Is that authentic or artificial? Understanding consumer perceptions of risk in e-service encounters

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Abstract. *As companies race to digitize physical-based service processes repackaging them as online e-services, it becomes increasingly important to understand how consumers perceive the digitized e-service alternative. We theorize that consumers often perceive e-services as being artificial and non-authentic, and that consumers must perform this assessment when deciding whether new e-services are viable alternatives to traditional service methods. This research investigates whether consumer perceptions of artificiality increase perceptions of e-service risk, which has been shown to hamper consumer acceptance in a variety of online settings. An empirical study operationalized perceived artificiality (PA) within a controlled laboratory experiment that manipulated the risk of a specific e-service class (e-payments). For a specific e-service brand, PA is reduced when the web interface is viewed as easy to use; alternatively, PA is increased when consumers have relatively high risk perceptions about the overall e-service class. Furthermore, consumers who were rated as information technology innovators had lower overall artificiality perceptions, however, exposure to negatively framed e-service efficacy information removed this artificiality reducing effect. The theoretical linkages between PA and perceived risk, and the two antecedents – ease of use and e-service class risk – were confirmed by survey results. The implications of these results for future research as well as the design and marketing of e-services are examined.*

Keywords: e-commerce, e-service, authenticity, artificiality, perceived risk, virtuality

INTRODUCTION

Although consumers are increasingly adopting electronic commerce (e-commerce) as a retail channel, the adoption of many web-delivered services (e-services) has languished. Similarly, a disproportionate amount of the prior business-to-consumer (B2C) e-commerce research has

centred on consumer purchases of physical product offerings, whereas research focusing on consumer purchases of e-service offerings has been limited. Because consumer-oriented services that are physically based are increasingly being converted to digitized B2C e-services, a deeper understanding of how web technologies change service provision is warranted.

Increasingly, consumers are utilizing online forms and email on vendor web sites rather than utilize paper forms, phone calls and site visits to perform various service transactions. In the quest to automate service-provision to reduce operating expenses, vendors are removing live representatives from customer service encounters. Additionally, it is becoming commonplace for consumers to be penalized for *not* utilizing self-service technologies such as kiosks, automated teller machines and internet-based service channels (e.g. being charged fees for various in-person banking services).

The evolution from physical to digital-based service provision may result in a reengineered process that is very unlike the original, physical process. E-service replacements may seem unfamiliar, artificial and non-authentic in comparison to traditional service processing methods. In these cases, we propose, consumers may experience increased disorientation, confusion and apprehension because of the seeming artificiality of the interface, and the uncertainty of new service processes, resultant e-service performance and e-service security. For example, consumers may believe that new internet-based processing methods expose them to new potential risks (e.g. many consumers have been slow to adopt financial e-services because of risk concerns – Costello, 2001).

Consequently, there is both strong practical and theoretical motivation for broader empirical examinations into the delivery of e-services to consumers. From a practical standpoint, the dangers of online fraud (Mello, 2001; Deutsche Welle, 2005), identity theft (CNN, 2002; Anonymous, 2005) and phishing swindles (schemes to steal confidential information using spoofed web sites, e.g. Deutsche Welle, 2004) have become commonplace, and are likely to cause alarm and fear within consumers. In order to increase consumer adoption of e-services, the sources of consumer confusion, apprehension and risk need to be identified, understood and alleviated.

From a theoretical standpoint, prior research suggests that e-services are an important innovation deserving further research (Bitner *et al*., 2000; Meuter *et al*., 2000; Parasuraman & Grewal, 2000; De Ruyter *et al*., 2001; Stafford, 2003; Rahman, 2004; Carter & Bélanger, 2005). Additionally, research into consumer perceptions and evaluation processes for e-services is especially relevant because the virtual domain where e-services are produced, delivered and consumed (currently the internet) is commonly perceived as being relatively risk inherent (Hoffman *et al*., 1999).

Previous research identifies the importance of understanding and countering risk perceptions in e-commerce product purchases (Jarvenpaa & Todd, 1996–97; Bhatnagar *et al*., 2000; Shneiderman, 2000). Research examining consumer perceptions of new service-provision technologies (such as e-services) including an assessment of their authenticity, or lack thereof, has unfortunately not been performed.

We therefore believe the research into how consumers evaluate e-services is imperative for several reasons. First, a greater understanding of how consumers perceive the inherent digital

nature of e-services may provide insights to e-service developers useful to improve e-service design. Second, developer awareness of the risks consumers attach to e-service usage can be used to create and incorporate specific risk-reducing design features. Finally, e-service providers may benefit from research insights gained to transition higher numbers of consumers to automated e-service channels, thereby lowering service provision costs.

This research therefore focuses on understanding consumer evaluations of e-services including assessments of their perceived authenticity (in comparison to the physical service provision methods which they are designed to replace). We claim that consumers analyse the legitimacy and authenticity of e-service offerings and often initially believe e-services are in fact, non-authentic and seemingly artificial. We contend that when consumers experience concern related to the seeming artificiality of an e-service their perceptions of usage risks increase.

This article has the following organization. The first section reviews relevant background literature for the focal research variables and context. The second section presents our research model and hypotheses. The third section explains the methods used to explore our research model. The fourth section reports the results from two studies, and the final section discusses the theoretical and practical implications.

RELEVANT LITERATURE

In this research, we investigate consumer perceptions of risk within an e-services context. The investigation of consumer e-services perceptions differentiates this research from past studies of e-commerce risk, as e-services are fundamentally different when compared with online product purchases in that there is no off-line fulfilment, nor physically tangible product delivery. Furthermore, e-service adoption typically creates a relatively long-term relationship with a vendor in comparison to often one-time product purchases. We therefore seek to extend the perceived risk (PR) and e-commerce literature by investigating consumer perceptions of online services rather than online consumer perceptions of off-line products. We contend that the inferences made from an interpretation of the results can inform e-service adoption research. We now turn to a brief literature review of the constructs employed.

The nature of e-services

Because services are inherently intangible, prior literature discusses the importance of using tangible cues as a method to positively influence consumer perceptions (Shostack, 1977; Zeithaml *et al.*, 1985). For example, while the storage of money is largely electronic, physical banks typically utilize massive structures and vaults that engender consumer beliefs that deposits are physically secure. Theory suggests that these tangible cues can be perceived both physically (Bateson, 1979; Berry & Parasuraman, 1991) and mentally (McDougal & Snetsinger, 1990).

In the interest of clarity, we refer to tangible cues as *evaluation cues* that consumers perceive via the human senses (e.g. sight, touch etc.). Understanding how consumers interpret these evaluation cues, physically vs. mentally, provides a distinction between traditional services and e-services. Developing useful evaluation cues in a virtual context should be an important factor for reducing consumer perceptions of risk that may become salient when evaluating an e-service.

Because the core e-service and related informational materials are primarily digital and web-delivered, consumers must *mentally* perceive and evaluate the service attributes (i.e. characteristics) virtually rather than inspect them *physically* (Berthon *et al.*, 1999). Even paper brochures or newspaper articles that describe e-service features provide a limited physical tangibility to a virtual e-service, and primarily require mental processing of service attributes.

Lovelock (1983) examines the nature of the service act, distinguishing between tangible and intangible actions that are directed at people or things. Tangible actions are directed at people's bodies (e.g. hair care) or physical possessions (e.g. lawn care) and these actions can act as evaluation cues that are perceived physically. Intuitively, one can conclude that these are services that *cannot* be represented digitally and produced/distributed via information technology (IT).

