant literature (Allen 2002; Gould 1999; Waterman and Newell 1971; Yang 2000). In this process, we sought to evaluate the initial learning experience, evaluate the *a priori* concepts, specify the emergent themes, and finally to provide as rich and as comprehensive interpretation as the data will allow.

FINDINGS: THE PROCESSES INVOLVED IN LEARNING TO USE A NOVEL INTERFACE

In this study, the texts of the consumers' initial encounters with the PDA revealed the emergence of a set of interacting and dynamic processes. This dynamism is important to consider in studying learning as indicated above because most studies of consumer learning have tended to be static. The narratives that emerged are internalized stories and understandings that the consumers themselves have constructed and are constantly updating. Consumers went back and forth between various aspects of the process, including the PDA, itself, instructions when used, prior experiences reflecting transferred knowledge, and their own thoughts.

We find that there is not necessarily one endpoint but instead many potential endpoints of learning that are intermediate to other points as manifested in the various practices, influences, and causal attributions discussed below. This learning process is largely similar among our respondents, though particular aspects, expressions and pathways often vary. As this process continues, new construals emerge, change the dynamic, and comprise what we call learning. Our analysis expands on the three

themes identified in the conceptual framework and sheds light into consumers' learning of a technology-based product during.

Interface and Functionality Practices

Consumers use new technologies in order to gain some perceived benefits. In doing so, they engage in culturally prescribed learning practices that are informed by their own continual learning and set up meaning and expectations based on transfer from prior experiences and the tacit standards embodied in existing products. Thus, consumers have developed certain understandings of these practices, based both on what they learn culturally and on their own individual experiences. As suggested by prior research, there are two major aspects of using a technological device that comprise the following practices (Hackos and Redish 1998; Norman 1998): (1) interface practices (i.e., human-device interactions) and (2) functional practices (i.e., capturing the benefits obtained from technological devices).

Interface Practices. In relation to practices, the interface should be viewed as more than a mere physical artifact since interacting with it reflects such things as the meanings, behaviors, organizations, and instructions involved in the process of application (Wenger 1998). Participants know how to write, of course, but the use of the stylus required learning and practicing a new, although not altogether unrelated, task. How consumers use and relate to the interface and each of its components situate and comprise a set of practices, both individually and culturally construed.

Prior research in human-computer interaction suggests that a series of components comprise an interface of a technology-based product (Preece et al. 1994). A product's interface includes physical input devices and virtual objects. *Input devices* transform information supplied by users into data that technology-based products can process (e.g., stylus, mouse, keyboard). *Virtual objects* have no existence except when the technology-based product is operating (e.g., cursor, touch-sensitive areas, lights).

In terms of discourse, it is not surprising that common interface terms such as keyboard and cursor were used by the participants. Primarily, the discourse of technology as we found it often takes on comparative meaning and significance across devices such as personal computers and the PDA. In practice, consumers came armed, albeit tacitly, with preconceived ideas and understandings and looked for them as they explored the technology at hand, namely the PDA. Our data show how these preconceived ideas and understandings interfered with the consumer's learning process.

A major concern with the PDA input mechanisms in our study related to the absence of a comparable keyboard. In particular, interacting with the PDA through the *Graffiti* writing rather than a keyboard generally was the most absorbing task. For example, Lynn (19), having in mind a computer, declared:

> *Lynn:* I didn't know there wasn't a keyboard on it. I thought there was a keyboard on it. I thought that there was a keyboard on it, but there is not.
>
> *Interviewer:* A keyboard. You mean…
>
> *Lynn:* Like, like, a, like something where you type in the letters instead of writing on it.

Interviewer: You type instead of writing. Why did you think of that? That there was a keyboard.

Lynn: Because that's how most of them were like.

Interviewer: 'Most' meaning?

Lynn: Like most products, like.. for writing phone numbers, and like e-mails and stuff, like, that you need.

Interviewer: A keyboard.

Lynn: In order to do so.

Another study participant, Susan (21), made a more tacit comparison of the PDA keyboard to a computer keyboard when she looked for a key that capitalized:

The instructions are ambiguous. It's like too complicated to understand. It's not simple. It's too detailed in a way. I don't want to read it. I just want something to capitalize. And there's no function here that says capitalize. I see the "Shift" and "Lock" but you can't press it. So that's the problem.

Jim (23) reflected his prior understanding of the basic power button, which didn't work the way he had expected:

Jim: The screen remained the same basically. I guess the power button didn't work as I expected.

Interviewer: You wanted to go back to the main menu right?

Jim: Yes, I wanted to go back to the menu. So I guess I kind of just... The instructions don't give any options for this particular situation. So, I am trying to

use the power button again. It just gives the sound. It doesn't turn off. It doesn't disappear. The screen still remains. I pressed the memo pad that gives the power tips. I guess it gives a different option to use power tips, which I could use but I don't need them now.

