

## Internet versus bricks-and-mortar retailers: An investigation into intangibility and its consequences

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### Abstract

Intangibility has long been studied as a unidimensional construct with the focus being placed upon the physical element. This paper explores the effects of three unique intangibility dimensions on a consumer's ability to evaluate goods and services, and the perceived risk (PR) associated with the transaction. The authors examine these relationships in purchase environments that include both traditional bricks-and-mortar retailers and the Internet. Their investigation further incorporates prior knowledge as a moderating factor into the proposed framework. This allows for a thorough comparison of the effects and relationships that exist between intangibility and its consequences in general, evaluation difficulty (ED) and perceived risk (PR) in particular. The authors develop hypotheses pertaining to the proposed model and test them with two experiments. The empirical results are broadly supportive of the hypotheses. Theoretical and managerial implications to the services marketing literature are discussed.

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**Keywords:** Intangibility; Evaluation difficulty; Perceived risk; Online purchasing; Offline purchasing; Prior knowledge

Intangibility is a key differentiating factor between goods and services. Kotler and Bloom (1984) define intangibility as “what cannot be seen, tasted, felt, heard, or smelled”. In this sense, intangibility refers to the total lack of the good or service's attribute accessibility through the senses. The conceptualization of intangibility has evolved, first to a two-dimensional construct (Dubé-Rioux, Regan, & Schmitt 1990; Breivik, Troye, & Olsson 1998) and most recently to a three-dimensional one (Laroche, Bergeron, & Goutaland 2001). This classification of goods and services has become particularly useful with the increased physical intangibility of both

goods and services that is mainly the result of technological advances. Digitized information is becoming commonplace with the advent of music technology (found in varying degrees in both CD and MP3 forms) and software products. Although both of those items are goods, they are physically intangible, being audible only through a CD or MP3 player or visible through a computer terminal (Freiden, Goldsmith, Takacs, & Hofacker 1998). Both of these goods are less palpable than a service such as a pizzeria dinner. It is reasonable to claim that evolving technology and the proliferation of Internet use necessitate a more complete understanding of intangibility.

Intangibility has strong impact on consumer decision-making (Laroche et al. 2001). A good/service's intangibility is a dominant feature of the ease or difficulty that an individual has when making a pre-purchase evaluation of the item. This is consistent with the research that has cited intangibility as a basis for difficulty in pre-purchase evaluations (Murray 1991) and as a major source of increased perceived risk (PR)

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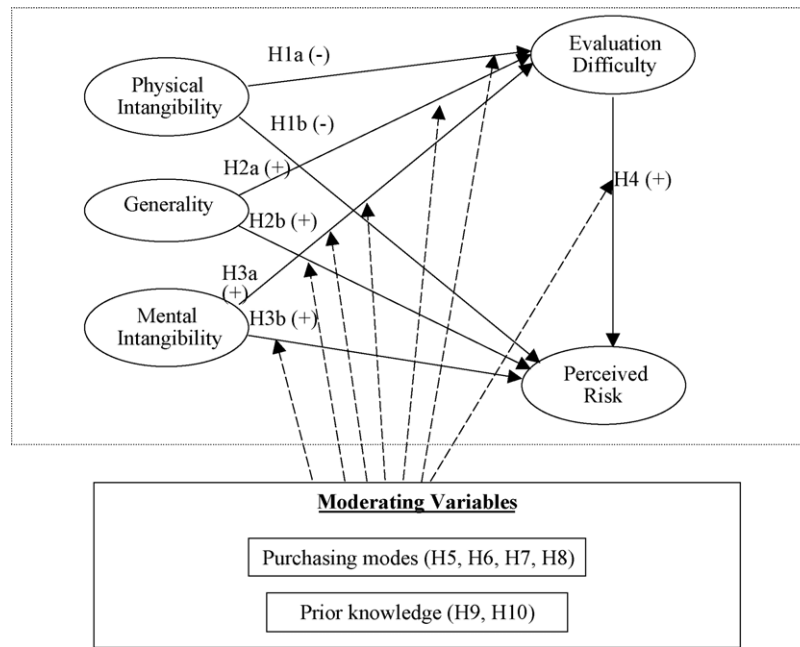


Fig. 1. The intangibility-evaluation difficulty-perceived risk model. Purchasing modes (H5, H6, H7, H8); prior knowledge (H9, H10).

(Murray & Schlacter 1990). One of the reasons attributed to this increased evaluation difficulty (ED) and perceived risk may be the lack of the “shopping qualities” that are normally found in tangible goods and that help consumers in forming pre-purchase judgments (Zeithaml 1981). Moreover, the intangibility of the purchasing medium also seemingly plays an important role in evaluation difficulty and perceived risk. Cox and Rich (1964), for instance, believe that when shopping in person in a department store the customer has the opportunity to reduce uncertainty by personally inspecting or testing the merchandise. This implies that certain forms of shopping may be riskier to the consumer than others, especially those that do not offer visual or tangible cues, such as the telephone (Cox & Rich 1964; Ross 1975), and later the Internet (Ratnasingham 1998).

The Internet has provided fertile soil for new forms of goods and services and delivery channels. Nowadays, a firm that has no physical presence can directly deliver music and banking services in a digital, non-physical format. Traditionally, these forms and channels are believed to be more intangible and increase evaluation difficulty and perceived risk. However, Berthon, Pitt, Katsikeas, and Berthon (1999) find that the Internet, despite being a fairly intangible context, is currently used to tangibilize the intangible by some practitioners. Thakor, Borsuk, and Kalamas (2004) attribute this phenomenon to the powerful function of the Internet in easily providing consumers with appropriate information and in lessening the efforts needed in making purchase decisions. Despite the importance of intangibility in the consumer decision-making process, the effect of intangible attributes of goods and services on perceived risk has rarely been addressed. Previous studies of online purchasing have focused only on privacy and security concerns, two most

widely used antecedents of perceived risk (Hoffman, Novak, & Peralta 1999; Miyazaki & Fernandez 2001). Therefore, identifying the impact of the Internet vis-à-vis the bricks-and-mortar environment on the relationship among intangibility, ED, and PR can provide insights to marketers, especially those who are dealing with online businesses.

This paper is organized as follows. We first provide a framework (see Fig. 1) to describe the effects of intangibility on evaluation difficulty and perceived risk. The model is then tested by Experiment 1 with a global measure of perceived risk by a set of products which have varying degree of multidimensional intangibility, ED, and PR. To enhance the validity of the proposed model, we further conduct Experiment 2 in which PR is measured by the risk elements and the product stimuli set is slightly different from that used in Experiment 1. Experiment 2 is designed not only to verify the findings in Experiment 1 but also to extend the proposed model by examining the following three issues: (1) whether the influence of intangibility associated with product cues on ED and PR is invariant across purchasing modes, (2) how the intangibility of the Internet as a virtual store impacts ED and PR, and (3) the moderating effects of consumer prior knowledge on the relationships among intangibility, ED, and PR.

## Conceptual framework

### Intangibility

Intangibility has initially been considered to be a single dimension related to the lack of physical evidence (Bebko 2000; Finn 1985; McDougall 1987). Some researchers view

it as impalpable and not corporeal (Shostack 1977), while others conceptualize it as “that which cannot be easily defined, formulated, or grasped mentally” (Berry 1980). In 1990, Dubé-Rioux, Regan, and Schmitt proposed that intangibility should be divided into two related dimensions, *concreteness* and *specificity*. Subsequent to Dubé-Rioux et al.’s (1990) research, Breivik et al. (1998) further explore the possibility of intangibility as a two-dimensional construct. They separate intangibility into inaccessibility to the senses and generality. *Inaccessibility to the sense* refers to the lack of physical evidence, while *generality* relates to good/service’ attributes that, when taken into consideration as a set, give a general outcome that is associated with that good/service (e.g., safety of a car). With greater specificity, the attributes can be evaluated on their own (e.g., whether an air bag is available in a car; Breivik et al. 1998).