Conversely, intangible actions directed at people's minds (e.g. education, therapy, entertainment) or intangible assets (e.g. financial service) can be represented digitally and, as a result, are perceived mentally, not physically. Moreover, intangible actions are more eligible for IT-enabled production and distribution. Thus, within the scope of this article, we offer the following definition of e-services: E-services are the application of IT to mediate the production and distribution of services directed towards an individual's mind or intangible assets.

For traditional off-line services, McDougal & Snetsinger (1990) make a distinction between physical and mental tangibility. IT-mediated e-services shift the emphasis exclusively to the issue of mental tangibility/intangibility (which we consider a measure of consumer mental clarity), primarily because evaluation cues are presented *virtually* and must be symbolically processed. Furthermore, these (digital) virtual e-service processes are perceived via senses that are processed mentally (e.g. sight) rather than *physically* (e.g. touch). Thus, evaluation cues in an e-service context manifest as elements of graphical interfaces, often virtual representations of a physical object (e.g. paper ticket, statement or check).

Because the intangibility of services has been found to increase consumer perceptions of risk (Mitchell & Greatorex, 1993), understanding how the virtual representation, or *virtuality*, of e-services affects consumer behaviour has become an important research question (Parasuraman & Grewal, 2000; Zinkhan, 2002). Investigating consumer's negative reactions to e-service intangibility, such as increased risk perceptions, is necessary to alleviate consumer uncertainty in online settings, and as a result increase e-service adoption.

E-service virtuality

We contend that consumer perceptions of the authenticity and therefore substitutability of e-service provision methods varies widely. The likely variance in consumer perceptions of

authenticity (or conversely artificiality) is likely due to the inherent virtuality or e-services, which is characterized by a 'lack of face-to-face human interaction, digital copies, and constructed experiences' (Koiso-Kanttila, 2005, p. 66). New concepts spawned to describe this phenomenon include virtual, virtuality, virtual experience and virtual reality. These concepts are briefly reviewed here.

Virtuality is referred to as the presentation of 'virtual elements in artificial worlds' with interaction facilitated via 'digital reconstructions of our natural and imaginary worlds' (Castel, 2000; p. 27). From an e-commerce perspective, virtuality describes the simulated environment where consumers evaluate and purchase products and services (Ryan, 2001; Li *et al.*, 2002).

At the core of virtuality in e-commerce environments is the contrast between direct and indirect experience (Smith & Swinyard, 1983). Direct experience occurs when a person is able to physically interact with the attributes of a product or service using any or all of the five senses (e.g. touch, smell). Conversely, indirect experience occurs when a consumer must evaluate and assess a product or service without directly (i.e. physically) interacting with it. For e-commerce, the concept of virtual experience is proposed as a means for consumers to 'virtually' experience a product or service (Li *et al.*, 2002).

Creating an effective virtual experience for products is fundamentally different when compared with services. The primary goal when facilitating a virtual product experience is to provide the consumer with an IT-mediated simulation of the product (e.g. customizing a car online) (Li *et al.*, 2002; Jiang & Benbasat, 2004). Conversely, the IT-mediated nature of e-services strips away any attributes that consumers previously perceived directly via physical senses (Berthon *et al.*, 1999). Therefore, the challenge is to provide the consumer with a virtual experience or virtuality that allows them to effectively evaluate and assess an e-service, and to convey a sense of e-service legitimacy and credibility.

Recent research suggests the importance of studying what consumers assess to be 'real' and authentic in e-commerce settings (Koiso-Kanttila, 2005). Extending that perspective, we propose that some consumers accept the virtuality of an e-service and perceive the e-service as being an authentic, legitimate service provision method while other consumers may perceive the e-service as being artificial. Thus, measuring the presence and strength of consumer authenticity or artificiality perceptions of an e-service's virtuality may provide important insights into consumer e-service evaluations.

Perceptions of virtual reality: authentic or artificial?

Recently Rosenbloom (2002; p. 29) asked, '[in the virtual world . . .] what is reality? What is fake?' This question is especially relevant for the e-commerce setting where consumers must constantly assess the authenticity (reality) of human–computer interfaces (HCIs), web-delivered content and vendor offerings. Prior research suggests that consumer assessments of product or service authenticity are important in many areas of consumer behaviour (Goldman & Papson, 1996; Brown, 2001).

Intuitively, consumers consider authentic objects to be genuine, real and true (Goldman & Papson, 1996). The authenticity assessment process, however, involves a complex subjective

perceptual process (Belk & Costa, 1998; Grayson & Martinec, 2004). Consumer assessment of e-service authenticity is made even more difficult because e-services and their evaluation cues are IT-mediated and inherently virtual, and thus harder to evaluate.

Pitt *et al*. (1999) propose that service representation and description can be enhanced via evaluation cues presented via the HCI. However, the virtual nature of these evaluation cues can be interpreted as lacking authenticity or, more simply stated, appearing artificial and unrealistic. We believe that consumers perform an artificiality assessment based on a review of the (here e-service) HCI as a result of cognitive processing and/or an emotional reaction (perhaps partially subconscious), where the resultant evaluation of the HCI is that 'something doesn't seem right'. Furthermore, artificiality perceptions gained from an evaluation of an e-service's HCI may produce negative cognitions and emotions such as apprehensiveness and uncertainty, thus potentially increasing a consumer's perceptions of risk in an e-service encounter and, more importantly, reducing the likelihood of engaging the consumer in e-service usage.

As an example, consider an online casino (e.g. romancasino.com) where one can gain access to a virtual craps table. A consumer is going to react in one of two ways to the inherent virtuality of this gaming environment – they'll either perceive it as authentic and perhaps engage in some wagering or perceive it as artificial and avoid interaction (or perhaps only play with hypothetical money). Thus, a consumer can formulate beliefs that an e-service is artificial resulting from an assessment of its virtuality.

We propose therefore that an aspect of consumer e-commerce evaluations is an assessment of the perceived authenticity or artificiality of the vendor offering, which is affected by the quality of the virtualization process. Virtualized services must appear to be authentic and realistic so that potential adopters believe them to be genuine, authorized replacements to traditional service provision methods.

The authenticity of the e-service HCI is likely to be a precondition for developing trust in an e-service provider. Rather than investigate aspects and antecedents to e-trust, however, (Gefen *et al*., 2003; Gefen & Straub, 2004), we investigate whether consumer assessments of the perceived artificiality (PA) of the HCI affect consumer perceptions of risk. E-services that are reengineered and rendered with poor HCI designs are likely to be perceived by consumers as being artificial. For some consumers the seeming artificiality of the HCI may be a minor peculiarity and for others an impediment to adoption.

Concerns of possible online fraud, service errors and possible financial and privacy losses may be salient for many consumers. We therefore operationalize the proposed PA beliefs and study their direct effect on consumer perceptions of risk. Because consumer perceptions of risk have been shown to reduce evaluations and purchases of products and services (Mitchell, 1994), the investigation into the potential drivers of PR is warranted for self-service technologies and specifically the e-services context.

Perceived risk

The further study of PR within an e-commerce and specifically e-services research context is considered necessary because when perceptions of risk are unacceptably high, consumers

avoid making service purchases (Dowling & Staelin, 1994; Mitchell, 1994). Many consumers do not trust the security of e-shopping (Hoffman *et al*., 1999) and PR is theorized to diminish consumer willingness to perform trust-taking behaviours (Mayer *et al*., 1995). Consumer adoption of e-services is a trust-taking behaviour that consumers may perform despite the calculated risks.