As another example, Marisa indicated that she had an established process of typing and referred to virtual objects that exist in other devices (23):

Actually, since I am so used to use the computer, I am used to always type next to the blinking cursor and I just realized that I shouldn't be typing there. I should type in at the bottom.

Julie (20) was initially pleased with the way the main menu was organized but ended up being very frustrated since she was also not able to figure out how to write:

Julie: And there are so many different features and I thought that it's fun, like it's interesting to play around with it. But, I don't like it because it's not as easy to use as it seems. When you look at the main menu it seems like it's so easy, like when you play with a cell phone. It's like very, very simple.

Interviewer: What made you think it was easy to use when you looked at the main menu?

Julie: Because everything was so, like so organized looking. Everything was organized. When you looked at it, it just seemed like very, like very straightforward.

Interviewer: This is interesting. Tell me a little bit more. Why did it look straightforward?

Julie: Because it looked organized. It's very like, it's set up nicely in rows, the headings are very clear, like what you are doing, you know.

Interviewer: So when you looked at the main menu you thought this would be easy to use because it was well, the information was well organized. Okay, and then?

Julie: And then when you went into the different menus it was pretty easy because it had explanations. But this whole writing thing just threw me off. I just don't like the writing.

Susan (21) found the new interface complicated and frustrating and was challenged to perform a new task while struggling to draw on familiar practices and interface components (i.e., virtual objects) that characterize a personal computer:

Susan: It's complicated and frustrating.

Interviewer: Complicated and frustrating. What's complicated about it?

Susan: Actually writing the words. It takes time to practice, to remember that upper case "L" is… I mean the difference between an "i" and an "l" is one stroke or two strokes or something. So it takes time to practice writing letters. And there is really little functions that you can see and use. Like there's no function for 'Cancel' or 'Erase'.

Interviewer: What did you expect? You said there is no function for 'Cancel' or, what else?

Susan: Erase.

Interviewer: Erase, ok. So what did you expect?

Susan: Like a computer! They have an "X" on the top for close and a "Delete" button like a computer.

Interviewer: What makes you think this should be like a computer?

Susan: Because it's functioning like a… it's being used like a tool to make our lives easier. So just like a computer. They have buttons to cancel and this doesn't.

Functional Practices. Generally, consumers use technological devices to achieve some function, such as writing a paper, sending an email, or creating a spreadsheet. Most of these functions are also cultural practices that have a long and prior history to the invention and diffusion of the technological device where they are often now performed. For example, spreadsheets and various accounting functions predate computers, but have migrated to them from other media (e.g., pencil and paper) in terms of what is intended to improve functionality (i.e., increase convenience and speed). Functional practices and understandings emanate from much the same types of sources as interface practices, namely individual experiences. However, the particular sources may vary. For example, a person may use a word processor on a personal computer and later migrate to a handheld device that incorporates a word processor, which may provide similar functionality.

The study participants often mentioned functional aspects of the PDA. This focus on functionality was largely based on prior knowledge of functionalities provided

by other devices, and it was assumed the PDA would do many of the same things computers or other devices did. Such assumptions are likely to obstruct the learning process since consumers will look for and try to obtain functionalities that the device cannot actually provide. For example, Stephanie (21) inferred possible uses of the PDA in the following way:

> *Stephanie*: I mean, I guess it's useful. It just takes a little longer to figure it out. How to use it.
>
> *Interviewer*: Yeah. What do you think is useful about it?
>
> *Stephanie*: I mean the fact that you can store a lot of information, like numbers and addresses, and… I am not sure what else it does, maybe… does it give you access to the Internet, like email and stuff like that? I don't know. Probably that's what I am assuming.

The study's participants also made many links between the functions of the PDA and those of other devices. For example, Jim (23) thought it acted like an organizer:

> Basically, what I liked about this, it gives an option to, if you get used to this product it gives an option to use it anytime you want to write something down. Some sort of a memo or something. If you need something to write down something really quick, you could use this product. This will be really useful. Also I saw all these options. Given different types of, like, memos for myself, let's say if I need to, I don't know, I didn't read the instructions, but if it gives like some sort of options, if you need something to do and you need the memo it gives this option. So, you just write down, it's like an organizer basically.

Laura (21) made the natural assumption that one could surf the Web with the PDA, although that was not true with this particular device:

Laura: The function that would be most useful is surfing the Web.

Interviewer: Why?

Laura: I have to get my email. And surfing the Web to search for something I need like restaurants or information. Like an encyclopedia.

Marisa (23) finds that the PDA will eliminate the need for other devices in that it will provide their functionality:

Marisa: I think the most useful is that it would eliminate other smaller devices. Other devices that you need to carry around. You have your address book and your date book and your calculator. Usually that's what you have. I am wondering how many numbers you can store but I assume quite a bit. I was wondering if this could somehow be a portable phone, a cellular phone, if you could email someone by using this device.

