

THE INFLUENCE OF RISK-REDUCING INFORMATION TECHNOLOGY TOOLS
ON E-COMMERCE TRANSACTION PERCEIVED RISK

by

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Abstract

This research addressed the question of how information technology (IT) tools influence the perceived risk of consumers in e-commerce transactions in three phases. First, an exposure-driven model of e-commerce transaction perceived risk was developed and tested, providing a theoretical and conceptual basis for this research. Nine salient risk beliefs were modeled as formative dimensions of three risk belief categories based on prior perceived risk research: information misuse risk, performance risk, and functionality inefficiency risk. The model was tested in an online survey of 565 internet users. The results support the proposed construct of e-commerce transaction perceived risk, modeled as formed by the three proposed risk categories, validating the measurement model and finding that the construct was associated as expected with accepted e-commerce constructs in a nomological network.

In the second phase, this model was used to examine the ways in which IT tools influence those beliefs. Participants were asked to observe an example of one risk-reducing IT tool (RRIT) and to indicate their willingness to use the tool for reducing the probability of each risk category and risk dimension. This research confirmed that consumers do perceive RRIT as being useful in reducing the probabilities of risk categories, compared to their willingness to adopt a control IT tool or other RRIT for that purpose.

The final phase of this research investigates the adoption and influence of RRIT. Participants were shown an example RRIT and were asked to compare a store providing the tool to an identical website that did not provide the tool. This research supported hypotheses that perceived improvements in the probability of one or more of the risk dimensions when an RRIT is provided would lead to an intention to adopt the RRIT, and that the intention to adopt the

RRIT would be associated with an improvement in attitude toward buying from a web retailer and the subsequent improvement in intention to buy from a web retailer.

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1. The Influence of Risk-Reducing Information Technology Tools on E-commerce Transaction Perceived Risk

1.1 Introduction

Although business-to-consumer (B2C) e-commerce in the U.S. grew at a rate of 19% from 2006 to 2007, the US Department of Commerce reports that only 3.4% of retail sales occurred over the web (Scheleur 2008). In Canada, retail e-commerce did not achieve the expected levels of sales in 2004 (the last year available from StatsCan), reaching just 0.8% of all retail sales (StatsCan 2005). The preponderance of e-commerce research has adopted a variety of trust models and trust constructs to explain and predict the willingness of consumers to transact using e-Commerce (for example, Ba et al. 2002; 2003a). Although most business-to-consumer (B2C) e-commerce trust researchers acknowledge that perceived risks faced by consumers in the internet environment create impediments that make trust necessary, such as events that are beyond the control of the consumer or the knowledge asymmetry of the buyer and seller (Grabner-Krauter et al. 2003; McKnight et al. 2002b), perceived risk has received much less attention than trust as an antecedent to consumers' on-line buying behaviour and intentions. In attempting to understand why potential e-commerce consumers do not buy on the web, the majority of e-commerce research has focused on ways to influence the level of trust a consumer perceives in order to overcome that reluctance (Bart et al. 2005; Komiak et al. 2006; Pavlou et al. 2006), rather than towards a reduction of the perceived risk that makes a high level of trust necessary.

One reason for this relative lack of attention to perceived risk might be the difficulty of untangling the many aspects of a transaction that can lead to “risks”. The nature of perceived risk is complex, and the range of risks that exist for the purchase of any product or service are intermingled with risks associated with conducting an online transaction without being able to experience the product or physically meeting an online merchant, which are compounded with the risks of making the purchase through electronic means over a public network (Gefen et al. 2003c). Further, these risks can be considered from different perspectives, examining the source of the risk, the events that generate harm for the consumer, or the types of harm that the consumer experiences.

However, there is good reason for Management Information Systems (MIS) researchers in e-commerce to understand consumers’ risk beliefs. Although many of the risks of a purchase are present to a greater or lesser degree for every transaction regardless of the channel, some perceived risks may be unique to or are exacerbated by the context of a B2C e-commerce transaction. As a result, these perceived risks may be important determinants for the reluctance of some consumers to buy on the web, and may offer an opportunity for information technology (IT) tools to reduce these perceived risks to overcome that reluctance. It is not enough for MIS researchers to identify that risk in general influences consumer behaviour, or even to determine the types of risk in particular that reduce consumers’ intention to buy on the web. IS researchers must go beyond this to facilitate the development of tools that will reduce such risks. For example, privacy and security risks are concerns commonly identified as hindrances to the growth of e- Commerce (Liebermann et al. 2002; Miyazaki et al. 2001), and technologies such as Secure Socket Layer may reduce the perceived risk for consumers. In the absence of a definition from prior research, a *risk-reducing IT tool is an information technology tool intended*

to reduce the expectations of the consumer that purchasing a good or a service on the web will result in unwanted outcomes. The IT tool may be provided by the e-commerce retailer, by a third-party, and/or by the consumer. Regardless of its source, the purpose of the IT tool is to facilitate a consumer's risk-reducing strategies – it must be used by the consumer for a perceived risk faced by the consumer if it is to be effective. An IT tool that reduces a risk *unknown* to the consumer would not be effective in reducing perceived risk. Further, an IT tool that exists and operates without the knowledge of the consumer would not reduce perceived risk and would not be considered a perceived risk-reducing IT tool under this definition.

The identification and improvement of perceived risk-reducing IT tools may have been hindered by the difficulty in measuring aspects of perceived risk that can be specifically influenced by such tools. E-Commerce research that has considered the role of perceived risk in the decision of a consumer to transact over the web has done so by operationalizing the construct as either a unidimensional whole (Gefen et al. 2003a; Grazioli et al. 2000; Jarvenpaa et al. 1999; Kimery et al. 2002; Pavlou et al. 2004), or as a multidimensional construct containing risks along a variety of dimensions (Featherman et al. 2003; Miyazaki et al. 2001; Park et al. 2004; Spiekermann et al. 2002) . However, neither the unidimensional nor the multidimensional conceptualizations to date provide researchers and practitioners with the information required to specifically design IT interventions that are effective in reducing the perceived risk of e-commerce consumers.

This research addresses in two phases the question of how IT tools influence the perceived risk of consumers in e-commerce transactions. First, a model of e-commerce transaction perceived risk is developed and tested (Chapter 2), providing a theoretical and

conceptual basis for this research. In the second phase, this model is used to examine the influence of IT tools on perceived risk: first, by testing the perceptions of consumers regarding IT tools found on retail web sites (Chapter 3); second by testing hypotheses regarding the adoption and influence of the IT tools (Chapter 4).

1.2 Phase 1: A Model of E-Commerce Transaction Perceived Risk

Although multidimensional conceptualizations of perceived risk have received some attention in the e-commerce literature, the consideration of perceived risk from a perspective that provides sufficient granularity to provide specific information regarding the concerns of consumers and the effect of IT tools on those concerns has been lacking. For example, Spiekermann and Paraschiv call for designers of decision support interface systems to consider both consumer initial perceived risk along various dimensions and the effectiveness of the interface in reducing those risks (Spiekermann et al. 2002). Instead, research to date has generally considered models of risk that are based on perspectives that are not easily addressable by IT tools (Miyazaki et al. 2001) or that contain more than one perspective of risk, confounding the type of harm with the source of the risk (Miyazaki et al. 2001), or the type of harm with the events that occur in the course of a transaction (for example, finding the that the product does not perform as expected) (Spiekermann et al. 2002), or types of harm with the sources of risk and events of e-commerce (Park et al. 2004).

A consistent use of the perspective of risk that is based on the ways in which consumers are exposed to risk in an e-commerce transaction can provide the information researchers and designers require if they are to apply the correct tools to reduce consumers risk and to understand the effect of these tools in order to improve them. Based on the theory of reasoned

action (TRA) (Ajzen et al. 1980), if we aim to increase the willingness of the consumer to buy on the web, we must first improve the consumer's attitude toward buying on the web by positively influencing the consumer's beliefs regarding buying on the web. However, before we can change these beliefs, we must understand what they are. To identify these beliefs, the theory of Cox (1967a) regarding the three generic risks faced by consumers in a transaction (consumers may not gain the benefit that was sought; the consumer may have to pay a penalty for trying to make the gain; and the consumer may lose the means by which he or she was trying to make the gain) was adapted to define three risk belief categories for e-commerce users: failure to gain product benefits risk, information misuse risk, and functionality inefficiency risk. This structure provides the dimensions of e-commerce transaction perceived risk. To develop a set of formative dimensions for these risk categories, a convenience sample of e-commerce students and researchers was then used to identify the salient risk beliefs regarding unwanted events that may occur in the course of an e-commerce transaction. The elicited events were categorized into nine sub-dimensions of risk according to their "bottom-line consequences" (Keeney 1999), or the ways in which they expose the consumer to harm. The sub-dimensions were modeled as nine formative dimensions of the three risk belief dimensions.

The model was tested in an online survey of 565 internet users. The results support the proposed model in a nomological network of accepted constructs that were hypothesized as being associated with e-commerce transaction perceived risk. The result supported a model that proposed the nine dimensions as forming the three risk categories, indicating that e-commerce transaction perceived risk is formed by three constructs: consumers' belief that: 1) something purchased on the web may not deliver the expected benefits (*failure to gain product benefits risk*); 2) information revealed in the course of an e-commerce transaction might be misused

(*information misuse risk*); and 3) functionalities offered by an e-commerce site to facilitate or enhance the primary service of the site might be require too much time, too much effort or too much money (e-commerce *transaction functionality inefficiency risk*). In a nomological network of predicted relationships, e-commerce transaction perceived risk was found to have a significant and important relationship with *attitude toward buying on the web* and the *intent to buy on the web*, even in the presence of the technology acceptance model (TAM) (Davis 1989) variables of *perceived usefulness* and *perceived ease of use*.

1.3 Phase 2: The Influence of IT Tools on E-Commerce Transaction Perceived Risk

If an IT tool is to change the intent of a consumer to buy from a web retailer, it must change the beliefs held by the consumer regarding this behaviour. Phase 1 found that the risk belief dimensions of *information misuse risk*, *failure to gain product benefits risk* and *functionality inefficiency risk* formed *e-commerce transaction perceived risk* that influenced the *attitude toward buying on the web* and the subsequent *intention to buy on the web*. Phase 2 examines the ways in which IT tools are expected by consumers to influence those beliefs. First, an online field study investigated the willingness of consumers to adopt IT tools for the purpose of reducing specific risks. Secondly, this research investigated the ways in which the expected effect of RRIT on consumer beliefs regarding the outcomes of buying from a web retailer influence consumer expectations regarding the intent to adopt the IT tool and the subsequent expected effect of the RRIT on attitude toward buying from a web retailer and the expected effect of the RRIT on the intention to buy from a web retailer.

In the first part of phase 2 (Chapter 3), this research examines whether consumers perceive specific IT tools as reducing the risks of e-commerce. An online field study of internet

users was conducted that measured the willingness of consumers to adopt a perceived risk-reducing IT tool (RRIT) for the purpose of reducing the probability of a specific risk. Ten different RRIT were identified on operating web sites as examples of tools intended to reduce the perceived risk of consumers in an e-commerce transaction; each participant was provided with an example of one RRIT. To determine whether consumers perceive RRIT as reducing the risks of buying from a web retailer, participants were then asked to assess their willingness to use the tool for the purpose of reducing the probability of each risk category. This research confirmed that consumers do perceive particular RRIT as being useful in reducing the probabilities of specific risk categories compared to a control group and compared to other RRIT.

The second part of phase 2 (Chapter 4) investigates the adoption and influence of RRIT. Since consumers recognize the purpose of the RRIT as reducing perceived risks of buying from a web retailer, the beliefs regarding *effect of the RRIT on the probability of e-commerce transaction perceived risk* (or perceived usefulness of the RRIT) and the *perceived ease of use of the RRIT* should lead to an intention to adopt the RRIT. With that increase in *intention to adopt the RRIT*, the *effect of the RRIT on the attitude of buying from a web retailer* should increase and the *effect of the RRIT on the intention to buy from a web retailer* should also increase. To test these hypotheses, participants were shown an example RRIT and asked to compare web retailers that provided the RRIT with an identical web retailer that did not provide the tool. For each of the variables, participants were asked to evaluate how a web retailer that provided the RRIT would rank on the variable compared to an identical web retailer that did not provide the RRIT. In this way, participants provided a direct measure of the expected effects of the RRIT on each variable of interest. The results supported the hypotheses that the *effect of the*

RRIT on e-commerce transaction perceived risk and perceived ease of use of the RRIT are influence the intention to adopt the RRIT, and that the intention to adopt the RRIT is correlated with the effect of the RRIT on the attitude toward buying from a web retailer and the subsequent effect of the RRIT on the intention to buy from a web retailer.

1.4 Contributions

This research makes a contribution to knowledge in a number of ways. First, by developing and testing a model of e-commerce transaction perceived risk based on the ways in which consumers are exposed to risk, this research identifies perceived risks of consumers that are intended to be acted upon by IT tools that may be provided by retail web sites. By considering e-commerce transaction perceived risk from this perspective, the model not only provides insights for researchers and practitioners regarding the risk beliefs held by consumers but provides these insights from a perspective that may be influenced by IT tools. This will make it possible to understand better the influence of risk-reducing IT tools on the risk beliefs and subsequent attitudes and intentions of consumers.

Second, by confirming that consumers recognize the purpose of RRIT (as shown by their willingness to adopt the RRIT for a specific purpose), this research supports the theoretical structure of e-commerce transaction perceived risk using RRIT found on active web retailers, and suggests the need for researchers and practitioners to consider the issues of perceived risk at the level of detail provided by the model.

Third, this research makes an additional contribution by testing the effect of the RRIT at two levels of a technology adoption process. The consumer is hindered in buying from a web

retailer by a set of beliefs regarding the perceived risks of this activity. The web retailer offers a RRIT to reduce these perceived risks. In this case, the web retailer is not particularly interested in the adoption of the RRIT itself; however, that adoption is necessary to facilitate the behaviour of buying from the web retailer by assisting the consumer to reduce specific perceived risks. By beginning to open this “black box” of RRIT, researchers can better understand how IT can be used to support and facilitate the desired behaviour, and can consider the factors that will make the RRIT more likely to be adopted by the consumer and therefore more likely to result in the desired behaviour of buying from the web retailer.

2. A Model of E-Commerce Transaction Perceived Risk

2.1 Prior Research

2.1.1 Perspectives on Perceived Risk

A commonly used definition of perceived risk is a person's perception of the uncertainty and adverse consequences of engaging in an activity (Dowling et al. 1994; Jarvenpaa et al. 1999). Other researchers have operationalized perceived risk of using the web as the extent to which a user believes it is unsafe to use the web or that negative consequences are possible (Grazioli et al. 2000; McKnight et al. 2002a). These conceptualizations echo Bauer's definition of perceived risk as a consumer's expectation that his or her actions in purchasing a good or a service could have unwanted consequences (Bauer 1967). However, the study of perceived risk in B2C e-commerce differs from that in traditional marketing in that it also considers concerns associated with the channel and point of purchase, rather than just the risks that arise from the product itself (Keeney 1999; Torkzadeh et al. 2002). Based on this, this research paraphrases Bauer (1967) to define B2C e-commerce transaction perceived risk as: *a consumer's expectation that his or her actions in purchasing a good or a service from a B2C e-commerce site could have unwanted outcomes.* This is not to say that e-commerce transaction perceived risks are necessarily unique to this channel of transaction; some of the perceived risk may exist in the purchase of a product at a physical store, but are exacerbated by differences between e-commerce and a transaction in a physical store: for example, the transactions are conducted at a distance; the transaction occurs over a public network; it may be difficult or impossible to test the product; the range of products available for purchase may be very large.

Two fundamental methods of conceptualizing perceived risk are commonly found in the e-commerce literature:

1) Operationalization of perceived risk as a *unidimensional* whole (Gefen et al. 2003a; Grazioli et al. 2000; Jarvenpaa et al. 1999; Kimery et al. 2002; Pavlou et al. 2004; Pavlou 2003). For example, Jarvenpaa et al. (1999) developed and tested a model of the relationship of perceived risk, trust, attitude and willingness to buy. In their research, perceived risk, measured as a unidimensional whole, was found to act as an antecedent of attitude and a mediator of the effect of trust on the willingness to buy. Grazioli et al. (2000) used the same measure to observe that trust and perceived risk interact to influence consumer buying behaviour in an experiment that measured consumer's willingness to buy a laptop from a legitimate commercial website and a fraudulent site that imitated the legitimate site. The study distinguished between the notion of assurance (the seller will not cheat because of the fear of penalty) and trust (the trustee will act in unforeseen circumstances in a spirit of goodwill in a benign fashion towards the trustor), demonstrating empirically that assurance mechanisms, such as third-party seals and warranties, are negatively correlated with perceived risk, while trust-generating mechanisms, such as store reputation or customer testimonials, act positively on trust.

Although the unidimensional conceptualization of perceived risk has shown this construct to be meaningful in e-commerce and has demonstrated that perceived risk and trust are separate (though related) constructs, it does not provide researchers and practitioners with the finer granularity of information required to design appropriate IT-based interventions. Consideration of the underlying dimensions of perceived risk would provide information

regarding the interrelationships of specific sub-constructs with the consumer's attitude and allow the testing of the specific influence of IT tools in a way that is not possible with a unidimensional operationalization.

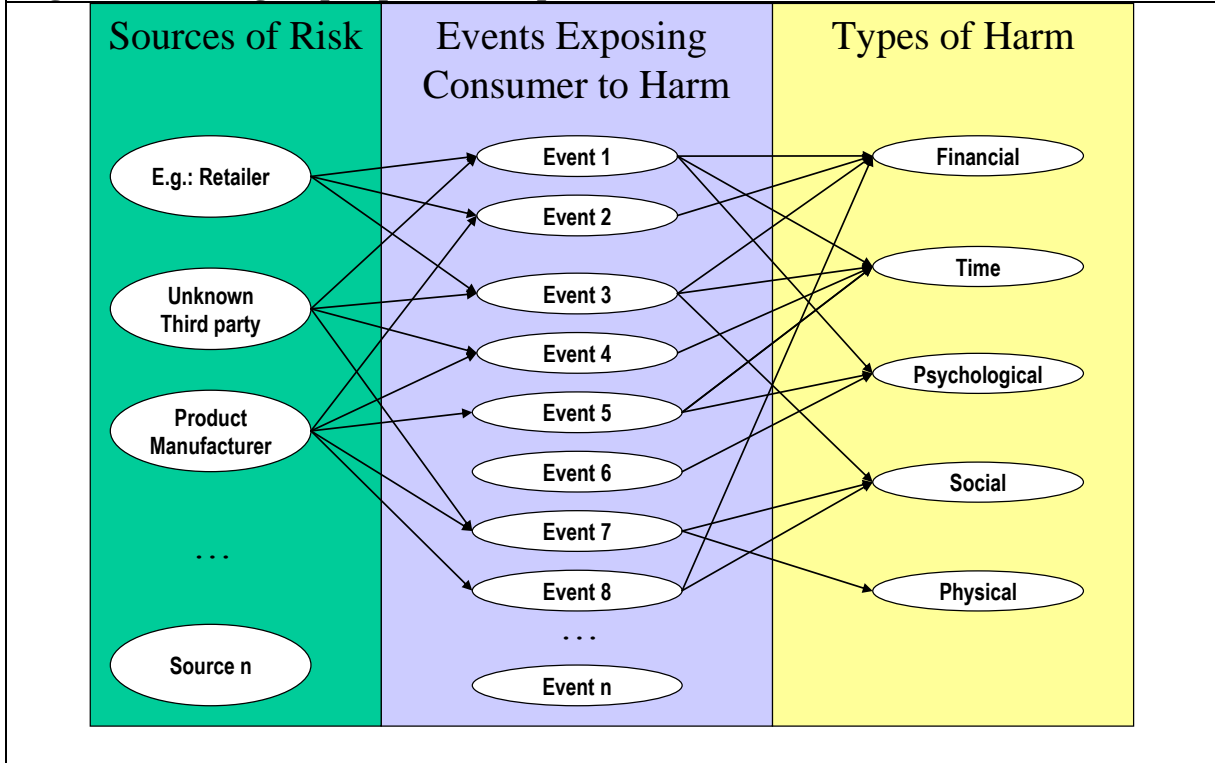
2) Operationalization of multiple dimensions (or attributes, or facets) of perceived risk. A second approach taken in the measurement of perceived risk reflects the understanding that perceived risk can be described along a number of different dimensions, which depend on the perspective adopted by the researcher. Cunningham (1967) distinguished between the two elements that compose the perceived risk (the severity of the consequences of the risk and likelihood of the occurrence of the risk) and the many possible dimensions that are the content of perceived risk (the type of risk perceived, for example, financial risk, social risk or health risk). Mitchell (1999) suggests that the combination of composition and content of perceived risk offers the potential for insights into the nature of perceived risk. This research adopts this approach in defining a consistent perspective to understand the content of perceived risk, and by measuring both the severity of consequences and the likelihood of occurrence as elements composing perceived risk.

Researchers have proposed a wide range of dimensions as defining the content of perceived risk. Spiekermann and Paraschiv (2002) suggest a breakdown of overall perceived risk into the attributes of social/psychological risk; functional risk; financial risk; and level of delivery risk. A model of perceived risk proposed by Park et al. (2004) posited two attributes of perceived risk: 1) perceived risk of the transaction, using items that reflect security, privacy, non-repudiation (deniability of the transaction); and 2) perceived risk of the product/service, using items that reflect functional loss; financial loss; time loss; opportunity loss; and overall

perceived risk with product/service. Featherman and Pavlou (2003) found that performance risk (the risk that an e-service system would not perform as expected) is an antecedent to perceived risk, distinct from the types of harm that might occur (financial; privacy; psychological; and time). Pavlou, Liang and Xue (2007) applied agency theory to study perceived uncertainty in e-commerce adoption, finding that fears of seller opportunism and perceived information asymmetry form perceived uncertainty, along with the additional constructs of information privacy concerns and information security concerns.

Risk communication research provides a process model for understanding the process through which a consumer experiences harm from a transaction (Webler et al. 1995). In this model, some phenomenon or actor is the source of the risk; for someone to suffer harm from that phenomenon, an event exposing the consumer to harm must occur. This event may result one or more of the types of harm that a consumer may suffer. Each stage of this process provides a perspective for the investigation of perceived risk in e-commerce, as shown in Figure 2.1: the source of the risk; the event that exposes the consumer to a consequence; and the type of harm to the consumer.

Figure 2.1: Emergent perspectives on perceived risk from e-commerce literature



The first perspective examines perceived risk from the point of view of that someone or something is the *source* of the risk. The source of the risk is the environment, an object, or an actor responsible for an event that then causes harm to the e-commerce consumer. For example, Tung et al. (2001) suggest that the risk in e-commerce may come about from the choice of the product or from the choice of the vendor, while Miyazaki et al. (2001) identified security risk as arising from either of two sources, the web retailer or third parties.

In the second perspective on the dimensions of perceived risk, the harm that the e-commerce consumer fears is the result of some *event* that may take place in the course of the e-commerce transaction that exposes the consumer to harm. For example, Featherman et al (2003) found that the harm perceived by the user of e-services arose from performance risk, an event which they defined as the possibility of the service failing to perform as designed and

advertised, and failing to deliver the desired benefits (an event that causes harm). Miyazaki et al. (2001) also adopted the event perspective (in combination with the source perspective) to identify privacy risk and the inconveniences of online shopping, as events that may occur in the course of online shopping, as risks perceived by consumers.

In the third perspective on the dimensions of perceived risk, researchers consider the result of the process, examining the various *types of harm* that the consumer may experience. This perspective on consumer perceived risk has been widely used by Marketing researchers, who generally agree that the types of harm that may occur consist of financial loss; time loss; psychological harm; social harm; and physical harm (Mitchell 1999). For example, this perspective on the types of harm that can occur was adapted to an e-services setting by Featherman et al. (2003), along with the perspective of the events that could cause the harm. This research provided support for the model described above, illustrated in figure 2.1, finding that performance risk (an event) was an antecedent to the types of harm that could occur.

A summary of the dimensions of perceived risk proposed in selected e-commerce perceived risk research that has adopted a multidimensional view of perceived risk and our analysis of the aspects of risk considered in that research is provided in Appendix A.

2.1.2 An IT-Based Focus on Risk Reduction

Multidimensional conceptualizations of perceived risk have received some attention in e-commerce literature, providing researchers with insights into different perspectives of the perceived risks of e-commerce. However, little connection has yet been made between the risks consumers perceive in buying goods and services on the web and the IT tools that web retailers may employ to reduce these risks. This research makes a novel and unique contribution by

making this connection, considering perceived risk from the perspective of a retailer wishing to use IT to alleviate the risks perceived by a potential customer.

Given the desire of the practitioner to reduce the perceived risk of a potential customer, the identification of the perceived source of a risk may not provide information regarding *what* the consumer fears from that source, and therefore may not allow an IT practitioner to design an IT tool overcome that fear. Institutional structures designed to address the concerns that the market place overall is safe and that the sources of risk are motivated to behave as they should may provide the best opportunity for e-commerce retailers to alleviate consumer concerns regarding *sources* of risk, but these are often legislative or regulatory structures or third-party assurances, and may not lend themselves to an IT-based solution.

Measuring the level of each of the five possible types of harm that a consumer perceives may occur as a result of buying on the web may provide little indication of how an IT tool might be used to change this perception since the *event* that exposed the consumer to this *type of harm* is not known. Knowing that the consumer fears both financial harm and wasting time as part of an e-commerce transaction provides very little information for the web retailer in providing IT tools to help the consumers overcome these fears. Often, the harm that is done to a consumer is mitigated after the fact through *insurance* mechanisms that reduce the harm experienced, a financial remedy, not an IT-based solution.

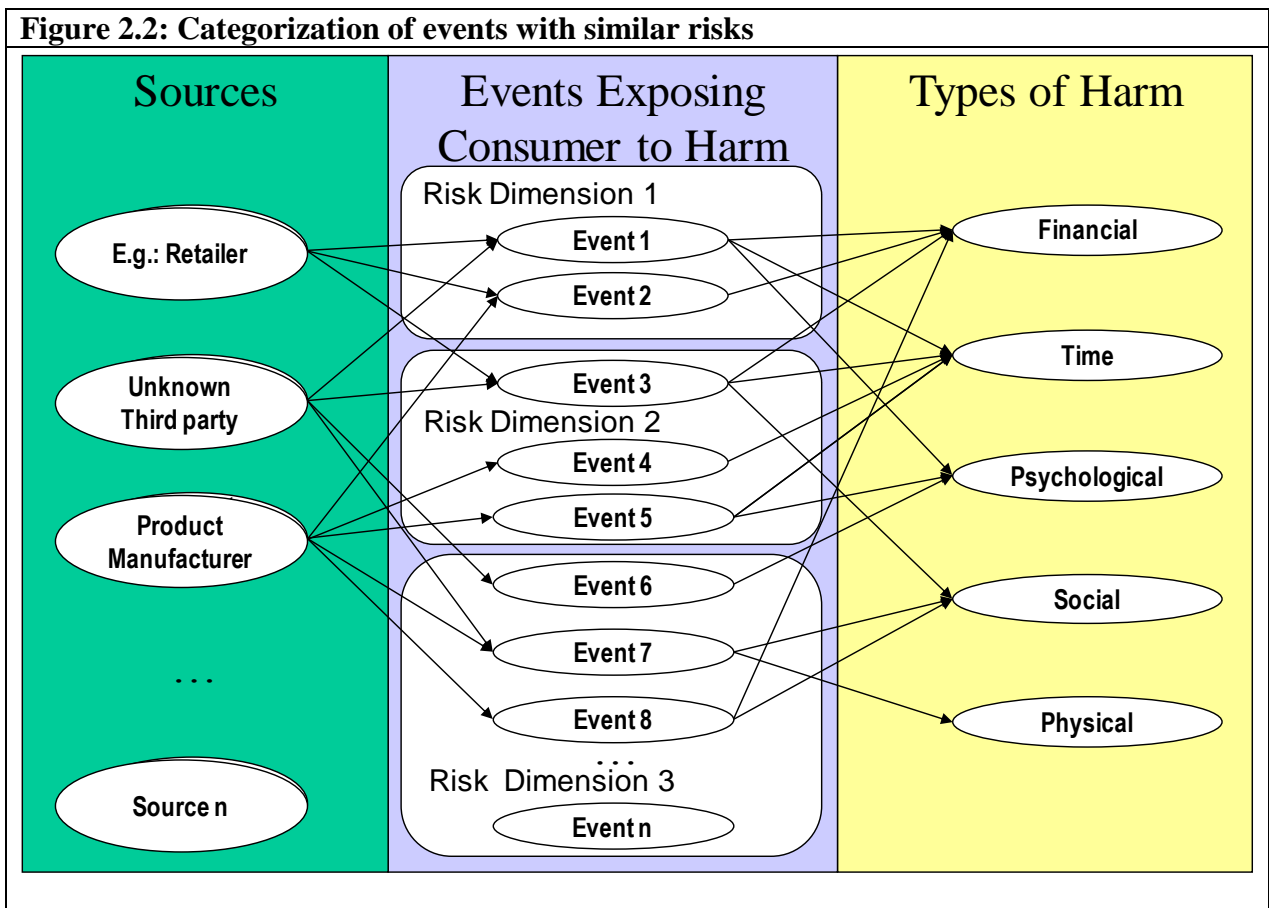
Alternatively, a perspective that investigates the *events that expose a consumer to harm* may direct IT practitioners to the design of IT tools that provide specific protection for the consumer from the potential events that are discouraging him or her from transacting on the web. Rather than protecting the consumer from a source of a risk, or mitigating harm done after

the fact, understanding the events that consumers fear may support the design of IT tools intended to reduce the risk of particular events, targeting directly the impediments to the transaction. In this way, an IT tool might be used to provide a consumer with confidence in the fact that a feared event would not occur, leading to the consumer buying from the web retailer. However, the challenge for researchers and practitioners in targeting specific events with IT tools is large: the range of individual events perceived as consumers as exposing them to harm is potentially limited only by the imagination of the consumer. If a specific IT tool must address each potential event, this approach may not be practical.

However, each unique event does not pose a unique risk for the consumer. Instead, certain events may expose the consumer to harm in similar ways, overlaying dimensions of risks on the events that may produce them as shown in figure 2.2. For example, consider a consumer selecting a digital camera to buy on a retail website: perhaps the consumer makes a poor choice; perhaps the retailer misrepresents the information about the products; perhaps the consumer cannot find a good choice from the large range of products available; or perhaps information important to the purchase is not available. All of these statements represent different events which may expose the consumer to harm. However, even though the unique events arise from a variety of sources, they result in a common dimension of risk: the needs of the consumer may not be met by the purchase. By grouping events according to the dimension of risk they produce, it will be possible to identify IT tools to address the relevant dimension of risk, rather than developing IT tools to prevent each of the component events. For example, an IT tool such as an online product recommendation agent might be effective in reducing a particular risk dimension (e.g., failure to meet the needs of the consumer), while not specifically targeting all of the *sources* of the risk (the manufacturer, the retailer, the product itself, the web channel), all

of the possible *events* (the consumer chooses poorly, the retailer misrepresents the product, the product is not tested prior to purchase), or all of the *types of harm* experienced by the consumer (the consumer loses money, the consumer wastes time, the consumer feels foolish for purchasing the wrong product).

By investigating risk using this event/risk dimension perspective, we may be better able to understand the effectiveness of IT tools in overcoming the reluctance of consumers to buy on the web, and provide direction to practitioners in the improvement of risk-reducing IT tools. In the following sections, this dissertation develops a model of e-commerce transaction perceived risk based on the event/risk dimension perspective.