Building on Germunden (1985) we believe that while many consumers focus on and appreciate the benefits of e-service usage, others become 'paralysed' into a state of cognitive dissonance driven by their uncertainty and concern for losses (a classic definition of PR). Consumers of this mindset should be more likely to reject e-services unless their risk concerns are alleviated. Further compounding problems inherent in the consumer evaluation process for e-services, is the finding that consumers commonly consider services to be more risk-inherent purchases than products due, in part, to their intangibility (Mitchell & Greatorex, 1993).

Historically, Bauer (1967) was the first to claim that consumer purchases involve risk because the consequences of product/service usage cannot be anticipated *a priori* with certainty, and that some consequences of usage are typically unpleasant. Bauer defines perceived risk as the 'combination of uncertainty plus seriousness of outcome' (p. 390) and distinguishes it from actual risk as he argues that consumers are bounded rational actors that do not perform actual mathematical calculations of risk (unlike economic theory), and rather form subjective risk beliefs based on internal and external information. Similarly, Peter & Ryan (1976) define PR as the expectation of losses associated with a purchase which acts to inhibit purchasing activity.

Prior theory conceptualizes PR as consisting of two distinct components (1) the probability of loss or uncertainty of outcomes; and (2) the costs of the loss or importance of that loss. While consumers are notorious poor estimators of true probabilities, they are in effect reporting their perceived reality of the actual risks. While the cost or importance of losses (such as to finances or privacy) may be defined more accurately by consumers, this measure often differs widely among consumer segments and therefore has been used primarily as a means to define consumer categories. For this article, we adopt the perspective that PR measures a consumer's assessment of potential losses resulting from using an e-service.

Consumers assess levels of PR inherent in a product or service class and specific individual brands within that class (Bettman, 1973; Dowling & Staelin, 1994). Therefore, the level of risk consumers deem inherent to an entire e-service class (e.g. e-travel planning services) directly affects branded vendor offerings within it (e.g. Orbitz.com). When an entire e-service class is deemed risky the importance of choosing the best vendor and brand within the e-service class increases (in order to limit the possibility of losses). This logic explains why a consumer may fear an entire e-service class, but trust a specific e-service provider and purchase a specifically branded e-service with confidence. Both levels of risk merit investigation for e-commerce and e-services research.

Within e-commerce research, Featherman & Pavlou (2003) find that consumer perceptions of e-service risk reduce consumer beliefs of the usefulness of an e-service and consumer intent to use the e-service. Similarly consumer perceptions of risk have been found to worsen consumer attitudes towards purchasing online (Van der Heijen *et al*., 2003), reduce the per-

ceived net gains associated with purchasing online (Teo & Yeong, 2003) reduce purchasing behaviour (Pavlou, 2003; Park *et al*., 2004) and affect behavioural intention to use mobile commerce (Wu & Wang, 2005).

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

Years ago, when telephone shopping and telephone banking were innovations many consumers were apprehensive of these intangible vendor shopping and service offerings. Many consumers considered them too risky to use because the product or service premises could not be physically inspected (Cox & Rich, 1964; Orr, 1981). We believe consumers are similarly apprehensive of e-services due, in part, to the intangibility, and security risks of internet-based offerings.

When service providers reengineer and virtualize a service offering creating a replacement e-service offering) they strip away the physical artefacts of service provision. We believe this service virtualization process acts to increase consumer uncertainty, apprehension and concern for the authenticity of the new virtualized e-service offering. Because the performance efficacy of the e-service is unknown, consumer uncertainty levels may increase because of privacy and security concerns and questions whether the e-service provider is capable of performing error-free transactions. As a result, we contend that consumer perceptions of risk increase. For these reasons we investigate consumer perceptions and reactions to e-service virtualizations, captured by their assessments of e-service artificiality and usage risks.

While we measure brand-specific perceived risk (BrPR), we are not comparing consumer risk levels for different e-service brands (i.e. testing for brand effects). We focus on consumer's post-trial risk perceptions for a specific vendor's e-service offering (brand), rather than for an e-service class, to retain the common terminology (Bettman, 1973) and the predominant level of analysis of prior research (Mitchell, 1994).

While a rich research stream exists for the effects of BrPR focusing on consumer's increased information seeking activity and reduced purchasing activity (Taylor, 1974; Mitchell, 1994), research into the antecedents of PR are few. Notable exceptions include Dowling & Staelin (1994) which suggests that BrPR is affected by purchase goals, intended usage, prior knowledge and involvement. Mitchell & Greatorex (1993) also suggest that service intangibility increases consumer perceptions of usage risks. Seeking to further close this gap in the literature, we theorize that consumers formulate BrPR beliefs, in part, based on the PA of the e-service.

Subsequently, potential antecedents to BrPR and PA are (1) consumer's *a priori* predisposed risk assessment for the entire e-service class (ScPR); and (2) the perceived ease of use (EOU) of the e-service. We also posit that the IT innovativeness of the consumer, a relatively stable consumer trait, affects consumer assessments of the PA of the e-service. While this is not an exhaustive list of antecedents, we believe it provides a rich initial investigation into consumer evaluations of e-services. Thus, we present a research model (see Figure 1) to test *a priori* hypothesized relationships among the set of variables.

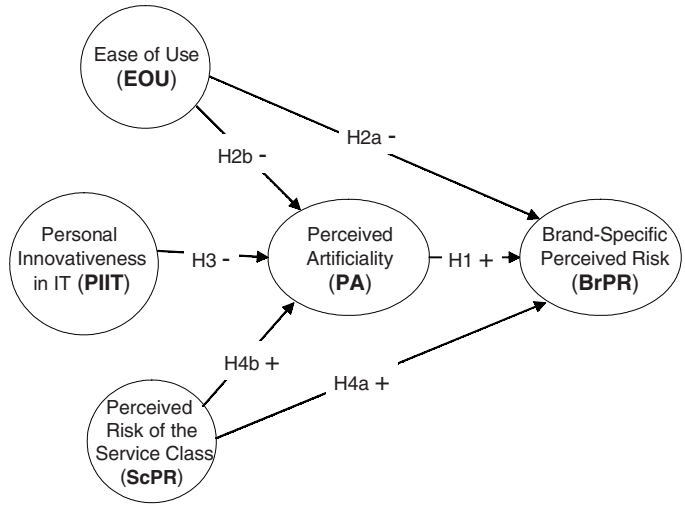


Figure 1. Research model and hypothesized relationships.

The influence of PA on BrPR

Mitchell & Greatorex (1993) find that consumer perceptions of service intangibility increase the PRs of service usage (see also Laroche *et al*., 2001; 2003). Extending the research of Belk & Costa (1998), we similarly propose that consumer e-service evaluations include an assessment of legitimacy and authenticity, or a lack thereof, which we call artificiality.

The HCI of an e-service may appear to be a genuine, valid and legitimate vendor offering – authentic according to Goldman & Papson (1996). The HCI of some e-services, however, may seem simulated, contrived, and radically unlike their current physical service equivalent. In the latter case, consumers may surmise that the vendor offering is non-authentic (Goldman & Papson, 1996; Kingston, 1999; Grayson & Martinec, 2004) and artificial. In order to protect themselves from cyber-fraud schemes, individuals must regularly make authenticity/artificiality assessments to decide if e-commerce (and other) web sites are non-authentic replicas such as recurring instances of spoofed Red Cross web sites (e.g. Krebs, 2005).

If consumers perceive a specific e-service to be an authentic, authorized vendor offered replacement to physical service provision methods, then consumers should develop trust in the e-service and its provider (Gefen & Straub, 2004). As a result, consumers should be less concerned with usage risks as prior research indicates that increased levels of consumer trust reduce risk concerns (Jarvenpaa *et al*., 2000; Gefen, 2002). If consumers believe a vendor's e-service is artificial, however, we theorize that consumers experience uncertainty, dissonance and apprehension. The PA of an e-service may make salient beliefs of risky outcomes such as potential financial and privacy losses (captured here by BrPR).