In the course of this study, although consumers clearly mentioned several functionalities they expected from the PDA, they did not attempt, most of the time, to obtain these functionalities. This was due to the fact that consumers were most concerned with the task given to them, namely to navigate and interact with the interface in order to learn *Graffiti*. In a real-life situation, however, consumers will obviously attempt to obtain the functionalities they expect from the device. Such

attempts are likely to interfere with their learning process when the device will not be able to provide the expected functionalities.

In summary, the process of learning with respect to interface and functional practices involves applying, situating, and recontextualizing prior experiences and meanings in new settings. These experiences are performed behaviorally while being simultaneously and recursively translated, monitored and constructed in terms of thoughts, feelings and discourse (Azevedo et al. 2004; Verhoeven and Graesser 2008). Our study suggests that prior interface and functionality practices are likely to hinder the consumer's initial learning process to the degree that consumers look for interface or functional elements that are not there in the device or that work differently than they were accustomed to with other devices. Such misconstruals lead them down the wrong path and needlessly consume time and effort.

Social Influence

In the present study, we did observe indirect learning based on observation of others who had used the PDA. In this context, learning involved both imitation and identification in which a consumer imitates in a more generalized way than a specific one (Baran and Meyer 1974). Moreover, it is likely in the case of learning to use the PDA that there may be delayed imitation, which, according to Baran and Meyer, involves an individual observing a behavior and reproducing it at some later time. For example, this would mean, as was the case in our data, that a consumer in the present situation would draw on his/her own memories of seeing others use the PDA, and then,

in a more generalized way, attempt a similar reproduction and identify with the practices s/he had observed.

Consumers remembered seeing others using the product, but did not have much insight into the actual details of use. For instance, Paula (21) was one of the informants who observed others using a PDA. She drew insights about the PDA's interface at the very outset of the learning process in querying about a stylus before she actually found it:

Paula: I thought there was a little pen?

Interviewer: Did you see it there, the little pen? How did you think about it?

Paula: Well, a friend of mine has one, but I never used it.

Interviewer: Oh, okay but you saw him using it.

Paula: Yes.

Such social learning may hinder the learning process since consumers' observations are often inexact or misleading, thus leading the learner to a dead-end. In our study, consumers had vague memories about the way others were interacting with the product and often made assumptions about the product's interface. An example is provided by Stella (20), who was unable to locate the stylus on the back of the product and decided to use a regular pen:

Stella: OK, the phone. It says accessories and there are some Address Lists. I'm in Address Lists now. It says accessories and technical stuff. OK, right now I again try to press the scroll button, but it doesn't seem to be responding in any of the—you know whenever I press the button for the field. OK, now I'm going for

the third button, which has lines and sort of boxes, which you have to check off on the side. As far as I remember, I saw other people using this kind of a thing and they used a pen or something to control the screen. They like – it says New Details Show. So I remember, they probably pressed on these things, and they got you know the rest of the screen to come up, obviously.

Interviewer: Yeah, where did you see them?

S*tella:* Where did I see them?

Interviewer: Yeah.

S*tella:* On the train, I have a neighbor that uses that thing, this particular product. It's mostly business people. I also work in the corporate environment and I have—I saw a couple of co-workers using this kind of a product.

Interviewer: Yeah, you told me that you saw other people using it with a pen or something.

S*tella:* Right.

Interviewer: Did you just think about it right now, or did you think about this when we started?

S*tella:* Yeah, it just occurred to me. It just occurred to me that these buttons are, there's no button on the product itself that controls the screen, other than giving me the Main List. So, and I just remembered that there was a pen that comes with this product, that probably does control the screen. OK, so, I tried out every button on this, on this, I forget the name.

Interviewer: The PDA.

S*tella:* Right, yeah**.** I have a pen, it's not the one I saw them using, because that one probably comes with the product. So I'm gonna try using the screen.

Others situated the potential functionality of the PDA based on observations of others. Stephanie (21) inferred uses of the PDA by identifying with a friend's use of it:

Stephanie: I mean, I guess it's useful. It just takes a little longer to figure it out, how to use it.

Interviewer: Yeah. What do you think is useful about it?

Stephanie: I mean the fact that you can store a lot of information, like numbers and addresses, and I am not sure what else it does. Maybe, does it give you access to the Internet, like email and stuff like that? I don't know. Probably that's what I am assuming.

Interviewer: Why? Why are you assuming that?

Stephanie: I mean, maybe you could load stuff into it, like information, like the weather, or I know that my friend is using it for that.

In this case, the consumer in our study drew on her memories of her friend using the PDA. However, she also inferred possible functionalities of the PDA. Such inferences are likely to obstruct the learning process since consumers will devote their time trying to find out how to obtain functionalities that the product cannot actually provide.

Participants dynamically drew on their various idiosyncratic experiences and cultural understandings to manage their given tasks and construct interpretations of

what they were doing in attempting to use the PDA. In this attempt, their observations tended not only to be secondary to their own real-time experiences, but also at times impeded them in their learning as they followed unavailable or irrelevant paths. In summary, social influence in the form and construction of past observation may, like other learning inputs and experiences, obstruct the learning process.