The most recent definition of intangibility evolves around three dimensions: physical intangibility, generality, and mental intangibility (Laroche et al. 2001). *Physical intangibility* is the component of intangibility that has been most frequently referred to in the service marketing literature (Breivik et al. 1998), representing the degree to which a product cannot be touched or seen, is inaccessible to the senses, and lacks a physical presence (e.g., advice from a professional service provider such as a doctor). The second dimension, *generality*, refers to the customer’s difficulty in precisely defining or describing a particular product. Products can be perceived as general if consumers cannot refer precisely to identifiable definitions, features, and/or outcomes of a particular product (e.g., a digital camera is a complex machine that one uses to take pictures). Inversely, products are perceived as specific if they generate numerous clear-cut definitions, features, and/or outcomes in the consumer’s mind (e.g., a digital camera is an intricate machine; made of many advanced technologies; powered by batteries; with numerous features such as 4.3 megapixel CCD, 3× optical zoom, recording 80 s of video with sound, etc.). *Mental intangibility* reflects the fact that a product can be physically tangible, but difficult to grasp mentally. Existing research shows that physical intangibility does not ensure a clear mental representation of an object, especially if the evaluator lacks experience with that object (Finn 1985; McDougall & Snetsinger 1990). For instance, a car engine is probably mentally intangible for most people, particularly for those who do not have sufficient knowledge to appreciate its mechanics.

#### *The intangibility-evaluation difficulty-perceived risk relationship*

The study of intangibility has led researchers to certain conclusions about its consequences on the purchaser. Good/service intangibility has been linked to increased evaluation difficulty (McDougall 1987; McDougall & Snetsinger 1990; Zeithaml 1981), greater perceived processing effort (McDougall 1987), lower certainty of evaluation (Mitchell & Greathorex 1993; Murray 1991), and finally, higher per-

ceived risk (De Ruyter, Wetzels, & Kleijnen 2001; Finn 1985; McDougall & Snetsinger 1990; Mitchell & Greateorex 1993; Murray & Schlacter 1990; Zeithaml & Bitner 2000). However, Breivik et al. (1998) find that specific dimensions of good/service intangibility may have different effects on ED and/or PR.

#### *Intangibility and evaluation difficulty*

According to McDougall (1987), *evaluation difficulty* refers to consumers’ perceptions of the cognitive and behavioral difficulty and effort required to judge and discriminate among alternatives, and make a selection decision. Breivik et al. (1998) find that sense inaccessibility (physical intangibility) is negatively related to evaluation difficulty. They argue that a physically intangible good/service would yield an easier evaluation process since it would involve a greater reliance upon prior experience rather than an assessment of the cues from the physical attributes. This finding challenges the traditional belief that services are “more difficult to evaluate than goods because they lack the physical evidence available for most products” (McDougall 1987).

Generality and mental intangibility are expected to increase the evaluation difficulty. The variability that is introduced by a good/service with high levels of generality (Zeithaml 1981) and mental intangibility is expected to induce high levels of consumer uncertainty about the outcomes. With respect to generality, this is a result of the lack of specific and clear attributes that are available for the consumer to evaluate. This makes the evaluation process more time consuming and effortful (Breivik et al. 1998). It is also reasonable to believe that mental intangibility gives consumers a fuzzier and less accurate cognitive representation with which to come to a decision. This introduces uncertainty, leading to an increasingly difficult evaluation process (Finn 1985).

#### *Intangibility and perceived risk*

Perceived risk is viewed as a subjective expectation of loss (Mitchell & Greateorex 1993; Peter & Ryan 1976). As noted earlier, researchers have found that intangibility is positively correlated with the perception of risk (Finn 1985; Zeithaml & Bitner 2000). Most claim that services are perceived as riskier to purchase than goods since services are more intangible. Mitchell and Greateorex (1993), for instance, point out that “intangibility . . . greatly increases the degree of perceived risk in the purchase of services by decreasing the certainty with which services can be made”.

However, the statement that services are more intangible than goods is questioned by Laroche et al. (2001). They use software products and music as examples. Compared with a meal in a restaurant, software goods and music show more intangibility since they consist of digitized information, are made of codes, and are untouchable in nature, with software being visible only through a computer screen, and music only listened to (Laroche et al. 2001). On the other hand, a meal (a service) is made of food ingredients that can be seen, smelled,

touched, tasted, and evaluated for their own quality (Berry 1980).

As intangibility dimensions have similar influential patterns on perceived risk and evaluation difficulty, it is reasonable to believe that physical intangibility is negatively related to perceived risk as well, while mental intangibility is believed to increase perceived risk levels. Generality has been thought to increase perceived risk (Zeithaml 1981), because the lack of specific attributes would increase the variability of the possible outcomes of a purchase situation; thereby increasing perceived risk. This discussion leads to the following hypotheses:

**H1.** Physical intangibility is negatively related to (a) evaluation difficulty and (b) perceived risk.

**H2.** Generality is positively related to (a) evaluation difficulty and (b) perceived risk.

**H3.** Mental intangibility is positively related to (a) evaluation difficulty and (b) perceived risk.

#### *Evaluation difficulty and perceived risk*

Perceived risk has two components: uncertainty (the likelihood of unfavorable outcomes), and consequences (the importance of a loss) (Bauer 1960). The first dimension, *certainty of evaluation*, is related to the consumers' confidence in their ability to make a correct purchase decision (Wendler 1983). It would therefore stand to reason that the greater the degree of perceived difficulty of evaluation, the greater the consumers' uncertainty in their decision. Mitchell and Greatorex (1993) explore that line of reasoning. Their study is based on the belief that uncertainty is a result of factors inherent to the good/service, and place and mode of purchase (Cox & Rich 1964). They claim that services can be associated with higher degrees of uncertainty than goods because services are more intangible. Increased uncertainty has also been associated with high levels of anxiety or discomfort (Taylor 1974). In this sense, evaluation difficulty increases the levels of uncertainty, which is directly related to perceived risk. Therefore,

**H4.** Evaluation difficulty is positively related to perceived risk.

they should suit well the student population from which the sample was selected. According to the researchers' judgment, three categories of goods (jeans, computers, and compact discs) and three categories of services (pizzeria diners, haircuts, and checking accounts) were retained from a list of products. As expected, the results of the product selection check showed that the selected goods and services had the desired variability along physical intangibility ( $F_{7,465} = 113.36, p < .001$ ), generality ( $F_{7,465} = 15.89, p < .001$ ), mental intangibility ( $F_{7,465} = 73.67, p < .001$ ), evaluation difficulty ( $F_{7,465} = 26.49, p < .001$ ), and perceived risk ( $F_{7,465} = 39.21, p < .001$ ).

#### *Sampling procedure*

The questionnaires were distributed to 540 students at a northeastern university. A total of 512 questionnaires were returned but 40 of them were incomplete, yielding 472 usable responses. University students were deemed to be appropriate subjects for this research because of the following reasons. First, this study focused on consumer perceptions. Students, as a category of consumers, are familiar with the type of goods/services studied, thus being able to evaluate them. Second, this population is more likely to have experience in online purchasing, which is a focal point in this research. Finally, students are relatively homogeneous, specifically in terms of education level and age. Controlling for these two demographic variables provides for a stronger test of our hypotheses. Analysis of basic demographic information suggested that the sample was representative of the student population in terms of gender (59% females) and age (46.7% between 21 and 25 years old).