Beliefs of the artificiality of an e-service are likely to cause increased process and outcome uncertainty and perhaps security and reliability concerns. In order to reduce the uncertainty

related to using a new e-service, consumers must perceive the e-service offering to be as capable, robust and legitimate as its real-world counterpart. For many consumers, however, e-services are likely to initially be perceived as being relatively unnatural and artificial, which we claim contributes to increased perceptions of risk. This suggests the following hypothesis (see Figure 1):

H1: E-service perceived artificiality increases brand-specific PR.

As mentioned, if a virtualized replacement service delivery system seems too dissimilar in comparison to its physical equivalent, concerns of the authenticity of the replacement system may arise. While poor HCI design and attachment to existing physically based processes are likely drivers of artificiality beliefs, what other information system (IS) constructs ACT to increase consumer perceptions of e-service artificiality and risk? Several antecedents are now investigated.

Antecedents to PA and BrPR

Consumers perform e-service appraisals based on evaluation cues gained from the HCI, and must decide (perhaps subconsciously) on the authenticity or artificiality of the e-service. Differing levels of consumer knowledge, ability and experience, however, add variance to consumer authenticity evaluations (Grayson & Martinec, 2004). Little is known about what factors affect this assessment. Similarly little research attempts to identify antecedents (e.g. individual characteristics) to PR (Mitchell, 1994), and this inquiry has not been pursued within IS research. We seek to address this void and further understand the consumer psychology underlying e-service evaluations.

Ease of use

As a pre-adoption predictor, the perceived EOU of an IS is an important predictor of IS adoption (Davis, 1989; Chau, 1996; Venkatesh & Davis, 1996; 2000; Venkatesh, 2000). EOU is defined as the '. . . the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989; p. 320). Consumers rely on pre-purchase evaluation cues (McDougal & Snetsinger, 1990) during product and service evaluation. For ISs, EOU has proven to be a salient pre-purchase evaluation cue (Gefen & Straub, 2000).

Because e-services are IS-based, their EOU should be an important evaluation cue, particularly relevant when the consumer has few other evaluation cues upon which to base their pre-purchase evaluation. E-service EOU should convey service reliability and responsiveness, acting to reduce consumer concerns of the performance efficacy and therefore PRs of e-service usage.

Furthermore, e-services that seem easy to learn and use should be well understood by potential adopters and e-service usage should therefore seem less uncertain. Uncertainty of service usage outcomes is a component of PR, therefore EOU may act as a risk-reducing factor (Roselius, 1971; Jarvenpaa *et al*., 2000; Gefen, 2002; Featherman & Pavlou, 2003) pro-

viding much needed information about the likely performance of the target e-service. EOU may act to reduce consumer's cognitive load (reducing navigation and system quality concerns), performance uncertainty and perceptions of risk.

Gefen *et al*. (2003) similarly find that EOU increases consumer trust in an e-vendor. Rather than confirm that EOU increases trust in an online vendor, we utilize a different perspective, that EOU decreases consumer perceptions of e-service PR. This suggests the following hypotheses (see Figure 1):

H2a: E-service ease of use lowers brand-specific perceived risk.

While considerable support exists for a relationship between EOU and PR, there is less support for *why* EOU will reduce PR. What is it about the perceived EOU of an application that reduces uncertainty or risk? Intuitively, people fear what they do not understand. Past IS research posits that EOU is associated with understanding the application domain, which can be positively influenced by training the user population (Igbaria *et al*., 1995), designing an intuitive user interface (Agarwal & Prasad, 1999), or targeting a user population that has strong mental/cognitive capacity (Chau & Hu, 2001). Given the correlation between a user's perceived EOU and an understanding of the application domain, we posit that EOU is a viable proxy for a user's positively valenced understanding of the application's functionality. EOU should provide consumers with an easily comprehensible evaluation cue helping consumers to form a clearer mental representation of the e-service's functionality, processes and likely outcomes (McDougal & Snetsinger, 1990).

Using a human–computer interaction perspective, when an interface is perceived as being easy to use, computer user's fear of the unknown should subside; facilitating the understanding of the computer application domain. An increased understanding of the e-service should in turn increase its perceived legitimacy, authenticity and decrease perceptions that it is artificial and not an authorized e-service offering from the stated vendor.

For example, Apple computer facilitated acceptance of its personal computer by facilitating EOU perceptions via the desktop metaphor (Mountford, 1990). Apple's leveraging of the desktop metaphor accomplished two things. First, users were provided with a more tangible mental conceptualization of how an operating system works. Subsequently, this more informed view of how an operating system works afforded users with higher levels of feedback and a sense that their actions were more salient or real. Past literature points to this phenomenon by speculating that 'Macintosh users believe that when they move a document icon from one folder to another, they are *really* (emphasis added) moving the document itself' (Erickson, 1990; p.66). Thus, while EOU is posited to reduce PR, we also propose that one of the reasons why PR is reduced is that the application is now better understood to be an effective service provision method. In effect we contend that EOU contributes to the assessment that the e-service is a viable, authentic and trustworthy service provision method.

Furthermore, based on Kumar (1996), Gefen *et al*. (2003) find support for their contention that a usable and navigable web site, as captured by perceived EOU, signals to consumers that the vendor is investing in the relationship and can be trusted. Similarly, Gefen & Straub (2004)

find that consumers perceive vendor ability to be an important facet of trust for e-services and that vendor ability can be signalled by a highly efficacious web site.

Similar to Gefen *et al*.'s (2003) contention, we assert that when e-service providers invest in their HCI to provide a realistic, vivid experience of service provision processes and likely performance, consumers perceive that the e-service provider is investing in the service relationship, and providing an authentic, legitimate service. For e-services, vendors can provide realistic, interactive demoware (Kennedy, 1998) that can afford consumers a highly diagnostic trial experience. Well designed trial experiences that simulate e-service processes can facilitate perceptions that the e-service will be easy to use. A potential result of experiencing an easy to use demoware-based trial is increased consumer confidence in the authenticity of the service offering, and decreased artificiality concerns.

In other words, we contend that EOU acts to reduce the PA of an unfamiliar application as the user can better visualize and assess the e-service features and capabilities. This suggests the following hypothesis (see Figure 1):

H2b: E-service ease of use lowers perceived artificiality.

Personal innovativeness in information technology (PIIT)

Consumers classified as innovators are typically eager to learn of new products and services, show expertise when evaluating them; and when the service is compatible with their lifestyle, adopt innovations before others (Rogers, 1995). Innovators are characterized as exhibiting a higher 'willingness to change' (Hurt *et al*., 1977) and try out new products and services. As such, personal innovativeness is a relatively stable, domain-specific character trait.

IT innovators are similarly believed to be willing to try out any new IT (Agarwal & Prasad, 1998). Using Agarwal and Prasad's items, individuals with higher PIIT like to experiment with IT innovations, and are usually the first (in their social or work group) to adopt them. Extending Rogers (1995), consumers with higher PIIT levels should also be more comfortable and confident when evaluating a new IT, such as an e-service.

Consumers that continually seek out and use new ITs typically have a higher risk-taking propensity and are more comfortable with higher levels of uncertainty (Rogers, 1995; Agarwal & Prasad, 1998). Consumers with higher PIIT, built-up over time by positive experiences when purchasing innovations, should be predisposed to believe that e-services are an authentic, viable service provision method, and be predisposed to believe they will function well.