Causal Attributions

Our research suggests that the nature of causal attributions is often based on consumers' prior beliefs about technological innovations. Participants seem to have prior beliefs on the users' limited ability to interact with technology-based products, and the manufacturers' ability to introduce superior products that are easy to use and perform as expected. Specifically, respondents seemed to feel responsible and blame themselves when they were not able to achieve their learning goals and obtain the desired functionality. They seemed to believe that the manufacturer is not responsible for making the product easy to use. Our data reveal that such beliefs lead to user frustration and as a result interfere with the learning process and sometimes lead to its termination.

For example, Ron seemed convinced that he was doing something wrong:

> *Ron*: It's sturdy and from its opening screen you can see that it has many capabilities. But the first time I went through I can't get it to work. It's a little disturbing because this costs several hundred dollars and I don't see what I am doing wrong. I am sure there is something I am missing. I am not sure what it is.

Lisa attributed her problems to the “user’s capacity,” apparently a third-person reference to herself. She mentioned explicitly that learning to use the product depends on the capability of the user and that the manufacturer was not responsible for the product’s failure to perform:

Lisa: The only thing I disliked about that, it is because I was not able to do, like typing the letters and the numbers I thought that I will just have to type.

Interviewer: But it didn’t work?

Lisa: No, it didn’t work.

Interviewer: Do you have any idea why things went wrong?

Lisa: Actually, it does not depend on the manufacturer; it depends on the user’s capability to use electronics.

John’s attributive thoughts reflected a prior belief about new products in general:

John: I thought it was a little difficult to get into but that’s how it is with everything, with all products. At first you have to get used to it. You have to know what they mean by *Graffiti* as opposed to what you have in your mind already as *Graffiti*. You just adapt to it.

Once again, the emphasis here is on the consumer who is expected to adapt and get used to any new product. This belief that the user’s capabilities determine whether or not the product will provide the expected functionality led respondents to pose some hypotheses about what type of person they were when compared to others. For

example, Stella (20) made a comparison between herself as an ordinary person and geniuses:

> At first I was frustrated, because I couldn't find the button to go back. I tried to use every possible knowledge I had. Obviously that did not work. And I tried to go to the manual. Didn't work. So for the first 20 minutes I was very frustrated trying to and I know that this product was designed for regular ordinary people, not Einstein or anybody else. So we are supposed to figure it out at some point.

In another example, Paul (22) revealed that he feels intimidated by technology-based products and specifically the PDA. He also made several self-attributions, including some based on his cultural background, in explaining why he was not able to quickly grasp how the product functions:

> *Paul:* I don't use technology so much, you know the computer stuff, and especially this part, this kind of thing, but I've seen a lot of students using it. I'm not good with computers. That's the problem…. And I know, I got used to my own values… And old things, so that's why I don't require, I am not the kind of person who uses new products, so I go and buy. I'm the kind of person, I got used to my old-fashioned things, you know, how I do it, even the computer. I got it for school, not because I was interested. That's why. Maybe it's because of my background. Because I am not from the country.
>
> *Interviewer:* Where are you from?
>
> *Paul:* Uzbekistan. So we didn't get a lot of things that. I guess it's because of my background.

The attributive comments on the learning process were related to the dimensions of self or others or self versus machine. In general, such causal attributions reflected their fear of using new technologies. Participants relied on these attributions to rationalize their own learning performance or used them as an excuse that allowed them to give up their effort to learn how to interact with the new product. As a result, these causal attributions created another impediment to consumer learning.

DISCUSSION

The main focus of this research was to examine the learning process and consumers' coping mechanisms when they encounter technological innovations. We designed a study to evaluate the learning process in real time as consumers engaged in a set of activities associated with a novel interface. We were able to observe the learning process *in situ*, and during this exploration, gain important insights about the factors that hinder the learning process. Thus the key theoretical motivation underlying our study is to be able to observe actual product trials that are more likely to yield a realistic understanding of consumer learning than would be possible under more conventional pre-trial exposure. In pursuing our research, our conceptual starting point was to reconfigure the standard adoption model proposed originally by Rogers (1995) and used extensively in the new product and marketing literature. While Rogers' framework is important, it does not shed any insights on the consumer's learning process during initial interactions with a technology-based product. Investigating learning during these initial interactions is critical in our effort to identify impediments to the learning process.

Our methodology involved a systematic inductive process that begins with some initial research questions and a set of relevant theoretical postulates and eventually, after empirical observation, leads to a full-fledged emergence or development of a theoretical model and a fuller understanding of research issues. Based on our analysis, we developed thematic theoretical categories resulting from our in-depth study of 37 users interacting with a novel interface with which none of them was familiar at the time of the study.

Our results suggest, that the product's interface, paradoxically serves to structure the consumer's learning process even as s/he responds in relatively unstructured ways. We uncovered three basic factors that are likely to hinder the learning process during consumers' initial interactions with a technological innovation: interface and functionality practices, social influence, and causal attributions (see figure 1).