#### *Measurement*

With the exception of demographic measures, all items in the questionnaire were measured via nine-point scales. The *intangibility* scale with three distinct dimensions developed by Laroche et al. (2001) was used in the present research. *Evaluation difficulty* was adapted from a scale originated from Breivik et al. (1998) study. A significant and pertinent scale of overall *perceived risk*, originally developed by Stone and Gronhaug (1993), was employed in this paper. A summary of the items used to measure each construct is presented in Table 1.

## Experiment 1

### *Method*

#### *Stimulus products*

To enhance the generalizability of the results, the present study selected more than one product as stimuli. The following three criteria were used to screen the products: (1) services and goods should be represented in equal numbers, (2) these products had to yield varying degree of intangibility, evaluation difficulty, and perceived risk, and (3)

## Results

The full latent model<sup>1</sup> (see Fig. 2) was specified to test our hypotheses about the relationship among intangibility dimensions, ED, and PR. Estimation of the structural model

<sup>1</sup> Before testing the full latent model, EQS software of Bentler (1992) was used to perform a CFA on the purified 18-item measurement model. Estimation displayed desirable goodness of fit statistics for our data, as indicated by  $\chi^2(103) = 293.63, p < .001$ ,  $\chi^2/df = 2.85$ , AOSR = 0.039, NFI = .97, and CFI = .97.



Table 1  
Results of the exploratory factor analysis for Experiment 1

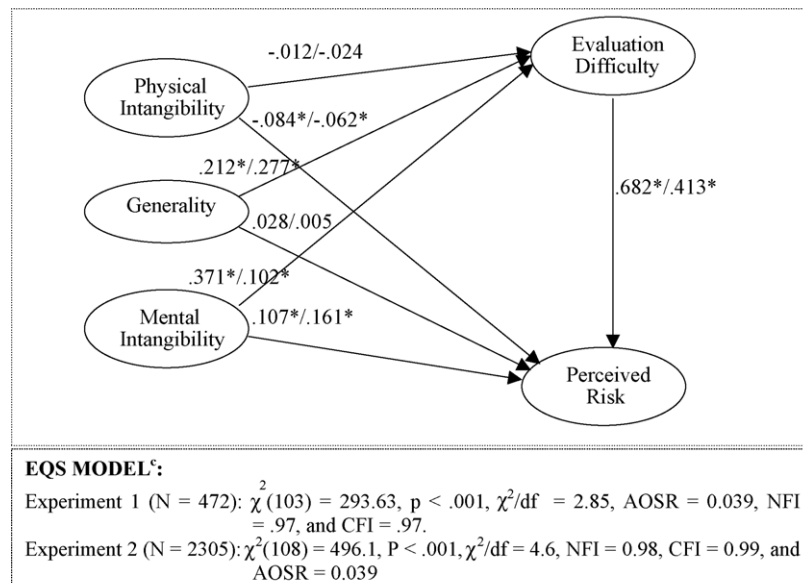
| Factors/measures <sup>a,b</sup>   | Alpha |
|---|-------|
| Physical intangibility (Phy-Int) <sup>b</sup>   | .871  |
| phy1 <i>This item</i> is very easy to see and touch.  |       |
| phy2 I can physically grasp <i>this item</i> .  |       |
| phy3 <i>This item</i> is very physically tangible.  |       |
| Generality (Gen-Int)  | .680  |
| gen1 I feel that <i>this item</i> is 1 = very general to 9 = very specific.                     |       |
| gen2 I feel that <i>this item</i> is 1 = very abstract to 9 = very concrete.                    |       |
| Mental intangibility (Men-Int) <sup>b</sup>   | .712  |
| men1 I need more information about <i>this item</i> to get a clear idea (image) of what it is.  |       |
| men2 This is a difficult product to think about.  |       |
| men3 This is not the sort of product that is easy to picture.                                   |       |
| Evaluation difficulty (ED)  | .782  |
| Given that I have to buy <i>an item</i> in a store, choosing among the available brands will be |       |
| ed1 very difficult (1) → very easy (9)  |       |
| ed2 very problematic (1) → not problematic at all (9)   |       |
| ed3 very complex (1) → very simple (9)  |       |
| ed4 very complicated (1) → not complicated at all (9)   |       |
| Perceived risk (PR) <sup>b</sup>  | .813  |
| pr1 There is a good chance I will make a mistake if I purchase <i>this item</i> .               |       |
| pr2 I have the feeling that purchasing <i>this item</i> will really cause me lots of trouble.   |       |
| pr3 I will incur some risk if I buy <i>this item</i> in the next twelve months.                 |       |
| pr4 <i>This item</i> is a very risky purchase.  |       |

<sup>a</sup> The term “item” was replaced with the appropriate term (good or service in the questionnaires).

<sup>b</sup> These scales were measured on a 9-point Likert-type scale (strongly disagree to strongly agree).

generated an excellent fit:  $\chi^2(103) = 293.63$ ,  $p < .001$ ,  $\chi^2/df = 2.85$ , AOSR = 0.039, NFI = .97, and CFI = .97. A close look at the patterns of the influence of intangibility on ED and PR showed a strong support for three out of

four hypotheses. Specifically, mental intangibility had direct impact on both ED (.371,  $p < .001$ ) and PR (.107,  $p < .001$ ), while generality directly influenced ED (.212,  $p < .001$ ) and indirectly influences PR via ED, lending strong support for



a Only path coefficients (standardized solution estimates) were presented. Numbers with a \* indicated significant causal paths ( $p < .05$ ).

b For experiment 2, the alpha for significance was set at .05/3 = .017 rather than .05 because of the Bonferroni adjustment.

c Good model fit is indicated when 1) the average off-diagonal standardized residuals (AOSR) approaches zero, 2) normed fit index (NFI) and comparative fit index (CFI) are more than 0.90 (Bentler 1992), and 3) standardized  $\chi^2$  ( $\chi^2/df$ ) values are smaller than 5 (Taylor & Todd 1995).

Fig. 2. Results<sup>a</sup> of the intangibility-evaluation difficulty-perceived risk model (Experiment 1/Experiment 2<sup>b</sup>).

H2 and H3. Consistent with our expectation, ED had a significant positive association with PR (.682,  $p < .001$ ); therefore, H4 was strongly supported. Although physical intangibility was found to be negatively related to both ED and PR, the estimate was significant only for PR ( $-.084$ ,  $p < .05$ ) but not for ED ( $-.012$ ,  $p > .15$ ). Therefore, H1 was partially supported.

### Discussion

In Experiment 1, the impact of three dimensions of intangibility on ED and PR was examined and the findings were consistent with our hypotheses but disconfirmed those presented in previous research. By independently investigating the effect of intangibility as a global measure either on ED or on PR, researchers have long believed that good/service's intangibility increases ED and PR (Murray 1991; Murray & Schlacter 1990; Zeithaml & Bitner 2000). However, the findings in the current study suggest a multidimensional structure of intangibility, with each dimension having different effects on ED and/or PR. Another important finding obtained in this research is the negative association between physical intangibility and PR, which shows that a physically intangible good/service tends to reduce perceived risk. Although intuitively surprising, this finding is logical in the sense that the lack of physical evidence of an object may push consumers, when making a decision, to rely more on their prior knowledge instead of assessing the physical attributes of that object. This will make the evaluation process easier and improve the consumers' confidence in their ability to make a correct purchase.