2.2 Development of the Research Model

2.2.1 Development of the Categories of E-Commerce Transaction Perceived Risk

Early Marketing researchers studying perceived risk provide a theory-driven starting point for the identification of the causes of e-commerce transaction perceived risk. In his foundational paper exploring the structure of perceived risk, Cox (1967a, p. 37) expressed risk from the point of view of the consumer to identify the range of perceived risks that could harm the consumer, a model that researchers still cite today to explain consumer perceived risk, for example in Lin (2008). Cox identified the total amount of risk that consumers experience in a transaction, identifying three overarching ways in which consumers are exposed to harm in transaction: 1) the consumer may not gain the benefit he or she is trying to gain; 2) the consumer may have to pay a penalty for trying to make the gain; and 3) the consumer may lose the means by which he or she hoped to make the gain. Cox uses the example of his purchasing a sports coat with the intention of impressing his friends. This purchase has three risks: 1) he may fail to impress his friends (not gain the benefit he was trying to gain); 2) he may look foolish in the eyes of his friends for making an inappropriate purchase (may pay a penalty for trying to make the gain); and 3) he may waste the money, time and effort spent on making a purchase that did not deliver the expected benefits (may lose the means by which he hoped to make the gain) (Cox 1967a). Writing in 1967, Cox was obviously not considering risks that might occur as a result of transacting over the Internet. Nevertheless, the general risk types he has proposed also encompass the risks that an Internet consumer faces today.

In e-commerce, the consumer is attempting to purchase a product that best meets his or her needs with the least amount of time and effort, and wants to avoid facing other harm, such as the theft of credit card information. Adapted to this context of an e-commerce transaction, the general risks proposed by Cox that the e-commerce consumer faces are: 1) that the product or service purchased on the web might not deliver the product-related benefits that were expected (benefits sought through the purchase are not gained); 2) that the consumer will face ancillary harm when buying on the web, such as loss of privacy (paying a penalty for trying to make the gain), and 3) that the consumer will waste time, money or effort in making the purchase on the web (losing the means by which the consumer hoped to make the gain). These three general risks form the basis for our model of e-commerce transaction perceived risk. In the context of describing the decision-making process in terms of perceived risk, Spiekermann et al. (2002) proposed a theoretical framework incorporating similar dimensions of perceived risk: functional risk (the risk that benefits will not be received), financial risk (the risk that the money spent on the purchase will be lost), socio-psychological risk (the risk that the consumer will appear foolish) and delivery risk (the risk that the purchase will not be delivered as promised). However, the dimensions were not empirically tested.

Park et al (2004) proposed dimensions of perceived risk that included the context of the transaction (privacy and information security risk) and the perceived risk of the product or service (the risk of not receiving the benefit), but did not consider the risk that the e-commerce transaction itself may be difficult or time-consuming. Miyazaki et al. (2001) identified the inconveniences of online shopping, but grouped other perceived risks according to the source of the risk, the online retailer or a third party.

Viewed from this perspective, the body of research discussed above aligns with the three general risk categories adapted from Cox. First, consumers are concerned that the product or service they buy on the web might not deliver the expected benefits (Featherman et al. 2003). This is true whether the problem results from the product itself; or from the retailer supplying the product, or from the transaction itself (Mauldin et al. 2002; Park et al. 2004; Tung et al. 2001), or results from the product not being delivered as expected (Spiekermann et al. 2002). This risk also exists in the purchase of a product from a physical store, but may be exacerbated by the limited means by which the consumer can interact with the product and the store on the web. Since the actual product cannot be directly experienced, consumers may perceive that this risk is greater in buying on the web, justifying its inclusion as a dimension of e-commerce transaction perceived risk. We label this general risk as *failure to gain product benefit risk*.

Second, consumers fear that they may face ancillary harm for buying a product on the web. In the e-commerce context, even if the transaction is performed quickly and easily, and the product purchased delivers the benefits expected by the consumer, additional unwanted events may harm the consumer. Cox differentiates this risk from the risk of not receiving the expected benefit of the transaction, and uses the example of looking foolish to his friends for buying an inappropriate sport coat. The type of ancillary harm used an example by Cox (looking foolish) also exists in e-commerce, but the major risk in e-commerce beyond the transaction stems from the need for the consumer to provide personal and financial information over a public network, often to a retailer whose use of the information cannot necessarily be predicted or controlled. Privacy and information security have been identified by many researchers as very important concerns for e-commerce users (Featherman et al. 2003; Liebermann et al. 2002; Miyazaki et al. 2001; Pavlou et al. 2007). Malhotra et al. (2004) found

that internet user information privacy concerns (UIIPC) were related to the perceived risk of the consumer. Similarly, Van Slyke et al. (2006) find that consumer concerns for information privacy (CFIP) were related to consumer's perceived risks. This general risk is labelled as *information misuse risk*.

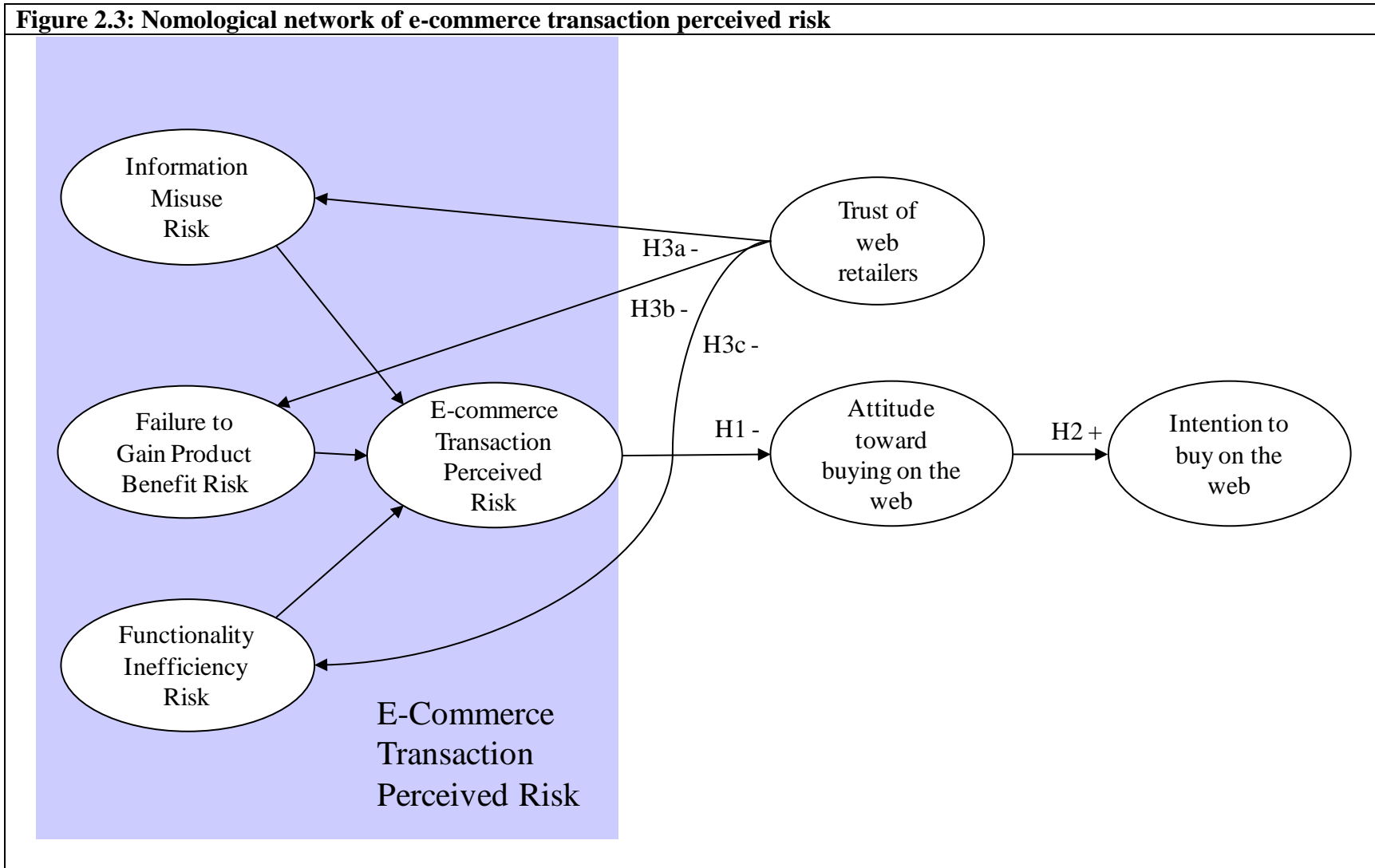
Third, the consumer fears he or she may lose the means by which he or she hoped to make the gain. Consistent with Cox, the possibility exists in any purchase that the means (money, time and effort) used to make the purchase may be wasted; this is not unique to e-commerce. Although the functionality offered in an e-commerce website exists to enhance or facilitate the identification, purchase, delivery and maintenance of the core product offering of the website (Cenfetelli et al. 2008), the e-commerce process remains mainly a self-serve process. Viewed from the perspective of the consumer, each aspect of functionality used during an e-commerce transaction requires an investment of time, effort, know-how and (perhaps) money on the part of the consumer in order to allow the consumer to make use of the function, similar to the "minimizing time" fundamental objectives identified by Keeney (1999) and the "inconveniences of online shopping" identified by Miyazaki and Fernandez (2001). For example, the use of an online recommendation agent in a purchase may require the time and effort to specify preferences for a number of attributes of the product in detail. In e-commerce terms, then, the risk considered by the consumer that is different from a physical store is that the use of the functionality may require more investment than the consumer cares to make, a calculation that cannot be known with certainty until the functionality provided by the website is utilized. We call the risk of wasting the time, effort and money expended in making a purchase transaction on the web by which the consumer hoped to make the gain the *functionality inefficiency risk*.

These three categories of risks facing consumers in an e-commerce transaction (*failure to gain product benefit risk; information misuse risk; and functionality inefficiency risk*) correspond to Cox's identification of the total risk to a consumer in a transaction: the consumer may not gain the benefit he or she is trying to gain; the consumer may have to pay a penalty for trying to make the gain; the consumer may lose the means by which he or she hoped to make the gain. The three categories represent the dimensions of e-commerce transaction perceived risk; e-commerce transaction perceived risk is an aggregate factor formed by information misuse risk; failure to gain product benefit risk; and functionality inefficiency risk.

2.2.2 Development of the Nomological Network

To validate the definition of the construct of e-commerce transaction perceived risk proposed above, it must be placed in a research model that describes its relationships with its associated constructs (Diamantopoulos et al. 2001). The nomological network is shown in Figure 2.3, and the relationships are defined below.

Figure 2.3: Nomological network of e-commerce transaction perceived risk



In defining e-commerce transaction perceived risk, this research paraphrased Bauer (1967): *e-commerce transaction perceived risk is a consumer's expectation that his or her actions in purchasing a good or a service from a B2C e-commerce site could have unwanted outcomes*. This implies that consumers begin considering an e-commerce transaction with a pre-existing set of beliefs regarding the outcomes of the behaviour of buying on the web in general, before consideration of the purchase from a specific retailer. Future stages of this research will examine the effect of IT tools on these beliefs, but this stage of the research seeks to establish the foundation of understanding the general beliefs. As a result, this research proposes a nomological network of relationships between e-commerce transaction perceived risk and general constructs of buying on the web: attitude toward buying on the web; trust in web retailers; and intention to buy on the web.

According to TRA (Ajzen et al. 1980), an individual's behaviour is influenced by his or her attitude toward a behaviour (along with beliefs regarding the subjective norm regarding the behaviour). The attitude toward the behaviour is influenced by the individual's beliefs regarding the events resulting from that behaviour, both negative and positive. The behaviour that an e-commerce practitioner may want to influence and that an e-commerce researcher may want to understand is the general behaviour of buying on the web. To understand this behaviour, the attitude toward the behaviour must be investigated, the attitude toward buying on the web. The research discussed above has identified a negative subset of those beliefs that are proposed to form a negative belief regarding the perceived risk of buying on the web: e-commerce transaction perceived risk. This construct of negative beliefs regarding buying on the web, *e-commerce transaction perceived risk*, negatively influences *attitude toward buying on*

the web, consistent with TRA. The set of positive belief that would also influence attitude are not included because the nomological network addresses only the relationship of e-commerce transaction perceived risk with attitude, and is not attempting to explain the maximum amount of the variance of attitude.

Hypothesis H1: a higher e-commerce transaction perceived risk will lead to a less favourable attitude toward buying on the web.

Behavioural intention is influenced by attitude toward the behaviour, as specified in TRA (Ajzen et al. 1980). Applied to the context of this research, the intention to buy on the web is determined by the attitude toward buying on the web

Hypothesis H2: a more favourable attitude toward buying on the web will lead to greater intention to buy on the web.

Trust in web retailers: Trust and risk have been modeled in a number of e-commerce studies, and both have been found to influence consumer attitudes. When these constructs have been modeled jointly, the preponderance of e-commerce research has concluded that, in general, trust influences perceived risk, rather than perceived risk influencing trust. For example: Jarvenpaa (1999) in a cross-cultural study of the effects of retailer reputation; Kimery (2002) in studying the effect of third-party seals on trust; Pavlou (2003) in examining the integration of trust and perceived risk in the context of TAM; Pavlou et al. (2004) researching trust and risk in the context of a community of sellers; and Van der Heijden et al. (2003) in examining trust and online purchasing. As a result, in the proposed nomological network, trust in web retailers influences perceived risk.

In our case, trust in web retailers in general, rather than the trust in a specific web retailer, was chosen as trust target most consistent with the general constructs of perceived risk of buying on the web and attitude toward buying on the web. Since the characteristics of a specific web retailer are not being considered, the construct represents the consumer's belief in the competence, integrity and reliability of web retailers in general. If the consumer has a positive belief in the competence, integrity and reliability of web retailers in general (resulting in a high level of trust in web retailers), then he or she is likely to perceive a lower risk of unwanted events from buying on the web. Rather than acting on *e-commerce transaction perceived risk* directly, however, *trust in web retailers* will influence each of the dimensions of the risk construct differently. Some aspects of the *risk of information misuse* and the *risk of failure to gain product benefits* are in the control of the web retailer, while others are not. As a result, the hypotheses describe the relationship of the *trust in web retailers* with the dimensions of *e-commerce transaction perceived risk*.

Most aspects of an e-commerce transaction that may lead to a misuse of information are under the control of the web retailer. For example, whether or not personal information is captured and how it is stored, or whether transaction information is used to market additional products or sold to other organizations is determined by the retailer. As a result, a lower level of trusting beliefs regarding web retailers should lead consumers to expect a higher risk of the misuse of information revealed when buying on the web.

Hypothesis H3a: information misuse risk will be negatively related to trust in web retailers.

Web retailers do not control all aspects of an e-commerce transaction that could lead to a failure of something bought on the web to deliver its product benefits. For example, the purchaser may simply not choose the appropriate product; or the delivery company may fail to deliver the product. However, the web retailer will be regarded as playing the most important role in this dimension of e-commerce transaction perceived risk because the retailer chooses the products and the brands to offer, provides the consumer with information and assistance, and selects companies to provide ancillary services. As a result, a low level of trust in web retailers will lead to a high level of perceived risk that something bought on the web will fail to provide the expected benefits.

Hypothesis H3b: failure to gain product benefit risk will be negatively related to trust in web retailers.

Web retailers will be regarded as being responsible for most of the aspects of an e-commerce transaction that may make buying something on the web difficult or time consuming, since they control the functions of the retail website. An exception should be inefficiencies caused by the proliferation of choices of web retailers and products sold on the web that may prevent consumers from quickly and easily finding the products they want. However, if web retailers in general are not considered by consumers to be competent, benevolent and honest (trusting beliefs) they are likely to offer a service that is difficult and time consuming for their customers. As a result, a low level of trust in web retailers will lead to a higher functionality inefficiency risk.

Hypothesis H3c: functionality inefficiency risk will be negatively related to trust in web retailers.

2.2.3 Development of the Formative Measures

As can be seen from the literature discussed above, each category of risk that forms e-commerce transaction perceived risk is a complex construct in its own right, conceived as being formed by a number of beliefs that consumers hold regarding the specific and individual events that cause harm to occur, meeting the definition of formative construct offered by Petter et al. (2007) as a composite of multiple measures. Each of the risk categories of information misuse risk, failure to gain product benefit risk and functionality inefficiency risk may best be measured, therefore, as a formative construct using dimensions that express the range of events that concern consumers (Petter et al. 2007).

Researchers developing formative measures need to be concerned with two critical issues prior to empirical validation of the measure (Diamantopoulos et al. 2001): content specification and indicator specification. For this research, the range of events that may cause harm to consumers was identified from theory, providing the content specification. To specify the indicators for the constructs, which are required to cover the entire scope of the latent variables, a systematic process to identify and summarize the events of concern to consumers was conducted to identify the indicators for the measurement of the three general risks. The measures were developed using the following process:

1. Using a panel of e-commerce researchers and consumers, events that consumers perceive could result in unwanted outcomes in an e-commerce transaction were elicited from three perspectives as recommended by Lewis et al. (2005);

2. The elicited events were grouped into nine emergent dimensions of the three general risk categories derived from Cox (1967a), based on the way in which the events expose the consumer to harm in a procedure similar to Keeney (1999);
3. The nine dimensions were validated as representing the consensus of the panel through Q-sorts of the events;
4. Semantic differential items were developed for each of the dimensions; and
5. The items were validated through another Q-sort of the items.

A panel comprised of ten e-commerce researchers and graduate students at a public university was surveyed to elicit the unwanted events that could cause them harm as consumers that they considered possible during an e-commerce transaction. In order to identify events resulting from as many aspects of an e-commerce transaction as possible three different frameworks were used to elicit events as recommended in the development of measures for MIS research by Lewis et al. (Lewis et al. 2005). First, respondents were asked to identify events that might occur during each stage of the e-commerce transaction, as represented by the e-commerce Customer Service Life Cycle (ECSLC) (Cenfetelli et al. 2008). Second, they were asked to identify events that might be caused by particular actors in an e-commerce transaction: the retailer; independent product recommendation agents; and the Internet channel itself. Third, respondents listed events that might arise from the characteristics of the transaction: website functionality; the act of conducting a transaction at a distance from the retailer; and conducting a self-service transaction. I eliminated events that do not occur because of the e-commerce transaction. For example, the event “Malware may be loaded on my computer” may occur in many types of web use and is not dependent on the e-commerce transaction; on the other hand, “I may receive a counterfeit product” is not limited to an e-commerce transaction, but it does

depend on the occurrence of a transaction. The former example was eliminated, while the latter was retained. As a result, the panel identified 104 separate unwanted e-commerce events. The questionnaire used to elicit the unwanted events, and the elicited responses are shown in Appendix B.

The 104 initializing events were grouped according to the way in which the event exposed the consumer to harm, following the approach of Keeney (1999) who grouped concerns about the internet according to their “bottom line consequences”. For example, a consumer may express a concern regarding a particular event: “someone may intercept my personal information during a transaction.” Another consumer may be concerned with other events: “the retailer might ask too many personal questions,” or “the website may not secure my personal information well,” or “the Internet site may sell my personal information to another company”. Each of these events causes harm to the consumer when personal information is misused; as a result, the statements of potential Internet shopping events expressed by the consumer can be categorized and summarized by the way in which they expose the consumer to harm: in this case, the *misuse of personal information*.

Based on several rounds of discussion with the panel, I formed preliminary dimensions of the three general risks by grouping elicited events based on the ways in which they expose the consumer to harm, guided by the three general risks (Cox 1967a) (the final groupings of events are provided in Appendix B). For example, consider two elicited events: “the recommendation agent may give me biased advice”; and “the goods might be lost in transit”. Both these events expose the consumer to harm through failing to gain the expected benefit through consuming the product. The former occurs because the product does not fulfill the

needs of the consumer; the second because the product purchased on the web does not arrive, and therefore cannot provide a benefit. As a result, these events are included under two dimensions of the general risk of *failure to gain product benefits*: “something bought on the web might not meet my needs”; and “something bought on the web may arrive late or not at all,” respectively.

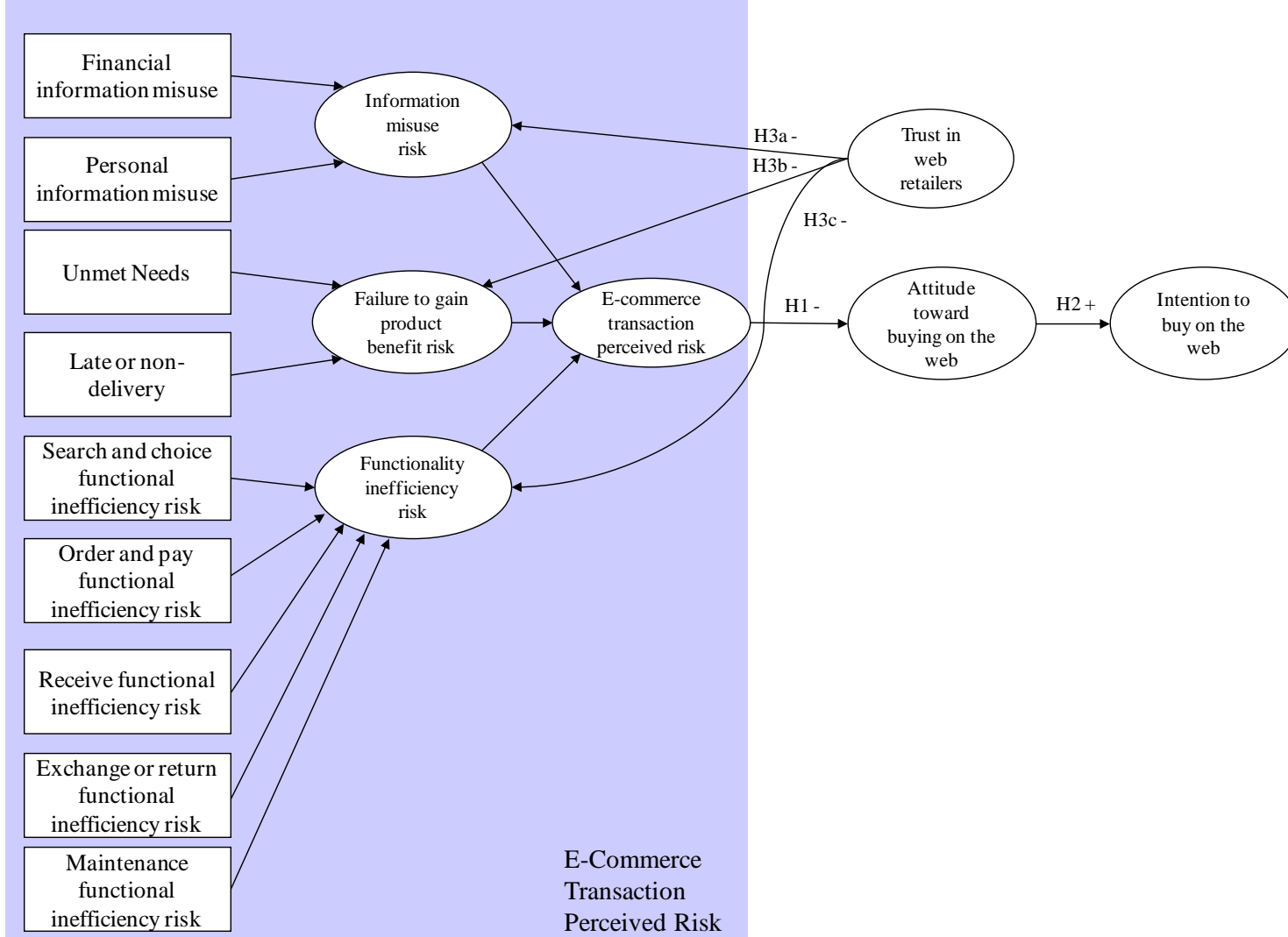
The next step was to test whether the dimensions identified represent all the ways in which a consumer might be exposed to harm in an e-commerce transaction. If this is the case, each of the events elicited from the panel should be able to be placed in one of the dimensions proposed. To verify this and refine the dimensions, a card-sort exercise was conducted using the e-commerce panel that had assisted in identifying the potential events, following the approach of Moore and Benbasat (1991). Because the process required multiple iterations, subsets of four panel members were used for judging. The composition of the subset of judges was changed for each iteration in order to reduce fatigue of the participants. The panel members were given a spreadsheet listing the 104 elicited events in a random order along descriptions of the proposed dimension for the events. Respondents were asked to identify the dimension with which each of the events was most associated; or if it was associated equally well with more than one dimension; or if it was not associated with any dimension. This activity was conducted iteratively, with the wording of the category descriptions or number categories changed to overcome difficulties identified in each previous card-sort. The refinement of the categories concluded when less than 5% of the events remained unassigned by **two or more** judges, providing an indication that the categories captured the full range of events identified by the panel. Based on this, the final nine risk dimensions were judged to represent a census of the events that could cause harm to the consumer and were adopted as the *formative dimensions*

(Petter et al. 2007) for the three general risks adapted from Cox (1967a): information misuse risk, failure to gain product benefits risk and functionality inefficiency risk. The events, the dimensions that include them, and the three general risks with which they are associated are listed in Appendix B. The dimensions and the associated risk categories are:

- The risk of information misuse:
 - personal information revealed when buying from a web retailer will be misused;
and
 - financial information revealed when buying from a web retailer will be misused.
- The risk of failure to gain product benefits:
 - something bought from a web retailer will not meet the needs of the buyer; and
 - something bought from a web retailer will arrive late or not at all.
- The risk of functionality inefficiency:
 - finding and choosing something to buy from a web retailer will be too difficult or time consuming;
 - ordering and paying for something bought from a web retailer will be too difficult or time consuming;
 - receiving something bought from a web retailer will be too difficult or time consuming;
 - returning or exchanging something bought from a web retailer will be too difficult or time consuming; and
 - maintaining something bought from a web retailer will be too difficult or time consuming.

Measurement items were then developed for the formative dimensions. Consistent with the recommendations of Ajzen and Fishbein (1980), semantic differential items were used to establish the *perceived likelihood* and the perceived severity of *consequence* of exposures to harm identified. For each formative dimension, three items of perceived probability were cross-multiplied with three items of perceived consequence (each on a 7-point semantic differential scale) to create nine indicators of the perceived risk of an exposure to harm. This multiplicative model of probability times severity of consequences was identified by Mitchell (1999) as the most common model in component-based measures of perceived risk, speculating that it was derived from the expected value concept where potential payoffs are multiplied by the probability of their occurrence to provide an expected value. Ajzen et al. (1980) employed this multiplicative approach of probability times the consequence of a belief as a measure of the belief. Content validity was established through the process of specifying the indicators described above (namely, the generation of events), and the fact that the initial convergent and discriminant validity was tested using an electronic Q-sort of the items (Moore et al. 1991). Six graduate e-commerce students were able to sort the items into the appropriate formative dimension (one of the nine discussed above) with 97% accuracy. A summary of the items used in the instrument is included in Appendix C. The resulting measurement model and its nomological network are shown in figure 2.4.

Figure 2.4: Formative measures of e-commerce transaction perceived risk categories



2.2.4 Control Variables

Additional variables were identified to control for other explanations of consumer attitude toward buying on the web. Perceived ease of use and perceived usefulness have been identified as important positive antecedents of attitude and intent in many studies of TAM in e-Commerce (Gefen et al. 2003b; Pavlou 2003; Venkatesh et al. 2003; Wixom et al. 2005). As a result, they were included as control variables, consistent with their treatment by Pavlou et al. (2007). The number of web purchases in the past year; dollar amount of web purchases in the past year; average web purchase; web experience; and the level of web usage, were included as controls because these variables might explain variations in the levels of attitudes toward buying on the web (Jarvenpaa et al. 1999). Propensity to trust was included because it has been cited as an antecedent to trust and perceived risk; age was included because difference in age among participants may result in differing comfort levels with the technology of the web and therefore attitudes toward it. Because the field survey was designed to measure perceived risk of buying on web in general, rather than the perceived risk of the purchase on the web of a specific product or product class, control variables of product class, specific web retailer or a specific transaction were not included (since the respondents would be considering all of their past and future purchases, rather than one purchase).

2.3 Test of the Research Model

2.3.1 Description of the Field Study

The measurement model was tested in a field study conducted using an on-line questionnaire completed by participants contacted through an Internet marketing research firm. The sample consisted of 564 Internet users, drawn from a North American-wide population by a

marketing research firm. The marketing firm sent an email invitation to participate to 2,700 randomly selected members of an e-commerce panel maintained for this purpose. Of these 2,700 invitations, website log statistics indicate that 671 unique visits were made to the website described in the invitation. Of these visitors, 564 elected to participate, creating an effective participation rate of 21%.

The demographic profile of the sample reflected the way in which the participants were obtained. Participation in the research company's e-commerce panel requires that the respondents become aware of the opportunity and opt-in to receive subsequent surveys. This implies an Internet user more likely to be an experienced user than the general US Internet user population. The average age of the participants was 46 (compared to an average age of 42 in a 2003 study by International Demographics, reported on <http://www.clickz.com/stats/>) and 57% of the participants were female (compared to a proportion of 51% female North American users reported in the Pew Internet & American Life Project at <http://www.pewinternet.org/>). 80% of the participants reported having used the Internet for more than five years (73% in Pew), and 90% of the participants had used e-commerce to make a purchase in the past 12 months (67% of all internet users in Pew), while 33% had made 10 or more purchases over the past 12 months. Because experienced Internet and e-commerce users are more likely to perceive less risk in buying on the web than inexperienced users, the sample represents a conservative test of the model.

The complete set of responses was examined to make certain that apparent contaminated data were discovered prior to analysis, a greater problem in online surveys than in traditional pencil and paper surveys (Couper 2000; Ilieva et al. 2002; Manfreda et al. 2002). This

examination eliminated 153 data records as unusable, 27% of the 564 participants, a level of problematic data that was expected in an online survey (Couper 2000; Roster et al. 2004). This resulted in a final sample size of 411 participants. To verify that the exclusion of the problematic data did not bias the results, the structural model was analyzed using data that included all responses following the completion of the structural model testing. The signs and significance of all relationships were unchanged.

The tests were conducted using partial least squares (PLS) structural equation modelling with PLS Graph 3.00. PLS was chosen because of its suitability for work with exploratory data in the absence of strong theory compared to covariance-based approaches such as LISREL, as well as its ability to work with formative constructs and non-normal data.

2.3.2 Measurement Model Validation

Each of the formative dimensions for the e-commerce transaction perceived risk model shown in figure 2.3 is measured using multiple reflective indicators of the dimension (Petter et al. 2007), provided in Appendix C. As a result, the procedures used to validate reflective measures are appropriate (Chin et al. 1995), examining individual item reliability, their internal consistency, and their discriminant validity (Barclay et al. 1995).

Inspection of the loading of the individual items on their respective constructs indicates that all loadings of the measures are above the threshold of 0.707 suggested by Barclay, Higgins and Thompson (1995). All indicators loaded with a p-value of <0.01, satisfying the criteria suggested Gefen and Straub (2005) for convergent validity. Internal consistencies for all the constructs (shown in table 2.1) are well above 0.70 supporting the reliability of the measures.