Interface and Functionality Practices

Cultural practices are typically embedded in the prevailing technological culture. The technological culture presumes some level of continuation even as new opportunities arise and new developments take place. Since the personal computer (PC) is the governing artifact of the existing culture, all practices and meanings are generated from interactions with the computer. Thus the ubiquity of the keyboard, one of the most common interfaces of the existing technological artifact, and the anticipated generalizability of the keyboard to other technological devices were mentioned by our respondents (e.g., Lynn). Stephanie was reacting in a similar way since she was also expecting to see some device (therefore, design) similarities. When we take a closer

look at the prevailing technological culture, we find that the practices are situated in the context of artifacts, meanings, behaviors, and organizational structures that are all part of the cultural scene. For example, Marissa internalized the new technology (PDA) as an offspring of existing technology, the computer. In Suchman's (1988) view this is known as situated learning. The challenge in all these cases is how do surface similarities between cultural realms translate easily and what are the consequences if they do not do so, that is, when they do not lead to positive outcomes for the users in the new setting? Expectations concerning a product's interface are a key to the practices within a technological culture. During initial interactions, learning involves applying, situating, and recontextualizing earlier experiences to new situations, and that goes beyond direct knowledge transfer. In other words, the user has no other choice but to understand the new technology on its own terms.

When consumers are confronted with a new product they attempt to understand it by transferring knowledge from an existing product category. In our context, this refers to relevant technological practices that are based on prior experiences with similar artifacts. As was shown by Vitalari and Venkatesh (1987), in the context of computer use, prior knowledge comes in handy when such knowledge can be applied to new situations. Of course, this is not always possible if the technology is novel or unfamiliar. Implied in the knowledge transfer process and associated with it is the notion that consumers display a certain level of personal learning, having been accustomed to similar technology. Our goal was to gain insights on how consumers use prior knowledge on interface and functionality practices and how this knowledge hinders their learning process. One of our informants began with the notion of tacit

comparison (therefore tacit knowledge) between existing technology and new technology. This is a way to establish the basic heuristic by which knowledge can be transferred to the new setting. When confronted with a new technology, the user looks at the essential ingredients of the new technology and explores how one can formulate a one-to-one correspondence between the two (computers and PDAs). When such correspondence is established, knowledge transfer takes place through direct transfer or through strategies for adaptation. In the absence of a familiar interface, such correspondence is not established, and knowledge transfer does not occur. For example, Marissa was looking for a blinking cursor, Julie was trying to play with a power button and was also expecting to write next to what she thought was a cursor, while Lynn was looking for a keyboard and did not know how to manage the device for it did not have a keyboard. Thus, in contrast with prior research, our findings reveal that prior knowledge can be an impediment to the learning process.

Social Influence

An important element of our framework is social influence on learning. Previous research in consumer behavior has looked primarily at external and interpersonal social influence (e.g., Rogers 1995). This may be attributed to the fact that consumer researchers have tended to focus more on cognitive models of information processing. Recent research on human-interaction, however, highlighted the importance of another aspect of social influence, that of social learning. Specifically, research has suggested that in the case of technology-based products, individuals learn by observing others interacting with the product (Mayes and Fowler 1999). Furthermore, with the

emergence of the social media and the network effects of communication, there is a shift towards and greater awareness of social learning, and a growing need to understand it. In addition, recent work on brand communities has highlighted the importance of social learning in the context of brand use and loyalty.

In this regard, our study clearly shows that individuals are often likely to learn by observing other users. Our goal was to understand how consumers use their observations and how these observations are likely to hinder the learning process. We found that consumers casually observe others interacting with the product, and this gives rise to preconceptions and expectations that often do not match their own actual experience. Furthermore, with several brands available, consumers are presented with different functionalities and interfaces. They draw on their memories that are often inexact and misleading because they are casual and because of the differences that exist across brands. In our study, although we did not observe social influence in real time, our respondents explicitly referred to such influence. To the extent that social learning does take place, it becomes an integral part of coping strategy.

Causal Attributions

The third theme concerned causal attributions generated from failure to learn satisfactorily. When the users fail in their attempts to transfer their prior knowledge, they have two options – they can blame the manufacturer for an unsatisfactory product, or they can blame themselves (self-attribution) for not living up to their own expectations and therefore feel unworthy of the product. Prior research suggests that consumers tend to attribute success to their own abilities and failure to external factors such as task

complexity (Ross and Fletcher 1985). Recent research on information technology management, however, suggests that users are likely to assume responsibility for failure when they consistently fail in their effort to interact with technological innovations (Standing et al. 2006). Users are reluctant to act for fear of being implicated further in failure (Halpin and Guilfoyle 2004), and feelings of helplessness, regret, and aimlessness emerge (Forsyth and McMillan 1981).

In our study, we found a similar pattern. Participants' causal attributions were often made in light of information stored in memory. A good number of informants were more likely to blame themselves and even call into question "user's capability [or lack thereof]." The participants in our study often made negative attributions toward themselves that were hindrances to learning; those who made these causal attributions tended to deny positive outcomes. They felt less competent and acted accordingly.