Innovators should also have greater familiarity and understanding of e-services, e-service HCIs and the structure of e-service interactions (Gefen, 2002). With more familiarity and a stronger 'framework for future expectations' (p. 728), IT innovators should expect that e-service innovations are legitimate and authentic vendor offerings.

Because IT innovators consider using the World Wide Web to be very compatible with their lifestyle (Agarwal & Prasad, 1998), we believe consumers with higher PIIT levels may prefer using e-service innovations rather than receiving services physically (e.g. purchasing airline tickets online rather than visiting a travel agent). Higher computer self-efficacy (Compeau &

Higgins, 1995) and a preference for a 'digital lifestyle' may predispose IT innovators to consider new e-services as similar to other legitimate e-services they have adopted (e.g. preparation and submission of income tax forms).

Related to their increased comfort with IT innovations, individuals with higher PIIT are theorized to require fewer positive pre-adoption evaluation cues (Agarwal & Prasad, 1998) perhaps because of higher IT knowledge and ability to evaluate innovations (Gatignon & Robertson, 1985). IT innovators may therefore place more credence in vendor provided e-service efficacy information and e-service trial experiences. Because IT innovators should be more comfortable with e-service innovations we argue that they should perceive e-services to be genuine, legitimate replacements for the physical (here paper-based) service method, and therefore less artificial. This suggests the following hypothesis (see Figure 1):

H3: Consumers with higher personal innovativeness in IT will report lower perceived artificiality.

Perceived risk of the e-service class

As noted earlier, Bettman (1973) distinguishes between (1) risk beliefs inherent to an entire product or service class and (2) perceptions of the riskiness of individual brands within that service class. While prior research mainly focuses on consumer perceptions of risk for specified brands (Mitchell, 1994), we believe it important to include consumer's *a priori* predisposition towards the riskiness of an e-service class. Building on prior research (Bettman, 1973; Dowling & Staelin, 1994), we believe consumer assessments of e-service class risk are projected onto specific vendor offerings often raising concerns about the riskiness of entering a service relationship with a particular vendor, and the riskiness of specific offerings.

An e-service class that stimulates consumer apprehension, uncertainty and risk perceptions may also cause consumers to question the legitimacy and authenticity of specific vendor offerings. For example, a consumer that views an entire e-service class (e.g. e-brokerages) to be risk inherent because of reported security breaches may perceive that a specific vendor's e-service (branded brokerage house) seems artificial and perhaps 'spoofed' and therefore non-authentic (non-legitimate impostor).

Based on prior research into the subjective nature of consumer authenticity assessments (Belk & Costa, 1998; Grayson & Martinec, 2004), we believe consumer assessments of the artificiality of e-services (labelled PA) are strengthened by e-service class risk. PA is likely to be driven in part by news reports of identity theft, breaches of computer security and impostor web sites (such as Anonymous, 2005; Krebs, 2005; Roth & Mehta, 2005). The bad press affecting e-commerce may cause consumers to perceive web site evaluation cues (onscreen objects) and vendor offerings as artificial, potentially non-authentic and risky to use. This suggests the following hypotheses (see Figure 1):

H4a: Perceived risk of the e-service class increases brand-specific perceived risk.
H4b: Perceived risk of the e-service class increased perceived artificiality.

METHODOLOGY

Study one

The method utilized to define and test the measure of PA is presented, followed by the description of methodology utilized to test the research model.

Subjects

College of Business students ($n = 526$, 34% female) from a large US university voluntarily participated in an e-service evaluation to earn nominal class credit. These young consumers represent an important target market for the e-service evaluated making this sample suitable for theory testing.

Task

Consumers evaluated a vendor's electronic bill presentation and payment (e-billpay) e-service then recorded their evaluation. The chosen e-billpay service is an online alternative to traditional paper-based bill receipt and payment processing. This context is deemed suitable because its evaluation and adoption is not motivated by greed (such as e-brokerage services) but rather by convenience and relative advantage. The e-service and evaluation task are relevant for the sample as virtually the entire sample performed monthly bill payment tasks. A small percentage of the sample occasionally made payments online (typically a credit card payment), however, over 95% of the sample exclusively wrote paper checks to pay monthly recurring bills. This ratio is not unlike the greater population (Costello, 2001).

Setting

The experiment was conducted in a controlled university computer lab.

Procedure

At the beginning of the experiment, a measure of consumer's *a priori* risk attributed to the e-payments service class (which includes e-billpay services) was collected. In addition demographics and consumer's PIIT was measured. Next, the sample pool was split into a control (sample 1) and treatment group (sample 2) based on subjects reading a brief fabricated web-delivered news article.

The news article discussed the rampant online fraud associated with e-payments and listed credit cards, electronic funds transfer and billpay e-services as troublesome, fraud-inherent consumer technologies. The treatment is similar to negatively framed messages in the public media (CNN.com, 2002) and was designed to increase consumer risk perceptions for the entire e-payments service class. Service category risk beliefs were therefore more assessable

and available – which Bettman (1979) defines as the ease to which consumer's can bring to mind examples of an event.

While this article does not formally propose any hypothesized effects from this manipulation, its administration enables insight into the internal relationships of the research model at two levels of PR for the e-payments service class, naturally occurring ($\overline{X} = 3.78$, SD = 1.05) and increased ($\overline{X} = 4.45$, SD = 1.18). A manipulation check comparing the treatment group's pre- and post-treatment e-payments class risk was significant ($t = 10.03$, $P < 0.001$); as was an independent samples *t*-test of the control group and treatment group ($t = 14.08$, $P < 0.001$).

After the experimental treatment, consumers accessed a vendor's e-billpay service, read e-service information, and used demonstration software to perform common monthly bill-paying tasks (trial length averaged 25 min). Consumers manipulated virtual representations of bills, checks and a check register. A list of instructions and required tasks was utilized to encourage uniform exposure to e-service features during the trial experience. A post-trial survey measured perceptions of the e-service's EOU, PA and BrPR.

Psychometrics

The psychometrics of the PA scale created for this research is presented followed by measures of its convergent and discriminant validity, and its reliability. The construct validation process develops an operational measure of a psychological construct that adequately samples from the theoretical domain on which the construct is based (Ghiselli *et al.*, 1981).

Content validity is concerned with the extent to which a specific set of items reflect a content domain (DeVillis, 1991). In an attempt to achieve content validity for the PA construct definition, items were drawn from related intangibility and virtuality literature (Rheingold, 1991; Turoff, 1997; Castel, 2000; Knights *et al.*, 2001) and from the American Heritage Dictionary of the English Language, 2000). The items reflect an interpretation of the definitions for virtual, virtuality and virtual reality, which refer to the sensed artificiality or non-reality (Nelson, 1970) of simulated digital environments, which are developed to exist in computer networks, and mimic their real world equivalents. Using Mitchell & Greatorex's (1993) related premise, the items were worded with a negatively valenced connotation with authenticity at the low end of the scale and artificiality at the high end of the 7-point scale (see Table 1).

High Cronbach's alpha and squared correlations (common factor variance) of each item to the latent variable (Bollen, 1989) provide indicants of strong convergent validity for the artificiality variable (see Table 1). A follow-up first order confirmatory factor analysis of the PA variable was next performed on each sample. Table 1 results indicate high factor loadings and fit indices (X^2/d.f., GFI, AGFI, RMSEA), indicants of acceptable convergent validity.

Items utilized to measure e-service class and BrPR were adopted from Featherman & Pavlou (2003). Here, performance risk, financial risk and privacy risk are utilized as the measure of BrPR. Items to measure PIIT were adopted from Agarwal & Prasad (1998), and the EOU items were adopted from Venkatesh & Davis (2000).