These findings, however, may not be universally held. First of all, the strength of the relationships among intangibility dimensions, ED, and PR may depend on consumers' prior knowledge. Moreover, one may argue that purchasing modes, such as the Internet and traditional bricks-and-mortar retailers, are likely to play a vital role in understanding intangibility and its consequences. In addition, researchers may have questions about the measure of perceived risk used in Experiment 1, where a global measure of PR was applied for the sake of parsimony. This scale reflects more on the importance of a loss and consumers' confidence with regard to their decision rather than on the traditional notions of perceived risk, which focus on the elements of PR.<sup>2</sup> Extant research shows that different types of risk exist, namely financial, performance, time, psychological, and social risks (Havlena & DeSarbo 1990; Murray & Schlacter 1990), and the importance of each varies across product categories (Kaplan, Szybillo, & Jacoby 1974). Our findings would be more convincing if these relevant dimensions of risk were used. Accordingly, Experiment 2 was conducted, by using the multidimensional scale of perceived risk, to provide further insights into the robustness of the intangibility–ED–PR model across retailing contexts.

## Experiment 2

### *The internet versus bricks-and-mortar retailers*

Recently, the Internet has seen its popularity and use increase to such high levels that it has become recognized as an important communications medium. Compared with a bricks-and-mortar environment, the Internet has the potential to facilitate the evaluation of goods/services in several ways. First, it can offer a greatly expanded alignment of goods/services relative to a bricks-and-mortar store, or a catalogue. Second, it can be an efficient tool at screening the various offerings to find the ones most appropriate for consideration. Third, it can offer an unimpeded search across brands and stores. And finally, it has the ability to remember past selections; thereby simplifying the purchase search and information processing portions of the buying process. On the other hand, a bricks-and-mortar operation makes available to the consumer the opportunity to get both in-store information (e.g., brand name, packaging design, presentation, store displays, etc.) and sales people's help.

### *The effects of the internet on the influence of intangibility*

Although advances in information technology are facilitating the delivery of multisensory stimuli over the Internet, it still needs time to market goods/services with high levels of somatic and sensorimotor inputs (e.g., touch, body movement, etc.) through the constrained two-dimensional interfaces, as can be seen from the limited success that Internet retailers have had with sensory products (Neuborne 2001). Given that physical tangibility is highly dependent upon attribute accessibility through the senses (Breivik et al. 1998; Dubé-Rioux et al. 1990; Hirschman 1980), it is a logical assumption that these attributes will not be conveyed efficiently through the Internet, whose ability is only in the transfer of visual and audio cues. The rest of the sensory cues are left inaccessible through the medium. This causes inefficient transfer of those goods and services that are most reliant upon tactile, olfactory, and oral cues. On the other hand, when purchasing a physically intangible item online, consumers may be pushed to count more on the easily accessed information provided by the Internet instead of assessing the cues from the physical attributes of that good/service; thereby yielding an easier evaluation process and higher consumers' confidence with regard to their decision. This is mainly due to the powerful function of the online medium, in comparison with purchasing the same item offline, in helping consumers with increased efficiency in the information search process. Thus,

**H5.** The impact of physical intangibility on perceived risk will be lower in an online environment than in an offline environment.

The Internet can be considered a “developing marketing channel that transcends national boundaries and encompasses

<sup>2</sup> We thank one reviewer for this comment.

elements of informing, investigating, interacting, distributing, transacting, eliciting feedback, and supporting” (Berthon et al. 1999). It makes a wealth of information available to the user and allows for proper access to and screening of that information to form appropriate consideration sets, which minimize the effort needed to make a purchase decision (Thakor et al. 2004). The increased efficiency at distributing, categorizing and screening information that the Internet offers to its users (Alba et al. 1997) should help diminish the impact of mental intangibility associated with goods and services on ED and PR in an online purchasing mode. In line with the same reasoning, the increased access to specific, organized information in the Internet should allow consumers to familiarize themselves with more specific attributes and functions of the services or goods that they are purchasing. This should lower the strength of the generality—ED—PR relationship.

**H6.** The impact of generality on (a) evaluation difficulty and (b) perceived risk will be lower in an online environment than in an offline environment.

**H7.** The impact of mental intangibility on (a) evaluation difficulty and (b) perceived risk will be lower in an online environment than in an offline environment.

#### *The effects of the Internet on the relationship between ED and PR*

As seen earlier, the Internet enables users to screen out useless information and access only the information that will be helpful in reaching a purchase decision. As such, we believe that purchasing online will probably lower the evaluation difficulty associated with the purchase of a good/service. Following in the same vein, an online environment may help diminish the perceived risk caused by the intangible attributes of the product as well. However, this does not necessarily mean the risk level will be lower in the online versus the offline purchase. Conversely, the risk associated with an online environment is expected to be higher than with an identical purchase offline because of the following two reasons: (1) online purchasing does not offer visual or tangible cues and therefore is perceived to be riskier to the consumer than other forms of shopping (Cox & Rich 1964), and (2) perceived risk in the online mode, compared with the offline purchasing, is more likely to be driven by such factors as privacy and security concerns (Hoffman et al. 1999; Miyazaki & Fernandez 2001).

In an online operation, not only does the buyer have to trust the quality of the goods or services that they are purchasing, they must also trust the seller to deliver their purchase. Furthermore, the buyer must trust the seller’s server administration security in order to confidently give their credit card information online. Even once this is assured, they must trust the seller not to misuse or handle carelessly their information that is necessary for any commercial exchange to take place. This includes not only credit card information, but also

addresses, telephone numbers, and the consumers’ purchasing habits (Clarke 1997). The problem of creating a trusting partnership is exacerbated in an online vis-à-vis offline environment since the parties involved in the transaction are not in the same physical location. As such, cues like physical proximity, handshakes, body signals, and the use of the five human senses (sight, hearing, smell, taste, and touch) are not available to the parties to facilitate the creation of a trust-based partnership (Clarke 1997; Nohria & Eccles 1992). This uncertainty may be further amplified due to general feeling of privacy concerns, identity theft concerns, and insecurity concerns in the technology used to facilitate the transaction (Ratnasingham 1998).

**H8.** The impact of evaluation difficulty on perceived risk in an online environment is greater than that in an offline mode.

#### *The moderating role of prior knowledge*

According to Engel, Blackwell, and Miniard 1993, prior knowledge is “the information stored within memory”. Prior knowledge has been often conceptualized with two dimensions: *experience*, which is a representation of the successful manipulations of the good or service that the consumer has had, and *expertise*, which reflects consumers’ acquired ability to effectively use the good or service. Prior knowledge is a characteristic that influences all phases in the decision process (Bettman & Park 1980) and specifically, how consumers evaluate the good/service and the risk inherent in their purchase (Murray & Schlacter 1990). Havlena and DeSarbo (1990), for example, claim that risks associated with the purchase of new products are often high because consumers lack information and prior experience. Additional experience and information lead to reducing the uncertainty of the outcome, which has been found to lead to a reduction in perceived risk (Cox & Rich 1964). Therefore, it is important to examine how prior knowledge moderates the impact of intangibility on evaluation difficulty and perceived risk.

Breivik et al. (1998) find that goods/services with attributes that are inaccessible to the senses are perceived to be less difficult to evaluate than goods/services whose attributes are rated highly in sense accessibility. They believe that this results from consumers’ ability to refer to mental representations of the product that are resultant of prior knowledge, a process that requires less effort than processing the information derived from tangible attributes.

**H9.** The impact of physical intangibility on perceived risk will be lower for consumers with high levels of prior knowledge than for consumers with low levels of prior knowledge.