Managerial Implications

There are some broad managerial and marketing implications of our study. Currently, we are in the midst of a digital revolution the like of which has not been seen previously. Products are being introduced with great speed and with promise of superior performance. The typical user does not have the time to absorb all the changes. Our study shows that even well educated users need to be prepared as new products appear in the marketplace. The challenge to many marketers is how to keep introducing new products into the marketplace without overwhelming the user (Thompson, Hamilton, and Rust 2005). This research provides valuable guidelines for firms commercializing technology-based products that result in a novel interface for

consumers. From a managerial perspective, a constructive view of consumer learning will allow firms to influence consumer perceptions, thereby creating a source of competitive advantage (Olshavsky and Spreng 1996).

Our results suggest that the presence of a novel interface provides certain technological challenges, which in turn lead to a certain degree of experimentation (or resignation). Experimentation may result in success or failure in mastering the new device. Technological challenges are the problem definition for coping strategies. Thus one respondent referred to this experimentation in the following terms: "We are supposed to figure it out." This sounds almost like a moral imperative because the burden seems to fall on the user. Another respondent commented, "I was not prepared for writing," because she was expecting to see a keyboard. Our study suggests that the average user has a basic concept of what an interface looks like and how it functions. The user expects to encounter some basic technological features and once s/he finds them missing disruption of the learning process occurs. From a managerial perspective, the challenge is to understand consumer learning experience and coping strategies and provide mechanisms that would make the transition easy and intuitive.

Our study reveals that users engage in three fundamental coping strategies: knowledge transfer from prior interface and functionality practices, social influence, and causal attributions. Specifically, our results suggest that in designing technology-based products there is a gap between the levels of know-how between the manufacturer and the user. The challenge for manufacturers is to make the user interface intuitive and as familiar as possible. A good example of this is the automobile design. However much the automobile technology has evolved and became more complex over the years, the

elements of the dashboard have remained more or less the same. That is all the driver of the automobile needs to know. The rest, as they say, is “under the hood”. By that it is meant that the user can operate a complex product, if it is intuitive, and interacting with the product does not extend to its technical details. In the terminology of human interaction, the product must be useful and usable.

Furthermore, our findings suggest that impediments to learning in various aspects require the insight from a more fine-grained customized learning paradigm. This customized learning paradigm is reflective of the singular learning process engaged in by each specific consumer rather than by type of consumer (Kolb 1984). In the present study, although, consumers were placed in the same, seemingly structured setting, the results nonetheless indicated that there was much that was individualized or open-ended. From a managerial point of view, this suggests that firms commercializing products involving a novel interface could develop products that incorporate some degree of flexibility such as pull-down menus that maximize flexibility by allowing consumers to modify tasks to their own preferences (Norman 1988), or indicators that provide feedback to the user (Rijsdijk and Hultink 2003).

Our findings also suggest implications for designing communication strategies. Advertising practitioners could counter the role of prior knowledge and social influence to minimize their negative impact on learning. For example, marketers could communicate specific steps describing how to use the new interface.

Future Research Directions

This study suggests several avenues for future research. First, future research could investigate consumers' response to a variety of novel interfaces in order to generalize the findings of this research. Furthermore, as prior research suggests, a single interface can map onto multiple products (Capon and Glazer 1987) and these products may differ in the degree of newness of the functionality they provide to the consumer. Future research could investigate the factors that obstruct learning for products that vary in their degree of newness (e.g., incremental vs. radical innovations).

Second, future research could also examine the role of emotions on the consumer's learning process. Prior research suggests that feelings of confusion, frustration, or hopelessness often occur during consumers' initial interactions with technological innovations (e.g., Rubin 1994). Future research may reveal important insights on the role emotions play in the learning process.

Third, another area for future research of interest to both consumer researchers and product development teams is the measurement of a successful interaction. This approach could emulate usability studies and measure, for example, the amount of time and the number of steps users need to complete a specific task, as well as the number of mistakes made during the learning process (e.g., Rubin, Chisnell, and Spool 2008).

Fourth, future research could investigate whether consumers follow a specific path in their learning process during initial interactions with technological innovations. In this research we found that consumers use prior interface and functionality practices, social influence, and causal attributions as coping mechanisms in their attempt to learn

about a new technology. Future research could examine whether consumers use all coping mechanisms simultaneously or in a particular sequence.

REFERENCES

Allen, D. E. (2002). Toward a Theory of Consumer Choice as Sociohistorically Shaped Practical Experience: The Fits-like-a-glove (Flag) Framework. *Journal of Consumer Research* 28: 515-532.

Azevedo, R., Winters, F. I., and Moos, D. C. (2004). Can Students Collaboratively Use Hypermedia to Learn Science? The Dynamics of Self – and Other – Regulatory Processes in an Ecology Classroom. *Journal of Educational Computing Research* 31 (3): 215-245.