Table 2.1: Attributes of measurement model of e-commerce transaction perceived risk

		Internal Consistency	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Financial informaton misuse	0.971	0.889															
2	Personal information misuse	0.986	0.829	0.942														
3	Unmet Needs	0.980	0.448	0.432	0.919													
4	Late Arrival	0.980	0.503	0.534	0.556	0.920												
5	Find and Choose Inefficiency	0.992	0.371	0.373	0.487	0.501	0.964											
6	Order and Pay Inefficiency	0.993	0.411	0.393	0.469	0.496	0.801	0.971										
7	Receive Inefficiency	0.994	0.366	0.415	0.505	0.530	0.736	0.757	0.974									
8	Exchange or Return Inefficiency	0.986	0.418	0.476	0.450	0.531	0.405	0.395	0.439	0.942								
9	Maintain Inefficiency	0.994	0.310	0.341	0.465	0.394	0.545	0.539	0.594	0.449	0.976							
10	Trust in Web Retailers	0.954	-0.181	-0.202	-0.125	-0.203	-0.167	-0.142	-0.160	-0.185	-0.181	0.866						
11	Overall Perceived Risk	0.886	0.440	0.401	0.352	0.399	0.432	0.473	0.422	0.331	0.382	-0.417	0.813					
12	Attitude toward buying on the web	0.882	-0.346	-0.317	-0.337	-0.315	-0.454	-0.450	-0.416	-0.276	-0.349	0.298	-0.656	0.846				
13	Intention to buy on the web	0.951	-0.191	-0.190	-0.197	-0.132	-0.303	-0.322	-0.316	-0.189	-0.256	0.209	-0.585	0.711	0.910			
14	Perceived Usefulness	0.940	-0.304	-0.303	-0.347	-0.285	-0.426	-0.395	-0.370	-0.273	-0.307	0.367	-0.639	0.600	0.545	0.893		
15	Perceived Ease of Use	0.952	-0.228	-0.216	-0.214	-0.166	-0.422	-0.379	-0.340	-0.216	-0.337	0.299	-0.569	0.600	0.533	0.686	0.894	
16	Web Purchase History	0.929	-0.228	-0.229	-0.215	-0.219	-0.320	-0.326	-0.299	-0.222	-0.270	0.180	-0.468	0.590	0.662	0.453	0.425	0.932

Note: Diagonal elements are the square root of the average value extracted (AVE); off-diagonals are the interconstruct correlation.

Comparison of the square root of the average value extracted (AVE) of a construct to its correlation with other constructs (shown in table 2.1) provides support for discriminant validity of the reflectively measured constructs of the model. Barclay et al. (1995) suggest that discriminant validity is supported when the square root of the AVE for each construct (the diagonal elements in the table) is larger than its correlations with other constructs (the off-diagonal elements). All constructs satisfy this requirement. Although a high correlation is present between *financial information misuse* and *personal information misuse* (0.83, VIF = 3.2); between *finding and choosing functionality inefficiency risk* and *ordering and paying functionality inefficiency risk* (0.80, VIF = 2.8); and between *receiving functionality inefficiency risk* and *finding and choosing functionality inefficiency risk* (0.74, VIF = 2.2) as well as *receiving functionality inefficiency risk* and *ordering and paying functionality inefficiency risk* (0.76, VIF = 2.3), examination of the variance inflation factors (VIF) of the correlated pairs of variables shows VIF to be well below the common threshold of 10 (Diamantopoulos et al. 2001), indicating that multicollinearity of the indicators is not a problem for the model.

Finally, an examination of the cross loading of indicators on other constructs supports the findings of previous tests. Gefen and Straub (2005) suggest that the loading of each of the indicators on its latent construct should be above a threshold of 0.60 and at least 0.10 above its loading on any other construct. Table 2.2 shows that each of the indicators satisfies these criteria for discriminant validity, although the items for the indicators *financial information misuse* and *personal information misuse* load heavily on each other. Further, the items for the indicators *finding and choosing functionality inefficiency risk*, *ordering and paying functionality inefficiency risk* and *receiving functionality inefficiency risk* also cross load heavily, albeit below

the threshold suggested. This cross loading is expected based on the collinearity shown in table 2.1. Taken in total, the tests of the measurement model support the validity and reliability of the measures developed for this study as well as the validities and reliabilities of the measures adapted from prior research. The validity and reliability of the adapted measures are also supported by the validity and reliability tests conducted in each of the references cited in Appendix C.

Table 2.2: Loadings of indicators on e-commerce transaction perceived risk constructs

	Fin	Personal	Needs	Late	Search	Order	Receive	Exchange	Repair	TWR	OPR	ATBW	Intent	PU	PEOU	WPH
FIN1X1	0.873	0.698	0.390	0.425	0.314	0.352	0.298	0.367	0.224	-0.113	0.361	-0.275	-0.114	-0.262	-0.141	-0.182
FIN1X2	0.876	0.698	0.386	0.422	0.323	0.359	0.300	0.368	0.225	-0.120	0.372	-0.288	-0.135	-0.272	-0.158	-0.193
FIN1X3	0.881	0.703	0.394	0.428	0.331	0.369	0.307	0.373	0.241	-0.122	0.379	-0.289	-0.142	-0.273	-0.163	-0.199
FIN2X1	0.927	0.776	0.382	0.442	0.313	0.351	0.309	0.331	0.251	-0.161	0.372	-0.299	-0.150	-0.226	-0.187	-0.197
FIN2X2	0.928	0.774	0.376	0.437	0.319	0.355	0.308	0.331	0.253	-0.167	0.382	-0.311	-0.172	-0.236	-0.207	-0.205
FIN2X3	0.933	0.778	0.383	0.442	0.326	0.364	0.315	0.334	0.266	-0.170	0.388	-0.314	-0.177	-0.237	-0.211	-0.211
FIN3X1	0.860	0.734	0.428	0.481	0.342	0.374	0.363	0.418	0.334	-0.192	0.413	-0.321	-0.193	-0.306	-0.234	-0.204
FIN3X2	0.862	0.734	0.425	0.477	0.351	0.382	0.366	0.418	0.339	-0.198	0.428	-0.337	-0.219	-0.318	-0.257	-0.215
FIN3X3	0.860	0.732	0.428	0.477	0.355	0.386	0.369	0.416	0.348	-0.204	0.431	-0.338	-0.222	-0.317	-0.261	-0.220
PERS1X1	0.818	0.939	0.417	0.481	0.342	0.360	0.341	0.412	0.277	-0.179	0.367	-0.284	-0.145	-0.284	-0.154	-0.207
PERS1X2	0.813	0.941	0.419	0.483	0.337	0.358	0.340	0.424	0.275	-0.176	0.362	-0.276	-0.136	-0.276	-0.150	-0.206
PERS1X3	0.815	0.943	0.421	0.495	0.343	0.364	0.346	0.426	0.286	-0.188	0.367	-0.283	-0.148	-0.287	-0.161	-0.208
PERS2X1	0.802	0.965	0.417	0.511	0.373	0.379	0.395	0.443	0.327	-0.183	0.374	-0.303	-0.164	-0.255	-0.216	-0.209
PERS2X2	0.798	0.967	0.418	0.513	0.367	0.377	0.393	0.457	0.325	-0.178	0.369	-0.295	-0.155	-0.247	-0.211	-0.207
PERS2X3	0.794	0.963	0.418	0.522	0.372	0.383	0.397	0.454	0.334	-0.190	0.372	-0.301	-0.167	-0.257	-0.223	-0.208
PERS3X1	0.728	0.918	0.381	0.503	0.345	0.370	0.439	0.468	0.356	-0.206	0.400	-0.320	-0.239	-0.325	-0.240	-0.234
PERS3X2	0.725	0.920	0.382	0.504	0.340	0.367	0.437	0.478	0.352	-0.202	0.393	-0.311	-0.228	-0.318	-0.235	-0.233
PERS3X3	0.725	0.919	0.385	0.515	0.346	0.372	0.442	0.479	0.363	-0.212	0.398	-0.318	-0.241	-0.328	-0.245	-0.235
NEED1X1	0.398	0.405	0.911	0.512	0.418	0.401	0.428	0.403	0.368	-0.075	0.241	-0.256	-0.106	-0.265	-0.139	-0.175
NEED1X2	0.412	0.426	0.908	0.507	0.417	0.399	0.413	0.418	0.367	-0.079	0.251	-0.256	-0.093	-0.264	-0.138	-0.155
NEED1X3	0.418	0.420	0.909	0.500	0.422	0.416	0.435	0.415	0.372	-0.068	0.266	-0.277	-0.129	-0.266	-0.151	-0.183
NEED2X1	0.428	0.402	0.945	0.529	0.464	0.443	0.486	0.408	0.443	-0.131	0.331	-0.313	-0.179	-0.340	-0.190	-0.207
NEED2X2	0.439	0.422	0.942	0.526	0.464	0.442	0.472	0.425	0.442	-0.137	0.343	-0.312	-0.164	-0.338	-0.187	-0.186
NEED2X3	0.441	0.412	0.943	0.513	0.468	0.455	0.492	0.416	0.449	-0.128	0.356	-0.334	-0.203	-0.340	-0.201	-0.217
NEED3X1	0.377	0.347	0.894	0.500	0.452	0.432	0.478	0.396	0.460	-0.130	0.356	-0.332	-0.243	-0.351	-0.249	-0.218
NEED3X2	0.393	0.372	0.911	0.508	0.463	0.439	0.474	0.421	0.469	-0.147	0.379	-0.343	-0.240	-0.357	-0.255	-0.206
NEED3X3	0.396	0.364	0.904	0.501	0.460	0.452	0.495	0.418	0.471	-0.136	0.386	-0.359	-0.272	-0.351	-0.259	-0.229
LATE1X1	0.466	0.505	0.523	0.910	0.448	0.437	0.452	0.515	0.288	-0.146	0.331	-0.245	-0.072	-0.232	-0.082	-0.175
LATE1X2	0.457	0.492	0.516	0.909	0.447	0.433	0.456	0.515	0.286	-0.144	0.337	-0.252	-0.065	-0.250	-0.088	-0.166
LATE1X3	0.446	0.489	0.508	0.907	0.449	0.434	0.466	0.509	0.292	-0.144	0.329	-0.241	-0.074	-0.238	-0.085	-0.167
LATE2X1	0.500	0.527	0.522	0.952	0.459	0.437	0.479	0.489	0.377	-0.201	0.360	-0.278	-0.102	-0.231	-0.149	-0.193
LATE2X2	0.493	0.515	0.517	0.952	0.458	0.435	0.482	0.492	0.375	-0.204	0.367	-0.287	-0.098	-0.247	-0.155	-0.185
LATE2X3	0.486	0.516	0.512	0.955	0.463	0.438	0.494	0.487	0.382	-0.202	0.363	-0.277	-0.109	-0.240	-0.155	-0.189
LATE3X1	0.444	0.463	0.505	0.895	0.472	0.499	0.513	0.463	0.421	-0.212	0.404	-0.342	-0.193	-0.301	-0.216	-0.251
LATE3X2	0.440	0.454	0.502	0.897	0.474	0.499	0.518	0.467	0.419	-0.214	0.411	-0.350	-0.188	-0.317	-0.221	-0.246
LATE3X3	0.429	0.452	0.494	0.895	0.475	0.501	0.527	0.457	0.423	-0.212	0.406	-0.341	-0.200	-0.311	-0.223	-0.248
SRCH1X1	0.352	0.361	0.456	0.465	0.960	0.768	0.689	0.380	0.512	-0.138	0.386	-0.437	-0.273	-0.375	-0.394	-0.291
SRCH1X2	0.356	0.373	0.466	0.473	0.966	0.770	0.706	0.403	0.512	-0.151	0.403	-0.426	-0.267	-0.393	-0.408	-0.296
SRCH1X3	0.359	0.371	0.464	0.465	0.966	0.762	0.710	0.396	0.506	-0.138	0.403	-0.444	-0.282	-0.390	-0.421	-0.311
SRCH2X1	0.355	0.346	0.458	0.487	0.971	0.778	0.701	0.375	0.520	-0.146	0.391	-0.438	-0.289	-0.384	-0.376	-0.302
SRCH2X2	0.355	0.358	0.469	0.494	0.975	0.776	0.717	0.398	0.514	-0.164	0.407	-0.425	-0.280	-0.405	-0.388	-0.306
SRCH2X3	0.356	0.355	0.466	0.484	0.974	0.767	0.723	0.394	0.510	-0.152	0.408	-0.443	-0.297	-0.402	-0.403	-0.321
SRCH3X1	0.362	0.351	0.475	0.491	0.952	0.782	0.697	0.374	0.551	-0.177	0.437	-0.446	-0.312	-0.435	-0.410	-0.308
SRCH3X2	0.361	0.363	0.487	0.498	0.957	0.781	0.718	0.399	0.554	-0.197	0.454	-0.434	-0.308	-0.459	-0.422	-0.314
SRCH3X3	0.365	0.362	0.487	0.490	0.959	0.772	0.725	0.394	0.549	-0.186	0.454	-0.451	-0.323	-0.454	-0.437	-0.329
PAY1X1	0.400	0.391	0.440	0.474	0.776	0.969	0.718	0.400	0.518	-0.127	0.456	-0.436	-0.303	-0.368	-0.360	-0.302
PAY1X2	0.403	0.393	0.451	0.478	0.784	0.971	0.733	0.404	0.536	-0.124	0.453	-0.437	-0.305	-0.365	-0.359	-0.295
PAY1X3	0.409	0.394	0.450	0.474	0.791	0.971	0.735	0.392	0.527	-0.127	0.453	-0.441	-0.306	-0.368	-0.362	-0.311
PAY2X1	0.400	0.388	0.453	0.490	0.787	0.980	0.730	0.393	0.510	-0.139	0.455	-0.440	-0.307	-0.380	-0.367	-0.328
PAY2X2	0.400	0.386	0.461	0.489	0.793	0.979	0.744	0.394	0.528	-0.135	0.451	-0.439	-0.307	-0.375	-0.366	-0.318
PAY2X3	0.405	0.387	0.463	0.489	0.799	0.980	0.747	0.384	0.520	-0.136	0.449	-0.443	-0.308	-0.379	-0.368	-0.333
PAY3X1	0.391	0.364	0.456	0.481	0.752	0.964	0.727	0.364	0.516	-0.154	0.477	-0.432	-0.326	-0.409	-0.377	-0.321
PAY3X2	0.392	0.366	0.463	0.483	0.758	0.965	0.741	0.366	0.535	-0.151	0.473	-0.433	-0.330	-0.402	-0.375	-0.314
PAY3X3	0.394	0.362	0.463	0.480	0.763	0.963	0.742	0.355	0.524	-0.150	0.471	-0.435	-0.328	-0.407	-0.378	-0.327

Table 2.2: Loadings of indicators on e-commerce transaction perceived risk constructs

	Fin	Personal	Needs	Late	Search	Order	Receive	Exchange	Repair	TWR	OPR	ATBW	Intent	PU	PEOU	WPH
GET1X1	0.364	0.412	0.499	0.528	0.721	0.746	0.972	0.452	0.587	-0.145	0.406	-0.396	-0.271	-0.346	-0.321	-0.270
GET1X2	0.361	0.406	0.504	0.534	0.717	0.731	0.978	0.454	0.589	-0.138	0.395	-0.390	-0.273	-0.338	-0.314	-0.263
GET1X3	0.359	0.404	0.488	0.510	0.699	0.716	0.971	0.444	0.585	-0.136	0.401	-0.389	-0.293	-0.358	-0.334	-0.268
GET2X1	0.367	0.422	0.498	0.521	0.744	0.768	0.981	0.435	0.566	-0.160	0.411	-0.412	-0.308	-0.366	-0.329	-0.302
GET2X2	0.365	0.414	0.502	0.526	0.737	0.748	0.982	0.434	0.567	-0.152	0.399	-0.406	-0.309	-0.357	-0.320	-0.292
GET2X3	0.362	0.410	0.487	0.501	0.719	0.732	0.977	0.423	0.561	-0.148	0.406	-0.404	-0.331	-0.378	-0.343	-0.300
GET3X1	0.346	0.396	0.484	0.514	0.715	0.749	0.970	0.406	0.585	-0.180	0.433	-0.421	-0.321	-0.366	-0.339	-0.314
GET3X2	0.343	0.389	0.488	0.517	0.707	0.730	0.970	0.406	0.585	-0.173	0.420	-0.413	-0.320	-0.356	-0.330	-0.302
GET3X3	0.343	0.387	0.474	0.492	0.690	0.714	0.964	0.397	0.580	-0.171	0.429	-0.413	-0.342	-0.377	-0.353	-0.312
EXCH1X1	0.423	0.472	0.446	0.520	0.378	0.367	0.380	0.936	0.391	-0.153	0.310	-0.248	-0.156	-0.254	-0.180	-0.196
EXCH1X2	0.420	0.470	0.439	0.520	0.370	0.360	0.376	0.939	0.384	-0.154	0.308	-0.254	-0.150	-0.253	-0.177	-0.193
EXCH1X3	0.423	0.472	0.449	0.509	0.368	0.362	0.383	0.946	0.393	-0.148	0.297	-0.238	-0.154	-0.257	-0.179	-0.182
EXCH2X1	0.408	0.457	0.419	0.519	0.395	0.388	0.406	0.963	0.406	-0.165	0.315	-0.260	-0.167	-0.245	-0.209	-0.196
EXCH2X2	0.404	0.456	0.412	0.520	0.387	0.380	0.401	0.966	0.400	-0.166	0.312	-0.267	-0.163	-0.244	-0.207	-0.194
EXCH2X3	0.401	0.453	0.416	0.505	0.379	0.376	0.403	0.964	0.403	-0.156	0.299	-0.249	-0.163	-0.245	-0.204	-0.180
EXCH3X1	0.359	0.421	0.413	0.472	0.391	0.376	0.458	0.922	0.478	-0.212	0.328	-0.275	-0.222	-0.275	-0.230	-0.253
EXCH3X2	0.353	0.418	0.406	0.472	0.380	0.367	0.452	0.923	0.469	-0.209	0.321	-0.277	-0.214	-0.271	-0.226	-0.247
EXCH3X3	0.357	0.420	0.416	0.466	0.382	0.371	0.460	0.917	0.475	-0.197	0.312	-0.265	-0.209	-0.268	-0.217	-0.235
FIX1X1	0.327	0.354	0.475	0.418	0.553	0.563	0.600	0.445	0.975	-0.190	0.374	-0.339	-0.232	-0.282	-0.328	-0.255
FIX1X2	0.319	0.353	0.468	0.411	0.546	0.549	0.590	0.443	0.974	-0.188	0.379	-0.336	-0.227	-0.283	-0.329	-0.250
FIX1X3	0.310	0.343	0.460	0.399	0.532	0.531	0.588	0.446	0.977	-0.189	0.375	-0.343	-0.240	-0.307	-0.358	-0.248
FIX2X1	0.318	0.339	0.464	0.398	0.547	0.547	0.592	0.438	0.982	-0.175	0.363	-0.340	-0.242	-0.280	-0.304	-0.264
FIX2X2	0.309	0.337	0.457	0.390	0.540	0.533	0.581	0.436	0.980	-0.173	0.368	-0.336	-0.237	-0.281	-0.305	-0.258
FIX2X3	0.297	0.326	0.447	0.376	0.524	0.512	0.578	0.438	0.980	-0.175	0.363	-0.343	-0.250	-0.304	-0.333	-0.255
FIX3X1	0.286	0.316	0.442	0.361	0.520	0.511	0.568	0.433	0.974	-0.167	0.376	-0.343	-0.275	-0.314	-0.328	-0.283
FIX3X2	0.280	0.317	0.436	0.356	0.515	0.500	0.560	0.434	0.975	-0.166	0.383	-0.342	-0.272	-0.318	-0.330	-0.281
FIX3X3	0.271	0.306	0.427	0.347	0.505	0.485	0.556	0.428	0.966	-0.162	0.373	-0.346	-0.277	-0.329	-0.346	-0.277
TRUST1	-0.180	-0.202	-0.132	-0.229	-0.149	-0.151	-0.144	-0.197	-0.160	0.847	-0.383	0.283	0.163	0.295	0.239	0.170
TRUST2	-0.259	-0.293	-0.178	-0.236	-0.187	-0.147	-0.187	-0.222	-0.170	0.833	-0.402	0.300	0.218	0.353	0.308	0.194
TRUST3	-0.106	-0.119	-0.050	-0.163	-0.138	-0.161	-0.139	-0.120	-0.190	0.891	-0.360	0.259	0.212	0.296	0.242	0.188
TRUST4	-0.130	-0.159	-0.076	-0.127	-0.129	-0.104	-0.104	-0.149	-0.131	0.925	-0.352	0.249	0.172	0.340	0.261	0.146
TRUST5	-0.153	-0.153	-0.113	-0.139	-0.127	-0.074	-0.099	-0.136	-0.174	0.766	-0.299	0.228	0.132	0.299	0.268	0.127
TRUST6	-0.126	-0.145	-0.115	-0.154	-0.148	-0.102	-0.151	-0.156	-0.134	0.912	-0.363	0.246	0.173	0.340	0.265	0.123
TRUST7	-0.099	-0.099	-0.059	-0.142	-0.113	-0.101	-0.120	-0.102	-0.127	0.876	-0.338	0.213	0.178	0.282	0.208	0.116
OPR1	0.416	0.377	0.308	0.329	0.339	0.361	0.310	0.308	0.334	-0.339	0.838	-0.535	-0.471	-0.493	-0.434	-0.371
OPR2	0.408	0.372	0.301	0.393	0.355	0.392	0.390	0.320	0.313	-0.382	0.852	-0.536	-0.492	-0.500	-0.417	-0.369
OPR3	0.332	0.288	0.261	0.305	0.309	0.374	0.318	0.215	0.338	-0.362	0.845	-0.586	-0.496	-0.518	-0.516	-0.423
OPR4	0.266	0.260	0.276	0.265	0.413	0.420	0.359	0.229	0.252	-0.265	0.711	-0.473	-0.441	-0.578	-0.493	-0.358
ABW1	-0.310	-0.285	-0.312	-0.282	-0.427	-0.418	-0.380	-0.275	-0.351	0.289	-0.638	0.931	0.713	0.587	0.587	0.621
ABW2	-0.327	-0.284	-0.259	-0.278	-0.392	-0.402	-0.378	-0.213	-0.276	0.280	-0.569	0.852	0.568	0.538	0.550	0.489
ABW3	-0.236	-0.234	-0.289	-0.240	-0.326	-0.314	-0.289	-0.205	-0.249	0.172	-0.435	0.745	0.499	0.369	0.353	0.346
INTENT1	-0.197	-0.202	-0.205	-0.159	-0.304	-0.317	-0.315	-0.196	-0.285	0.205	-0.568	0.678	0.958	0.531	0.532	0.588
INTENT2	-0.137	-0.144	-0.155	-0.097	-0.273	-0.298	-0.287	-0.144	-0.202	0.181	-0.538	0.624	0.946	0.480	0.501	0.554
INTENT3	-0.172	-0.164	-0.174	-0.124	-0.287	-0.296	-0.291	-0.176	-0.243	0.188	-0.547	0.663	0.962	0.513	0.515	0.586
INTENT4	-0.185	-0.180	-0.180	-0.098	-0.236	-0.260	-0.252	-0.169	-0.196	0.182	-0.468	0.616	0.761	0.452	0.381	0.683
PU1	-0.317	-0.285	-0.373	-0.287	-0.378	-0.344	-0.298	-0.265	-0.254	0.353	-0.626	0.524	0.485	0.879	0.577	0.380
PU2	-0.191	-0.223	-0.211	-0.197	-0.369	-0.354	-0.334	-0.195	-0.274	0.292	-0.503	0.529	0.500	0.823	0.622	0.426
PU3	-0.274	-0.271	-0.303	-0.261	-0.392	-0.371	-0.353	-0.241	-0.269	0.347	-0.579	0.545	0.487	0.938	0.626	0.386
PU4	-0.305	-0.302	-0.352	-0.274	-0.382	-0.340	-0.334	-0.272	-0.297	0.318	-0.571	0.543	0.473	0.925	0.623	0.423
PEOU1	-0.155	-0.129	-0.161	-0.100	-0.335	-0.320	-0.300	-0.156	-0.279	0.226	-0.494	0.529	0.476	0.589	0.882	0.391
PEOU2	-0.192	-0.163	-0.160	-0.105	-0.339	-0.290	-0.264	-0.130	-0.307	0.264	-0.484	0.512	0.474	0.561	0.880	0.350
PEOU3	-0.185	-0.169	-0.202	-0.146	-0.377	-0.325	-0.270	-0.164	-0.287	0.259	-0.493	0.516	0.457	0.603	0.927	0.377
PEOU4	-0.216	-0.222	-0.166	-0.156	-0.363	-0.329	-0.296	-0.219	-0.298	0.271	-0.457	0.504	0.411	0.586	0.880	0.328
PEOU5	-0.260	-0.269	-0.255	-0.221	-0.458	-0.416	-0.378	-0.282	-0.331	0.310	-0.600	0.610	0.549	0.711	0.901	0.442
WPH1	-0.234	-0.240	-0.242	-0.211	-0.321	-0.319	-0.279	-0.222	-0.253	0.208	-0.481	0.607	0.680	0.445	0.435	0.948
WPH2	-0.186	-0.181	-0.148	-0.197	-0.271	-0.285	-0.279	-0.189	-0.250	0.116	-0.380	0.479	0.540	0.394	0.348	0.915

The cross-loading of some items and the high correlation of some latent constructs could also indicate the presence of common method bias. Two procedures were performed to test for the presence of this bias. First, an analysis was conducted using Harman's single factor test. This test uses an exploratory factor analysis to test whether a single common factor accounts for a majority of the variance in all factors. Harman's test showed that the first factor accounted for 27% of the variance of the measures, with twelve factors having an eigenvalue greater than one, which does not indicate the presence of common method bias. Although this result does not indicate common method bias, Djurkovic et al. (2006) caution that the absence of a single factor accounting for the majority of variance does not necessarily eliminate the possibility of common method bias. As a result, the procedure for identifying the method factor loadings discussed by Podsakoff et al. (2003) as controlling for the effects of an unmeasured latent methods factor were adapted for PLS as suggested by Liang et al. (2007). In this procedure, two additional types of constructs are included in the model: individual constructs for each of the indicators in the model and a single construct representing the common method factor for the model, reflected by all the indicators used in the model. Each individual indicator construct is then modeled as reflecting both its intended construct and the common method factor construct. The square of the path weight from the common method factor to each single indicator construct is interpreted as the variance in the indicator explained by common method variance, while the square of the path weight from the intended construct to the single indicator construct is interpreted as the variance in the indicator explained by the intended construct. Using this procedure, only 8 of the 111 method factor loadings on the single indicator constructs were significant. The square of the path weight from the common method factor to the single item

indicator is interpreted as the variance in the indicator explained by common method variance, and the average for all the paths was 0.005 compared to 0.92 for the square of the path weight from the intended construct to the indicator. Taken in total, these findings indicate that common method bias is likely not a problem for this data.

2.3.3 Structural Model Assessment

The structural model assessment was conducted in two parts. First, the data was randomly split into two datasets using the random data selection function of SPSS 15.0. One dataset (n=206) was used for model building purposes, while the second dataset (n=205) was retained for model testing following the completion of model building.

Model Building

The model building data was used to test the structure of the of e-commerce transaction perceived risk developed from Cox(1967a), shown in figure 2.3. *E-commerce transaction perceived risk* is an aggregate factor formed by the three risk categories of *information misuse risk*, *failure to gain product benefit risk* and *functionality inefficiency risk*; these risk categories are in turn formed by nine formative dimensions of risk. *E-commerce transaction perceived risk* is related to *attitude toward buying on the web*.

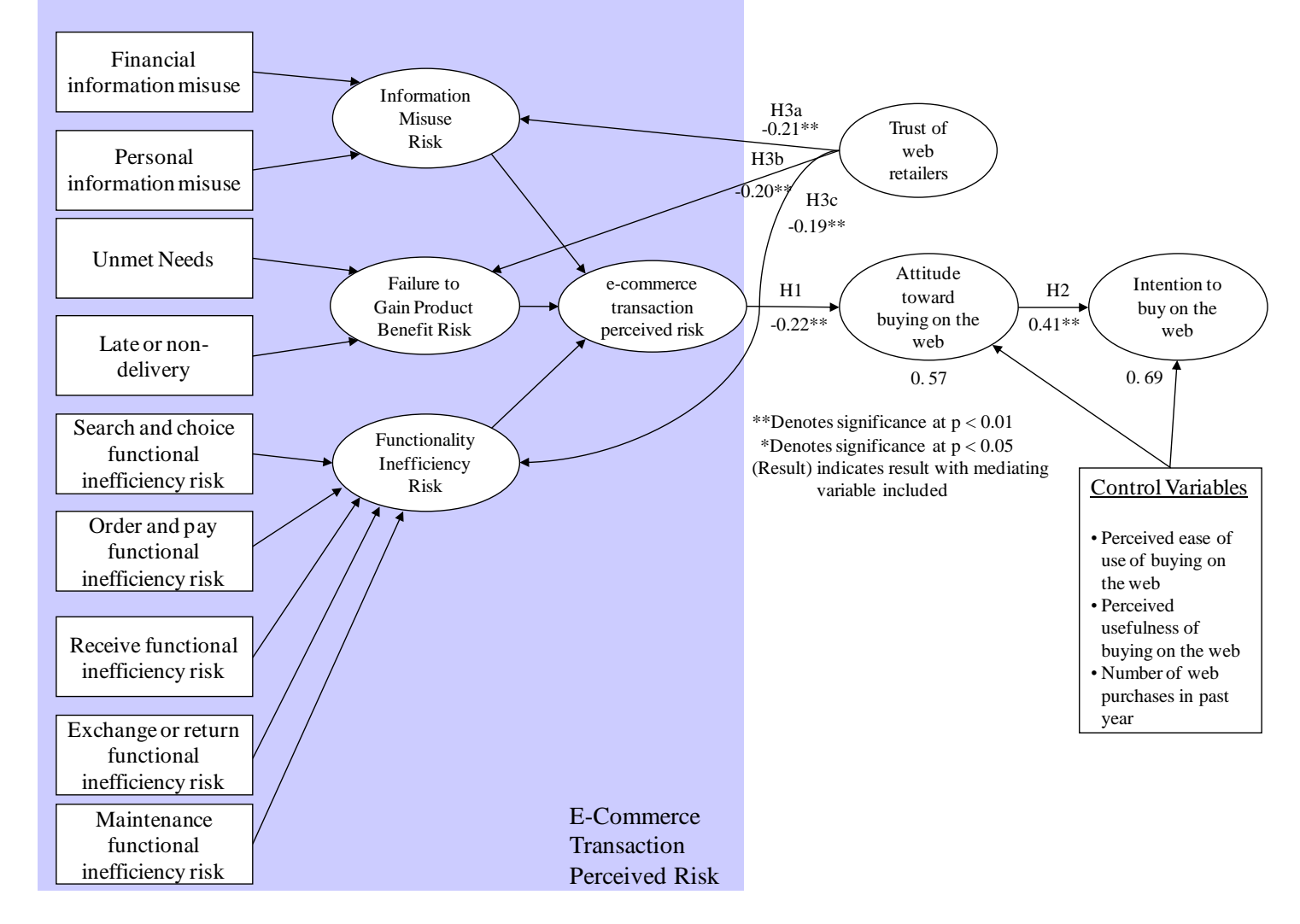
PLS does not assess the overall fit of a proposed model; as a result, the validity of the model is assessed by examining R^2 and the size and significance of the structural paths among the constructs as with a multiple regression model (Barclay et al. 1995). The model was tested according to the procedures recommended in Chin (2000), using all the indicators of the first order constructs to create indicators for the second order factor. The validity of this model can

be assessed by relative size and significance of the loadings of the first order constructs on the second order factor, and by the strength and significance of the paths from the second order factor to the constructs it is proposed to influence. Using the model building data, path weights of all risk categories to *e-commerce transaction perceived risk* are significant: *information misuse risk* ($\beta = 0.24$, $t = 12.2$); *failure to gain benefits of product risk* ($\beta = 0.22$, $t = 13.9$); and *functionality inefficiency risk* ($\beta = 0.71$, $t = 27.2$). The path weights of e-commerce transaction perceived risk to *attitude toward buying on the web* is significant ($\beta = -0.46$, $t = 7.7$). Using this model (without control variables) and the model building data, *e-commerce transaction perceived risk* explains 21% of the variance of *attitude toward buying on the web*, supporting the structure of the model.