Zeithaml, Berry, and Parasuraman (1993) also find that prior knowledge of a product allows for a clearer mental representation of it. This clearer representation can help lower

mental intangibility associated with the good/service, causing the ease of evaluation and diminishing the associated risk. Thus,

**H10.** The impact of mental intangibility on (a) evaluation difficulty and (b) perceived risk will be lower for consumers with high levels of prior knowledge than for consumers with low levels of prior knowledge.

## Method

### Stimulus products

Results from Experiment 1 showed that a haircut service is physically intangible but mentally very tangible. To increase the external validity of our model, in Experiment 2 we intended to choose another service with high degrees of intangibility along its three dimensions. On the basis of this guideline, Internet browsers was selected to replace haircuts as a service with high level of both generality and mental intangibility. Therefore, the new set of goods/services in Experiment 2 was characterized by varying degrees of intangibility: jeans and computers were thought of highly tangible goods, while compact discs were considered to be less tangible goods. Pizzeria dinners were regarded as a tangible service, whereas Internet browsers and checking accounts were believed to be intangible services.

### Survey instrument

Two versions of the questionnaire were used, each dealing with three of the six products in order to minimize respondent fatigue. To reduce order effects, two versions of each questionnaire were used with the products presented in a reverse order. These four versions were used for both online and offline purchases, with the word *online* (e.g., *online* purchase of jeans) and the word *store* (e.g., *music store* for a CD purchase) clearly specified in the instructions and in the body of the questions where appropriate; thus yielding a total of eight different versions (approximately an equal number of each). The questionnaires were divided into four subsections. The first three examined the consumer perceptions for the three different good/service classes. Each section dealt with the consumer perceptions of one good/service. The fourth section (common to all eight versions) was included to gather general demographic information about each respondent.

### Sampling procedure

The population consisted of undergraduate and graduate-level students. Participation was on a voluntary basis. A total of 783 self-administered questionnaires were distributed in classes at a northeastern university. Surveys were collected immediately upon completion (53.6% females, 46.4% males), each dealing with three categories of goods and/or services. Because, in testing the general model, we were interested in the aggregated responses to each product, this became the unit of analysis and the sample size was then

2,349 responses.<sup>3</sup> After removing 39 cases with missing variables, we further discarded 5 outliers from this study because they met the following two conditions simultaneously: (a) They gave the largest contribution to normalized multivariate kurtosis, and (b) They changed the estimates of the model after being removed. Therefore, the final analysis included the remaining 2,305 observations. Demographic data revealed that the sample had similar education level (92% undergraduate students), and age (94% between 20 and 25 years).

### Measurement

The *intangibility* scale in Experiment 1 was used and the generality scale was modified to more adequately reflect the conceptual definition of generality (i.e., products are perceived as general if consumers cannot refer precisely to identifiable definitions, features, and/or outcomes). The same items of *evaluation difficult*, as used in Experiment 1, were applied in Experiment 2. Five different types of *perceived risk*, originally developed by Stone and Gronhaug (1993), were used in this investigation: financial, time, performance, social, and psychological risks. Since our purpose is not to examine specific elements of PR but to view the role of PR in this broader context, means of these five kinds of risks were used as indicators of perceived risk in our model. *Prior knowledge* was included as a moderator in this study. Prior knowledge was drawn from earlier studies by Park, Mothersbaugh, and Feick (1994), who developed an interesting scale of knowledge to differentiate experience (i.e., past encounters with the product category) and subjective knowledge (i.e., what the consumer thinks s/he knows about the product category). Besides, two additional items were used from Oliver and Bearden (1983) comprehensive research in order to put emphasis on the fact that the measure of knowledge was global. A composite score of prior knowledge for each subject was calculated. The median split method (median = 5.00) was applied to divide the subjects into high-versus low-knowledge groups. Table 2 summarized the items used to measure these related constructs.

## Results

### Initial analysis

Since the same respondents were asked to evaluate multiple product categories, the within-respondent intraclass correlations across products for each measured item of the six constructs were calculated to evaluate the severity of the possible non-independence problem. Results showed that most of the correlations were between .087 and .198, with only two larger than .198. Therefore, these two items were

<sup>3</sup> Since the same respondents were asked to evaluate multiple product categories, there might be a potential non-independence problem. To correct the possible bias in the model estimation process, within-respondent intraclass correlations were first calculated and used to purify the measured items and the Bonferroni adjustment method was then applied to claim the significant estimates in order to decrease the chance of making a Type I error.



Table 2  
Results of the exploratory factor analysis for Experiment 2

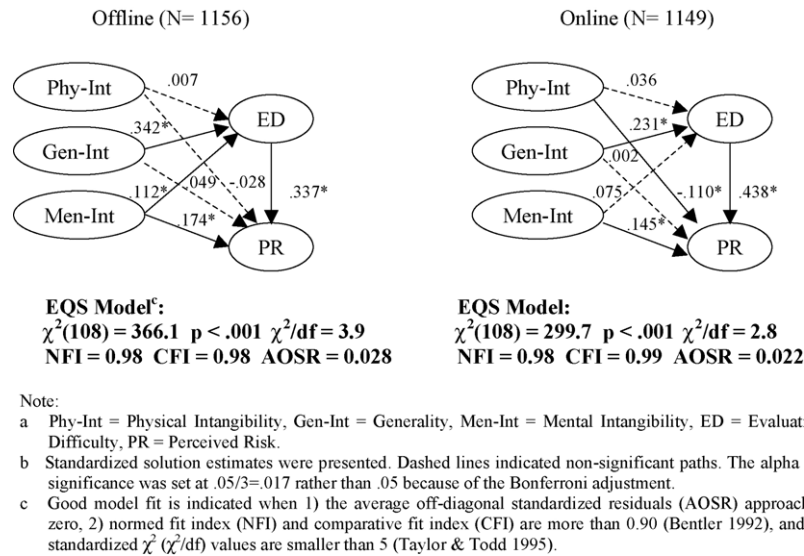
| Factors/measures <sup>a</sup>   | Alpha (off/on <sup>d</sup> ) |
|---|------------------------------|
| Physical intangibility (Phy-Int) <sup>b</sup>   | .945/.947                    |
| phy1 <i>This item</i> is very easy to see and touch.  |                              |
| phy2 I can physically grasp <i>this item</i> .  |                              |
| phy3 <i>This item</i> is very physically tangible.  |                              |
| Generality (Gen-Int) <sup>b</sup>   | .907/.925                    |
| gen3 It is easy to describe many features related to <i>this item</i> .   |                              |
| gen1 I could easily explain many features associated with <i>this item</i> .  |                              |
| gen2 It is not difficult to give a precise description of <i>this item</i> .  |                              |
| Mental Intangibility (Men-Int) <sup>b</sup>   | .789/.800                    |
| men1 I need more information about <i>this item</i> to get a clear idea (image) of what it is.  |                              |
| men2 This is a difficult product to think about.  |                              |
| men3 This is not the sort of product that is easy to picture.   |                              |
| Evaluation difficulty (ED)  | .945/.952                    |
| Given that I have to buy <i>an item</i> in a store (“the Internet” in the online environment), choosing among the available brands will be  |                              |
| ed1 very difficult (1) → very easy (9)  |                              |
| ed2 very problematic (1) → not problematic at all (9)   |                              |
| ed3 very complex (1) → very simple (9)  |                              |
| ed4 very complicated (1) → not complicated at all (9)   |                              |
| Perceived risk <sup>c</sup>   | .838/.822                    |
| pr1 (i.e., mean score of Financial Risk)  |                              |
| (1) If I bought <i>an item</i> for myself within the next twelve months, I would be concerned that the financial investment I would make would <i>not</i> be wise.                      |                              |
| (2) Purchasing <i>this item</i> could involve important financial losses.   |                              |
| (3) If I bought <i>an item</i> for myself within the next twelve months, I would be concerned that I would not get my money’s worth.  |                              |
| pr2 (i.e., mean score of Time Risk)   |                              |
| (1) Purchasing <i>an item</i> could lead to an inefficient use of my time.  |                              |
| (2) Purchasing <i>an item</i> could involve important time losses.  |                              |
| (3) The demands on my schedule are such that purchasing <i>an item</i> concerns me, because it could create even more time pressures on me that I do not need.                          |                              |
| pr3 (i.e., mean score of Performance Risk)  |                              |
| (1) If I were to purchase <i>an item</i> within the next twelve months, I would become concerned that <i>the item</i> will not provide the level of benefits that I would be expecting. |                              |
| (2) As I consider the purchase of <i>an item</i> soon, I worry about whether it will really “perform” as well as it is supposed to.   |                              |
| (3) The thought of purchasing <i>an item</i> causes me to be concerned for how really reliable that product will be.  |                              |
| pr4 (i.e., mean score of Psychological Risk)  |                              |
| (1) The thought of purchasing <i>an item</i> gives me a feeling of unwanted anxiety.  |                              |
| (2) The thought of purchasing <i>an item</i> makes me feel psychologically uncomfortable.   |                              |
| (3) The thought of purchasing <i>an item</i> causes me to experience unnecessary tension.   |                              |
| pr5 (i.e., mean score of Social Risk)   |                              |
| (1) If I bought <i>an item</i> , I think I would be held in higher esteem by my friends.  |                              |
| (2) If I bought <i>an item</i> , I think I would be held in higher esteem by my family.   |                              |
| (3) The thought of purchasing <i>an item</i> causes me to experience unnecessary tension.   |                              |
| Knowledge   | .874/.886                    |
| know1 Compared with my friends and acquaintances, my knowledge of <i>items</i> is: (1 = weaker to 9 = stronger).  |                              |
| know2 In general, my knowledge of <i>items</i> is: (1 = very weak to 9 = very strong).  |                              |
| know3 Would you consider yourself informed or uninformed about <i>items</i> : (1 = very informed to 9 = very uninformed)?   |                              |
| know4 Compared with experts in that area, my knowledge of <i>items</i> is (1 = weaker to 9 = stronger).   |                              |
| know5 The information search I have performed on <i>items</i> is: (1 = very weak to 9 = very thorough).   |                              |
| know6 I “use” <i>this item</i> : (1 = never to 9 = very often).   |                              |
| know7 I don’t have much experience making this kind of decision: (1 = strongly disagree to 9 = strongly agree).   |                              |