Bagozzi, R. P., Davis, F. D., and Warshaw, P.R. (1992). Development and Test of a Theory of Technological Learning and Usage. *Human Relations* 45: 659-687 (July).

Bandura, A. (1977). *Social Learning Theory.* Englewood Cliffs, NJ: Prentice-Hall.

Baran, S. J. and Meyer, T.P. (1974). Imitation and Identification: Two Compatible Approaches to Social Learning from the Electronic Media. *AV Communication Review* 22: 167-179 (Summer).

Bettman, J. R. (1979). *An Information Processing Theory of Consumer Choice*. Addison-Wesley.

Capon, N. and Glazer R. (1987). Marketing and Technology: A Strategic Coalignement. *Journal of Marketing* 51: 1-14.

Carroll, J., Smith-Kerker P., Ford, J. and Mazur-Rimetz, S. (1987). The Minimal

Manual. *Human Computer Interaction* 3: 123-153.

Cutrona, C. E., Russell D., and Dallas, J.R. (1984). Cross-Situational Consistency in Causal Attribution: Does Attributional Style Exist? *Journal of Personality and Social Psychology* 47(5): 1043-1058.

Ericsson, K. A. and Simon, H.A. (1984), *Protocol Analysis: Verbal Reports as Data*. Cambridge, MA: The MIT Press.

Feiereisen, S., Wong, V., and Broderick A.J. (2008). Analogies and Mental Simulations in Learning for Really New Products: The Role of Visual Attention. *Journal of Product Innovation Management* 25 (6): 593-607 (September).

Folkes, V. S. (1984). Consumer Reactions to Product Failure: An Attributional Approach. *Journal of Consumer Research* 10: 398-409 (March).

Forsyth, D. R. and McMillan, J. H. (1981). Attributions, Affect, and Expectations: A Test of Weiner's Three-Dimensional Model. *Journal of Educational Psychology* 73: 393-403 (3).

Frieze, I. H. and Weiner B. (1971). Cue Utilization and Attributional Judgments for Success and Failure. *Journal of Personality* 39: 591-605.

Gatignon, H. and Robertson T.S. (1991). Innovative Decision Processes," in *Handbook of Consumer Behavior*. Robertson T.S. and Kassarjian H.H. (eds.), Englewood Cliffs, NJ: Prentice-Hall: 316-348.

Gregan-Paxton, J. and Roedder John D. (1997). Consumer Learning by Analogy: A Model of Internal Knowledge Transfer. *Journal of Consumer Research* 24: 266-284 (December).

Gould, S. J. (1999). Protocol and Cognitive Response Analysis. In Earl, P.E. and

Kemp S. (Eds.), *The Elgar Companion to Consumer Research and Economic Psychology*, Cheltenham, UK: Elgar Publishing Limited: 468-471.

Hackos, J. T. and Redish, J.C. (1998). *User and Task Analysis for Interface Design*, New York, NY: Wiley.

Halpin, D. and Guilfoyle, A. (2004). Attributions of Responsibility: Rural Neo Liberalism and Farmers' Explanations of the Australian Rural Crisis. *Rural Society*, 14 (1): 45-59.

Hempel, J. (2007). Nokia's Design Research for Everyone. Accessed January 23, 2009. Available at http://www.businessweek.com/print/innovate).

Hill, T., Smith, N.D., and Mann, M.F. (1987). Role of Efficacy Expectations in Predicting the Decision to Use Advanced Technologies: The Case of Computers. *Journal of Applied Psychology*, 72 (2): 307-313 (May).

Hoch, S. J. and Deighton J. (1989). Managing What Consumers Learn from Experience. *Journal of Marketing* 53: 1-20 (April).

Hoeffler, S. (2003). Measuring Preferences for Really New Products. *Journal of Marketing Research*, 40: 406-420 (November).

Hoque, A. Y. and Lohse G.L. (1999). An Information Search Cost Perspective for Designing Interfaces for Electronic Commerce. *Journal of Marketing Research* 36: 387-394 (August).

Killingsworth, M. J. and Gilbertson, M.K. (1992). *Signs, Genres, and Communities in Technical Communication*. Amityville, NY: Baywood.

Kolb, D. A. (1984). *Experiential Learning*. Englewood Cliffs, NJ: Prentice-Hall.

Krahmer, E. and Ummelen N. (2004). Thinking Aloud about Thinking Aloud: A

Comparison of Two Verbal Protocols for Usability Testing. *IEEE Transactions on Professional Communication* 47: 105-117 (June).

Mayes, J. T. and Fowler, C.J. (1999). Learning Technology and Usability: A Framework for Understanding Courseware. *Interacting with Computers* 11: 485-497.

Mick, D.G. and Fournier, C. (1998). Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies. *Journal of Consumer Research* 25: 123-143 (September).

Mittal, V. J. and Sawhney (2001). Learning and Using Electronic Information Products and Services: A Field Study. *Journal of Interactive Marketing* 15 (1): 2-12.