However, Chin et al. (1995) caution that the PLS method for modeling factors works best when the number of indicators is equal for all the constructs, and in our model functionality inefficiency risk uses five formative dimensions while information misuse risk and failure to gain product benefit risk each use two dimensions. To test whether the difference in path weights among the general risks was an tool of the number of indicators, the model was run using all ten combinations of two of the five formative dimensions for functionality inefficiency risk. In all ten cases, the path weight for functionality inefficiency risk remained almost double the path weights of the other general risks, ranging from 0.51 to 0.58, averaging 0.55, while the sign and significance of all other paths in the model remain unchanged throughout. This indicates that the difference in path weights among the general risks was not an tool of model construction.

The model was then tested in its full nomological network along with control variables, using the model-testing portion of the data sample (n=205). Statistical significance was assessed using a bootstrap procedure and 100 resamples. The results of the structural model assessment are provided in Figure 2.5.

Figure 2.5: PLS results of model testing for e-commerce transaction perceived risk



The hypotheses place e-commerce transaction perceived risk in its nomological network. Consistent with the approach of Pavlou et al. (2007), the TAM independent variables were included in the model as control variables. All control variables were tested to determine their importance to the model in the presence of the independent variables. *Perceived ease of use of buying on the web* (PEOU), *perceived usefulness of buying on the web* (PU), and *web purchase history* (WPH) were determined to have a statistically significant effect on *attitude toward buying on the web*, or *intention to buy on the web* in the presence of the modeled independent variables. The control variables for *age*, *gender*, *average web purchase*, *experience with the web*, *level of use of the web*, and *propensity to trust web retailers* were not found to have a significant effect in the presence of the independent variables of the model and were eliminated from additional analysis.

In the presence of the control variables identified as significant (PU, PEOU and web purchase history), the aggregate factor of *e-commerce transaction perceived risk* was found to be significantly related to *attitude toward buying on the web* ($\beta = -0.22$, $t = 3.6$), supporting H1 and explaining 57% of the variance along with the control variables ($R^2 = 0.57$). Using the approach suggested by Gefen and Straub (2005) to test a nested model in PLS, the control variables alone explained 53% of the variance ($R^2 = 0.53$), suggesting that e-commerce transaction perceived risk explains 4% of the variance, an small to medium effect size according to Cohen (Cohen 1992) ($f^2 = 0.09$, $F = 17.4$). *Attitude toward buying on the web* was significantly related to *intention to buy on the web* ($\beta = 0.41$, $t = 5.6$), explaining 69% of the variance of *intention to buy on the web* along with the control variables ($R^2 = 0.69$), providing support for H2.

Trust in web retailers was found to be negatively related to *information misuse risk* at $p < 0.01$ ($\beta = -0.21$, $t = 3.4$), supporting H3a; negatively related to *failure to gain product benefit risk* at $p < 0.01$ ($\beta = -0.20$, $t = 3.6$), supporting H3b; and negatively related to *functionality inefficiency risk* at $p < 0.01$ ($\beta = -0.19$, $t = 2.9$), supporting H3c.

2.4 Discussion

2.4.1 Limitations

A limitation of this research results from the general nature of the research question. That is, the survey collected information regarding the beliefs, attitudes and intents about the behaviour of buying on the web in general, rather than on the specific behaviour of buying a specific class of product or service, from a specific web retailer, or specific type of e-commerce site (retail versus auction, for example). TRA emphasizes the importance of the target and context of beliefs, and marketing research tells us that product attributes are important variables in the field of consumer behaviour (Cunningham 1967). As a result, the specific product or product classes or the specific retailers, or the type of e-commerce site that respondents brought to mind when answering the questionnaire might offer an alternative explanation for the results.

This research attempted to control for these alternative explanations as much as possible. Control variables for *number of web purchases in the past year* and *dollar amount of web purchases during the past year* were included. Although *number of web purchases* was found to be significant when included as a control for *attitude toward buying on the web* and *intention to buy on the web*, *dollar amount of web purchases* was not. Further, when these two indicators were combined to impute an average purchase amount for web purchases, the result was not found to be a significant control variable for *attitude toward buying on the web* or *intention to*

buy on the web. Since it is likely that respondents considered a range of product classes and types when completing the survey, the lack of significance of the purchase amount in the past 12 months and the imputed average purchase amount suggest generalizability of the results across a range of levels of internet purchase. However, the actual context of the participants' responses was not a subject of the survey. As a result, the verifiability of the generalizability to specific products or product classes, or to a specific retailer or type of e-commerce site is a limitation of this research, and should be addressed by future studies.

It is likely that some respondents considered expensive e-commerce purchases when completing the survey, while others answered in the context of purchasing low-cost items. Clearly, these two cases have the possibility of creating two different levels of one of the general risks (failure to gain product benefits risk), but the other general risks (information misuse risk and functionality inefficiency risk) may not vary greatly between the two cases. However, the intent of this research was to propose and test a model of e-commerce transaction perceived risk that might be usefully applied to e-commerce purchases of both high and low involvement. As a result, the difference in the contexts considered by the two hypothetical respondents would serve to provide a variance in the risk levels measured and the resulting attitude toward shopping on the web. In addition, the phrasing of the items measuring the severity of the consequences is self-referential, measuring if the potential harm is significant *to the respondent*. This phrasing was intended to deal with differences among the respondents in tolerance for harm, as well as to place the harm in the context of the purchase considered by the respondent.

Our sample frame consists of people currently using the internet who have volunteered to participate in an e-commerce panel with a marketing research firm. As a result, although our sample is likely to be representative of internet users and e-commerce users, it does not include people who do not use the internet, and therefore cannot be generalized to a group of potential customers that might be of interest to e-commerce practitioners. Although this limits generalizability of this research outside of the internet and e-commerce users, the usefulness of the findings remain, since increasing the purchasing of existing users is likely to be of greater concern to internet marketers than the attraction and conversion of people who do not use the internet at all.

A further limitation is the potentially unlimited number of events stemming from the behaviour of buying on the web. Do the events and beliefs elicited truly capture the complete range of possible events? While it is impossible to be certain that all meaningful events have been elicited, the procedure followed in this research provides some assurance that at least the most salient of the potential events and their summary beliefs have been captured. In any case, it is not necessary that all potential events be captured, only that representative events are surveyed that result in a smaller set of exposures to harm from buying on the web. If unwanted events have been missed by this research, the content validity of the factors as an index of perceived risk has not been compromised as long as the exposures to harm are complete; however, if exposures to harm summarizing the events have been missed, then the content validity of the measures are reduced. In any case, the usefulness and the validity of the identified exposures to harm that have been demonstrated to be significant predictors of the attitude of e-commerce transaction perceived risk will remain intact. By attempting to

accomplish this, the research provides a starting point for further investigation of the interesting and useful construct of e-commerce perceived risk and the factors that comprise it.

2.4.2 Implications

This research tests a model of e-commerce transactions perceived risk developed from theory and the identification of the ways in which consumers are exposed to harm as a result of an e-commerce transaction. In an online survey, the general categories of risk identified in this model were found to form the construct of e-commerce transaction perceived risk, supporting the structure of the proposed construct. Adding additional support, the hypothesized relationships of the constructs of e-commerce transaction perceived risk with other constructs in its nomological network (*trust in web retailers* and *attitude toward buying on the web*) were supported by the survey. At the level of identifying useful dimensions of perceived risk, this research provides a novel contribution by using dimensions of perceived risk based on the ways in which consumers are exposed to harm to measure *information misuse risk*, *failure to gain product benefits risk* and *functionality inefficiency risk*, which comprise *e-commerce transaction perceived risk*. By separating the measurement of these risk categories, researchers and practitioners can evaluate specific effects of an IT tool designed to reduce the perceived risks of consumers, isolating the effect on each dimension and category of perceived risk.

This research was based on the premise that a model of *e-commerce transaction perceived risk* based on dimensions describing the way in which consumers are exposed to harm would provide useful information to e-commerce researchers and designers about the ways in which IT tools influence perceived risk and the resulting attitude toward buying on the web. Support for the model based on this premise makes a novel contribution as illustrated by the

following example of how the dimensions of *e-commerce transaction perceived risk* might be useful to the e-commerce researcher and practitioner. Consider the use of software intended to simplify the customer's ordering procedure: measurement of perceived risk using a unidimensional construct might suggest that such a tool had limited effect. However, examination of the effect of the tool along the dimensions of perceived risk proposed by this research might reveal two different effects: on one hand, the tool might do what it is ostensibly intended to do by reducing consumers' perceived risk that ordering and paying for something on the web might be too difficult or time consuming. On the other hand, because such an IT tool requires that financial information, delivery address information and personal contact information be stored and ready for use, the IT tool might very well increase the consumer's perceived risk that information may be misused. Therefore, the net effect of the IT tool on perceived risk may be small, but without the dimensions of the e-commerce transaction perceived risk model, the researcher or practitioner would not know why.

Another example along the same line is the use of an online product recommendation agent. This type of IT tool assists consumers in choosing among the large number of product choices available on the web. Such a tool may therefore reduce a consumer's fear that he or she will make a poor product choice in the self-serve environment of the web, lowering the perceived risk that something bought on the web will not provide the expected benefits. However, such a tool can be complex and the information entry requirements, reviewing and identifying preferences among the many attributes of a product could be onerous, potentially increasing the perceived risk of functionality inefficiency. With the dimensions of the e-commerce transaction perceived risk model, the researcher and designer can evaluate trade-off

between these effects of the IT tool to design an implementation of it that is better for both retailers and consumers.

Information misuse risk was supported as a component of *e-commerce transaction perceived risk*, representing the perceived dangers associated with providing the financial and personal information necessary to transact on the web. This finding provides additional empirical support for the importance of privacy and security to e-commerce users. Further, the finding not only provides a way for researchers to assess the effect of an IT tool on an important consumer concern, it also provides a vehicle for practitioners to assess the trade-off between the value of additional data collected and the discomfort consumers may experience as a result of this collection.

Failure to gain product benefit risk was also found to be significant as a component of *e-commerce transaction perceived risk*. This risk category is related to performance risk, but is broader in the sense that it may result from a range of events that may not be related to the product itself. In this way, the risk category lends itself to measuring the effect of a number of IT tools intended to address the myriad events that might result in the consumer not gaining the expected benefit, from product recommendation agents to shipment tracking software.

Functionality inefficiency risk, which expresses the risk that a user may have to expend too much time, effort or money on one or more functionalities offered by the web retailer, is also shown to be a significant component of e-commerce transaction perceived risk. This suggests a trade-off for consumers in using the web as a channel for a purchase as discussed above: there is an investment required to use the channel which may prove to be a barrier to some consumers. Indeed, the tools offered by practitioners to reduce this (or other) risks may

themselves require an investment of time or effort that reduces their effect on e-commerce transaction perceived risk. This research offers a way for practitioners and researchers to assess the trade-off and to make design decisions that optimize the effect of the tools offered on a web site.

The identification of the dimensions along which consumers are harmed by e-commerce transaction risks so that they may be addressed directly through IT tools in future research is a novel contribution of this research, and the development of indicators of these dimensions provides an important and promising path for future research. By making use of the novel contribution of this study, future research can seek to understand and improve the ways in which IT tools influence the perceived risk of consumers regarding e-commerce transactions.

3. Investigation of the Perceived Effect of RRIT

This phase of the research examines the influence of IT tools on the model of e-commerce transaction perceived risk. In Chapter 2, it was proposed that consumers considering buying on the web are influenced by three general categories of perceived risk: information misuse risk; failure to gain product benefit risk; and functionality inefficiency risk. In this study, the ways in which IT tools influence the perceived risks of the e-commerce consumer to encourage the behaviour of buying from a web retailer are investigated. Recent e-commerce statistics indicate that e-commerce is still not reaching its potential as a marketing channel: although business-to-consumer (B2C) e-commerce in the U.S. grew at a rate of 19% from 2006 to 2007, the US Department of Commerce reports that only 3.4% of retail sales occurred over the web (Scheleur 2008). In Canada, retail e-commerce did not achieve the expected levels of sales in 2004 (the last year available from StatsCan), reaching just 0.8% of all retail sales (StatsCan 2005). As a result, the ways in which IT tools may be used to overcome the reluctance of consumers is of interest to both researchers and e-commerce practitioners.

Both early marketing studies and current research on the nature of perceived risk make a clear distinction between objective risk as it exists in the “real world” and risk as it is understood subjectively by the consumer. Bauer (1967) differentiates between perceived risk and objective risk and identifies perceived risk as the appropriate focus of consumer behaviour researchers, asserting that an individual can deal only with risk as he or she perceives it subjectively. If an objective risk exists, but the consumer does not perceive it, he or she cannot be influenced by it. Alternatively, the consumer may be influenced by perceived risk that does

not objectively exist, or may use risk reduction strategies that reduce his perception of the risk, but have no effect on the objective risk (Bauer 1967).

The distinction between objective and subjective risk becomes important in the consideration of IT tools intended to reduce risk: IT tools intended to reduce objective risk may not necessarily reduce perceived risk. If the IT tool is intended to reduce objective risk, it is possible for the IT to operate without the knowledge of the e-commerce consumer as long as the actual probability or the consequence of the objective risk is reduced. On the other hand, if the IT tool is to reduce perceived risk it must be known to the e-commerce consumer and should be acting upon a risk perceived by the consumer in order to be effective. As a result, it is the consumer's perception of the function of an IT tool intended to reduce perceived risk that is the determinant of the effectiveness of the IT tool. However, this effectiveness extends only to the reduction of perceived risk; objective risks may be unaffected in spite of the consumer's perception.

Some IT tools intended to reduce perceived risk provide information to the consumer, such as a product recommendation agent. For this tool to be most effective in reducing perceived risk, the consumer must interact with the tool to be provided with useful information. Other IT tools structure the transaction in a way that reduces risk (Cho et al. 2006; Mitchell et al. 1993). For example, consider Secure Socket Layer (SSL): this IT tool prevents the misuse of information by encrypting data exchanges, but provides no information to the consumer beyond the knowledge that the IT tool is implemented on the e-commerce website being used. In this case, the consumer could "use" the software, but not notice its presence, and the IT tool would not therefore be effective in reducing perceived risk. As a result, this research uses the term

“adopt” to refer to the consumer’s acceptance of the functionality offered by the IT tool, whether that functionality requires the user to interact with the software or simply to notice and accept its benefits.

In summary, for an IT tool to have some effect on the perceived risk of a consumer, the IT tool must be: 1) perceived to reduce a risk that concerns the consumer; and 2) adopted by the consumer in some way. As a result, this study examines the willingness of consumers to adopt an IT tool for the purpose of reducing particular categories and dimensions of perceived risk.

3.1 Prior Research on Risk-Reducing Strategies

The earliest research in consumer perceived risk proposed that consumers would react to a perception of risk in a transaction by consciously employing strategies to reduce or handle perceived risk (Bauer 1967), termed risk-reducing strategies (RRS). A body of marketing literature has considered how consumers employ these RRS, and how merchants and advertisers might facilitate such strategies; for example, by supplying money-back guarantees or providing a demonstration of a product (Dowling et al. 1994; Heiman et al. 2001; Henthorne et al. 1993).

Research in the psychology of decision making has also found evidence of a similar approach to uncertainty. Huber (2001) proposes that risk-defusing behaviour plays a central role in the decision process. In much decision research, the choice for the participant is presented as a gamble with a preset (albeit uncertain) selection of outcomes. The choice among the outcomes is made through analysis of the expected value of the outcomes. Huber argues that this operationalization of decision tasks as a choice among preset alternatives is incomplete. Faced with uncertainty, decision makers tend not to search for information that allows them to

assess the probabilities of each outcome (and therefore the expected value of an outcome) more accurately. Instead, decision makers search for risk-defusing operators (RDO), such as insurance or a restructuring of the problem. These RDO either reduce the probability of occurrence of an unwanted outcome or limit the severity of its consequences (Huber 2001; Huber et al. 2004).

However, much less research has been conducted within the discipline of e-commerce on the RRS or RDO employed by e-commerce consumers, and less still on the operation of IT tools that are offered by e-commerce retailers to enable or facilitate these RRS or RDO. This section of this research proposes to investigate the willingness of consumers to adopt e-commerce transaction perceived risk-reducing IT tools (RRIT) for the purpose of reducing the risks of buying from a web retailer.

In the absence of an accepted definition of RRIT from prior research, this thesis proposes the following: *an e-commerce transaction perceived risk-reducing IT tool is an information technology artifact that can be adopted by the consumer to reduce his or her expectations that purchasing a good or a service on the web will result in unwanted outcomes.* This definition assumes a cognitive process for the use of the IT tool: that a consumer wishes to reduce his or her perceived risk in a transaction, and uses the information technology tools (or the information that they provide) to support or enable his or her risk-reducing strategies. While aspects of the website (such as the colours employed or elements of the visual design) may have an unconscious effect on the perceived risk of a consumer, this definition concentrates this research on those IT tools that influence the consumer through a cognitive process. However, this distinction does not preclude the heuristic use of the IT tool, as in marketing research that

characterizes the use of the same RRS as either a clarifying strategy (using systematic processing) or simplifying strategy (using heuristic processing) (Mitchell et al. 1996).

In this definition, the source of the RRIT is not specified: the RRIT may be provided by the e-commerce retailer; by a third-party; or by the consumer. However, regardless of its source, the purpose of the RRIT is to facilitate a consumer's risk-reducing strategies in the eyes of the consumer – it must be used or perceived by the consumer to be effective. An IT tool that is effective in reducing an unknown risk would not be effective in reducing perceived risk. Further, an IT tool that exists and operates without the knowledge of the consumer would not reduce perceived risk and would not be an RRIT under this definition.

3.2 Identification of Potential RRIT

Dowling and Staelin (1994) provide a list of potential RRS available to consumers, and Mitchell and McGoldrick (1996) survey the literature to provide a listing of RRS considered in marketing research. The RRS considered in marketing literature concern primarily product and product category risk, or in terms of the research discussed above, the risk that something purchased may not provide the benefits expected. The risks facing the Internet consumer include both the risks considered by marketing researchers and the risks posed by the Internet channel (information misuse risk and functional inefficiency risk). As a result, I have adapted the RRS identified by marketing researchers to include Internet channel risks and identified the risk category of e-commerce transaction perceived risk that is addressed by the risk-reducing strategy. Once this was completed, operating retail websites were surveyed and potential RRIT that appeared to support the risk reducing strategies to reduce the identified risk were identified,

listed below in the left-hand column of table 4.1. This was the source of the corollaries of hypothesis 1 discussed in following sections.

Table 3.1 groups the RRS according to the risk category they are predicted to reduce, and the right-hand column proposes an example of an RRIT that enables or facilitates these RRS.

Table 3.1: Targets of consumer RRS and potential enabling RRIT	
Consumer RRS adapted from (Dowling et al. 1994; Mitchell et al. 1996)	Examples of Potential RRIT
Reduce the risk that buying something from a web retailer will not provide the expected benefits	
<ul style="list-style-type: none"> • Visit or call the retailer • Ask the salesperson • Delegation of buying decision to others who are more competent • Joint decisions • Government tested and approved • Information from journal papers and articles • Referrals from other professionals • Endorsements/testimonials • Private testing/consumer reports • Ask family and friends • Information from packaging and merchandising • Number of brands examined • Shopping around • Pre-purchasing deliberation • Yellow pages • Information from direct mail • Information from TV commercials • Information from printed advertisements • Spend more time gathering information • Using someone known socially or through business • Store reputation/image • Brand loyalty • Buy a well known brand • Well-known or reputable manufacturing company • Product newness • Warranty quality • Service contract • Past experience • Free sample/Trial size 	<ul style="list-style-type: none"> • Decision support tools <ul style="list-style-type: none"> ○ Product recommendation agent ○ Site product comparison tools ○ Product configuration tool • Attribute comparison tools • Collaborative shopping tools • Functional Demonstration <ul style="list-style-type: none"> ○ Trial of product through website functionality ○ Amazon “Search Inside” ○ Music demonstration clip ○ Software demonstration • Performance review database • Frequently asked question database • On-line backup of purchased software
Reduce the risk that buying something from a web retailer will be too difficult or time consuming	
<ul style="list-style-type: none"> • Money-back guarantee • A free gift • Coupons • Using someone in a convenient location 	<ul style="list-style-type: none"> • Decision support tools <ul style="list-style-type: none"> ○ Internet search engine ○ Product recommendation agent • Frequently asked question database • Problem/resolution database • Simplified ordering <ul style="list-style-type: none"> ○ Amazon One-click ordering ○ Google Auto-fill • Shipment tracking software

Table 3.1: Targets of consumer RRS and potential enabling RRIT	
Consumer RRS adapted from (Dowling et al. 1994; Mitchell et al. 1996)	Examples of Potential RRIT
Reduce the risk that information revealed when buying something from a web retailer will be misused.	
<ul style="list-style-type: none"> ● Decline to supply personal information ● Retain credit cards ● Pay by check or money order 	<ul style="list-style-type: none"> ● Site validation tools <ul style="list-style-type: none"> ○ Anti-virus programs “Trusted site” rating ○ EBay toolbar ○ Website certifications ● Spam reduction tools <ul style="list-style-type: none"> ○ Opt-out of information ○ Spam filter ○ Do not spam directory ● Encryption tools <ul style="list-style-type: none"> ○ Secure socket layer encryption technology ○ Proprietary encryption technology

The strategy adopted in a RRS has been considered to be important to RRS since early perceived risk research. Consumers’ RRS have been defined by Bauer (1967) and confirmed by many researchers (Mitchell et al. 1996) as reducing perceived risk in two ways: 1) a strategy of prevention, reducing the probability of an unwanted outcome occurring; or 2) a strategy of mitigation, reducing the severity of the consequences of the outcome for the consumer. Although these strategies are not mutually exclusive, RRIT are likely to influence one or the other because an RRIT supporting an RRS using a prevention strategy will vary in its design and approach from an IT tool supporting an RRS using a mitigation strategy. RRIT supporting a prevention strategy must exist and must be perceived to be active prior to the transaction, since they are intended to prevent an outcome that will cause harm to the consumer from occurring in the future. Further, since one outcome may result in many types of harm types (such as financial loss, time wasted, psychological, social or physical harm (Mitchell 1999)), an RRIT supporting a prevention strategy may prevent all of these types of harm. On the other hand, an RRIT that supports a mitigation strategy may exist or be active during or following the transaction, and may mitigate only one of a number of types of harm arising from an outcome (for example, reducing financial harm, but not the time wasted by the event).

The identification of the strategies used by the RRIT identified above is proposed in

Table 3.2:

Table 3.2: Strategy of RRIT	
Prevention Strategy	Mitigation Strategy
<ul style="list-style-type: none"> • Decision support tools <ul style="list-style-type: none"> ○ Product recommendation agent ○ Site product comparison tools ○ Product configuration tool ○ Internet search engine • Attribute comparison tools • Collaborative shopping tools • Functional Demonstration <ul style="list-style-type: none"> ○ Trial of product through website functionality ○ Amazon “Search Inside” ○ Music demonstration clip ○ Software demonstration • Performance review database • Simplified ordering <ul style="list-style-type: none"> ○ Amazon One-click ordering ○ Google Auto-fill • Shipment tracking software • Site validation tools <ul style="list-style-type: none"> ○ Anti-virus programs “Trusted site” rating ○ EBay toolbar ○ Website certifications • Spam reduction tools <ul style="list-style-type: none"> ○ Opt-out of information ○ Spam filter ○ Do not spam directory • Encryption tools <ul style="list-style-type: none"> ○ Secure socket layer encryption technology ○ Proprietary encryption technology 	<ul style="list-style-type: none"> • On-line backup of purchased software • Frequently asked question database • Problem/resolution database • Shipment tracking software

The preponderance of IT tools with the strategy of prevention rather than mitigation is consistent with a similar imbalance identified in marketing RRS (Mitchell et al. 1993). The strategy of mitigation requires reduction of the severity of the consequences of an outcome, and therefore has two possible approaches: insurance and contingency planning. Insurance is a financial instrument and provides mitigating financial compensation in the event of the unwanted outcome occurring, reducing the financial harm done to the consumer, and potentially

compensating financially for other types of harm experienced. Even if an IT is used to facilitate the acceptance or payment of insurance against an outcome, the underlying reduction of the severity of the consequences results from the financial instrument rather than from the IT tools that facilitate it; the IT tool is not essential to its operation. Contingency planning requires the investment in prior planning of the steps that will be taken in the event of the unwanted outcome occurring, resulting in the reduction in the harm actually experienced in the event (for example, the purchase of a spare tire is a contingency plan that reduces the severity of the consequences of a flat tire). Contingency planning may rely on IT tools for their operation, as is the case in the problem/resolution database or the online backup of purchased software, and may therefore be considered as an RRIT, but is an approach that appears to be less well supported by IT tools. In addition, RRIT which appear to facilitate this approach, such as shipment tracking software, which can be viewed as a way of reducing the consequence of a lost package (allowing a consumer to find the lost package) can also be viewed as reducing the probability that the package will be lost (since the consumer can intervene) or reducing the difficulty of receiving something bought from a web retailer (since the consumer can better predict when the package will be delivered).

Further, my unpublished prior research (Glover et al. 2006) has indicated that although the perceived probability of a dimension of e-commerce transaction perceived risk predicts whether an internet user is also an e-commerce user, the perceived seriousness of the consequence of that dimension of risk does not predict the use of e-commerce: both users and non-users regarded the consequences of the dimensions of risk as equally serious. Because of this, and the paucity of IT tools using the mitigation strategy, this research will concentrate on the mainstream of RRIT: those using a strategy of prevention. This research will therefore also

concentrate on the measurement of the perceived probability of the risk dimensions rather than the perceived consequences of the risk dimensions.

3.3 Development of Hypotheses

If RRIT are to be effective in changing the beliefs of consumers regarding the outcome of buying from a web retailer, consumers must recognize their purpose and be willing to adopt them for that purpose. This study proposes consumers will recognize that the purpose of RRIT found on working retail web sites is to reduce the probability of one or more of the perceived risk dimensions examined in Chapter 2.

3.3.1 Perceived Effect of Individual RRIT on Risk Dimensions

If RRIT are to be effective in reducing e-commerce transaction perceived risk, consumers will perceive specific types of RRIT as being effective in reducing the probability one or more of the dimensions of the e-commerce transaction perceived risk categories shown below:

- The risk of information misuse:
 - personal information revealed when buying from a web retailer will be misused;
 - and
 - financial information revealed when buying from a web retailer will be misused.
- The risk of failure to gain product benefits:
 - something bought from a web retailer will not meet the needs of the buyer; and
 - something bought from a web retailer will arrive late or not at all.
- The risk of functionality inefficiency:

- finding and choosing something to buy from a web retailer will be too difficult or time consuming;
- ordering and paying for something bought from a web retailer will be too difficult or time consuming;
- receiving something bought from a web retailer will be too difficult or time consuming;
- returning or exchanging something bought from a web retailer will be too difficult or time consuming; and
- maintaining something bought from a web retailer will be too difficult or time consuming.

As discussed above, for an RRIT to be effective in reducing perceived risk, it must be seen by the consumer as being effective and it must be adopted by the consumer for that purpose. Cox (1967b) proposes that in seeking information to allay perceived risk, consumers consider the information value of the cue, and use the information that provides the greatest reduction of perceived risk. Similarly, Newell et al. (2004) find that the expected success of a cue, that is, the expected proportion of correct choices when only that cue can be used, is the most important determinant of cue choice. In both these conceptualizations, consumers make use of the information or cue that they perceive will help them most in making a correct decision. Put another way, when faced with a decision that involves some degree of perceived risk, consumers assess the cues and tools available to them and make use of the information that is most likely to result in the greatest reduction of perceived risk and the correct decision.

Applying the technology adoption model (TAM) (Davis 1989), the decision to adopt the RRIT to reduce the probability of a risk dimension is determined by the perceived usefulness and the perceived ease of use of the RRIT, that is, the effectiveness of the RRIT in reducing the probability of the risk dimension. This belief of a consumer in the effectiveness of the RRIT for a specific purpose will therefore be reflected in the consumer's willingness to use the RRIT for that specific risk-reduction purpose. For example, consider two types of RRIT: type A is perceived by consumers as being both useful and easy to use for reducing the probability of information misuse; type B is not. If this is true, then a consumer provided with RRIT type A should show greater willingness to use the RRIT for the purpose of reducing the probability of information misuse than a consumer who is provided with RRIT type B. Individual RRIT are not expected to be perceived by consumers as reducing the probability of the dimensions all risk categories. However, hypotheses are proposed only for the strongest predicted effects, and are not proposed for the absence of a relationship.

Comparison with control group

To examine the effect of the example RRIT, the willingness to adopt the RRIT to reduce a risk dimension was compared between an RRIT and a control group. To achieve this, the RRIT tested included as a control an IT tool that should not be perceived by consumers as reducing the probability of any of the risk dimensions. Game software was provided as an example to the control group for purposes of comparing the effect of the other treatment RRIT with a control IT. Game software is likely to be perceived by participants as being provided to improve the enjoyment the consumer experiences in visiting a website. However, this type of software does not offer any functionality that would be perceived by the consumer as reducing

the probability of any of the risks discussed above. As a result, game software is not predicted to reduce the probability of any of the risk dimensions and is suitable as a control IT example. Inclusion of a control group also eliminated the possibility that a response bias was responsible for the results of the study.

Based on the discussion above, the first hypothesis is presented as a general hypothesis regarding the willingness of consumers to accept an RRIT to reduce the probability of dimensions of risk. This is followed by predictions that arise from this hypothesis regarding the willingness of consumers to adopt a specific RRIT to reduce the probability of specific risk dimensions. The specific predictions were tested individually to test the general hypothesis.

Hypothesis 1: consumers will have a greater willingness to adopt an RRIT for its predicted purpose compared to the willingness of consumers to adopt a control IT for that purpose.

The following descriptions develop corollary sub-hypotheses of the perceived purpose for ten RRIT of types commonly used by consumers in e-commerce compared to the perceived purpose of a control IT not predicted to have an effect on any of the perceived probabilities of risk dimensions (the proposed example RRIT are provided in Appendix D). The ten tools are examples of the types of RRIT identified in table 3.1 above, and are intended to provide a cross-section of the tools available to the consumer rather than an exhaustive census. A summary of the corollary hypotheses regarding the tools is provided below in table 3.2; a description of RRIT and the derivation of the corollary hypotheses follow the table.