Tests of convergent and discriminant validity for each research variable were performed next (see Appendix 1). Two measures of convergent validity were computed, standardized Cron-

Table 1. Perceived artificiality measure and psychometrics

Item no.	Measure	Sample 1		Sample 2		Sample 3	
		λ	SMC	λ	SMC	λ	SMC
1	Bills received online **do not seem real** to me	0.87	0.77	0.90	0.82	0.88	0.77
2	Bills received online and paid with online check **seem like illusions** to me	0.72	0.52	0.73	0.53	0.87	0.76
3	Images of online bills and checks **do not appear to be authentic**	0.76	0.58	0.71	0.51	0.68	0.46
4	Bills and checks that cannot be touched or felt **do not feel genuine**	0.83	0.69	0.80	0.64	0.86	0.73
5	Filling out a computer image of a check to pay bills online **seem artificial**	0.88	0.77	0.87	0.76	0.74	0.55
	Standardized alpha		0.91		0.90		0.90
	X^2/ d.f.		2.04		1.72		1.14
	GFI		0.99		0.98		0.99
	AGFI		0.96		0.95		0.97
	RMSEA		0.06		0.06		0.03

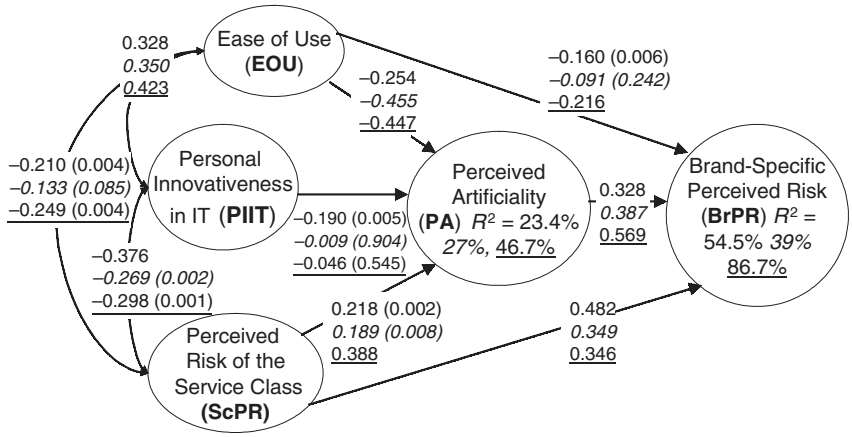
SMC, squared multiple correlation; λ, lambda coefficient.

bach's alpha and the maximum likelihood (ML)-estimated average variance extracted (AVE) by the construct. Cronbach's alpha scores for each variable were greater than 0.81 except for e-service class risk (alpha = 0.77 and 0.73). The AVE scores were all greater than 0.64 indicating strong internal reliability and therefore convergent validity (Fornell & Larker, 1981). Strong evidence for discriminant validity was also indicated as AVE (within factor shared variance) scores were considerably larger than the squared correlation coefficients (R^2) between variables (Fornell & Larker, 1981).

The full set of research model variables were subjected to an ML-estimated exploratory factor analysis to further test discriminant validity. The Promax rotated solution yielded the five research model factors accounting for 64% of the items variance. All items exhibited strong loadings on the theorized factors suggesting convergent validity and low cross loadings, suggesting discriminant validity. In particular, each PA item loading to cross-loading ratio was greater than 8 : 1.

Study one research model results

The full research model was next analysed using structural equation model (SEM) software (AMOS version 4). The ML-estimated results shown in Figure 2 provide both evidence of discriminant and nomological validity for the PA variable as the fit indices reported excellent model fit for both samples with most GFI, AGFI, NFI and CFI indices > 0.90. The 0.891 AGFI score for the treatment group was the lone exception, likely a result of the smaller sample size (14 : 1 sample to indicant ratio), however, this fit is still considered excellent (Kline, 1998). The chi-square fit to the data was below the suggested 2.0 threshold (Byrne, 2001) and the RMSEA



Model	N	X^2/df	GFI	AGFI	NFI	CFI	RMSEA
Control Group (Sample 1)	310	1.710	0.936	0.905	0.934	0.971	0.037
Treatment Group (Sample 2)	216	1.605	0.927	0.891	0.926	0.970	0.053
Sample 3	196	1.391	0.930	0.896	0.942	0.983	0.045

Path significance of $P < 0.001$ unless noted otherwise in parentheses

Figure 2. Structural equation model results.

score indicated that less than 5% of the variance in the data set was unexplained by the models.

Figure 2 shows the exogenous variables covaried to provide a clean estimation of their effects on the endogenous variables (Byrne, 2001). The SEM-based results utilized for hypotheses testing are now presented followed by their discussion.

Hypothesis H1, that PA would lead to increased BrPR, was supported. Specifically, as shown in Figure 2, beliefs of e-service artificiality increased BrPR for both the control ($\beta = 0.328$, $P < 0.001$) and treatment ($\beta = 0.387$, $P < 0.001$) groups. A more granular SEM was utilized to gain insight into the effect of PA on each BrPR risk facet. The PA path weight and percentage of variance accounted for financial risk was ($\beta = 0.513$, $r^2 = 26.3\%$), for performance risk was ($\beta = 0.566$, $r^2 = 32\%$), and for privacy risk was ($\beta = 0.473$, $r^2 = 22.4\%$), with all paths significant at $P < 0.001$.

Hypothesis H2a, that EOU would lower BrPR, was partially supported. Specifically, EOU was found to reduce BrPR within only the control group ($\beta = -0.160$, $P = 0.006$). Hypothesis H2b, that EOU would decrease PA, was supported. Specifically, perceived EOU significantly reduced PA for both the control ($\beta = -0.254$, $P < 0.001$) and treatment ($\beta = -0.455$, $P < 0.001$) groups.

Hypothesis H3, that PIIT would decrease PA, was partially supported. Specifically, IT innovators perceived slightly less artificiality in the target e-billpay service, however, this effect held for the control group only ($\beta = -0.190$, $P = 0.005$). When risk concerns were made salient by the negatively framed news article, this effect was non-significant.

Hypothesis H4a, that PR of the service class (ScPR) would increase BrPR, was supported and significant for both the control ($\beta = 0.482$, $P < 0.001$) and treatment groups ($\beta = 0.349$, $P < 0.001$). Hypothesis H4b, that ScPR would increase PA, was supported and significant for the control ($\beta = 0.218$, $P = 0.002$) and treatment ($\beta = 0.189$, $P = 0.008$) groups.

Study one discussion

At varying levels of intensity, consumers were theorized as perceiving e-service replacements to paper-based services as being non-authentic and artificial. This phenomenon was operationalized, labelled PA and tested using demoware depicting an e-billpay service. The PA variable exhibited strong internal reliability and validity in two samples and PA significantly increased the PR of using an e-billpay service. In addition, risk concerns for the e-service class were projected onto the specific brand tested. Three antecedents of PA were tested; EOU and PIIT significantly reduced PA (for one sample only) and e-service class risk increased artificiality beliefs.

Consumers reporting higher e-service class risk also reported higher artificiality beliefs. This suggests that risk assessments for the e-service class cause consumer apprehension when they are mentally processing new e-service innovations, and as a result, reduce the subjective authenticity placed on the evaluation cues of the target e-service. Thus, *a priori* predisposition of the risks for an e-service class may increase the likelihood that the e-service will fail consumer's initial 'reality checks'.

While not an explicit feature of this research, the sample was split into two subsamples based on a risk inducing treatment. This enabled exploratory testing of boundary conditions for the effects of the three exogenous variables (e-service class risk, EOU and PIIT) on PA and PR.