<sup>a</sup> The term “item” was replaced with the appropriate term (good or service) in the questionnaires.

<sup>b</sup> These scales were measured on a 9-point Likert-type scale (strongly disagree to strongly agree).

<sup>c</sup> The means of each type of risks were used as indicators of a global measure of perceived risk.

<sup>d</sup> Off/on: offline sub-sample/online sub-sample.

Fig. 3. Offline and Online Baseline Models.<sup>a,b</sup>

discarded from the pool of measures before factor analyses were conducted to further remove the items with poor loadings on the respective factors ( $<0.50$ ) and/or those loadings on multiple factors (cross-loadings  $>0.40$ ) (Pedhazur & Schmelkin 1991). The results provided six distinct factors, jointly explaining 83.52% and 85.17% of the variance for the offline and the online sample, respectively. The mean score of social risk had poor loadings on the respective factor ( $<0.50$ ) and was dropped from the perceived risk construct. As shown in Table 2, all the extracted factors have strong reliabilities, with all Cronbach's alphas above the 0.70 (Nunnally 1978).

An additional effort was made to overcome the possible bias in the model estimation process. Specifically, the alpha for significance was set at  $.05/3 = .017$  rather than .05 because of the Bonferroni adjustment, which was applied to make it harder to claim a significant estimate and in so doing decreased the chance of making a Type I error.

#### Structural models<sup>4</sup>

A joint model for the proposed intangibility—ED—PR relationship was first tested with all observations ( $N = 2305$ ). This model fitted the data very well, with  $\chi^2(108) = 496.1$ ,  $P < .001$ ,  $\chi^2/df = 4.6$ , NFI = 0.98, CFI = 0.99, and AOSR = 0.039. An investigation into the patterns of estimates showed a perfect replication of what we found in Experiment 1, even though we used different types of risks as indicators of perceived risk in this experiment. Specifically, mental intangibility was found to be directly associated with both ED (.102,  $p < .001$ ) and PR (.161,  $p < .001$ ), whereas generality had a direct influence on ED

(.277,  $p < .001$ ) and an indirect influence on PR via ED, with a significant positive relation from ED to PR (.413,  $p < .001$ ). For the negative effect of physical intangibility on PR, Experiment 2 brought an extra evidence for this relationship ( $-.062$ ,  $p < .017$ ). Taken together, the results of Experiment 2 exactly replicated those of Experiment 1; thereby strongly supporting for H2, H3, and H4, and partially supporting for H1, as indicated in Fig. 2.

A series of analyses via the EQS program were performed to test whether the proposed framework is invariant across offline/online purchasing modes and/or between high- and low-knowledge consumers. Prior to model invariance tests across groups, it is customary to first establish separate baseline models for each group. Then two additional levels of constraints (i.e., measurement and structural) were introduced to test their equality simultaneously (Byrne 1994).

**Offline and online baseline models.** Following the procedure recommended by Byrne (1994), two baseline structural models were tested, one for the offline condition ( $n = 1156$ ) and the other for the online mode ( $n = 1149$ ). These models, along with corresponding fit indices and standardized parameter estimates were depicted in Fig. 3. For the offline model, the overall goodness-of-fit was excellent ( $\chi^2/df = 3.9$  and CFI = 0.98). Similar results were found for the overall fit of the online model ( $\chi^2/df = 2.8$  and CFI = 0.99). In both offline and online conditions, all measurement model paths were significant and four out of seven causal paths were significant and in the hypothesized direction. Overall, the standardized results of these models were very good.

**High- and low-knowledge baseline models.** Results of the analysis, as shown in Fig. 4, indicated an excellent fit of the proposed model for high- and low-knowledge consumers across the offline context (high-knowledge:  $\chi^2/df = 2.1$

<sup>4</sup> The estimation of the measurement model showed an excellent fit of our data:  $\chi^2/df = 2.8$ , AOSR = 0.03, NFI = 0.99, and CFI = 0.99. Convergent and discriminant validity of the intangibility dimensions for both online and offline modes were tested following a procedure suggested by Fornell and Larcker (1981). Detailed results can be obtained from the second author.