Table 3.3: Summary of hypothesis regarding effect of RRIT by risk dimension

RRIT	Hypotheses	Compared to the control group, greater willingness to adopt the example RRIT for the purpose of reducing the probability of the risk of:						
		Personal information misuse	Financial information misuse	Fail to meet needs	Delivered late or not at all	Find and choose inefficiency	Order and pay inefficiency	Receive inefficiency
Spam reduction	1.1	Yes						
Site validation	1.2a	Yes						
	1.2b		Yes					
	1.2c			Yes				
	1.2d				Yes			
Simplified ordering	1.3						Yes	
Shipment tracking	1.4a				Yes			
	1.4b							Yes
Performance review	1.5			Yes				
Functional demonstration	1.6			Yes				
Encryption	1.7a	Yes						
	1.7b		Yes					
Collaborative shopping	1.8			Yes				
Attribute comparison	1.9a			Yes				
	1.9b					Yes		
Decision support	1.10a			Yes				
	1.10b					Yes		

Spam reduction tools prevent the consumer from receiving unwanted solicitations for products and services. For example, spam filter products accomplish this by reviewing incoming email and filtering out messages determined to be spam. Information opt-out software on e-commerce websites can also be considered as an IT tool to reduce spam, allowing the retailer to avoid sending unwanted information to consumers that have not requested it. Both IT tools act to reduce the probability that a consumer will receive spam after providing his or her email address in the course of a transaction, and should be perceived as reducing the probability of the risk of misuse of personal information.

Hypothesis 1.1: consumers will have a greater willingness to adopt a spam reduction tool to reduce the probability of personal information misuse compared to the willingness of consumers to adopt a control IT for that purpose.

A site-validation toolbar, such as the eBay toolbar, VirusScan Antifraud toolbar, or MacAfee anti-fraud toolbar presents information to the consumer regarding the legitimacy of the current website in order to prevent the consumer's use of a fraudulent website, often used for the purpose of collecting financial and personal information for subsequent misuse. Therefore, a tool that can provide a positive or negative indication of the legitimacy of the site will reduce the probability of personal information and financial information misuse perceived by the consumer. However, a site that is not a legitimate user of the information provided by the user is also unlikely to be perceived by the consumer as a legitimate provider of the goods or services it purports to sell. As a result, consumers will also expect that a site validation tool will provide

an indication of the probability that the product purchased by the consumer will not meet their needs, and the probability that the product may be delivered late or not at all.

Hypothesis 1.2a: consumers will have a greater willingness to adopt site validation software to reduce the probability of personal information misuse compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.2b: consumers will have a greater willingness to adopt site validation software to reduce the probability of financial information misuse compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.2c: consumers will have a greater willingness to adopt site validation software to reduce the probability of failure to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.2d: consumers will have a greater willingness to adopt the site validation software to reduce the probability the product purchased will be delivered late or not at all compared to the willingness of consumers to adopt a control IT for that purpose.

Simplified ordering software reduces the effort involved in the ordering and paying process of an e-commerce transaction. Consumers may consider the entry of billing and shipping information for an online transaction to require too much time or effort. As a result, Amazon's "One-Click" ordering or Google's "Autofill" toolbar offers consumers simplified ordering, making use of stored information to fill in the required fields, preventing the occurrence of functional inefficiency. Therefore, simplified ordering software should be

perceived as reducing the probability that ordering and paying for something bought from a web retailer will be too difficult or time consuming.

Hypothesis 1.3: consumers will have a greater willingness to adopt simplified ordering software to reduce the probability that ordering and paying for something bought from a web retailer will be too difficult or time consuming compared to the willingness of consumers to adopt a control IT for that purpose.

Shipment tracking software informs the consumer of the progress of his or her goods through the shipment process. The purchase of a physical good on the web entails a delay between the order and the delivery of the good. The software allows consumers to track the package with minimal effort: no phone calls are required, and the consumer does not need to be uncertain about shipment status and delivery dates. As a result, the tool will be perceived by the consumer as reducing the probability that receiving something bought from a web retailer will be too difficult or time consuming. Since the consumer also has the ability to follow up on the shipment of the purchased goods and ensure that they are delivered on time, the probability the something bought on the web will be delivered late or not at all will also be perceived as reduced.

Hypothesis 1.4a: consumers will have a greater willingness to adopt shipment tracking software to reduce the probability that receiving something bought from a web retailer will be too difficult or time consuming compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.4b: consumers will have a greater willingness to adopt shipment tracking software to reduce the probability that something purchased from the web retailers will be delivered late or not at all compared to the willingness of consumers to adopt a control IT for that purpose.

Performance review database software provides information regarding how the product or service has performed in formal tests or in use by customers. By supplying performance information, such tools allow consumers to compare the performance of the product with their own needs, increasing the confidence consumers have that the product selected will provide the expected benefits, and should be perceived as reducing the probability of failure to gain product benefit risk.

Hypothesis 1.5: consumers will have a greater willingness to adopt performance review software to reduce the probability of the product purchased from the web retailer will fail to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Functional demonstration software allows an e-commerce consumer to interact with a product on the web and try its functions. One of the factors that may cause a product to fail to meet the needs of the consumer is the difficulty of testing its operation for suitability over the web. For example, Amazon's "Search Inside" function allows a consumer to review the content of a book being considered, fulfilling a similar function to downloads of trial music clips or demonstration software. Functional controls have been found to influence consumers' perception of the ability to evaluate a product and the perception of flow (Jiang et al. 2004). These IT tools allow the user to test how the product being considered will work and may

prevent the consumer from buying a product that does not meet their needs. Therefore, functional control software should be perceived as reducing the probability of failure to gain product benefits.

Hypothesis 1.6: consumers will have a greater willingness to adopt functional demonstration software to reduce the probability that a product purchased from the web retailer will fail to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Encryption of transmitted information prevents the interception of transaction information. Purchase of a product on the web usually requires that financial and personal information be transferred over a public network, susceptible to interception. Transmission encryption through technology such as the Secure Socket Layer (SSL) prevents this interception, and should be perceived as reducing the probability of financial and personal information misuse risk.

Hypothesis 1.7a: consumers will have a greater willingness to adopt encryption software to reduce the probability of personal information misuse compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.7b: consumers will have a greater willingness to adopt encryption software to reduce the probability of financial information misuse compared to the willingness of consumers to adopt a control IT for that purpose.

Collaborative shopping tools allow shoppers to collaborate with colleagues and friends to obtain advice about the products being considered. The collaborator is able to view the same

information as the shopper and offer input to the decisions of the shopper (Zhu et al. forthcoming). By allowing consumers to obtain information from trusted sources, collaborative shopping tools should reduce the probability that a product bought on the web will not meet the needs of the purchaser, and should be perceived as reducing the probability of failure to gain product benefits.

Hypothesis 1.8: consumers will have a greater willingness to adopt collaborative shopping software to reduce the probability of failure that a product purchased from the web retailer will fail to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Attribute comparison software allows consumers to compare a specific attribute of a product or service. The RRIT may provide a ranking based on the attribute (such as price, feature, or popularity) allowing the consumer to identify the best item based on that attribute. Such an RRIT supplied by an ecommerce retailer can be used to compare among items on the retailer's site, or, supplied by a third-party service, to compare among prices for a specific product from multiple retailers. Without such software, a consumer may perceive that the process of finding acceptable features and price for a purchase would be too difficult or time consuming. By enabling the comparison of products on an attribute considered important by the consumer (for example, ratings in customer reviews), the RRIT should reduce the perceived probability that the product selected will meet the needs of the consumer. As a result, attribute comparison software should be perceived as reducing the probability that finding and choosing a product to buy from the web retailer will be too difficult or time consuming, and the probability that a product purchased from the web retailer would fail to meet the needs of the consumer.

Hypothesis 1.9a: consumers will have a greater willingness to adopt attribute comparison software to reduce the probability that a product purchased from the web retailer will fail to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.9b: consumers will have a greater willingness to adopt attribute comparison software to reduce the probability finding and choosing something to buy at the web retailer will be too difficult or time consuming compared to the willingness of consumers to adopt a control IT for that purpose.

Decision support software assists consumers in choosing among the large number of product choices available on the web. For example, online product recommendation agents and product configuration tools, typically supplied by an online retailer, assist the consumer to sort through the different products and options available from the retailer. Two risks arise from the complexity of sorting through and evaluating the features and tradeoffs involved in a product: the risk that the product selected may not meet the needs of the consumer, and the risk that the task itself may be daunting in the self-serve environment of e-commerce. A product recommendation agent is used to reduce these risks. First, by applying a database of information about the product along with a selection algorithm, an online product recommendation agent can help the consumer identify and source a product that meets his or her needs. Second, the online product recommendation agent can free the consumer from having to search multiple sites to read and compare product attributes, saving the consumer from expending excessive time and effort in his or her e-commerce transaction. Therefore, an online product recommendation agent should be perceived as reducing the probability that a product

purchased from the web retailer will fail to meet the needs of the consumer and the probability that finding and choosing something to buy on from the web retailer will be too difficult or time consuming.

Hypothesis 1.10a: consumers will have a greater willingness to adopt decision support software to reduce the probability that a product purchased from the web retailer will fail to meet the needs of the consumer compared to the willingness of consumers to adopt a control IT for that purpose.

Hypothesis 1.10b: consumers will have a greater willingness to adopt decision support software to reduce the probability that finding and choosing something to buy from the web retailer will be too difficult or time consuming compared to the willingness of consumers to adopt a control IT for that purpose.

Table 3.3 provides a summary the predictions regarding the effects of individual types of RRIT.

3.3.2 Perceived Differentiation from Other RRIT

If an RRIT supports a specific risk-reducing strategy, then the RRIT should be identified by consumers as being more effective in the reduction of the probability of the dimensions of that risk than other RRIT. That is, in addition to being perceived as having an effect on a risk category dimension that differs from the control group tested using game software as described above, consumers should ascribe differing levels of usefulness for a specific risk category dimension to differing RRIT. Hypothesis H1 proposed that each RRIT would be perceived by consumers as reducing the probability of one or more specific risk categories, reflected as their

willingness to adopt the RRIT to reduce the probability of a specific risk category compared to a control group. If consumers regard different RRIT as supporting different risk-reducing strategies, then groups tested with RRIT predicted to have an effect on a specific risk category dimension in H1 should have greater willingness to use those RRIT to reduce the probability of that risk category dimension compared to groups tested with other RRIT.

Hypothesis 2: consumers shown an example of an RRIT predicted to be perceived as reducing the probability for a specific dimension of a risk category will be more willing to adopt their example RRIT to reduce that risk category than will consumers shown an example RRIT not predicted to be perceived as reducing the probability for that risk category.

The following descriptions develop corollary sub-hypotheses for the RRIT predicted to reduce the probability of each of the risk sub-dimensions. Table 3.4 provides a summary of the groups of RRIT predicted to have a greater effect on each risk dimension; the derivation of the corollary hypotheses follows the table.

Table 3.4: Summary of hypotheses regarding effect of RRIT by risk dimension							
	RRIT proposed to affect willingness to adopt RRIT to reduce probability of information misuse in hypothesis 1		RRIT proposed to affect willingness to adopt RRIT to reduce probability of failure to gain product benefits in hypothesis 1		RRIT proposed to affect willingness to adopt RRIT to reduce probability of functionality inefficiency in hypothesis 1		
	Personal information	Financial information	Fail to meet needs	Delivered late or not at all	Finding and choosing inefficiency	Ordering and paying inefficiency	Receiving inefficiency
H2.1a	<ul style="list-style-type: none"> • Spam reduction • Site Validation • Encryption 						
H2.1b		<ul style="list-style-type: none"> • Site Validation • Encryption 					
H2.2a			<ul style="list-style-type: none"> • Site Validation • Performance Review • Functional Demonstration • Collaborative Shopping • Attribute comparison • Decision support 				
H2.2b				<ul style="list-style-type: none"> • Site Validation • Shipment Tracking 			
H2.3a					<ul style="list-style-type: none"> • Attribute Comparison • Decision support 		
H2.3b						<ul style="list-style-type: none"> • Simplified ordering 	
H2.3c							<ul style="list-style-type: none"> • Shipment Tracking

Hypothesis 2.1a: consumers will have a greater willingness to adopt spam reduction software, site validation software and encryption software for the purpose of reducing the probability of personal information misuse compared to the willingness of consumers to adopt other treatment software (simplified ordering, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) for that purpose.

Hypothesis 2.1b: consumers will have a greater willingness to adopt site validation software and encryption software for the purpose of reducing the probability of financial information misuse compared to the willingness of consumers to adopt other treatment software (simplified ordering, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) for that purpose.

Hypothesis 2.2a: consumers will have a greater willingness to adopt site validation software, performance review software, functional demonstration software, collaborative shopping software, attribute comparison software and decision support software for the purpose of reducing the probability of a product purchased from a web retailer failing to meet the needs of the consumer compared to the willingness of consumers to adopt other treatment software (spam reduction, simplified ordering, shipment tracking, encryption) for that purpose.

Hypothesis 2.2b: consumers will have a greater willingness to adopt site validation software and shipment tracking software for the purpose of reducing the probability of a product purchased from a web retailer arriving late or not at all compared to the willingness of consumers to adopt other treatment software (spam reduction, simplified ordering, performance

review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) for that purpose.

Hypothesis 2.3a: consumers will have a greater willingness to adopt attribute comparison and decision support software for the purpose of reducing the probability that finding and choosing a product to be purchased on the web will be too difficult or time consuming compared to the willingness of consumers to adopt other treatment software (spam reduction, site validation, simplified ordering, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping) for that purpose.

Hypothesis 2.3b: consumers will have a greater willingness to adopt simplified ordering software for the purpose of reducing the probability that ordering and paying for a product purchased on the web will be too difficult or time consuming compared to the willingness of consumers to adopt other treatment (spam reduction, site validation, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) software for that purpose.

Hypothesis 2.3c: consumers will have a greater willingness to adopt shipment tracking software for the purpose of reducing the probability that receiving a product purchased on the web will be too difficult or time consuming compared to the willingness of consumers to adopt other treatment software (spam reduction, site validation, simplified ordering, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) for that purpose.

3.4 Test of the Hypotheses

3.4.1 Description of the Field Study

To test the hypotheses developed above, an online field study of internet users was conducted to measure the willingness of consumers to adopt an RRIT for the purpose of reducing the probability of a specific risk. Ten different RRIT were identified on operating web sites as examples of tools intended to reduce the perceived risk of consumers in an e-commerce transaction in ways that are described in the hypotheses. Participants were randomly assigned to one of eleven groups (ten RRIT and one control group shown an example of game software). Each group was provided with an example of one RRIT, comprised of a graphical depiction of the RRIT and a short written description of the RRIT (shown in Appendix D). To determine whether consumers perceive RRIT as reducing the risks of buying from a web retailer, participants were then asked to assess their willingness to use the tool for the purpose of reducing the probability of each risk category, in the context of a purchase of an MP3 player from a web retailer. The measures used are provided in Appendix E. The items were tested in a preliminary test of the survey, and a subsequent pilot of the final items involving over 80 participants.

Sample

The sample consisted of 668 Internet users, drawn from a North American-wide population by a marketing research firm. The marketing firm sent an email invitation to participate to 7,700 randomly selected members of an e-commerce panel maintained for this purpose. Of these 7,700 invitations, website log statistics indicate that 827 unique visits were made to the website described in the invitation. Of these visitors, 756 elected to participate and

668 provided usable responses, creating an effective participation rate of 9% (or 81% of the invitees that visited the research website).

The demographic profile of the sample reflected the way in which the participants were obtained. Participation in the research company's e-commerce panel requires that the respondents become aware of the opportunity and opt-in to receive subsequent surveys. This implies an Internet user more likely to be an experienced user than the general US Internet user population, and more likely to be an active user of functions and activities found on the web. The average age of the participants was 40 (compared to an average age of 42 in a 2003 study by International Demographics, reported on <http://www.clickz.com/stats/>) and 53% of the participants were female (compared to a proportion of 51% female North American users reported in the Pew Internet & American Life Project at <http://www.pewinternet.org/>). The respondents were less likely to be long-time users of the web than the internet-using population reported by Pew: 56% of the participants reported having used the Internet for five years or more, versus 73% in Pew. However, 81% of the respondents reported buying on the web versus 66% percent of respondents reported by Pew. Since experienced e-commerce users are more likely to perceive less risk in buying on the web than inexperienced users, the sample represents a conservative test of the model.

Examination of the Data to Test Assumptions

The data was examined to identify unusable responses, a greater problem in online surveys than in traditional techniques (Couper 2000; Ilieva et al. 2002; Manfreda et al. 2002). Responses that had a variance in all responses of less than 0.5 were examined in detail for evidence of repeated entry of a single value (a technique used to complete an online survey

quickly). Eighty-eight responses that appeared to have been entered in this manner were eliminated as inappropriate, 12% of the 756 participants, a level of problematic data that was expected in an online survey (Couper 2000; Roster et al. 2004). This resulted in a final sample size of 668 participants.

Examination of the normality assumptions for the variables to be used in between group tests showed very few causes for concern with kurtosis and skewness for the dependent variables: only two of seventy-seven tests (seven dependent variables in eleven groups) showed evidence of kurtosis; twelve of seventy-seven tests showed evidence of skewness in the data. A test of the homogeneity of variance among the groups for these variables was not significant at the $p < 0.05$, with the exception of the dependent variable *willingness to use the example RRIT to reduce the probability that something bought from a web retailer will be delivered late or not at all* (Levene's statistic = 2.7, $p = 0.003$). As a result, the data was determined to sufficiently meet the assumptions for normality; Dunnett's test and linear contrasts were determined to be appropriate techniques. Cronbach's alpha indicated that all seven measures showed excellent reliability, all well above the acceptable level of 0.707. As a result, ANOVA was used to test the hypotheses regarding the effects of specific RRIT.

3.4.2 Results

Individual Effects of RRITs

Hypotheses H1 and H2 propose the effect of individual RRIT on the willingness of the consumer to adopt an RRIT for the purpose of reducing the probability of a particular risk category. These hypotheses were tested in two ways. First, the significance of the difference between treatment groups and a control group (game software) was tested using Dunnett's

procedure, recommended for controlling familywise error in multiple comparisons (Howell 2002). Since the means for the treatment groups are expected to be greater than the means for the control group, a single-sided test was used to maximize the power of the test. Second, pre-planned contrasts were used as suggested by Howell (2002) to compare the averages of group means against each other. The variables tested are indicators of the perceived purpose of the RRIT: the *willingness to adopt the treatment RRIT to reduce the probability of:*

- personal information misuse;
- financial information misuse;
- something bought from web retailer will not meet consumer's needs;
- something bought from a web retailer will be delivered late or not at all;
- finding and choosing something to buy from a web retailer will be too difficult or to time-consuming;
- ordering and paying for something bought from a web retailer will be too difficult or to time-consuming;
- receiving something bought from a web retailer will be too difficult or to time-consuming;
- returning or exchanging something bought from a web retailer will be too difficult or to time-consuming;
- receiving something bought from a web retailer will be too difficult or to time-consuming;
- maintaining something bought from a web retailer will be too difficult or to time-consuming;

Results of Dunnett's Test of Mean Difference Compared to Control Group

Dunnett's test, which compares the mean of each treatment group to the mean of a control group was used to test H1, maximizing power while limiting familywise error to $\alpha = 0.05$. The results of this test are presented in Table 3.5.

H1 was fully supported. Each of the seventeen predictions made regarding the willingness to adopt the example RRIT for the predicted purpose in comparison to the control software supported H1. For each of these predictions, the mean of the *willingness to adopt the example RRIT to reduce the probability of the predicted risk category* was significantly higher for the group tested with the RRIT predicted to influence the probability of that risk category than was the mean of the group tested using the control software (the mean differences and the t-statistics are provided in Table 3.5).

Table 3.5: Results of Dunnett's Test of effect of RRIT on risk dimension																	
			Compared to the control group, greater willingness to adopt the example RRIT for the purpose of reducing the probability of the risk of:														
			Personal information misuse		Financial information misuse		Fail to meet needs		Delivered late or not at all		Find and choose inefficiency		Order and pay inefficiency		Receive inefficiency		
	n	H	Mean Diff. ¹	P	Mean Diff. ¹	P	Mean Diff. ¹	P	Mean Diff. ¹	P	Mean Diff. ¹	P	Mean Diff. ¹	P	Mean Diff. ¹	P	Supports H1?
Control (Game)	69																
Spam reduction	60	1.1	1.6**	.00													Yes
Site validation	61	1.2a	1.9**	.00													Yes
		1.2b			1.9**	.00											Yes
		1.2c					1.3**	.00									Yes
		1.2d							1.8**	.00							Yes
Simplified ordering	59	1.3										1.6**	.00			Yes	
Shipment tracking	57	1.4a							2.0**	.00							Yes
		1.4b												1.3**	.00	Yes	
Performance review	59	1.5					1.7**	.00									Yes
Functional demonstration	59	1.6					2.0**	.00									Yes
Encryption	60	1.7a	2.2**	.00													Yes
		1.7b			2.1**	.00											Yes
Collaborative shopping	55	1.8					.77*	.04									Yes
Attribute comparison	61	1.9a					1.78**	.00									Yes
		1.9b									1.9**	.00				Yes	
Decision support	68	1.10a					1.4**	.00									Yes
		1.10b									1.4**	.00				Yes	

* significant at $p < 0.05$; **significant at $p < 0.001$

¹ The mean differences are between measures on a 7-point scale

Results of Comparisons with Other RRIT

Hypotheses H2.1a, H2.1b, H2.2a, H2.2b, H2.3a, H2.3b and H2.3c propose that groups tested with RRIT predicted to be perceived as reducing the probability for a specific dimension of a risk category will be more willing to adopt their example RRIT to reduce that risk category than will groups tested with example RRIT not predicted to be perceived as reducing the probability for that risk category. To control the large familywise error that would occur from multiple comparisons among ten groups and maintain high power, the hypotheses were tested using a single pre-planned contrast for each of the risk dimensions predicted to be influenced by the example RRIT. As an example of this procedure, the average of the means of the groups predicted to have a higher willingness to adopt their RRIT for the purpose of reducing the probability of personal information misuse was compared to the average of the means of the groups not predicted to have a higher willingness to adopt their RRIT for the purpose of reducing the probability of personal information misuse (excluding the control group).

H1.2a is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability of personal information misuse*, the average of the means of the groups tested with an example RRIT predicted to influence this probability (spam reduction, site validation and encryption) is significantly greater than the average of the means of the groups tested with an example RRIT (simplified ordering, shipment tracking, performance review, functional demonstration, collaborative shopping, attribute comparison, decision support) that were not predicted to influence this perceived probability (mean difference = 1.1, $t = 7.5$, $p < 0.000$).

H2.1b is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability of financial information misuse*, the average of the means of the groups tested with an example RRIT predicted to influence this probability (site validation and encryption) is significantly greater than the average of the means of the groups tested with an example RRIT (spam reduction, simplified ordering, shipment tracking, performance review, functional demonstration, collaborative shopping, attribute comparison, decision support) that were not predicted to influence this perceived probability (mean difference = 1.1, $t = 6.3$, $p < 0.000$).

H2.2a is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability that a product bought on the web will not meet needs*, the average of the means of the groups tested with an example RRIT predicted to influence this probability (site validation, performance review, functional demonstration, collaborative shopping, attribute comparison and decision support) is significantly greater than the average of the means of the groups tested with an example RRIT (spam reduction, simplified ordering, shipment tracking, encryption) that were not predicted to influence this perceived probability (mean difference = 0.9, $t = 6.2$, $p < 0.000$).

H2.2b is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability that products bought on the web will arrive late or not at all*, the average of the means of the groups tested with an example RRIT predicted to influence this probability (site validation and shipment tracking) is significantly greater than the average of the means of the groups tested with an example RRIT (spam reduction, simplified ordering, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision

support) that were not predicted to influence this perceived probability (mean difference = 0.8, $t = 4.2$, $p < 0.000$).

H2.3a is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability that finding and choosing a product to buy on the web will be too difficult or time-consuming*, the average of the means of the groups tested with an example RRIT predicted to influence this probability (attribute comparison and decision support) is significantly greater than the average of the means of the groups tested with an example RRIT (spam reduction, site validation, simplified ordering, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping) that were not predicted to influence this perceived probability (mean difference = 0.6, $t = 3.8$, $p < 0.000$).

H2.3b is supported: for the dependent variable *willingness to adopt RRIT to reduce the probability ordering and paying for a product bought on the web will be too difficult or time-consuming*, the mean of the group tested with an example RRIT predicted to influence this probability (simplified ordering) is significantly greater than the average of the means of the groups tested with an example RRIT (spam reduction, site validation, shipment tracking, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) that were not predicted to influence this perceived probability (mean difference = 0.5, $t = 2.2$, $p = 0.031$).

H2.3c is not supported: for the dependent variable *willingness to adopt RRIT to reduce the probability that receiving a product bought on the web will be too difficult or time-consuming*, the mean of the group shown an example RRIT predicted to influence this probability (shipment tracking) is not significantly greater than the average of the means of the

groups shown example RRIT (spam reduction, site validation, simplified ordering, performance review, functional demonstration, encryption, collaborative shopping, attribute comparison, decision support) that were not predicted to influence this perceived probability (mean difference = 0.3, $t = 1.2$, $p = 0.25$).

A summary of the results is provided in table 3.6. The means of the individual RRIT are also provided in the table in order to assist in identifying any reasons for the lack of support for the hypothesis: for example, was the average affected by a single high or low score for an RRIT? However, because individual tests of the means are not performed due to the familywise error that would result, it is not possible to use these means to evaluate the way in which an individual RRIT is perceived in comparison to other RRIT. As a result, high and low scores within groups have not been commented upon. Individual RRIT were compared with a control group in testing H1.

Table 3.6: Results of comparison among RRIT		
Hypothesis 2.1a: supported		Mean of DV
Dependent Variable		Willingness to adopt RRIT to reduce the probability of personal information misuse
RRIT predicted to affect DV	Spam reduction	5.1
	Site Validation	5.3
	Encryption	5.5
	Mean of means	5.3
RRIT not predicted to affect DV	Simplified ordering	4.2
	Shipment tracking	4.6
	Performance review	4.4
	Functional demonstration	4.6
	Collaborative shopping	3.6
	Attribute comparison	4.2
	Decision support	4.2
	Mean of means	4.2
		Mean difference = 1.1, t = 7.5
Hypothesis 2.1b: supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability of financial information misuse
RRIT predicted to affect DV	Site Validation	5.4
	Encryption	5.7
	Mean of means	5.5
RRIT not predicted to affect DV	Spam reduction	5.2
	Simplified ordering	4.3
	Shipment tracking	4.5
	Performance review	4.6
	Functional demonstration	4.8
	Collaborative shopping	3.9
	Attribute comparison	4.2
	Decision support	4.1
	Mean of means	4.4
		Mean difference = 1.1, t = 6.3

Table 3.6: Results of comparison among RRIT		
Hypothesis 2.2a: supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability of failing to meet needs
RRIT predicted to effect DV	Site Validation	4.4
	Performance review	4.7
	Functional demonstration	5.1
	Collaborative shopping	3.8
	Attribute comparison	4.8
	Decision support	4.4
	Mean of means	4.6
RRIT not predicted to affect DV	Spam reduction	3.7
	Simplified ordering	3.7
	Shipment tracking	3.8
	Encryption	3.6
	Mean of means	3.7
		Mean difference = 0.9, t = 6.2
Hypothesis 2.2b: supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability of something bought from a web retailer will be delivered late or not at all
RRIT predicted to effect DV	Site Validation	4.8
	Shipment tracking	5.0
	Mean of means	4.9
RRIT not predicted to affect DV	Spam reduction	3.7
	Simplified ordering	3.8
	Performance review	4.8
	Functional demonstration	4.6
	Encryption	3.8
	Collaborative shopping	3.7
	Attribute comparison	4.5
	Decision support	4.0
Mean of means	4.1	
		Mean difference = 0.8, t = 4.2

Table 3.6: Results of comparison among RRIT		
Hypothesis 2.3a: supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability that finding and choosing will be too difficult or time consuming
RRIT predicted to affect DV	Attribute comparison	4.8
	Decision support	4.3
	Mean of means	4.5
RRIT not predicted to affect DV	Spam reduction	3.5
	Site Validation	4.0
	Simplified ordering	4.0
	Shipment tracking	3.5
	Performance review	4.1
	Functional demonstration	4.8
	Encryption	3.6
	Collaborative shopping	3.9
	Mean of means	3.9
		Mean difference = 0.6, t = 3.8
Hypothesis 2.3b: supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability that ordering and paying will be too difficult or time consuming
RRIT predicted to affect DV	Simplified ordering	4.5
RRIT not predicted to affect DV	Spam reduction	3.7
	Site Validation	4.2
	Shipment tracking	3.7
	Performance review	4.1
	Functional demonstration	4.7
	Encryption	3.9
	Collaborative shopping	3.6
	Attribute comparison	4.3
	Decision support	4.0
	Mean of means	4.0
		Mean difference = 0.5, t = 2.2

Table 3.6: Results of comparison among RRIT		
Hypothesis 2.3c: not supported		
Dependent Variable		Willingness to adopt RRIT to reduce the probability that receiving will be too difficult or time consuming
RRIT predicted to effect DV	Shipment tracking	4.2
RRIT not predicted to affect DV	Spam reduction	3.4
	Site Validation	4.1
	Simplified ordering	3.8
	Performance review	4.3
	Functional demonstration	4.5
	Encryption	3.8
	Collaborative shopping	3.6
	Attribute comparison	4.2
	Decision support	3.7
		Mean of means
		Mean difference = 0.3, t = 1.2

3.4 Discussion

3.4.1 Limitations

A limitation of this work results from the way in which the respondents are exposed to the RRIT treatments for the studies. The respondents do not actually use the RRIT; instead, they are shown an example and given a description of the RRIT and are asked to assess how they would respond in the presence of the RRIT, or to compare their beliefs about a web retailer that provides the RRIT in comparison with a web retailer that does not. As a result, responses regarding the effect of the RRIT reflect what respondents believe would happen in a web-buying situation. We cannot be certain that they reflect what will actually occur.

However, the structure of the adoption test is actually similar to the process that a consumer might undertake in buying on the web. Arriving at a retail web site with a buying task as a goal, the consumer will have a current level of e-commerce transaction perceived risk of

each of the risk categories depending on his or her experience with buying on the web and the web retailer in particular. If this level of perceived risk is high, the consumer may choose to use an IT tool offered by the web site to reduce this perceived risk. The consumer might observe the available IT tools, weigh his or her beliefs about their effectiveness in reducing each of the risk categories, and choose to adopt an IT tool, making the decision without having used the IT tool in question. In this way, the test of the willingness to adopt an RRIT employed in this study mirrors what would take place in an actual purchase.

In using an RRIT for a treatment condition, two types of information were provided. First, a general description of the RRIT was given that would apply to a wide range of specific examples of the RRIT. Second, the experiment provided a single graphic example of each RRIT, found on an operating e-commerce site and disguised to obscure its origins. The general nature of the description supports the generalizability of the results to other RRIT of the same type; however, the single example may serve to limit that generalizability.

The sample frames of the field study consisted of people currently using the internet who volunteered to participate in the e-commerce panel of a marketing research firm. This resulted in samples that should be representative of experienced e-commerce users, but does not include people who do not use the internet. As a result, the findings cannot be generalized to a group of potential customers that may be of interest to e-commerce practitioners (non-users). However, even though the generalizability of the findings is limited in this way, the findings are still useful for practitioners to increase the purchase of existing e-commerce consumers. Further, since the sample consists of experienced e-commerce users, they represent a conservative test of the model, since experienced e-commerce users are likely to have a lower level of e-commerce

transaction perceived risk and would be less likely to willing to use the RRIT to reduce the probabilities of risk because they do not perceive a high probability of the risk.