IT innovators of the sample reported slightly reduced artificiality concerns, however, exposure to negatively framed service performance information negated this effect. Stated another way, risk concerns for the e-service class negated the ability of the PIIT trait to reduce the PA of the e-billpay service. Consumers higher in PIIT were no more likely to assess the e-service to be authentic (non-artificial).

Similarly, EOU reduced consumer perceptions of both PA and risk, however, this risk-reducing effect may be bounded. When PR was manipulated higher by the negatively framed service efficacy information, EOU did not reduce PR. This signals a potential conditional relationship, which was explored for group invariance using a multiple regression interaction term to signify group membership (0 for the control group, 1 for the treatment group).

The exploratory results supported the moderated relationship as the EOU–treatment group interaction term was positive and significant ($\beta = 0.158$, $P < 0.001$) suggesting that the risk reducing influence was deflated by the message framing treatment. Group mean EOU levels did not differ, however, the risk-reducing effect of EOU was attenuated for the treatment group. This result suggests that the payback from system EOU will occur only if e-service vendors also build strong risk-reducing security measures and assurances into their trial systems, e-service information and e-service offerings to counter media and personal influences.

Direct trial experience may provide enough feedback to engender perceptions of e-service efficacy and reliability, reduce cognitive load and provide performance evaluation cues that can reduce risk perceptions. The risk-reducing effect of e-service EOU, however, may be tenuous for many consumers as exposure to negatively framed messages in the public mass media are common. An opposite phenomenon occurred for the EOU to PA relationship. The effect strengthened for the treatment group suggesting its importance as an evaluation cue increasingly useful to reduce PA when risk concerns (and therefore consumer apprehension) are salient.

In summary, PA was identified as a salient pre-adoption concern for this sample and context. As PA here is a direct antecedent to BrPR, attempts to increase e-service authenticity (thereby reducing its artificiality) are warranted. While experiments testing artificiality reducing treatments warrant future investigation, the remainder of this article focuses on a confirmatory study to further validate the PA operational definition, and the research model relationships.

Study two

To provide confirmatory evidence for the perceived authenticity variable and its proposed relationships within the research model, a survey format was utilized to gather data from a third sample. As no treatment was administered, this sample replicates the control group of the prior study (sample 1).

Sample

A third sample ($n = 196$) was drawn from the same population.

Task

Subjects again evaluated an e-billpay service utilizing the identical interactive demonstration software utilized in Study one, however, a different vendor offered the service and demonstration software. The specific e-billpay brand evaluated in Study one was no longer offered, however, was actually provided by the vendor evaluated in Study two. The e-billpay service utilized in Study two was therefore branded differently, but the service offering and information presented were nearly identical.

Setting

The software evaluation and survey was performed in the same controlled university computer lab.

Procedure

Identical to study one, except no pre-trial risk manipulation was administered. SEM results are again used to provide support for each hypothesized relationship and are referred to below.

Study two results

Psychometrics

Study two provided further evidence for the convergent validity of the PA variable (see Table 1). In addition Cronbach's alpha scores for each research variable were all 0.84 or higher, and AVE reliability measures were 0.71 or higher (see Appendix 1). Support for research variable discriminant validity is provided by the excellent SEM fit indices reported in Figure 2, as RMSEA results indicate only 4.5% of the variance in the data was unexplained. Results indicate that all but one hypothesized relationship was significant, providing further support for the nomological validity of the linkages within the theoretical model for the e-service research context and sample population.

Hypothesis H1, that PA would lead to increased BrPR, was supported ($\beta = 0.569$, $P < 0.001$). A more granular SEM was again utilized to gain insight into the effect of PA on each BrPR risk facet. The PA path weight and percentage of variance accounted for financial risk was ($\beta = 0.497$, $r^2 = 24.7\%$), for performance risk was ($\beta = 0.500$, $r^2 = 25\%$), and for privacy risk was ($\beta = 0.442$, $r^2 = 19.6\%$), with all paths significant at $P < 0.001$.

Hypothesis H2a, that EOU would lower BrPR, was supported ($\beta = -0.216$, $P < 0.001$). Hypothesis H2b, that EOU would decrease PA, was supported ($\beta = -0.447$, $P < 0.001$). Hypothesis H3, that PIIT would decrease PA, was not supported ($\beta = -0.046$, $P = 0.545$). Hypothesis H4a, that PR of the service class would lower BrPR, was supported ($\beta = 0.346$, $P < 0.001$). Hypothesis H4b, that PR of the service class would increase PA, was supported ($\beta = 0.388$, $P < 0.001$).

Study two discussion

Study two provides confirmatory evidence for the empirical definition of the PA variable, its fit within the research model, and further evidence that artificiality beliefs increase e-service risk perceptions. All but one of the hypothesized relationships was supported; higher IT innovativeness again did not contribute to reduced PA thus sample 1's modest results were not confirmed.

In summary when consumers perceived an e-service to be artificial and non-authentic, their risk perceptions increased. Higher EOU levels reduced artificiality and risk concerns while concerns for the riskiness of the entire e-payments service class increased the artificiality of the e-billpay service. A summary of results hypotheses is shown in Table 2, and a general discussion and implications follows.

GENERAL DISCUSSION AND IMPLICATIONS FOR FUTURE RESEARCH

This article had three goals. First, to define what we believe to be a common consumer reaction to the virtualization of paper-based processes and services, that intangible e-services

Table 2. Summary of findings

Hypotheses	Study one		Study two
	Sample 1	Simple 2	Simple 3
H1: Higher perceived artificiality increases the perceived usage risk of a branded e-service	√***	√***	√***
H2a: Higher e-service ease of use lowers the usage risks of a branded e-service	√**	⊗	√***
H2b: Higher e-service ease of use lowers the perceived artificiality of an e-service	√***	√***	√***
H3: Personal Innovativeness in IT lowers perceived artificiality	√**	⊗	⊗
H4a: Higher e-service class risk is associated with higher perceived risk for a specific brand within that service class	√***	√***	√***
H4b: Higher e-service class risk is associated with higher e-service artificiality	√**	√**	√***

√**, supported at $P < 0.01$; √***, supported at $P < 0.001$; ⊗, not supported.

often seem artificial and non-authentic. Second, the article sought to identify possible factors that affect these perceptions of artificiality. The third goal was to examine downstream effects on consumer perceptions of e-service usage risk in order to shed light on a likely impediment to e-service usage so that it may be controlled. Support for a negative outcome of the service virtualization process – perceptions of e-service artificiality – was provided across three samples. The results from this study make both theoretical and practical contributions to the ISs as well as e-commerce literature. The following sections expand upon these contributions.

Theoretical contributions

Future models of internet consumer behaviour need to include a richer understanding of the antecedents to both trust formation and risk perception. While factors affecting consumer trust in e-commerce settings (such as privacy and security concerns, vendor reputation and service quality) are well-studied, antecedents to consumer perceptions of risk in e-commerce settings are less understood. We identified several factors likely to affect consumer perceptions of risk; research considered necessary by trust researchers (Jarvenpaa *et al*., 2000; Gefen, 2002; McKnight *et al*., 2002; Gefen *et al*., 2003). A better understanding of factors, which cause consumer PR, apprehension and avoidance behaviours, can serve to guide future research into the development and testing of trust-building measures into e-commerce web sites.

A multifaceted PR perspective was used to research consumer perceptions of a new e-service, which was designed to replace the traditional physical process of receiving paper bills, and then write/rip/mailing paper checks to pay them. This article identifies a salient driver of PR – that content on vendor web sites often seems artificial and non-authentic. This finding is especially pertinent for the research of consumer evaluations and adoption of e-services, as wide variance exists in how consumers perceive and evaluate virtual evaluation cues and intangible processes.