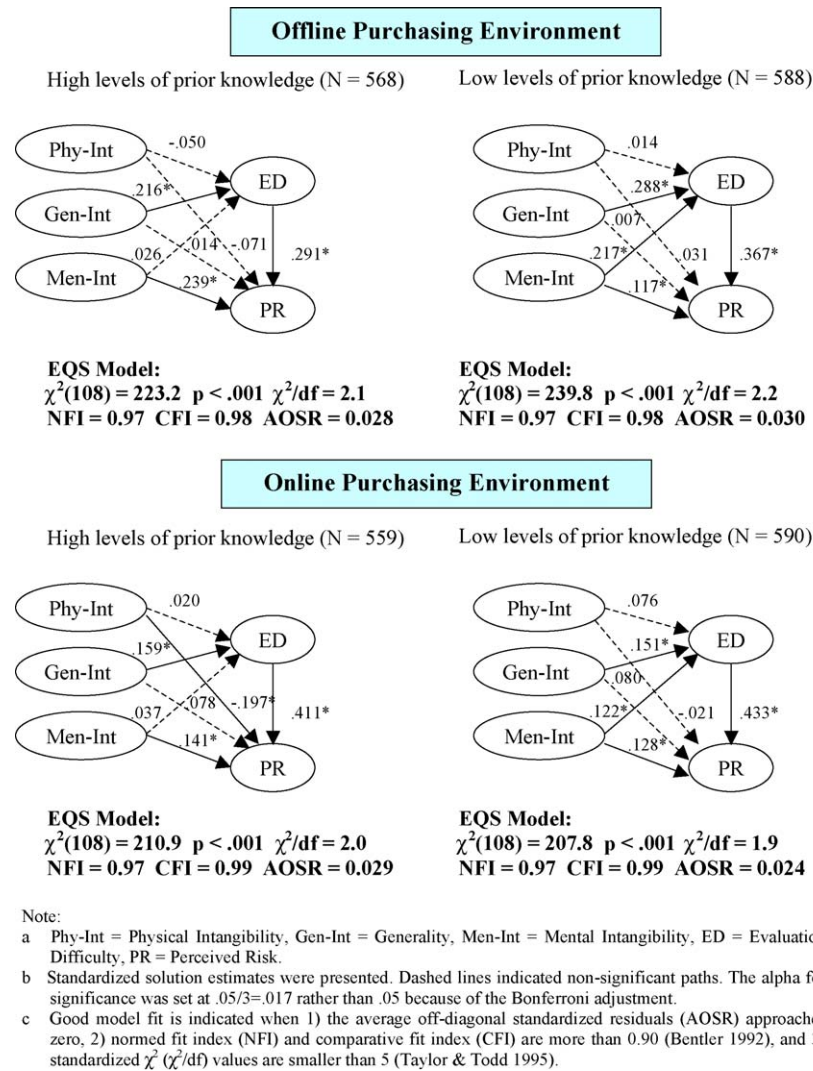


Fig. 4. High- and Low-knowledgeable Consumers Baseline Models.

and CFI = 0.98; low-knowledge:  $\chi^2/df = 2.2$  and CFI = 0.98) and the online context (high-knowledge:  $\chi^2/df = 2.0$  and CFI = 0.99; low-knowledge:  $\chi^2/df = 1.9$  and CFI = 0.99). All measurement paths in these four models were significant, each with four out of seven significant structural paths. The difference between high- and low-knowledge models in each purchasing mode will be discussed later.

#### Testing hypotheses 5, 6, 7, and 8

We predicted that the strength of (1) the influence of the intangibility dimensions on ED and PR, and (2) the relationship between ED and PR would be different across online and offline conditions. Looking back at Fig. 3, we found that the offline model and the online model were different in two paths. Specifically, physical intangibility had a significant impact on PR in an online condition ( $-.110, p < .001$ ); however, such relationship was not statistically significant in an offline environment ( $-.028, p > .15$ ); thus, lending strong support for H5. The other difference was for the mental

intangibility–ED relationship, with a significant path showing up in the offline mode ( $.112, p < .001$ ) but no such link in the online mode ( $.075, p > .15$ ). Therefore, H7 was supported. To test other hypotheses, we conducted a multiple-group analysis, where we tested the equality of both measurement and structural paths across purchasing modes, by imposing equality constraints on common significant parameters of the offline and the online models (Byrne 1994). The results suggested that some aspects of the models were indeed structurally different (see Table 3). Three out of fifteen parameters were found to be noninvariant between the offline and the online models: (1) The path between generality and ED latent factors ( $\chi^2 = 6.11, p < .015$ ), (2) The path between ED and PR latent factors ( $\chi^2 = 6.18, p < .015$ ), and (3) The path between the fourth measurement pr4 and the latent construct PR ( $\chi^2 = 20.41, p < .001$ ). The first two noninvariances were consistent with our H6 (Offline: .342 vs. Online: .231) and H8 (Offline: .337 vs. Online: .438), respectively; thus lending strong support for these two hypotheses.

Table 3

Testing the invariance of paths between offline and online models

| Path <sup>a</sup>  | $\chi^2$ | <i>p</i> -value <sup>b</sup> | Path <sup>a</sup> | $\chi^2$ | <i>p</i> -value <sup>b</sup> |
|--------------------|----------|------------------------------|-------------------|----------|------------------------------|
| phy-int2 → Phy-Int | 1.05     | .311                         | ed4 → ED          | .23      | .631                         |
| phy-int3 → Phy-Int | .99      | .320                         | pr2 → PR          | .18      | .670                         |
| gen-int2 → Gen-Int | .26      | .610                         | pr3 → PR          | 1.22     | .270                         |
| gen-int3 → Gen-Int | .04      | .848                         | pr4 → PR          | 20.41    | .000                         |
| men-int2 → Men-Int | .04      | .852                         | Gen-Int → ED      | 6.11     | .016                         |
| men-int3 → Men-Int | .16      | .658                         | Men-Int → PR      | .23      | .630                         |
| ed2 → ED           | 3.68     | .063                         | ED → PR           | 6.18     | .013                         |
| ed3 → ED           | .22      | .641                         |                   |          |                              |

Fit indices of the invariance test<sup>c</sup> $\chi^2(230) = 708.51, p < .001; \chi^2/df = 3.1; NFI = .98; CFI = .98$ <sup>a</sup> Phy-Int: physical intangibility, Gen-Int: generality, Men-Int: mental intangibility, PR: perceived risk, ED: evaluation difficulty. Numbers referred to the position of the manifested item in each latent construct.<sup>b</sup> Shaded areas indicated significant difference between the pair of causal paths. The alpha for significance was set at .05/3 = .017 rather than .05 because of the Bonferroni adjustment.<sup>c</sup> Good model fit is indicated when normed fit index (NFI) and comparative fit index (CFI) are more than 0.90 (Bentler 1992) and standardized  $\chi^2$  ( $\chi^2/df$ ) values are smaller than 5 (Taylor & Todd 1995).

### Hypotheses 9 and 10

It was hypothesized that the impact of physical intangibility and mental intangibility on ED and PR would be moderated by consumers' prior knowledge of the good/service. In the offline purchasing situation, as shown in Fig. 4, mental intangibility had a significant influence on ED for consumers with low levels of prior knowledge (.217,  $p < .001$ ), but no such significant effect was found for consumers with high levels of prior knowledge (.026,  $p > .15$ ); therefore, H10 was supported. The path from physical intangibility to PR, however, was found to be statistically insignificant for both high- and low-knowledge models in the offline mode even though the estimates were in the hypothesized direction (high-knowledge:  $-.071, p > .15$ ; low-knowledge: .031,  $p > .15$ ); therefore, H9 was partially supported. This insignificant relationship between physical intangibility and PR was probably due to the dominant impact of mental intangibility (high-knowledge: .239 on PR,  $p < .001$ ; low-knowledge: .217 on ED and .117 on PR,  $p < .001$ ). It showed that physical dimension of a product might not be enough to compensate for a lack of a clear mental representation. To further make group comparisons, we conducted a multiple-group analysis to test the equality of the common significant paths across high- and low-knowledge models for the offline purchasing condition. Consistent with our expectations, results (see Table 4) revealed that measurement loadings were invariant while two structural paths were different across these two models: (1) the path between mental intangibility and PR latent factors ( $\chi^2 = 8.47, p < .010$ ), and (2) the path between ED and PR latent factors ( $\chi^2 = 6.12, p < .015$ ); thereby providing further support for H10.