3.4.2 Implications

Chapter 3 examined the effect of the proposed RRIT on the nine dimensions of the three risk categories. The results of the study found strong support for hypothesis that consumers were willing to adopt an RRIT to reduce the probability of a specific risk dimension, supporting all of the seventeen predictions made for H1 (comparison with a control group) and supporting H2a, H2b, H3a, H3b, H3c, H3d, H4a and H4b (comparison of the average of the means of the groups tested with RRIT predicted to reduce the probability of the risk dimension with the average of the means of the groups not predicted to reduce the probability of the risk dimension). H4c was not supported: for the group tested with the RRIT of shipment tracking, the willingness to adopt the RRIT to reduce the probability that receiving something bought from a web retailer will be too difficult or time-consuming did not significantly differ from the average of the means of groups tested with other RRIT.

The results offer support for the proposition that users perceive a purpose for specific types of RRIT that is at the level of dimensions of a risk category: users perceive that an RRIT can reduce the probability of a particular dimension of risk, but may not be regarded by consumers as being effective in reducing the probability of other risk dimensions. This suggests that practitioners must be specific in use of RRIT: each of the tools only addresses certain risks in the eyes of the consumer. However, users also perceive that some RRIT reduce the probability of more than one dimension of risk. This suggests an area for future research: would web retailers see better results from providing some sort of omnibus tool that consumers

perceived as reducing the probabilities of many dimensions of risk; or would it be better to provide individual tools designed to address the specific concerns of the consumer?

The exception was the result for RRIT of shipment tracking. Testing the dependent variable of *willingness to adopt the example RRIT to reduce the risk that receiving something bought from a web retailer would be too difficult or time-consuming*, the group provided with the shipment tracking example was more willing to adopt the RRIT than the group provided with the control software example (H1, prediction 4b); however, the group provided with the shipment tracking example was not more willing to adopt the RRIT than the average of the means of the groups provided with the other RRIT. Examining the means of the groups that were not expected to influence this dependent variable in table 3.6 suggest that the problem does not lie in one or two outliers among these RRIT boosting the average of this group: five of the RRIT have means that are close to the mean of the shipment tracking group. This suggests that the participants simply did not perceive shipment tracking as being useful in reducing the probability that receiving something bought from a web retailer would be too difficult or time consuming, or participants felt that the shipment tracking RRIT would not be easy to use (either perceived usefulness or perceived ease of use could affect acceptance, according to TAM (Davis 1989). An examination of the assessment of the participants of the *perceived ease of use* for each of the RRIT reveals that there is no significant difference between the assessment of the *perceived ease of use* of shipment tracking and seven of the nine other RRIT, although shipment tracking was deemed to be more difficult to use than collaborative shopping software (mean difference = 0.8, $p = 0.03$) and decision support software (mean difference = 0.9, $p = 0.004$). This suggests that the perceived usefulness of the shipment tracking tool in reducing the probability that receiving would be too difficult or time consuming is lacking: although the

software can tell a consumer where a package is, it does not necessarily make the delivery less difficult or time consuming. Practitioners whose customers expressed this as a concern should invest in improving this tool or developing others to address this dimension of risk.

4. Adoption and Influence of RRIT

Chapter 2 developed and tested a model of the structure of e-commerce transaction perceived risk. Chapter 3 supported the hypothesis that consumers perceive certain RRIT as reducing the probability of the dimensions of risk categories of buying from web retailers in general. This study moves from the general risk of buying on the web, or from web retailers in general to the effect of RRIT on the perceived risk of buying from a web retailer that provides the RRIT. First, the adoption of the RRIT by the consumer is considered as an event that needs to occur before the attitudes of the consumer can be changed by the RRIT. Following that discussion, the influence of the RRIT on the beliefs of the consumer regarding the unwanted outcomes of buying from a web retailer is examined.

4.1 Prior Research on the Adoption of an RRIT to Reduce Perceived Risk

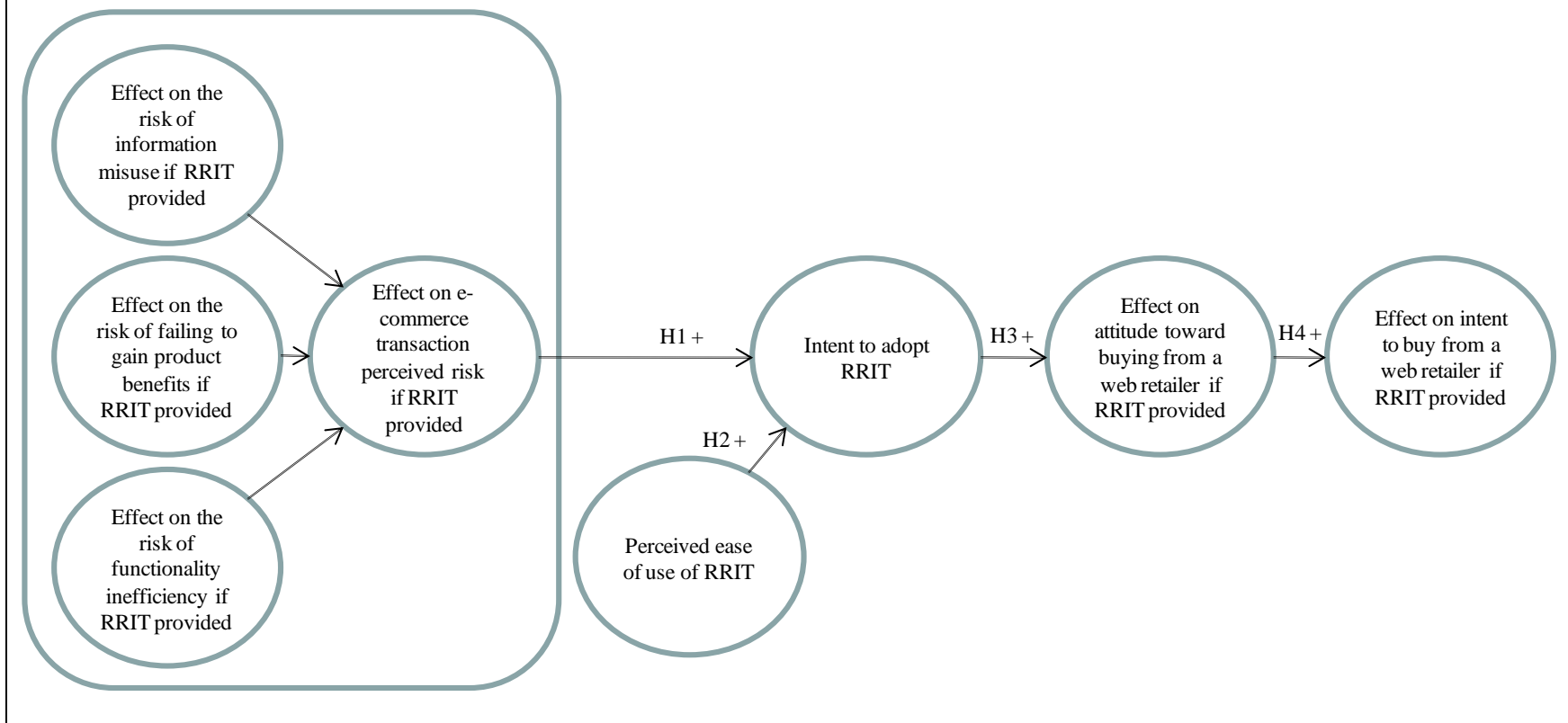
If an e-commerce consumer faces uncertainty, and identifies some potential RRIT that may alleviate that uncertainty, what characteristics of the RRIT cause the consumer adopt one RRIT while not using another? To answer this, the ways in which an RRIT may be used must first be considered. Some IT tools intended to reduce perceived risk provide information to the consumer, such as a product recommendation agent. For this tool to be effective in reducing perceived risk the consumer must interact with the tool to be provided with useful information. Other IT tools structure the transaction in a way that reduces risk (Cho et al. 2006; Mitchell et al. 1993). For example, consider Secure Socket Layer (SSL): this IT tool prevents the misuse of information by encrypting data exchanges, but provides no information to the consumer beyond the knowledge that the IT tool is implemented on the e-commerce website being used. In this

case, the consumer could “use” the software, but not notice its presence, and the IT tool would not therefore be effective in reducing perceived risk. As a result, this research uses the term “adopt” to refer to the consumer’s acceptance of the functionality offered by the IT tool, whether that functionality requires the user to interact with the software or simply to notice and accept its benefits.

The technology acceptance model (TAM) (Davis 1989) has been found to be useful in predicting the use of technology in a wide variety of contexts, including e-commerce (for example, Gefen et al. 2003b; Pavlou 2003). According to Venkatesh et al (2003), TAM is an example of a user acceptance model: in these models, individual reactions to using a technology influence the intent to use the technology, which influences the actual use. In TAM, beliefs regarding the perceived usefulness of a technology and the perceived ease of use of the technology influence the intent to use the technology and its actual use.

The hypotheses developed regarding the adoption and influence of RRIT are summarized in figure 4.1 below, and developed in the sections following the figure.

Figure 4.1: Proposed research model of RRIT adoption and influence



4.2 Development of the Research Model

4.2.1 Beliefs Regarding the Use of the RRIT

Although the prior research on risk-reducing strategies (RRS) and risk-defusing operators (RDO) reviewed in Chapter 3 do not discuss the antecedents of the decision to use a particular strategy or operator in the same terms as TAM, the research considers the acceptance of RRS and RDO by implication. Marketing research refers to the choice of an RRS from among many options (Kempf et al. 1998; Mitchell et al. 1996; Newell et al. 2004; Rakow et al. 2005); research regarding RDO examines choices among several alternatives, some which may include an RDO (Huber 2001; Huber et al. 2004). The decision to undertake a behaviour to use a specific RRS or RDO is implied in the choice of a strategy or operator.

As discussed in Chapter 3, Cox (1967b) and Newell et al. (Newell et al. 2004) find that consumers, when faced with a decision that involves some degree of perceived risk, assess the cues and tools available to them and make use of the information that is most likely to result in a) the greatest reduction of perceived risk; and b) the correct decision.

In applying this perspective to an e-commerce scenario, the degree to which an RRIT is perceived by the consumer to reduce his or her perceived risks is equivalent to the perceived usefulness of the RRIT; therefore, in making a decision to adopt an RRIT, consumers must assess the degree to which the RRIT will assist them in reducing their perceived risk along with the perceived ease of use of the RRIT, consistent with TAM (Davis 1989). However, the research discussed in Chapter 2 supported the proposition that three risk categories form e-commerce transaction perceived risk: the risk of information misuse, the risk of failure to gain product benefits and the risk of functionality inefficiency. That research found support for the

model of e-commerce transaction perceived risk as an aggregate factor of the risk categories of *information misuse risk* (the belief that information supplied in the course of an e-commerce transaction may be misused), *failure to gain product benefit risk* (the belief of the consumer that a service or product purchased on the web might not meet his or her needs) and *functionality inefficiency risk* (the consumer's belief that the process of buying something on the web might take too much time, effort or money). It is reasonable, then, that a consumer may regard an RRIT as useful for the purpose of reducing the probability of one of these risk categories, while regarding the same RRIT as being less useful for reducing the probability of another risk category, as was shown in Chapter 3. In this case, the perceived usefulness of the RRIT is also expressed in the three risk categories: the degree to which the RRIT reduces 1) the probability of information misuse; 2) the probability of failure to gain product benefits; and 3) the probability of functionality inefficiency. The model supported in Chapter 2 provides the basis for the model of the adoption of an RRIT proposed in this study.

Consequently, in the consumers decision to accept an RRIT, the perceived usefulness of the RRIT is represented by the consumer's belief regarding the amount by which the probabilities of each risk category dimension will be changed through adopting the RRIT, or:

- The effect on the risk of information misuse if the RRIT is provided:
 - The effect on the probability that personal information revealed when buying from a web retailer will be misused if the RRIT is provided; and
 - The effect on the probability that financial information revealed when buying from a web retailer will be misused.
- The effect on the risk of failure to gain product benefits:

- The effect on the probability that something bought from a web retailer will not meet the needs of the buyer; and
- The effect on the probability that something bought from a web retailer will arrive late or not at all.
- The effect on the risk of functionality inefficiency:
 - The effect on the probability that finding and choosing something to buy from a web retailer will be too difficult or time consuming;
 - The effect on the probability that ordering and paying for something bought from a web retailer will be too difficult or time consuming;
 - The effect on the probability that receiving something bought from a web retailer will be too difficult or time consuming;
 - The effect on the probability that returning or exchanging something bought from a web retailer will be too difficult or time consuming; and
 - The effect on the probability that maintaining something bought from a web retailer will be too difficult or time consuming.

If the consumer believes the risk of any of the risk dimensions will be reduced by a large amount, then he or she will have a greater intent to adopt the RRIT to reduce that risk.

Conversely, if the consumer does not believe in the usefulness of the RRIT to reduce the probability of one or more of the risk dimensions, then he or she will have less intent to adopt the RRIT. This relationship is expressed through a single aggregate factor as supported by the previous research. The research model is shown in figure 4.1. Although the model mirrors the construct of e-commerce transaction perceived risk tested in Chapter 2, the relationships of the construct to the other constructs are different. In Chapter 2, other constructs were included in a

nomological network to validate the model. In this research, the relationships are proposed to represent the adoption and influence of the RRIT.

Hypotheses H1: *the effect on the probability of e-commerce transaction perceived risk if the RRIT is provided will positively influence the intention to adopt the RRIT.*

According to Davis (1989), perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort.” Huber (2001) proposed a similar criterion for the selection of RDO: that the RDO would have to have less cost (in terms of time, effort and money) than the benefits expected from the alternative with which the RDO was associated. Cox (1967b) proposed that the choice of a consumer in selecting a risk-reducing cue was influenced by the consumer’s confidence in his ability to interpret the meaning of the cue. As a result, the perceived ease of use of an RRIT is an antecedent to the intent to use the RRIT. However, it is not proposed that the consumer will regard the ease use of the RRIT as being different for different categories of risk. Since the RRIT would be used the same way for each of the risk categories, a single construct of ease of use is proposed to influence the intent to adopt the RRIT to reduce each of the risk categories.

Hypothesis H2: the perceived ease of use of an RRIT will positively influence the intent to adopt the RRIT.

4.2.2. Influence of RRIT

In the previous section, the intent of the consumer to engage in the behaviour of adopting an RRIT was discussed as a consequent of his or her beliefs in the usefulness of that tool to reduce the probability of one or more risk categories. Consistent with the theory of

reasoned action (TRA) (Ajzen et al. 1980) and the theory of planned behaviour (TPB) (Ajzen 1991), if an RRIT is to be effective in reducing a consumer's e-commerce transaction perceived risk and subsequent intention to buy from a web retailer, it must act by changing the consumer's beliefs about the positive and negative outcomes of the behaviour of buying on the web. The construct of improvement of e-commerce transaction perceived risks measure the change in the level of perceived risk by the respondent when an RRIT is provided, a subset of the positive and negative beliefs of the respondent regarding the outcome of buying from a web retailer.

However, for the anticipated improvement in the beliefs regarding the outcomes of buying on the web when an RRIT is provided to affect the attitude of consumer, the RRIT must be adopted by the consumer as discussed above. To clarify the structure of this process, consider a scenario of an e-commerce consumer: the consumer arrives at a retail website with a pre-existing level of beliefs regarding the outcomes of buying from a web retailer (negative outcomes in this case, since we are concerned with perceived risk). Based on these beliefs, the consumer may not be willing to transact; however, the consumer is offered an RRIT. The consumer evaluates the ease of use of this IT tool along with its usefulness in reducing the risks that concern the consumer, and makes the decision to adopt the RRIT. As a result of his or her adoption of the tool, the consumer believes the probabilities of one or more risk categories are reduced, and his or her attitude toward buying from the web retailer is improved along with the subsequent intent to buy from a web retailer (Ajzen 1991; Ajzen et al. 1980). Conversely, a consumer who does not intend to adopt the RRIT will express little change in his or her attitude toward buying from a web retailer when an RRIT is provided. Thus, the adoption of the RRIT is a necessary antecedent to the desired change in attitude. In that case, the level of *intention to*

adopt an RRIT will be related to the effect on attitude toward buying from a web retailer if an RRIT is provided.

Hypotheses H3: the intent to adopt an RRIT will be positively related to the effect on attitude toward buying from a web retailer if an RRIT is provided.

Behavioural intention is influenced by attitude toward the behaviour, as specified in TRA (Ajzen et al. 1980). Applied to the context of this research, the *effect on intention to buy from a web retailer if an RRIT is provided* is predicted by the *effect on attitude toward buying from a web retailer if an RRIT is provided*. Subjective norm was not included in the study because it was not found to be a significant influence on intent to buy on the web in this context in Pavlou (2005), perhaps due to the solitary nature of the decision to buy from a web retailer.

Hypothesis H4: the *effect on attitude toward buying from a web retailer if an RRIT is provided* will positively influence the *effect on intention to buy from a web retailer if an RRIT is provided*.

4.3 Test of the Research Model

4.3.1 Description of the Field Study

To test the hypotheses described above, further measures were used in conjunction with the field study described in Chapter 3. Participants were randomly assigned to one of ten groups, each of which was provided with a graphic example of one RRIT along with a short written description. The effect of the RRIT on the dimensions of e-commerce transaction perceived risk were then measured using explicit comparisons similar to (Jiang et al. 2004; Wang et al. 2005). Respondents were asked to imagine two identical web retailers, one of

which provided the RRIT while the other did not. The respondent was then asked to evaluate which of the two retailers had a higher probability (or likelihood, or frequency) of each of the risk dimensions and to score the amount of difference on a nine point scale, allowing the respondent to report either an improvement or a decline in the variable if the example RRIT was provided. In this way, the effects of the RRIT on the probabilities of the risk dimensions are measured directly. A similar approach was used to measure *effect on attitude toward buying from a web retailer if an RRIT is provided* and *effect on intention to buy from a web retailer if an RRIT is provided*. An example screen-shot of the measurement approach is provided as part of Appendix E.

In addition, variables were identified to control for other explanations of the dependent variables. *Web purchase history, extent of planned web purchases, internet experience* and *extent of internet use* were included as controls because these variables might explain variations in the levels of *intent to adopt RRIT, improvement in attitude toward buying from a web retailer when an RRIT is provided* and *improvement in intention to buy from a web retailer when an RRIT is provided* as more experienced users are expected to have more comfort with buying on the web and perceive less risk. Similarly, the initial levels of *overall perceived risk* were included because someone that did not perceive a high level of risk may not adopt the RRIT regardless of the usefulness and ease of use he or she perceives for the tool. Differences in *age* may result in differing comfort levels with the technology of the web and therefore attitudes toward it, while *gender* differences may result from asymmetry in internet and e-commerce adoption rates. *Trust in web retailers* is also included as a control variable because it has been shown in Chapter 2 to negatively influence the level of perceived risk.

The measures and their sources in prior research are included in Appendix F. All measures were subjected to a pilot test using a sample of 80 participants provided by a marketing research firm.

Sample

The hypotheses were tested in a field study conducted using an on-line questionnaire completed by participants contacted through an Internet marketing research firm, completed along with the research described in Chapter 3. To ensure that the elimination of inappropriate responses described in Chapter 3 did not bias the results, the structural model was evaluated using both the original and the cleansed dataset. The direction and significance of the relationships were unchanged.

Structural equation modeling was chosen to test the hypotheses. Since the model contains multiple formative constructs, partial least squares (PLS) structural equation modelling was chosen for the analysis of the overall dataset, because this technique more easily accommodates this measurement form. SmartPLS version 2.0 was used for all model analysis (Ringle et al., 2005).

4.3.2 Measurement Model Validation

Tests of a model in PLS require a validation of the measurement model, followed by an assessment of the structural model. To validate the measurement model, the individual item reliability, their internal consistency and their discriminant validity are examined (Barclay et al. 1995).

Inspection of the loading of the individual measures on their respective constructs indicates that all loadings of the model measures are above the threshold of 0.707 suggested by Barclay, Higgins and Thompson (1995), with two exceptions: two items of *perceived ease of use* (PEOU1, loading 0.36; PEOU2, loading 0.38). These are reverse-coded items, which may account for the low loading. The second exception is also a reverse-coded item, an item for *overall perceived risk* (OPR3, loading 0.67). These items were removed for the structural assessment stage of analysis. All indicators load with a p-value of <0.01, satisfying the criteria suggested by Gefen and Straub (2005) for convergent validity. Composite reliability for each of the constructs is well above 0.70 supporting the reliability of the measures.

Comparison of the square root of the average value extracted (AVE) of a construct to its correlation with other constructs (shown in table 4.1 below) provides support for discriminant validity. Barclay et al. (1995) suggest that discriminant validity is supported when the square root of the AVE for each construct (the diagonal elements in table 4.1) is larger than its correlations with other constructs (the off-diagonal elements). All constructs satisfy this requirement.

Table 4.1: Correlation of latent variables for RRIT adoption and influence

	Composite Reliability	EATT	EBEN	EFUNC	EINFO	EINTENT	INTENTIT	IOPR	PEOU	TRUST
Effect on Attitude	0.98	0.96								
Effect on Fail Benefits	0.95	0.11	0.86							
Effect on Functional Inefficiency	0.97	0.10	0.76	0.84						
Effect on Information Misuse	0.96	0.13	0.51	0.53	0.89					
Effect on Intent	0.98	0.81	0.20	0.18	0.23	0.97				
Intent to Adopt RRIT	0.98	0.25	0.31	0.30	0.35	0.35	0.96			
Initial Overall Perceived Risk	0.91	-0.10	-0.04	-0.03	-0.12	-0.10	-0.21	0.88		
Perceived Ease of Use	0.97	0.10	0.20	0.21	0.20	0.12	0.60	-0.25	0.95	
Trust in Web Retailers	0.97	-0.06	0.08	0.09	0.08	-0.09	0.22	-0.36	0.28	0.89

Diagonals are the square root of the Average Value Extracted; off-diagonals are correlations

Two procedures were conducted to test for the presence of common method bias. First, Harman's single factor test: all indicators used in the model were tested in an exploratory principal components factor analysis with no rotation using SPSS 16.0. The factor analysis revealed that 24% of the variance was accounted for by a single factor, with 13 factors extracted with eigenvalue over 1. Although this result does not indicate common method bias, Djurkovic et al.(2006) caution that the absence of a single factor accounting for the majority of variance does not mean that common method bias is not present. As a result, the procedure for identifying the method factor loadings discussed by Podsakoff et al. (2003) as controlling for the effects of an unmeasured latent methods factor were adapted for PLS as suggested by Liang et al. (2007). In this procedure, two additional types of constructs are included in the model: individual constructs for each of the indicators in the model and a single construct representing the common method factor for the model, reflected by all the indicators used in the model. Each individual indicator construct is then modeled as reflecting both its intended construct and the common method factor construct. The square of the path weight from the common method factor to each single indicator construct is interpreted as the variance in the indicator explained by common method variance, while the square of the path weight from the intended construct to the single indicator construct is interpreted as the variance in the indicator explained by the intended construct. For this data, the average variance of the single indicators explained by the common method factor was 1% compared to 88% for intended constructs. Further, the inclusion of the common method factor in the model did not change the sign or significance of any of the model relationships. Taken in total, these findings indicate that common method bias is likely not a problem for this data.

As a final validation of the measurement model, an examination of the cross loading of indicators on other constructs supports the findings of previous tests. Gefen and Straub (2005) suggest that the loading of each of the indicators on its intended latent construct should be above a threshold of 0.60 and at least 0.10 above its loading on any other construct. Table 4.2 shows that each of the indicators satisfies these criteria for discriminant validity.

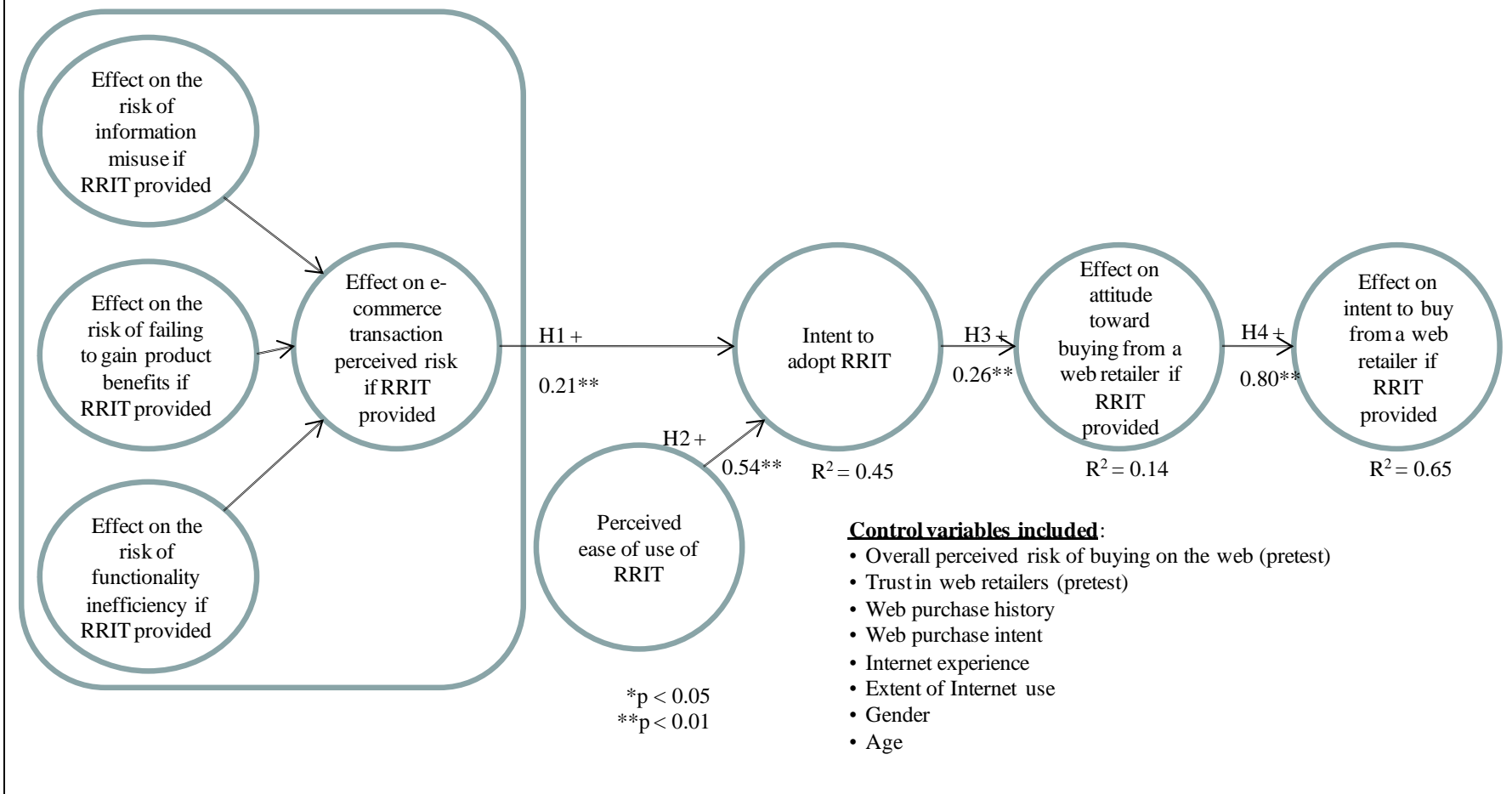
Table 4.2: Cross loadings of items for RRIT adoption and influence

	EINFO	EBEN	EFUNC	PEOU	INTENTIT	EATT	EINTENT	IOPR	TRUST
EITPersInfo1	0.79	0.34	0.37	0.16	0.27	0.05	0.11	-0.07	0.07
EITPersInfo2	0.88	0.40	0.43	0.19	0.31	0.11	0.19	-0.10	0.08
EITPersInfo3	0.89	0.41	0.43	0.18	0.31	0.14	0.19	-0.11	0.10
EITFinInfo1	0.91	0.48	0.50	0.18	0.32	0.12	0.22	-0.09	0.07
EITFinInfo2	0.92	0.52	0.55	0.18	0.33	0.12	0.23	-0.07	0.05
EITFinInfo3	0.91	0.53	0.53	0.15	0.33	0.12	0.24	-0.08	0.02
EITNeed1	0.43	0.83	0.62	0.19	0.25	0.11	0.15	-0.05	0.08
EITNeed2	0.43	0.86	0.63	0.15	0.23	0.12	0.17	-0.03	0.09
EITNeed3	0.43	0.87	0.65	0.18	0.25	0.13	0.18	-0.05	0.10
EITLate1	0.44	0.87	0.69	0.18	0.29	0.07	0.18	-0.01	0.05
EITLate2	0.45	0.88	0.67	0.17	0.29	0.06	0.17	0.03	0.03
EITLate3	0.45	0.87	0.69	0.16	0.29	0.07	0.18	0.00	0.05
EITFind1	0.39	0.68	0.79	0.20	0.27	0.06	0.13	-0.01	0.06
EITFind2	0.41	0.68	0.80	0.19	0.28	0.07	0.14	0.00	0.07
EITFind3	0.43	0.67	0.78	0.23	0.31	0.08	0.14	0.00	0.11
EITPay1	0.47	0.60	0.83	0.20	0.25	0.06	0.13	-0.06	0.08
EITPay2	0.48	0.60	0.83	0.18	0.24	0.08	0.14	-0.06	0.08
EITPay3	0.46	0.57	0.81	0.20	0.24	0.10	0.14	-0.05	0.09
EITGet1	0.46	0.66	0.87	0.17	0.27	0.06	0.13	0.01	0.07
EITGet3	0.45	0.64	0.86	0.17	0.27	0.07	0.14	0.01	0.07
EITReturn1	0.48	0.63	0.85	0.17	0.24	0.14	0.22	-0.01	0.06
EITReturn2	0.50	0.64	0.86	0.17	0.25	0.15	0.22	-0.01	0.05
EITReturn3	0.49	0.65	0.87	0.15	0.23	0.13	0.21	-0.02	0.05
EITFix1	0.40	0.66	0.86	0.16	0.20	0.04	0.12	-0.02	0.07
EITFix2	0.39	0.64	0.84	0.15	0.20	0.04	0.11	-0.02	0.08
EITFix3	0.39	0.64	0.83	0.17	0.22	0.05	0.11	-0.05	0.12
PEOU3	0.17	0.17	0.19	0.96	0.57	0.08	0.12	-0.25	0.26
PEOU4	0.19	0.20	0.20	0.97	0.58	0.09	0.12	-0.25	0.26
PEOU5	0.20	0.19	0.21	0.92	0.58	0.11	0.11	-0.23	0.28
ITUIT1	0.34	0.30	0.27	0.59	0.95	0.23	0.33	-0.22	0.23
ITUIT2	0.35	0.30	0.28	0.57	0.96	0.23	0.33	-0.21	0.21
ITUIT3	0.33	0.28	0.29	0.57	0.95	0.24	0.33	-0.20	0.20
ITUIT4	0.34	0.31	0.29	0.58	0.96	0.25	0.35	-0.21	0.19
EITATBWR1	0.13	0.10	0.09	0.10	0.23	0.96	0.76	-0.08	-0.05
EITATBWR2	0.11	0.09	0.09	0.09	0.78	0.97	0.23	-0.09	-0.04
EITATBWR3	0.12	0.12	0.10	0.09	0.25	0.96	0.79	-0.07	-0.05
EITITBWR1	0.23	0.19	0.16	0.12	0.34	0.79	0.97	-0.08	-0.07
EITITBWR2	0.22	0.18	0.17	0.12	0.34	0.78	0.97	-0.09	-0.08
EITITBWR3	0.22	0.19	0.17	0.12	0.35	0.78	0.97	-0.09	-0.08
EITITBWR4	0.22	0.21	0.18	0.12	0.34	0.78	0.97	-0.09	-0.08
OPR1	-0.06	0.01	0.00	-0.25	-0.19	-0.04	-0.06	0.91	-0.31
OPR2	-0.07	0.00	-0.01	-0.23	-0.21	-0.07	-0.07	0.93	-0.34
OPR4	-0.15	-0.07	-0.05	-0.21	-0.18	-0.11	-0.12	0.84	-0.31
TrustWR1	0.06	0.07	0.09	0.25	0.20	-0.01	-0.03	-0.36	0.91
TrustWR2	0.04	0.06	0.04	0.23	0.17	-0.01	-0.04	-0.28	0.89
TrustWR3	0.05	0.05	0.06	0.25	0.18	-0.03	-0.08	-0.34	0.91
TrustWR4	0.06	0.06	0.08	0.28	0.21	-0.04	-0.07	-0.35	0.92
TrustWR5	0.08	0.06	0.09	0.24	0.20	-0.06	-0.09	-0.35	0.92
TrustWR6	0.08	0.09	0.10	0.24	0.19	-0.05	-0.08	-0.29	0.90
TrustWR7	0.11	0.13	0.10	0.24	0.20	-0.07	-0.07	-0.26	0.83
TrustWR8	0.05	0.07	0.08	0.24	0.17	-0.06	-0.09	-0.27	0.91
TrustWR9	0.05	0.04	0.05	0.29	0.23	-0.08	-0.10	-0.40	0.89

4.3.3 Structural Model Assessment

Statistical significance was assessed using a bootstrap procedure with 150 cases and 200 resamples. PLS does not assess the overall fit of a proposed model; as a result, the validity of the model is assessed by examining R^2 and the size and significance of the structural paths among the constructs as with a multiple regression model (Barclay et al. 1995). The results of the structural model assessment are provided in Figure 4.2.