This research hopes to enrich future consumer-oriented e-commerce and employee-oriented organizational research into the impediments of e-service adoption. The parsimonious PA scale may prove useful to measure individual evaluations of different interface designs akin to prior usage of EOU scales.

While this study provides interesting insights into how consumers potentially formulate and perceive the risks of using e-services, it does not attempt to predict consumer adoption of these innovative services. Featherman & Pavlou (2003), however, previously reported that PR reduces consumer perceptions of the usefulness of an e-service (β –0.284, $P < 0.001$) and their stated intent to use that e-service (β –0.197, $P = 0.01$). Paired with that prior research, the current finding of a salient antecedent to PR – PA – provides an opportunity for the expansion of IT acceptance and attitude-intentions models.

Practical contributions

From a pragmatic perspective, organizations that both provide and adopt newly virtualized processes and e-services must recognize that many individuals are made uncomfortable when core daily processes are moved to the virtual realm, for fear that virtualized systems and e-services seem 'not quite real', and that 'something is wrong with them'. For example, consumers may now be accustomed to reading their daily newspaper via the web, but still balk at the thought of planning their retirement or next vacation using an e-service. This human reaction to services that have been 'blown to bits' (Evans & Wurster, 2000) and rehosted as e-services may be reduced by improving the on-screen objects, context and information.

E-service providers must therefore carefully consider and test innovative IS design features that infuse an effective degree of tangibility to the interface to overcome artificiality concerns. Possible solutions related to the financial payments context investigated here include changes to the evaluation cues afforded by e-service providers. Perhaps e-service providers could clearly display when a bill is 'in the consumer's mailbox' (via a red flag) or that paid bills are 'dropped into the blue mailbox'. Providing a mixture of digital and tangible (printed) output may also reduce consumer's artificiality and risk concerns.

The results from this study support the contention that e-services of less risky e-service categories will be perceived as more authentic and less risky to use. Thus, e-service providers must carefully assess their respective categories and plan accordingly. For instance, an e-service provider operating in a relatively risky category may want to invest more resources to develop an interface that projects a higher degree of authenticity. Conversely, e-service providers operating in a less risky category may relax their interface requirements as consumer perceptions of artificiality and, subsequently, brand-specific risk may be relatively lower.

Interface designs also need to be flexible enough to support different categories of IT innovativeness, as a consumer's technical prowess can produce different effects, depending on the degree of innovativeness. For instance, a consumer with a novice level of technical proficiency may perceive a non-authentic seeming e-service as authentic because of inexperience; this type of consumer would not need to learn of complex security systems in place. At the same time, IT innovators may perceive an authentic e-service as non-authentic because of technical

concerns (e.g. lack of security resulting in risk concerns); this type of consumer would appreciate straightforward security information.

These different consumer categories may prompt a need for different levels of pre-adoption information. For example, vendors may display in-depth security information on separate pages accessible to those consumers with an affinity to read it, and simple catchy graphics for more novice system users. Finally, any consumer artificiality and risk concerns made salient during e-service evaluation must be reduced to a manageable level before the benefit can be reaped from efforts to develop and deploy easy to use trial software.

Limitations

There are several limitations to this work the first being that consumers formed perceptions of the online e-billpay systems based on interacting with 'canned' demoware. Subjects viewed and paid fictitious bills from funds in a fictitious checking account. As such, the subjects performed a 'shopping trial' using demoware rather than an actual trial of e-billpay services utilizing their own bank account. This provides a limited insight into the online e-services evaluation process.

A full investigation of the effect of PIIT on e-service perceptions may not have been possible with the relatively homogeneous samples. While the samples were not skewed on the innovativeness trait a more heterogeneous sample with varied levels of computer efficacy may have provided further insights into the hypothesized relationships. Furthermore, the investigation of the relationship between PA and PR would be improved by utilizing a longitudinal rather than cross-sectional manner.

Future research

While perceived artificiality or authenticity has the potential to be a revealing antecedent for a PR/TAM model, e-service virtuality points to another important antecedent – intangibility. Early e-commerce research has argued that graphical interfaces and the persistence of encoded service processes via IT can lead to effective service automation and, at the same time, add the necessary degree of tangibility (Pitt *et al*., 1999). Services based on tangible actions (e.g. haircut, lawn care) enjoy the luxury of providing consumers with concrete evidence as to their authenticity. Conversely, services based on intangible actions (e.g. banking, education) must overcome their inherent intangibility to alleviate consumer concerns of artificiality. Thus, future research should integrate the concept of intangibility into a broader PR/trust consumer acceptance model to explore the potential effect that perceptions of intangibility and PA have on evaluation and adoption of e-services.

Finally, an opportunity exists to study the various individual characteristics that can affect perceptions of e-services and moderate the theoretical relationship proposed here. These include age, computer self-efficacy, involvement, level of similar web transaction experience and strength of paper-based traditions. Many individuals may resist the virtualization of paper-based personal transactions and services. The PA scale defined here may serve as an impor-

tant measure to gauge consumer reactions to new e-services. Finally, further investigation of the drivers of PR is warranted to shed further insight into the drivers of consumer trust and risk within an e-commerce context.

CONCLUSION

In summary, the PA of e-services presents an important problem to consumers and service providers. The PA of an e-service's HCI appears to increase consumer beliefs that using an e-service is a risky endeavour. PA and is therefore likely to contribute to reduced e-service acceptance levels. Perceptions and reactions to the 'simulated reality' of newly virtualized e-services deserve further study as an antecedent to consumer perceptions of risk, e-service evaluations and adoption.

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APPENDIX 1: CORRELATION MATRICES

	$\bar{X}$ (SD)	No. items	Alpha	GFI	1	2	3	4	5
Study one sample 1 ($n = 310$)									
1. Perceived artificiality	3.481.38	5	0.91	0.987	0.82				
2. Ease of use	5.39 (1.04)	4	0.87	0.992	–0.332	0.79			
3. Personal innovativeness in IT	4.76 (1.17)	4	0.86	0.999	–0.321	0.309	0.78		
4. Perceived risk of e-service class	3.36 (1.05)	4	0.77	0.978	0.294	–0.170	–0.301	0.67	
5. Brand-specific perceived risk	3.85 (0.96)	9	0.88	0.921	0.491	–0.364	–0.302	0.490	0.67
Study one sample 2 ($n = 216$)									
1. Perceived artificiality	3.771.29	5	0.90	0.984	0.81				
2. Ease of use	5.22 (0.99)	4	0.88	0.991	–0.425	0.80			
3. Personal innovativeness in IT	4.71 (1.00)	4	0.81	0.993	–0.233	0.353	0.73		
4. Perceived risk of e-service class	3.78 (1.06)	4	0.73	0.968	0.324	–0.281	–0.287	0.64	
5. Brand-specific perceived risk	4.19 (0.92)	9	0.88	0.893	0.466	–0.325	–0.226	0.510	0.67
Study two ($n = 196$)									
1. Perceived artificiality	3.771.28	5	0.90	0.992	0.81				
2. Ease of use	5.05 (1.11)	4	0.88	0.996	–0.539	0.80			
3. Personal innovativeness in IT	4.92 (1.14)	4	0.84	0.994	–0.316	0.407	0.77		
4. Perceived risk of e-service class	3.63 (1.09)	6	0.86	0.940	0.424	–0.230	–0.260	0.71	
5. Brand-specific perceived risk	3.86 (1.02)	11	0.91	0.884	0.754	–0.527	–0.283	0.605	0.76

Significance for all correlations was <0.001.

Square root of the average ML extracted communality presented in each matrix diagonal.