Mukherjee A. and Hoyer, W.D. (2001). The Effect of Novel Attributes on Product Evaluation," *Journal of Consumer Research* 28: 462-472 (December).

Murray, K. B. and Haubl, G. (2007). Explaining Cognitive Lock-In: The Role of Skill-Based Habits of Use in Consumer Choice. *Journal of Consumer Research* 34: 77-88 (June).

Nielsen, J. (1993*). Usability Engineering*, San Francisco, CA: Morgan Kaufmann.

Norman, D. A. (1998). *The Invisible Computer: Why Good Products Can Fail, Why the Personal Computer is So Complex, and Information Appliances Are the Solution*. Cambridge, MA: The MIT Press.

Olshavsky, R. W. and Spreng, R.W. (1996). An Exploratory Study of the Innovation Evaluation Process. *Journal of Product Innovation Management* 13: 512-529 (November).

Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., and Carey T. (1994). Human-Computer Interaction. Addison-Wesley.

Rijsdijk, S.A. and Hultink, E.J. (2003). Honey, Have you Seen Our Hamster?" Consumer Evaluations of Autonomous Domestic Products. *Journal of Product Innovation Management* 20: 204-216.

Rijsdijk, S.A. and Hultink, E.J. (2009). How Today's Consumers Perceive Tomorrow's Smart Products, *Journal of Product Innovation Management* 26: 24-42.

Rogers, E. M. (1995). *Diffusion of Innovations*. New York : The Free Press (4th ed.).

Rosa, J.A., Porac, J.F., Runser-Spanjol, J., and Saxon, M.S. (1999). Sociocognitive Dynamics in a Product Market. *Journal of Marketing* 63: 64-77 (January).

Ross, M. and Fletcher G.J.O. (1985). Attribution and Social Perception in *The Handbook of Social Psychology,* Lindsey G. and Aronson A. (eds.), Vol. 3. Reading, MA: Addison-Wesley, 73-122.

Rubin, J. (1994). *Handbook of Usability Testing*. New York, NY: John Wiley.

Rubin, J., Chisnell, D. and Spool J. (2008). *Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests.* New York: Wiley.

Shih, C.F. and Venkatesh A. (2004). Beyond Adoption: Development and Application of a Use-Diffusion Model. *Journal of Marketing* 68 (1): 59-72.

Standing, C., Guilfoyle, A., Lin, C., and Love, P.E.D. (2006). The Attribution of Success and Failure in IT Projects. *Industrial Management and Data Systems* 106: 1148-1165 (October).

Suchman, L. A. (1988). Designing with the User. In *ACM Transactions on Information Systems*, 6 (2): 173-183.

Thompson D.B., Hamilton, R.W., and Rust, R.T. (2005). Feature Fatigue:

When Product Capabilities Become Too Much of a Good Thing. *Journal of Marketing Research* 42: 431-442 (November).

Todd, P. and Benbasat, I. (1987). Process-Tracing Methods in Decision Support Systems Research: Exploring the Black Box. *MIS Quarterly*: 493-512 (December).

Verhoeven, L. and Graesser, A. (2008). Cognitive and Linguistic Factors in Interactive Knowledge Construction. *Discourse Processes* 45: 289-297 (July-October).

Veryzer, R.W. and Borja de Mozota B. (2005). The Impact of User-Oriented Design on New Product Development: An Examination of Fundamental Relationships. *Journal of Product Innovation Management* 22: 128-143.

Vitalari, N. P. and Venkatesh A. (1987). In-Home Computing and Information Services: A Twenty-Year Analysis of the Technology and its Impacts. *Telecommunications Policy*, 11(1): 65-82.

Waterman, D. A. and Newell A. (1971). Protocol Analysis as a Task for Artificial Intelligence. *Artificial Intelligence*, 2: 285-318.

Weiner, B. (2000). Attributional Thoughts about Consumer Behavior. *Journal of Consumer Research*, 27: 382-387 (December).

Wenger, E. (1998). *Communities of Practice: Learning, Meaning and Identity*. New York: Cambridge University Press.

Wood, S. L. and Moreau P.C. (2006). From Fear to Loathing? How Emotion Influences the Evaluation and Early Use of Innovations. *Journal of Marketing* 70 (3): 44-57.

Yang, S. C. (2000). Hypermedia Learning and Evaluation: A Qualitative Study of

Learners' Interaction with the Perseus Project. *Computers in Human Behavior* 16: 451-472.

Young, R. M. (1983). Surrogates and Mappings: Two Kinds of Conceptual Models for Interactive Devices. In: Gentner D., Stevens A. L. (Eds.), *Mental Models*. New Jersey: Lawrence Erlbaum: 35-52.

Ziamou, P. L. and Ratneshwar S. (2003). Innovations in Product Functionality: When and Why Are Explicit Comparisons Effective. *Journal of Marketing* 67 (2): 49-61.

Figure 1: Schematic Diagram of the Theoretical Framework