Figure 4.2: Structural model assessment results for RRIT adoption and influence



Control variables of *age, gender, trust in web retailers, internet experience, extent of internet use, web purchase history, web purchase intent* and *overall perceived risk of buying on the web* were not found to be significantly related to the *intention to adopt an RRIT*, or to *improvement in attitude toward buying from a web retailer when an RRIT is provided* or *change in intention to buy from a web retailer when an RRIT is provided*.

The construct of the effect on the probability of e-commerce transaction perceived risk if an RRIT is provided was modeled in manner parallel to the model of e-commerce transaction perceived risk discussed in Chapter 2: it is an aggregate factor of the effect on the probabilities of the three risk categories if an RRIT is provided, which are formed by the effect on the nine formative dimensions of risk if an RRIT is provided. Within this construct, all paths were significant, exhibiting path weights consistent with the results of Chapter 2.

Adoption of RRIT

With regard to the hypotheses associated with the adoption of the RRIT, the findings provide support for hypothesis H1. The *effect on the probability of e-commerce transaction perceived risk if an RRIT is provided* was found to be positively related to *intent to adopt an RRIT* ($\beta = 0.21$, $t = 2.7$). *Perceived ease of use of an RRIT* was found to be positively related to *intent to adopt an RRIT* ($\beta = 0.54$, $t = 6.1$), providing support for H2.

Influence of RRIT

The second set of hypotheses concerned the effect of the RRIT on the attitude toward buying on the web and the subsequent intent to buy on the web.

The data from the field study provide support for H3 and H4. The *intent to adopt an RRIT* is found to be positively related to the *effect on attitude toward buying from a web retailer if an RRIT is provided* ($\beta = 0.26$, $t = 2.4$), providing support for H3. The *effect on attitude toward buying from a web retailer if an RRIT is provided* was found to be positively related to the *effect on intent to buy from a web retailer if an RRIT is provided* ($\beta = 0.8$, $t = 14.0$), supporting H4. In the presence of the control variables, the model explains 45% of the variance of *intention to adopt an RRIT*, 14% of the variance of *effect on attitude toward buying from a web retailer when an RRIT is provided* and 65% of the variance of *effect on intention to buy from a web retailer when an RRIT is provided*. When only the control variables are included, the model explains 8% of the variance of *effect on attitude toward buying from a web retailer when an RRIT is provided*. Using the procedure of Gefen and Straub (2005) to test nested PLS models, the effect size of the RRIT adoption model is small to medium ($f^2 = 0.07$, $F = 50.7$) (Cohen 1992).

4.4 Discussion

4.4.1 Limitations

The field study was conducted using single method (web survey) at a single time period, raising the possibility that common method bias may be at play. To overcome this, the survey used techniques recommended by Podsakoff et al. (2003), including the use of semantic differential items, explicit wording, and multiple items for each constructs. Tests for the presence of common method bias described above did not indicate that a problem was present in this data. Other limitations to this study are discussed in Chapter 3, which used a set of data collected at the same time as the data for this study.

4.4.2 Implications

This research addresses the influence of RRIT on consumers in two stages: first, this research addresses the adoption decision of the consumer regarding RRIT; and the second stage examines the influence of the RRIT on the attitudes of the consumer and the subsequent intention to buy from a web retailer once an RRIT has been adopted by the consumer.

Adoption of RRIT

The prior analysis provided an indication that consumers are willing to use an RRIT for specific purposes. But what leads a consumer to this adoption willingness? The section of Chapter 4 concerning the adoption of RRIT by consumers makes a novel contribution by identifying and testing some dimensions of perceived usefulness that influence a consumer's decision to adopt an RRIT as part of his or her e-commerce transaction. In the case of a consumer seeking to reduce his or her perceived risk, the *effect on the probability of e-commerce transaction perceived risk if an RRIT is provided*, along with *perceived ease of use*, influence the *intention to adopt the RRIT*. This lends further support (in addition to the findings of Chapter 3) to the proposition that these IT tools are, in the eyes of consumers, risk-reducing information technology tools and are used by consumers for this purpose. The perceived usefulness of tools such as decision support software or performance review databases resides in their effectiveness at reducing the risk perceived by the consumer. As a result, if the consumer believes that the tool will reduce the probability of one or more of the risk categories, the consumer will express an intention to adopt the RRIT for that purpose; if the consumer does not believe the RRIT will affect those risks, the consumer will not express an intention to adopt the RRIT.

Influence of RRIT

The second part of this research provides a contribution by examining the ways in which an RRIT acts through beliefs and attitudes to influence intention to buy from a web retailer. The *intention to adopt an RRIT* (influenced by the beliefs in the outcomes of buying from a web retailer if an RRIT is provided, discussed above) was shown to be associated with the *effect on attitude toward buying from a web retailer if an RRIT is provided*, which was shown to influence *effect on intention to buy from a web retailer if an RRIT is provided*. If a consumer does not intend to adopt an RRIT, the attitudes of the consumer in the presence of the RRIT do not change; conversely, if the consumer does express an intention to adopt the RRIT, the attitudes of the consumer toward buying on the web improve. Although the variance explained in the *effect on attitude if an RRIT is provided* is small, the adoption model has a small to medium, statistically significant effect size. The low level of variance explained may be due to the fact that *attitude toward buying from a web retailer* is a very general construct, potentially influenced by many beliefs beyond the variables include in the model. However, the effect size indicates that an RRIT can have effect on the attitude toward buying from a web retailer and the subsequent intention to buy from a web retailer.

The favourable effect of the RRIT on *intention to adopt the RRIT* and subsequent *improvement in attitude toward buying from a web retailer* suggests that e-commerce practitioners can employ such RRIT and expect a resulting improvement the attitude of the consumer. The support for the relationship between the *improvement in attitude toward buying from a web retailer when an RRIT is provided* and the *intention to buy from a web retailer when an RRIT is provided* suggests that the e-commerce practitioner may usefully employ an RRIT in

an attempt to improve the consumer's attitude and intention of the customer to buy on the practitioner's website.

5. Conclusion

This dissertation begins with the proposition that some aspect of the process of buying on line was preventing e-commerce from reaching its potential as a distribution channel for goods and services. It was proposed that a multidimensional construct of perceived risk provided a mechanism for understanding the barriers that consumers perceive in making use of this important channel. For that construct to be useful to MIS researchers, web retailers and consumers, however, the construct must describe the dimensions of perceived risk from a perspective that can be addressed in a practical way by IT tools. To accomplish this goal, this research was conducted in two phases.

First, this research identified the perceived risks of consumers in an e-commerce transaction. Existing literature in marketing and e-commerce on perceived risk was reviewed and a theoretical structure that expressed the composition of e-commerce transaction perceived risk was identified: e-commerce transaction perceived risk is comprised of the risk of information misuse; the risk of failure to obtain product benefits; and the risk of functionality inefficiency. Using a panel of e-commerce researchers and users, the events which may cause harm to the consumer were identified and categorized in nine dimensions according to how the events expose the consumer to harm. The construct was validated and supported in its nomological network in an online survey.

Second, this thesis examined the influence of RRIT on the attitude and intention of consumers to buy from a web retailer. As a first step, this research determined whether consumers recognize the purpose of existing risk-reducing IT tools and were willing to adopt

them to reduce the probability of specific dimensions of risk. RRIT were identified on operating retail websites, and predictions were made regarding the dimensions of e-commerce transaction perceived risk the RRIT would be perceived by consumers to influence. The willingness of consumers to adopt an RRIT for a specific purpose was compared with the willingness to adopt a control group, and compared among RRIT. The findings of an online field study supported the proposition that consumers recognized these tools as reducing particular dimensions of perceived risk and were willing to adopt them for the predicted purpose.

As the second step of the second phase, this research examined the decision of consumers to adopt an RRIT, and tested the influence of the RRIT on buying from a web retailer. This stage of this research found in an online field study that the *effect on e-commerce transaction perceived risk if an RRIT is provided* and the *perceived ease of use of the RRIT* influence the *intention to adopt the RRIT*; that *intention to adopt the RRIT* influences the *effect on attitude toward buying from a web retailer if an RRIT is provided*; which in turn influences *effect on intentions to buy from a web retailer if an RRIT is provided*.

Novel contributions to knowledge come from each stage of this research. By considering risks from the point of view of the ways in which a consumer is exposed to harm, this research provides a multidimensional construct of perceived risk that can be used to aid researchers and practitioners. The researcher and the designer can use the construct to understand the concerns of consumers more clearly than is possible using unidimensional operationalizations of the construct or source- or harm-based models of perceived risk.

Although this risk-focused model provides a starting point, MIS researchers are interested in the role of an IT tool in reducing these perceived risks rather than a new model of e-commerce transaction perceived risk identified in Chapter 2. If the proposed model of e-commerce transaction perceived risk is to be useful to researchers and practitioners, IT tools must be perceived by consumers as having some effect on the risk dimensions proposed. Chapter 3 makes a novel contribution by identifying existing RRIT and confirming that consumers recognize their purpose and are willing to adopt them for that purpose. As a result, e-commerce researchers and practitioners can isolate the effects of individual IT tools, examining if they are effective in reducing the targeted risk. Further, this research enables researchers and practitioners to examine unintended effects as well as intended effects. For example, the effect of a data gathering IT tool on the perceived risk of personal information misuse; or the counter-productive effect of an overly complex recommendation agent on the risk that finding and choosing a product to buy from a web retailer will be too difficult or time-consuming.

Chapter 4 makes a novel contribution by testing the mechanism to adopt an RRIT, and connecting this decision to a desired change in behaviour of buying from a web retailer. If the model is to be useful, RRIT found to be recognized by consumers as reducing risk in Chapter 3 should have some effect on the desired behaviour of consumers. In short, the model of e-commerce transaction perceived risk allowed for predictions of the effect of an IT tool from the beliefs of the consumer to the subsequent attitudes and intentions of the consumer to buy from a web retailer.

The results of this research overall support the use to the model in the selection and modification of RRIT by practitioners. An understanding of the exposure-driven risk categories that most concern the consumers targeted by a web retailer would allow the selection of the most effective tool, while the measurement of the effects of the tools employed would allow refinement to optimize their effect. Researchers also may find the model useful, making a direct connection from the IT tool to the consumer behaviour that is the focus of much MIS e-commerce research.

This research described above supports a model of e-commerce transaction perceived risk that is consciously addressed by consumers in their recognition of the purpose of RRIT, their choice to adopt the RRIT and the effect of this choice on the attitude they expect to have if the RRIT is provided by a web retailer. As discussed above, the structure of this research mimics the choice of consumers to use such an IT tool in many ways. However, this research is less similar to an actual web-buying scenario, since the research respondents were not placed in a buying situation, using their own money to find and purchase a product or service they will actually receive. The fact that the respondents in this research do not actually engage in buying limits the risk that they actually perceive: they are not placed in a risky situation. Further, the respondents are asked to react to an example of an RRIT, but do not actually adopt the RRIT for the purpose for which it was intended. As a result, the respondents express what they expect the effect of the RRIT to be, but this research is not able to measure the actual effects of the RRIT.

Future research could address both of these shortcomings by testing consumers under conditions that replicate the perceived risks in an actual buying situation. For this to be achieved, participants will need to be placed in a situation where they believe the e-commerce

transaction perceived risks exist, and be given the opportunity to actually use the treatment IT tools. This might be accomplished by actually operating a web store and completing the transaction, supplying a product to the consumer after intervening with a measurement instrument. Although this approach would be realistic in creating perceived risk, recruiting would be a problem, since participants would have to remain ignorant of the connection with a research institution (to avoid unwanted effects on perceived risk). Participants would need to be invited to the test store for some reason, and then offered the chance buy some product. It may not be possible to measure the dimensions of e-commerce transaction perceived risk before and after the experience with the web site and maintain the deception of an ordinary web store. If the test was limited to participants willing to buy something in order to ensure effects of the RRIT (some dimensions of perceived risk could be affected by an RRIT only if the participant actually transacts; for example, an RRIT to reduce the risk of misuse of financial information, or to reduce the risk that something bought from a web retailer might not meet the consumer's needs). However, in this case, the participation of an individual would be dependent on their need and ability to buy the offered product, a process that would reduce the random assignment to a treatment group. An alternative approach would be to pretest for levels of the dimensions of perceived risk and assign participants randomly to treatment sites with differing RRIT. The proportion of participants willing to buy should vary with the RRIT available to them (with pre-existing levels of perceived risk as a covariate, along with financial ability and interest in the offered product).

Another area for additional study would enhance the generalization of the model to other RRIT. Candidates may be RRIT that support other risk-reducing strategies, or RRIT that support risk-reducing strategies in other ways. In either case, a systematic review and

classification of RRIT offered on the web and the placement of the tool in a typology based on the model of e-commerce transaction perceived risk would advance our knowledge of such tools and serve to validate further the e-commerce transaction perceived risk model. If the model is valid, tools found on the web (which have presumably been found to be effective by practitioners) should be able to be defined as addressing one or more of the dimensions of e-commerce transaction perceived risk. Alternatively, if a number of RRIT do not appear to address any of the dimensions, further research regarding these dimensions is called for.

One aspect of the use of RRIT that remains unanswered by this research is whether the use of an omnibus RRIT is a better approach for web retailers than the use of narrowly defined RRIT. This might be tested initially in a direct comparison of the two types of tools in a measurement approach similar to that used in Chapter 4, but ultimately should be tested in a realistic shopping scenario as described above.

Finally, the sample frame in this research was, in every case, the population internet users, and in the vast majority of cases, e-commerce users. There exists a sizable population that is not addressed by this sample frame. Future research might seek to test the population of non-internet users and/or non-e-commerce users to determine if one of the dimensions of e-commerce transaction perceived risk is the major impediment to the use of the internet and e-commerce. RRIT could be tested using this sample frame to extend the generalization of the findings to the population of consumers as a whole.

6. References

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7. Appendices

Appendix A: Perspectives of Multidimensional Perceived Risk Research

Selected Multidimensional Conceptualizations of Perceived Risk		
Study	Dimensions of Perceived Risk	Perspective
(Tung et al. 2001)	<ul style="list-style-type: none"> • Choice of product risk • Choice of vendor risk 	Source orientation: perceived risks are conceptualized as resulting from the choice of the product and the choice of the vendor.
(Pavlou et al. 2004)	<ul style="list-style-type: none"> • Perceived risk in community of sellers 	Source orientation: although only one source of risk was examined empirically, the research specifically distinguishes this source from other sources, such as the nature of the online context or the behaviour of entities other than the seller.
(Miyazaki et al. 2001)	<ul style="list-style-type: none"> • Privacy Concerns • Security (third-party fraudulent behaviour) • Security (on-line retailer fraudulent behaviour) • Inconveniences of on-line shopping 	Source/Event orientation: Security concerns are events that may result in harm for the consumer, identified by the source of risk (third party or retailer); inconvenience and privacy concerns are events that may result in harm for a consumer.
(Mauldin et al. 2002)	<ul style="list-style-type: none"> • Product/Retailer risk • Transaction risk • Privacy risk • Security risk • Disclosure risk 	Source/Event orientation: Sources of risk are Product/Retailer risk and Transaction risk. Privacy risk, security risk and disclosure risk are events that may generate harm for the consumer.

Selected Multidimensional Conceptualizations of Perceived Risk		
Study	Dimensions of Perceived Risk	Perspective
(Pavlou et al. 2007)	<ul style="list-style-type: none"> ● Perceived information asymmetry ● Fears of seller opportunism ● Information privacy concerns ● Information security concerns 	Source/Event orientation: Dimensions of risk are identified as sources of risk to consumer. Information privacy concerns and information security concerns distinguish the potential sources (retailer or external) of a event that could harm the consumer.
(Park et al. 2004)	<ul style="list-style-type: none"> ● Perceived Risk of the Transaction, including Security, Privacy, Non-repudiation ● Perceived Risk of the Product/Service, including functional loss, financial loss, time loss, opportunity loss and overall perceived risk with product/service 	Source/Event/Type of Harm orientation: Sources of risk are the transaction and the product or service purchased; items reflect the type of harm that might occur from each source (financial loss, time loss) as well as events that may generate harm (functional loss, security, privacy, non-repudiation).
(Spiekermann et al. 2002)	<ul style="list-style-type: none"> ● Social/Psychological risk ● Functional risk ● Financial risk ● Delivery risk 	Event/Type of Harm orientation: functional risk and delivery risk are events occurring from a transaction that may harm consumers. The type of harm experienced are the financial risk and social/psychological risk.
(Featherman et al. 2003)	<ul style="list-style-type: none"> ● Performance Risk ● Financial Risk ● Time Risk ● Psychological Risk ● Privacy Risk 	Event/Type of Harm orientation: Performance risk is identified as the event that causes types of harm to occur. Financial risk, time risk and psychological risk are types of harm that the consumer may experience. Privacy risk is an also a belief of something that could occur that will generate harm.

Appendix B: Unwanted Events Elicitation and Categorization

Questionnaire to Elicit Unwanted Events

I am conducting some research leading to a more diagnostic measure of Perceived Risk in e-commerce. As part of this research, I want to conduct a broad survey of the events within an e-commerce transaction that could lead to outcomes that are harmful to the user. The harm may affect the user in one or many ways: financial harm, a loss of time, damage to their self respect, damage to the way their friends and family think of them, or physical harm.

To help me identify these events, please consider the actors or causes of the events that could occur and identify those e-commerce events that could occur that could harm the user along one or more of the dimensions discussed above, and write those events in the table below. After you have completed this, please save the file as a word document and return it to glover99@shaw.ca by Tuesday, November 16.

Thank you for your help.

Actor or Cause	Event, potentially harmful to the user in one or many ways: financial harm, a loss of time, damage to their self respect, damage to the way their friends and family think of them, or physical harm
Independent Recommendation Agent	
Third Party	
Internet	
Website Functionality	
Self-Service Transaction	
Transaction at a distance	
Retailer	
Other	

I am conducting some research leading to a more diagnostic measure of Perceived Risk in e-commerce. As part of this research, I want to conduct a broad survey of the events within an e-commerce transaction that could lead to outcomes that are harmful to the user. The harm may affect the user in one or many ways: financial harm, a loss of time, damage to their self respect, damage to the way their friends and family think of them, or physical harm.

To help me identify these events, please consider the framework of the e-commerce Customer Service Life Cycle (Cenfetelli et al. 2002). Within each phase of the CSLC, identify those e-commerce events that could occur that could harm the user along one or more of the dimensions discussed above, and write that event in the table below. After you have completed this, please save the file as a word document and return it to glover99@shaw.ca by Tuesday, November 2.

Thank you for your help.

E-Commerce CSLC: Definition of stage (Cenfetelli et al. 2002, p. 701)	Event
Establish Requirements: Helping the customer to understand what a product or service does and how it can meet their particular need.	•
Specifying: Determining the specific features or model of the product or service that is appropriate for the particular customer.	•
Sourcing: Making it easy for the customer to find a location to obtain the product or service. For instance, identifying nearby retail outlets or outlets that have the item in stock.	•
Ordering: The customer accepts the suppliers offer to sell the product or service and provides specifics regarding features and delivery.	•
Paying For: The mechanism by which the customer pays for the product and the means by which that payment is authorized.	•
Obtaining: Taking ownership of the product or beginning to receive the particular service. Refers to the means by which the product or service is distributed to the customer.	•
Test & Accept: Demonstrating product or service meets the customer's requirement. Information based products or services can often be tested prior to purchase.	•
Training: The process that supports resource utilization by making the customer capable of making use of the resource to its full extent.	•
Maintaining: Helping the customer to analyze, diagnose, and repair problems with the product or service. Assist in tracking usage (how the product is being used, amount remaining, problems in usage, recommendations for more effective use). Upgrading to improved version	•
Replace/Return/Dispose: Returning the product; reselling the product; recognizing the need to buy a new one; disposing of the product; trading the product in; returning a rental product. Replacing a product that has been consumed or beyond repair.	•
Accounting for: Helping the customer to understand how much they are spending (or saving) on the product, the use of the product, and or other resources used in conjunction with the product.	•
Evaluating: The final "tally" by the customer of the life-cycle experience. Were expectations met? Satisfied?	•
Other: Events that could cause unfavourable consequences for the e-commerce consumer that do not fall within the e-commerce CSLC	•

Categorization of Elicited Events

Elicited Unwanted Events	Cause of Harm (Formative dimensions)	General Risk
<ul style="list-style-type: none"> • The retailer might not be a real merchant • The seller might falsely represent himself as an agent of a respectable company from which I originally want to buy the product from • I might not have enough information to choose a trustworthy retailer • The site might charge my credit card/paypal more than I agree to • The retailer might misuse my financial information • My credit card information may be not stored safely • My financial information might be intercepted by a third party and misused 	1. Financial Information Misuse: Financial information I reveal when I buy something on the web might be misused.	Information misuse risk
<ul style="list-style-type: none"> • I might be forced to provide personal information to get the product I want • The site might build an profile of me based on my purchases • The retailer might fail to protect my personal information from hackers • The website might sell my personal information • The retailer data might use my information and send emails to me without my permission. • My personal information might be intercepted by a third party and misused 	2. Personal Information Misuse: Personal information I reveal when I buy something on the web might be misused.	Information misuse risk

Elicited Unwanted Events	Cause of Harm (Formative dimensions)	General Risk
<ul style="list-style-type: none"> • Product information online may be incomplete • The recommendation agent may give me biased advice • The features or models showing in the website may not be authentic • The Recommendation Agent May not give me all the correct information on the product • I might not be able to specify the features of products. • The Recommendation Agent might misunderstand my needs. • The recommendation agent might not be effective in its determination of the best product on the market • The agent may not work well or give inaccurate results • The product list used by the Recommendation Agent might not be complete • The retailer may not be fully knowledgeable about the product • There might not be reliable/reputable recommendation agents for this product • The recommendation agent may not have a powerful algorithm to filter products • The recommendation of the recommendation agent might not match with my expectations • The retailer may lead me to some product it wants to sell and not something I would really need or like • Other shoppers comments and reviews might not be authentic • The site might provide product virtual experience that is not representative of real use. • The retailer might not be able to understand my requirements • I might not be able to articulate my requirements according to the specifications of the site • I might be misled by technical information that I can't understand • I might not be able to ask all the questions I need to ask • The information I am given might be outdated • The item might be damaged when I receive it. • I might be sent a counterfeit or illicit product • I might purchase the wrong product • I might not be satisfied with the product although it fits my expressed preferences • I won't be able to smell, taste, touch, experience, and examine the product before I purchase it. • The product might not receive the approval of friends and family • The virtual product experience might be misleading • There are long-term downsides to the product that might not surface during sample testing • The information on how to use the product might not be detailed enough. • The product use information provided might be wrong • Instructions on the product might not be clear • I might not be able to ask questions • The Recommendation Agent might recommend an unreliable product. • The Recommendation Agent might recommend an overpriced product. 	<p>3. Unmet Needs: Something I buy on the web might not fit my needs.</p>	<p>Failure to gain product benefits risk</p>

Elicited Unwanted Events	Cause of Harm (Formative dimensions)	General Risk
<ul style="list-style-type: none"> • The product received might not be what I ordered • I might not be able to download a product • The item might be lost in transit. • The tested product might be different from the product shipped • The retailer may go out of business after I have purchased something. • The retailer may not ship to where I live • The site might allow for ordering when product is not in stock • The site might indicate availability when there is none • I might not receive a number to track the shipment • I might not know whether item in stock or not • I might not know the expected shipping/delivery date. • The product may not ship on time • The delivery might be delayed. • I might not get the product when I expect or need it • The item might be damaged when I receive it. • The product might appear to be in stock but is not 	<p>4. Late Arrival: Something I buy on the web might arrive too late or not at all.</p>	<p>Failure to gain product benefits risk</p>
<ul style="list-style-type: none"> • The Recommendation Agent might waste my time and energy without actually coming up with valid results. • There might be too much information from too many sources to choose • I might not be able to choose the the best retailer because the internet has too many choices • The website might have an inefficient website design • The recommendation agent might take a long time to process my inquiry. • The website might not work • I might not know how to effectively use the site or its tools • The RA might ask me too many unnecessary questions. • The RA might ask question I can't understand • The website might be difficult to use • I might not have enough information to make a purchase decision 	<p>5. Finding and Choosing Functional Inefficiency: Finding and choosing something to buy on the web might be too expensive, too difficult, or too time-consuming.</p>	<p>Functionality inefficiency risk</p>
<ul style="list-style-type: none"> • The website may only accept my order if I provide enough detail of the product, which I may not know about • I might be forced to enter same information again and again • I might not receive a confirmation of my order • The exchange rates shown might be wrong • I might get charged for the wrong item. • The price on item and price paid might not match. • The seller might charge me taxes when taxes are not charged where the seller is located 	<p>6. Ordering and Paying Functional Inefficiency: Ordering and paying for something I buy on the web might be too expensive, too difficult, or too time-consuming.</p>	<p>Functionality inefficiency risk</p>

Elicited Unwanted Events	Cause of Harm (Formative dimensions)	General Risk
<ul style="list-style-type: none"> • I may need to deal with the customs to receive the product • Someone need to stay home to receive the delivery • Shipping may be costly • The retailer might charge me unexpected shipping, sales tax and customs charges 	7. Receiving Functional Inefficiency: Receiving something I buy on the web might be too expensive, too difficult, or too time-consuming.	Functionality inefficiency risk
<ul style="list-style-type: none"> • I may not be able to return the product, because the retailer no longer exists online. • There are no local stores willing to accept my return • The site might provide misleading information on where to return the product • I might have to incur costs when trying to return or replace the product • The return procedures might be stringent, tedious and time-consuming • I might not be able to change my mind once the transaction is final • There might be no way to return a product if it was a download. • I can't test a piece of software and return it later. 	8. Exchange Functional Inefficiency: Exchanging or returning something I buy on the web might be too expensive, too difficult, or too time-consuming.	Functionality inefficiency risk
<ul style="list-style-type: none"> • There may be no warnings of ways in which the product can be damaged. • I might not understand the instructions • I have no one to talk with before, during, and after the purchase. • I might not be able to find the vendor when the product needs maintenance • The vendor might not be able to find me when the product needs maintenance (I changed my address or email address) • Upgrades and patches might not be available for software products • It might be difficult for me to have the product repaired even under warranty • I may not be able to access a help desk or customer service. • The site might misinform me about maintenance needs • I may have to spend a lot of money to send the product to the service location. • The seller might provide false information regarding warranties and maintenance 	9. Maintaining Functional Inefficiency: Maintaining something I buy on the web might too expensive, too difficult, or too time-consuming.	Functionality inefficiency risk

Appendix C: Survey Items for Chapter 2

Sources of Adapted Variables

Variable	Adapted from
Trust in web retailers	(Pavlou et al. 2007)
Attitude toward buying on the web	(Stewart 2003)
PEOU; PU	(Wixom et al. 2005) and (Gefen et al. 2003a)
Internet experience; Internet use	(Kim et al. 2006)
Intention to buy on the web	Developed for this research

Items Used in Field Survey

Attitude toward buying on the web: Disagree – Agree 5 point Likert scale	
ATBW1	I like buying on the World Wide Web.
ATBW2	My experiences buying on the World Wide Web have generally been positive.
ATBW3	I do not enjoy buying on the World Wide Web.
Trust in web retailers: Disagree – Agree 7 point Likert scale	
TWR1	Promises made by e-commerce websites are likely to be reliable.
TWR2	I do not doubt the honesty of e-commerce websites.
TWR3	I expect that e-commerce websites will keep the promises they make.
TWR4	I expect that e-commerce websites have good intentions toward me.
TWR5	I expect that the intentions of e-commerce websites are benevolent.
TWR6	I expect that e-commerce websites are well meaning.
TWR7	I expect that e-commerce websites are competent.

Intention to buy on the web	
IBW1	I intend to buy on the web. Disagree – Agree 7 point Likert scale
IBW2	I predict I will buy on the web. Disagree – Agree 7 point Likert scale
IBW3	I plan to buy on the web. Disagree – Agree 7 point Likert scale
IBW4	When do you intend to buy on the web next? Categorical: Within 1 month; 1 to 3 months; 3 to 6 months; 6 to 12 months; not within 12 months
Perceived ease of use of buying on the web: Disagree – Agree 7 point Likert scale	
PEOU1	Buying on the web is easy to do.
PEOU2	It is easy to become skilful at buying on the web.
PEOU3	Learning to buy on the web is easy.
PEOU4	Buying on the web is clear and understandable.
PEOU5	When I buy on the web, it is easy to do what I want to do.
Perceived usefulness of buying on the web: Disagree – Agree 7 point Likert scale	
PU1	Buying on the web improves my ability to make good purchase decisions.
PU2	Buying on the web allows me to get my shopping done more quickly.
PU3	Buying on the web allows me to enhance my purchasing effectiveness.
PU4	When I buy on the web, my performance in purchasing is improved.
Probability of exposures to harm: Semantic Differential, each item measured with Improbable – Probable; Unlikely – Likely; and Rare – Frequent on 7-point scales	
FinProb1-3	"Financial information I reveal when I buy something on the web might be misused." This outcome is:
PersProb1-3	"Personal information I reveal when I buy something on the web might be misused." This outcome is:
NeedProb1-3	"Something I buy on the web might not meet my needs." This outcome is:
LateProb1-3	"Something I buy on the web might be delivered too late, or not at all." This outcome is:
SrchProb1-3	"Finding and choosing something to buy on the web might be too expensive, too difficult or too time-consuming." This outcome is:
PayProb1-3	"Ordering and paying for something I buy on the web might be too expensive, too difficult or too time-consuming." This outcome is:
GetProb1-3	"Receiving something I buy on the web might be too expensive, too difficult or too time consuming." This outcome is:
ExchProb1-3	"Exchanging or returning something I buy on the web might be too expensive, too difficult or too time-consuming." This outcome is:
FixProb1-3	"Maintaining something I buy on the web might be too expensive, too difficult or too time-consuming." This outcome is:

Consequence of exposures to harm: Semantic Differential, each item measured with Meaningless to me – Meaningful to me; Unimportant to me – Important to me; and Insignificant to me – Significant to me on 7-point scales	
FinCons1-3	"Financial information I reveal when I buy something on the web might be misused." If this happens, the negative consequences I will experience are...
PersCons1-3	"Personal information I reveal when I buy something on the web might be misused." If this happens, the negative consequences I will experience are...
NeedCons1-3	"Something I buy on the web might not fit my needs." If this happens, the negative consequences I will experience are...
LateCons1-3	"Something I buy on the web might be delivered too late, or not at all." If this happens, the negative consequences I will experience are...
SrchCons1-3	"Finding and choosing something to buy on the web might be too expensive, too difficult or too time-consuming." If this happens, the negative consequences I will experience are...
PayCons1-3	"Ordering and paying for something I buy on the web might be too expensive, too difficult or too time-consuming." If this happens, the negative consequences I will experience are...
GetCons1-3	"Receiving something I buy on the web might be too expensive, too difficult or too time-consuming." If this happens, the negative consequences I will experience are...
ExchCons1-3	"Exchanging or returning something I buy on the web might be too expensive, too difficult or too time-consuming." If this happens, the negative consequences I will experience are...
FixCons1-3	"Maintaining something I buy on the web might be too expensive, too difficult or too time-consuming." If this happens, the negative consequences I will experience are...

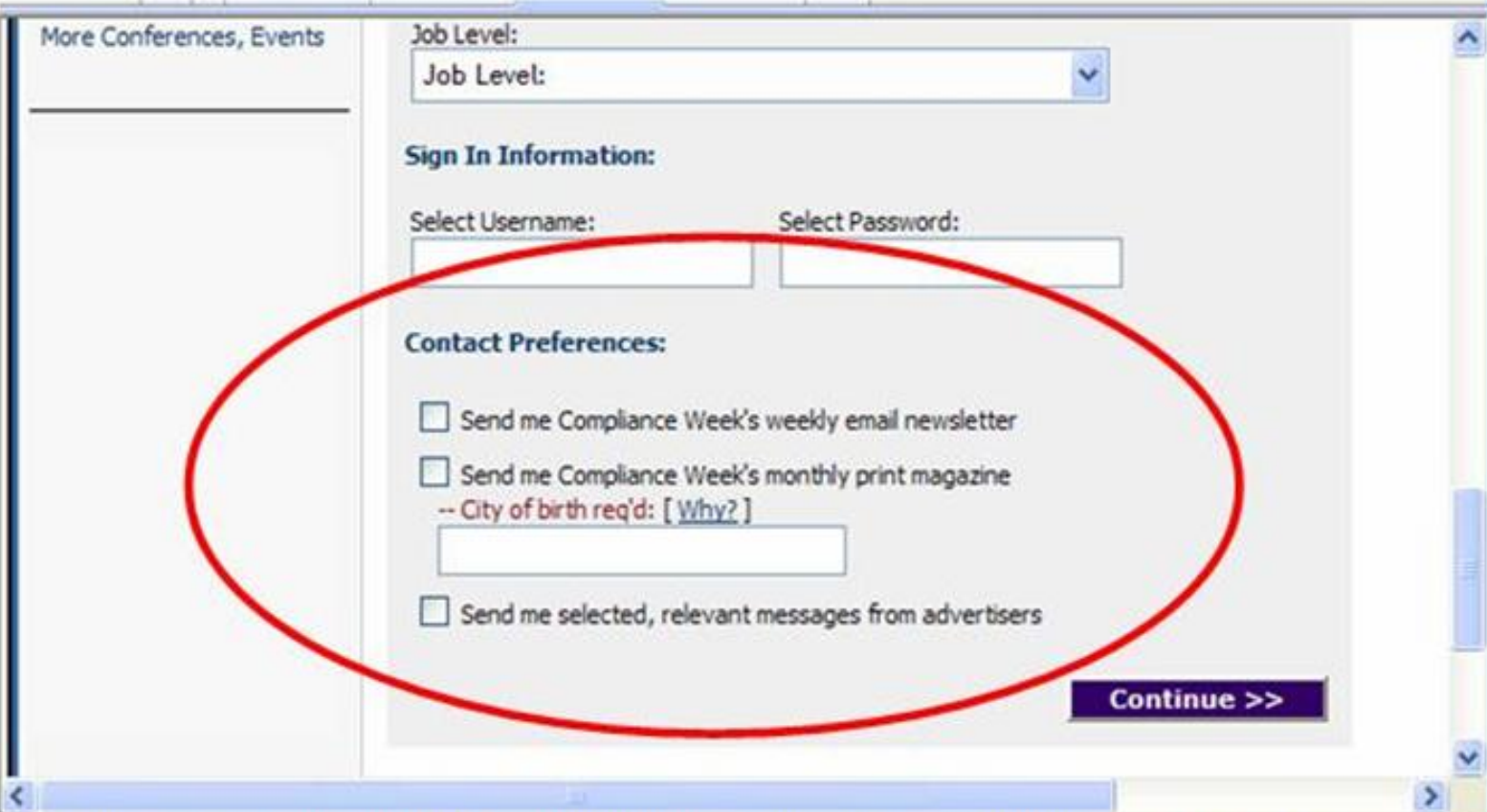
Appendix D: RRIT Treatments for Chapter 3 and Chapter 4

Game software example, reproduced with permission of Orbitz, LLC (Orbitz 2007)



This is an example of *game software*, designed to provide a pleasant experience on the website.

Spam reduction software example, reproduced with permission from Financial Media Holdings Group, Inc. (ComplianceWeek 2007)

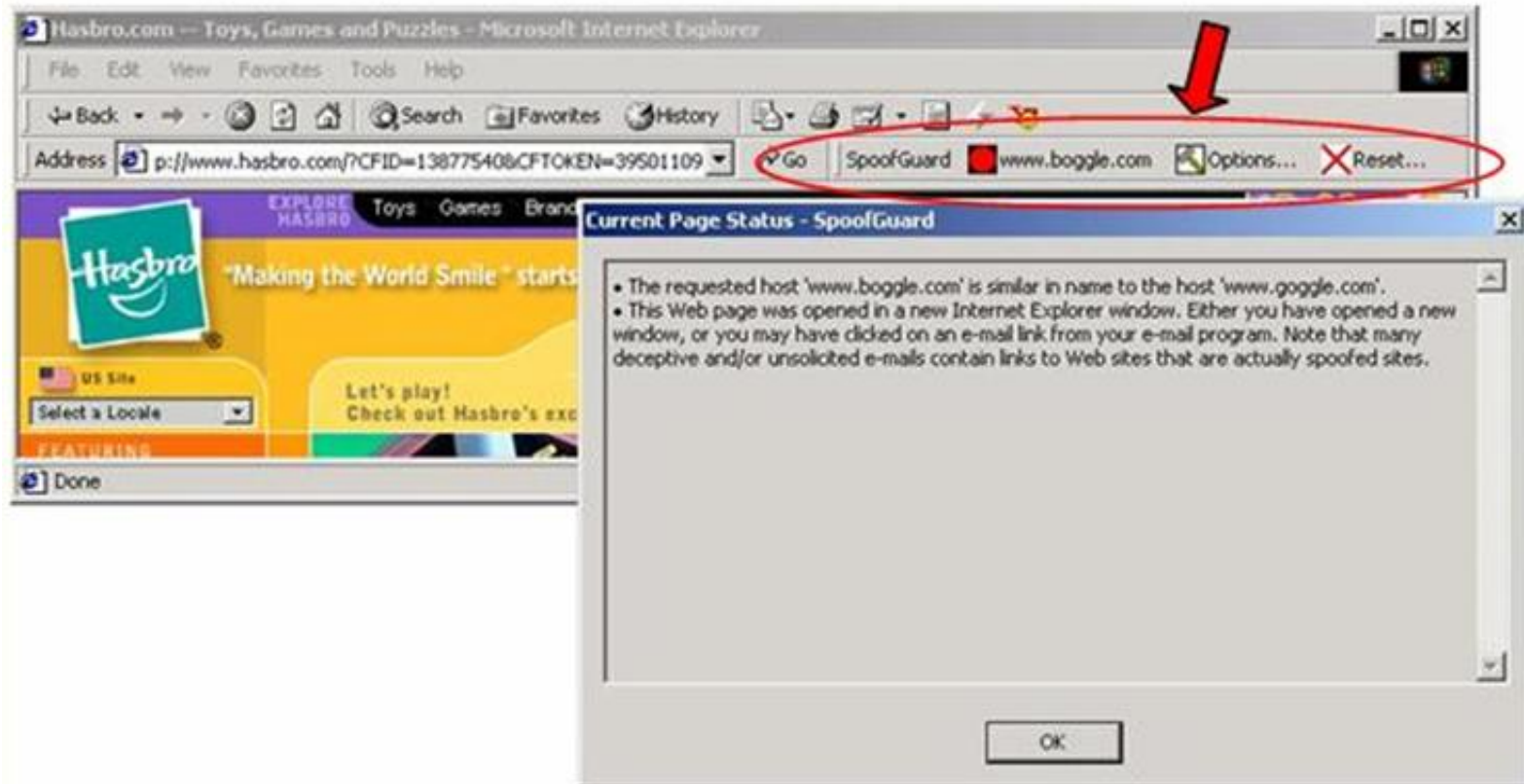


The screenshot shows a web form with the following sections:

- More Conferences, Events**: A sidebar menu on the left.
- Job Level:** A dropdown menu with "Job Level:" selected.
- Sign In Information:** Two input fields labeled "Select Username:" and "Select Password:".
- Contact Preferences:** A section highlighted by a red circle, containing three checkboxes:
 - Send me Compliance Week's weekly email newsletter
 - Send me Compliance Week's monthly print magazine
-- City of birth req'd: [Why?]
 - Send me selected, relevant messages from advertisers
- Continue >>**: A dark blue button at the bottom right of the form.

This is an example of *spam reduction software*, designed to prevent unwanted email advertisements.

Site validation software example, reproduced with permission from Stanford Security Lab, Stanford University (Boneh et al. 2007)



This is an example of *site validation software*, designed to alert you if you are visiting a known or suspected problem website.

Simplified ordering software example, reproduced with permission from Amazon.com. Amazon, Amazon.com, the Amazon.com logo and 1-Click Ordering are registered trademarks of Amazon.com, Inc. or its affiliates (Amazon 2007a)



This is an example of *simplified ordering software*, designed to reduce the information you must enter when you buy from a web retailer.

Shipment tracking software example has been removed due to copyright restrictions. The information removed is a screenshot of shipment tracking software from the FedEx website (Fedex 2007)

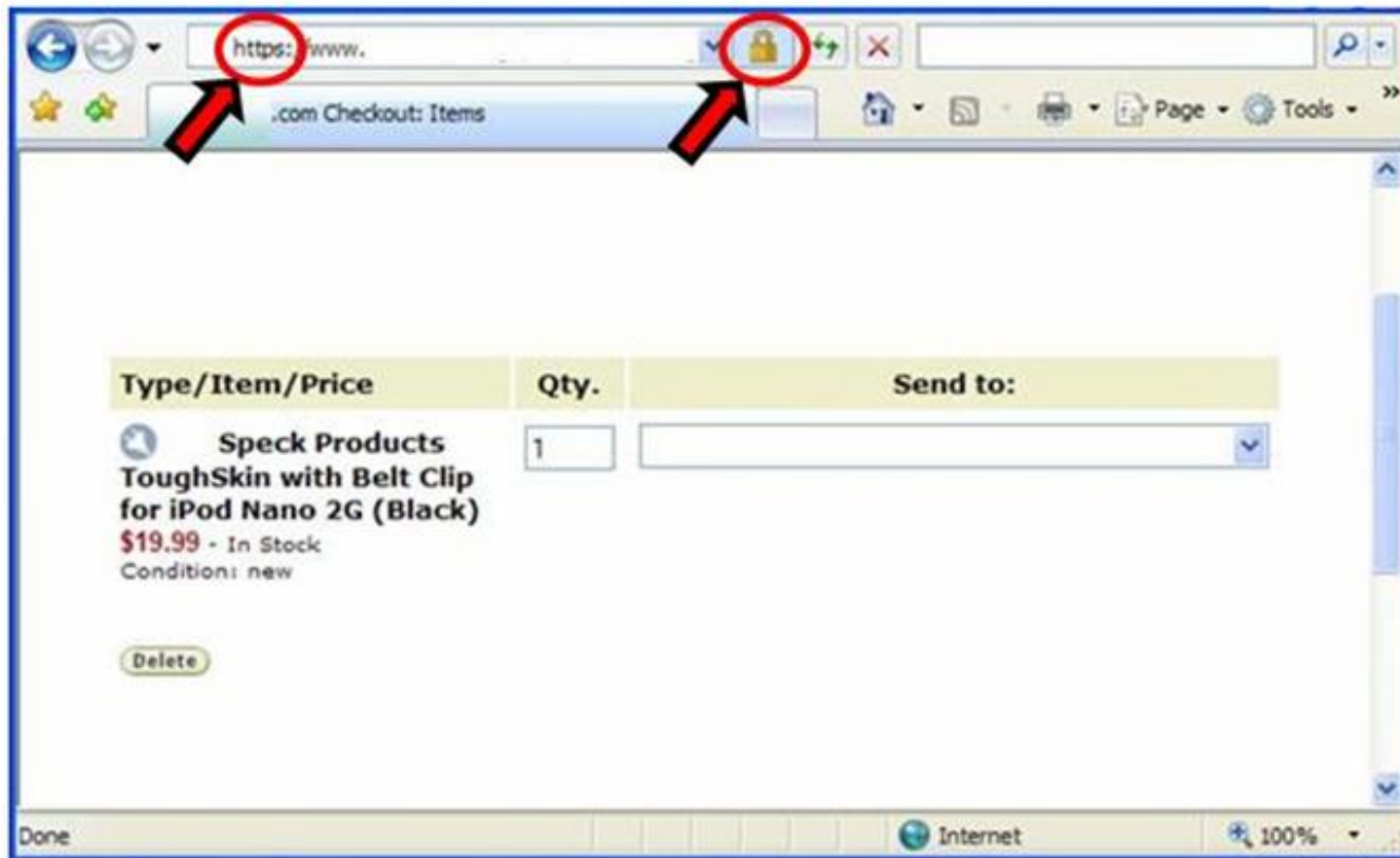
Performance review software example, reproduced with permission from Amazon.com. Amazon, Amazon.com, and the Amazon.com logo are registered trademarks of Amazon.com, Inc. or its affiliates (Amazon 2007b)



This is an example of *performance review software*, designed to provide information about the performance of a product.

Functional demonstration software example has been removed due to copyright restrictions. The information removed is a screenshot of functional demonstration software from the Creative Technology Inc. website (Creative 2007)

Encryption software example, reproduced with permission from Amazon.com. Amazon, Amazon.com, and the Amazon.com logo are registered trademarks of Amazon.com, Inc. or its affiliates (Amazon 2007c)



This is an example of *encryption software*, designed to prevent unauthorized people from reading information you transmit over the web.

Collaborative shopping software example has been removed due to copyright restrictions. The information removed is a screenshot a description of the function of collaborative shopping software from the website of SURFSquared, Inc. (BuddyShopping 2008)

Attribute comparison software example has been removed due to copyright restrictions. The information removed is a screenshot of product attribute comparison software from the website of Futureshop (Futureshop 2007)

Decision support software example, reproduced with permission of Yahoo! Inc. YAHOO!, the YAHOO! logo and SmartSort are trademarks of Yahoo! Inc. (Yahoo 2007)

The screenshot shows a web interface titled "Find the best MP3 Player for you." with a sub-header "SmartSort other products: MP3 Players". The interface includes several sliders for user input:

- "How much do you want to spend?": A range slider with "min" and "max" labels and a "Set" button.
- "How important is Song Capacity (Memory + Hard Disk)?": A slider with a "not important" label.
- "How important is Battery Life?": A slider with a "not important" label.
- "How important is Audio Format?": A slider with a "not important" label and a link to "Select Audio Formats".
- "How important is Brand?": A slider with a "not important" label and a link to "Select Brands".
- "How important is Compact Size?": A slider with a "not important" label.

Below the sliders, it says "Instant Results: Your Top 10 MP3 Players based on the sliders above." with a "Reset" link and "Updated: 03 Mar 2006".

There are two sections: "MP3 Player SmartSort Instructions" and "Slider Demo".

MP3 Player SmartSort Instructions

1. Set the price range.
2. Use the sliders to tell us how important each features is.
3. Watch as your results are re-ordered based on your preferences.
4. See a personalized list of the top 10 mp3 players for you!

Slider Demo

The slider demo shows a horizontal bar with a slider knob. Below the bar are labels: "not important", "slightly important", "important", "very important", and "most important".

This is an example of *decision support software*, designed to provide advice on what products to buy on the web.

Appendix E: Survey Items for Chapter 3

Willingness to use RRIT to reduce the probability of personal information misuse (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITPersInfo1	I would make use of (the treatment RRIT) to reduce the probability that personal information I provide when I buy from a web retailer will be misused.
WUITPersInfo2	I would use (the treatment RRIT) to reduce the likelihood that personal information I provide when I buy from a web retailer will be misused.
WUITPersInfo3	I would employ (the treatment RRIT) to reduce the chance that personal information I provide when I buy from a web retailer will be misused.
Willingness to use RRIT to reduce the probability of financial information misuse (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITFinInfo1	I would make use of (the treatment RRIT) to reduce the probability that financial information I provide when I buy from a web retailer will be misused.
WUITFinInfo2	I would use (the treatment RRIT) to reduce the likelihood that financial information I provide when I buy from a web retailer will be misused.
WUITFinInfo3	I would employ (the treatment RRIT) to reduce the chance that financial information I provide when I buy from a web retailer will be misused.
Willingness to use RRIT to reduce the probability of unmet needs (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITNeeds1	I would make use of (the treatment RRIT) to reduce the probability that something I buy from a web retailer would not meet my needs.
WUITNeeds2	I would use (the treatment RRIT) to reduce the likelihood that something I buy from a web retailer would not meet my needs.
WUITNeeds3	I would employ (the treatment RRIT) to reduce the chance that something I buy from a web retailer would not meet my needs.
Willingness to use RRIT to reduce the probability of late arrival (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITLate1	I would make use of (the treatment RRIT) to reduce the probability that something I buy from a web retailer would arrive late or not at all.
WUITLate2	I would use (the treatment RRIT) to reduce the likelihood that something I buy from a web retailer would arrive late or not at all.
WUITLate3	I would employ (the treatment RRIT) to reduce the chance that something I buy from a web retailer would arrive late or not at all.
Willingness to use RRIT to reduce the probability finding and choosing will be too difficult or time consuming (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITFind1	I would make use of (the treatment RRIT) to reduce the probability that finding and choosing something to buy from a web retailer will be too difficult or time consuming.
WUITFind2	I would use (the treatment RRIT) to reduce the likelihood that finding and choosing something to buy from a web retailer will be too difficult or time consuming.
WUITFind3	I would employ (the treatment RRIT) to reduce the chance that finding and choosing something to buy from a web retailer will be too difficult or time consuming.
Willingness to use RRIT to reduce the probability that ordering and paying will be too difficult or time consuming (Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITPay1	I would make use of (the treatment RRIT) to reduce the probability that ordering and paying for something bought from a web retailer will be too difficult or time consuming.
WUITPay2	I would use (the treatment RRIT) to reduce the likelihood that ordering and paying for something bought from a web retailer will be too difficult or time consuming.
WUITPay3	I would employ (the treatment RRIT) to reduce the chance that ordering and paying for something bought from a web retailer will be too difficult or time consuming.

Willingness to use RRIT to reduce the probability receiving will be too difficult or time consuming(Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITGet1	I would make use of (the treatment RRIT) to reduce the probability that receiving something bought from a web retailer will be too difficult or time consuming.
WUITGet2	I would use (the treatment RRIT) to reduce the likelihood that receiving something bought from a web retailer will be too difficult or time consuming.
WUITGet3	I would employ (the treatment RRIT) to reduce the chance that receiving something bought from a web retailer will be too difficult or time consuming.
Willingness to use RRIT to reduce the probability exchanging or returning will be too difficult or time consuming(Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITReturn1	I would make use of (the treatment RRIT) to reduce the probability that exchanging or returning something bought from a web retailer will be too difficult or time consuming.
WUITReturn2	I would use (the treatment RRIT) to reduce the likelihood that exchanging or returning something bought from a web retailer will be too difficult or time consuming.
WUITReturn3	I would employ (the treatment RRIT) to reduce the chance that exchanging or returning something bought from a web retailer will be too difficult or time consuming.
Willingness to use RRIT to reduce the probability maintaining will be too difficult or time consuming(Agree – Disagree, 7-point scale) Adapted from (Gefen et al. 2003b)	
WUITFix1	I would make use of (the treatment RRIT) to reduce the probability that maintaining something bought from a web retailer will be too difficult or time consuming.
WUITFix2	I would use (the treatment RRIT) to reduce the likelihood that maintaining something bought from a web retailer will be too difficult or time consuming.
WUITFix3	I would employ (the treatment RRIT) to reduce the chance that maintaining something bought from a web retailer will be too difficult or time consuming.

Appendix F: Variable Items for Chapter 4

Non-comparison Items

Perceived Ease of Use of RRIT (Agree – Disagree, 7-point scale) Adapted from (Venkatesh et al. 2003)	
PEOUR1	I would need to expend a lot of effort to use (the treatment RRIT).
PEOUR2	I would need to do a lot of work to use (the treatment RRIT).
PEOUR3	Using (the treatment RRIT) would be easy for me.
PEOUR4	I would find it easy to use (the treatment RRIT).
PEOUR5	The things I would do to use (the treatment RRIT) are clear and understandable to me.
Intent to Adopt RRIT: Disagree – Agree 7 point Likert scale	
If I was buying from a web retailer that provided (the treatment RRIT)...	
Allintnt1	I would always use (the treatment RRIT).
Allintnt2	I would certainly employ (the treatment RRIT)
Allintnt3	I would make use of (the treatment RRIT) every time.
Allintnt4 (removed)	I would never utilize (the treatment RRIT).
Trust in web retailers: Disagree – Agree 7 point Likert scale Adapted from (Pavlou et al. 2007)	
TWR1	Promises made by web retailers are likely to be reliable.
TWR2	I do not doubt the honesty of web retailers.
TWR3	I expect that web retailers will keep the promises they make.
TWR4	I expect that web retailers have good intentions toward me.
TWR5	I expect that web retailers are well meaning.
TWR6	I expect that web retailers are competent.
TWR7	I expect that the intentions of web retailers are benevolent.
TWR8	Web retailers know a lot about the business they work in.
TWR9	I expect that web retailers will tell the truth.
TWR10	Overall, I believe that web retailers are trustworthy.

Format for Comparison Items

Please consider two web retailers selling MP3 players. The websites they provide are identical in every way (the products, the price, the delivery) **except**:

- Web retailer 1 provides spam reduction software
- Web retailer 2 does not provide spam reduction software

Please answer the following questions by mentally comparing these two web retailers.

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"Information I reveal when buying from a web retailer will be misused."

Which web retailer has a higher probability that this outcome will occur?

(Web retailer 1 provides spam reduction software, web retailer 2 does not)

Web retailer 1 has a much higher probability	Web retailer 1 has a somewhat higher probability	Web retailer 1 has the same probability as Web retailer 2	Web retailer 2 has a somewhat higher probability	Web retailer 2 has a much higher probability
--	--	---	--	--

1 2 3 4 5 6 7 8 9

Comparative Items for Chapter 4

Effect on probability of personal information misuse if RRIT is used: 9 point comparative scale									
"Personal information I reveal when buying on the web will be misused."									
EITPersInfo1	Which web retailer has a higher probability that this outcome will occur?								
Example scale (similar scale used for all comparison questions):									
Web retailer 1 has a much higher probability	Web retailer 1 has a somewhat higher probability	Web retailer 1 has the same probability as web retailer 2	Web retailer 2 has a somewhat higher probability	Web retailer 2 has a much higher probability					
1	2	3	4	5	6	7	8	9	
EITPersInfo2	For which web retailer is this outcome more likely?								
EITPersInfo3	For which web retailer will this happen more frequently?								
Effect on probability of financial information misuse if RRIT is provided: 9 point comparative scale									
"Personal information I reveal when buying on the web will be misused."									
EITFinInfo1	Which web retailer has a higher probability that this outcome will occur?								
EITFinInfo2	For which web retailer is this outcome more likely?								
EITFinInfo3	For which web retailer will this happen more frequently?								
Effect on probability of unmet needs if RRIT is provided: 9 point comparative scale									
"Something I from a web retailer will not meet my needs."									
EITNeeds1	Which web retailer has a higher probability that this outcome will occur?								
EITNeeds2	For which web retailer is this outcome more likely?								
EITNeeds3	For which web retailer will this happen more frequently?								
Effect on probability of late arrival if RRIT is provided: 9 point comparative scale									
"Something I from a web retailer will arrive late or not at all."									
EITLate1	Which web retailer has a higher probability that this outcome will occur?								
EITLate2	For which web retailer is this outcome more likely?								
EITLate3	For which web retailer will this happen more frequently?								
Effect on probability of finding and choosing difficulty if RRIT is provided: 9 point comparative scale									
"Finding and choosing something to buy from a web retailer will be too difficult or too time-consuming."									
EITFind1	Which web retailer has a higher probability that this outcome will occur?								
EITFind2	For which web retailer is this outcome more likely?								
EITFind3	For which web retailer will this happen more frequently?								

Effect on probability of ordering and paying difficulty if RRIT is provided: 9 point comparative scale	
“Ordering and paying for something bought from a web retailer will be too difficult or too time-consuming.”	
EITPay1	Which web retailer has a higher probability that this outcome will occur?
EITPay2	For which web retailer is this outcome more likely?
EITPay3	For which web retailer will this happen more frequently?
Effect on probability of receiving difficulty if RRIT is provided: 9 point comparative scale	
“Receiving something bought from a web retailer will be too difficult or too time-consuming.”	
EITGet1	Which web retailer has a higher probability that this outcome will occur?
EITGet2	For which web retailer is this outcome more likely?
EITGet3	For which web retailer will this happen more frequently?
Effect on probability of exchanging or returning difficulty if RRIT is provided: 9 point comparative scale	
“Exchanging or returning something bought from a web retailer will be too difficult or too time-consuming.”	
EITReturn1	Which web retailer has a higher probability that this outcome will occur?
EITReturn2	For which web retailer is this outcome more likely?
EITReturn3	For which web retailer will this happen more frequently?
Effect on probability of maintaining difficulty if RRIT is provided: 9 point comparative scale	
“Maintaining something bought from a web retailer will be too difficult or too time-consuming.”	
EITFix1	Which web retailer has a higher probability that this outcome will occur?
EITFix2	For which web retailer is this outcome more likely?
EITFix3	For which web retailer will this happen more frequently?
Effect on attitude toward buying from a web retailer if an RRIT is provided: 9 point comparative scale	
EITATBWR1	For which web retailer would your experience of buying be more positive?
EITATBWR2	Which web retailer would you enjoy buying from more?
EITATBWR3	Which web retailer would you like buying from more?
Effect on intention to buy from a web retailer if an RRIT is provided: 9 point comparative scale	
EITITBWR1	If you intended to buy from a web retailer in the next 3 months, for which web retailer would your intention be stronger?
EITITBWR2	If you planned to buy from a web retailer in the next three months, for which web retailer would your plans be more definite?
EITITBWR3	If you predicted that you would buy from a web retailer in the next three months, for which web retailer would your prediction be more certain?
EITITBWR4	If you expected to buy from a web retailer in the next three months, for which web retailer would you be more confident in your expectations?

Appendix G: Ethics Board Approval Certificates



The University of British Columbia
Office of Research Services and Administration
Behavioural Research Ethics Board

Certificate of Approval

<small>PRINCIPAL INVESTIGATOR</small> Benbasat, I.	<small>DEPARTMENT</small> Sauder School of Business	<small>NUMBER</small> B05-0394
<small>INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT</small> UBC Campus ,		
<small>CO-INVESTIGATORS:</small> Glover, Steven, Sauder School of Business		
<small>SPONSORING AGENCIES</small> UBC Grants from Federal Granting Councils		
<small>TITLE:</small> Measuring Perceived Customer Risk in Electronic Commerce and Identifying the Mechanisms to Reduct it (Instrument Validation Phase)		
<small>APPROVAL DATE</small> JUN - 3 2005	<small>TERM (YEARS)</small> 1	<small>DOCUMENTS INCLUDED IN THIS APPROVAL:</small> May 24, 2005, Consent form / Contact letter / April 19, 2005, Questionnaire
<small>CERTIFICATION:</small> <p style="text-align: center;">The protocol describing the above-named project has been reviewed by the Committee and the experimental procedures were found to be acceptable on ethical grounds for research involving human subjects.</p> <p style="text-align: center;"><i>Approval of the Behavioural Research Ethics Board by one of the following:</i> Dr. James Frankish, Chair, Dr. Cay Holbrook, Associate Chair, Dr. Susan Rowley, Associate Chair</p> <p style="text-align: center;">This Certificate of Approval is valid for the above term provided there is no change in the experimental procedures</p>		



The University of British Columbia
 Office of Research Services
 Behavioural Research Ethics Board
 Suite 102, 6190 Agronomy Road, Vancouver, B.C. V6T 1Z3

CERTIFICATE OF APPROVAL - MINIMAL RISK

PRINCIPAL INVESTIGATOR: Izak Benbasat	INSTITUTION / DEPARTMENT: UBC/Sauder School of Business	UBC BREB NUMBER: H07-00304
INSTITUTION(S) WHERE RESEARCH WILL BE CARRIED OUT:		
Institution	Site	
N/A Other locations where the research will be conducted: N/A		
CO-INVESTIGATOR(S): Steven Glover		
SPONSORING AGENCIES: Social Sciences & Humanities Research Council - "Improving the design of information technology tools intended to reduce customers' perceived risk in e-commerce (funding applied for)"		
PROJECT TITLE: The Adoption and Influence of Risk-Reducing IT Artifacts on e-Commerce Transaction Perceived Risk		

CERTIFICATE EXPIRY DATE: March 15, 2008

DOCUMENTS INCLUDED IN THIS APPROVAL:	DATE APPROVED: March 15, 2007	
Document Name	Version	Date
Protocol:		
Survey Proposal	N/A	February 5, 2007
Consent Forms:		
RRIT Consent Form Page	N/A	February 5, 2007
Questionnaire, Questionnaire Cover Letter, Tests:		
RRIT Survey Questionnaire	N/A	February 5, 2007
Letter of Initial Contact:		
RRIT Survey Letter of Initial Contact	N/A	February 5, 2007
The application for ethical review and the document(s) listed above have been reviewed and the procedures were found to be acceptable on ethical grounds for research involving human subjects.		
<p>Approval is issued on behalf of the Behavioural Research Ethics Board and signed electronically by one of the following:</p> <hr style="width: 60%; margin: 0 auto;"/> <p>Dr. Peter Suedfeld, Chair Dr. Jim Rupert, Associate Chair Dr. Arminee Kazanjian, Associate Chair Dr. M. Judith Lynam, Associate Chair</p>		