In an online purchasing environment, as indicated in Fig. 4, physical intangibility had a significant negative impact on PR ( $-.197, p < .001$ ) for respondents with high levels of knowledge but not for those with low levels of knowledge ( $-.021, p > .15$ ); thereby lending strong support for H9. Mental intangibility had no significant impact on ED (.037,

$p > .15$ ) for high-knowledge respondents but such relationship was significant for low-knowledgeable subjects (.122,  $p < .001$ ), whereas the effects of mental intangibility on PR were invariant for both groups (high-knowledge: .141 vs. low-knowledge: .128,  $\chi^2 = .73, p > .15$ ). Accordingly, H10 was supported. Additional constraints were added to test for equality of the common parameters across high- and low-knowledge models in the online context. In this subsequent test of invariance, all the equality constraints held, except for the path between the third measurement phy3 and the latent construct of physical intangibility ( $\chi^2 = 6.37, p < .015$ ); thus lending support for both H9 and H10 in an online form.

Taking the results from both offline and online purchasing modes into account, we concluded that H9 was partially supported, while H10 was strongly supported.

### Discussion

The objective of Experiment 2 was to determine if the results found in Experiment 1 were robust when the types of risks were used as indicators of perceived risk in our framework. By using a set of product stimuli different from Experiment 1 (i.e., Internet browsers was used to replace haircut), the results of Experiment 2 replicated those found in Experiment 1, indicating that three unique dimensions of intangibility exist, and each dimension impacts evaluation difficulty and/or perceived risk in a different way. However, the strength of the intangibility–ED–PR relationship depends on both purchasing environments and consumers' prior knowledge.

Specifically, compared with the traditional bricks-and-mortar retailers, the online purchasing not only reduces the direct influence of generality on ED at a significant level, but also diminishes the impact of mental intangibility on both ED and PR in a dramatic way. These findings provide empirical evidence to show that the Internet, in comparison with the bricks-and-mortar stores, is powerful and efficient in provid-



Table 4  
Testing the invariance of paths between high- and low-knowledge models

| Path <sup>a</sup>   | $\chi^2$ | <i>p</i> -value <sup>b</sup> | Path <sup>a</sup> | $\chi^2$ | <i>p</i> -value <sup>b</sup> |
|---|----------|------------------------------|-------------------|----------|------------------------------|
| Offline   |          |                              |                   |          |                              |
| phy-int2 → Phy-Int  | .25      | .617                         | ed4 → ED          | 2.29     | .130                         |
| phy-int3 → Phy-Int  | 3.09     | .079                         | pr2 → PR          | .28      | .600                         |
| gen-int2 → Gen-Int  | .091     | .763                         | pr3 → PR          | .02      | .901                         |
| gen-int3 → Gen-Int  | 4.93     | .026                         | pr4 → PR          | .03      | .865                         |
| men-int2 → Men-Int  | 1.04     | .307                         | Gen-Int → ED      | 2.29     | .130                         |
| men-int3 → Men-Int  | 1.45     | .228                         | Men-Int → PR      | 8.47     | .004                         |
| ed2 → ED  | .94      | .332                         | ED → PR           | 6.12     | .014                         |
| ed3 → ED  | .51      | .477                         |                   |          |                              |
| Fit indices of the invariance test <sup>c</sup>                         |          |                              |                   |          |                              |
| $\chi^2(235) = 497.34, p < .001; \chi^2/df = 2.1; NFI = .97; CFI = .98$ |          |                              |                   |          |                              |
| Online  |          |                              |                   |          |                              |
| phy-int2 → Phy-Int  | 3.86     | .050                         | ed4 → ED          | .64      | .423                         |
| phy-int3 → Phy-Int  | 6.37     | .012                         | pr2 → PR          | .44      | .507                         |
| gen-int2 → Gen-Int  | .17      | .678                         | pr3 → PR          | .90      | .344                         |
| gen-int3 → Gen-Int  | 2.90     | .089                         | pr4 → PR          | .91      | .341                         |
| men-int2 → Men-Int  | 4.59     | .032                         | Gen-Int → ED      | .32      | .570                         |
| men-int3 → Men-Int  | 3.87     | .049                         | Men-Int → PR      | .73      | .393                         |
| ed2 → ED  | 4.05     | .044                         | ED → PR           | .03      | .857                         |
| ed3 → ED  | .03      | .859                         |                   |          |                              |
| Fit indices of the invariance test                                      |          |                              |                   |          |                              |
| $\chi^2(235) = 457.49, p < .001; \chi^2/df = 1.9; NFI = .97; CFI = .99$ |          |                              |                   |          |                              |

<sup>a</sup> Phy-Int: physical intangibility, Gen-Int: generality, Men-Int: mental intangibility, PR: perceived risk, ED: evaluation difficulty. Numbers referred to the position of the manifested item in each latent construct.

<sup>b</sup> Shaded areas indicated significant difference between the pair of causal paths. The alpha for significance was set at .05/3 = .017 rather than .05 because of the Bonferroni adjustment.

<sup>c</sup> Good model fit is indicated when normed fit index (NFI) and comparative fit index (CFI) are more than 0.90 (Bentler 1992) and standardized  $\chi^2$  ( $\chi^2/df$ ) values are smaller than 5 (Taylor & Todd 1995).

ing, screening, and categorizing appropriate information for consumers to facilitate their evaluation process. This minimizes the effort and reduces the uncertainty in the process of forming the consideration set, as well as making the final purchase decision. In turn, this helps diminish the perceived risk caused by the intangible attributes of the product. However, this does not necessarily mean the overall risk level will be lower in the online versus the offline purchase. In contrast, our model suggests a stronger association between ED and PR in an online versus an offline purchasing. Consistent with our expectations, a review of the mean scores for intangibility dimensions and perceived risk showed that perceived risk was significantly greater for the online versus the offline environments ( $M_{\text{offline}} = 2.87$  vs.  $M_{\text{online}} = 3.81$ ,  $t = -12.8$ ,  $p < .001$ ), whereas no significant difference was found in any of the three intangibility scale means across these two purchase situations (all  $ps > .15$ ). These results brought empirical evidence to Cox and Rich's (1964) argument that intangible channels may be perceived riskier than retailers with physical evidence.

This finding also indicates that while intangibility does influence perceived risk in the online environment it is apparent that other factors might be influencing perceived risk as well, relative to the offline environment. Privacy and security concerns may be two of them in driving consumers to perceive higher level of risks in the Internet transactions (Hoffman et al. 1999; Miyazaki & Fernandez 2001) in addition

to the fact that virtual shops do not offer as many tangible cues as the traditional bricks-and-mortar stores. To better understand the intangibility–ED–PR model in the online environment it would be appropriate to incorporate privacy, security and other moderators into the model in future research.

As for the physical intangibility–PR relationship, congruent with our expectations, no significant negative association was found between physical intangibility and PR in an offline environment but such relationship existed in an online condition. The lack of a significant relationship between physical intangibility and PR in an offline environment indicated that the effect of physical intangibility may depend on mental intangibility. In particular, with the inclusion of mental intangibility in our offline model (.112 and .174 with ED and PR, respectively), the physical dimension of a good/service might not be enough to compensate for a lack of a clear mental representation. For example, the fact that a computer has a physical entity that is accessible to the senses does not make evaluation any less difficult if one does not know how the computer works. Thus, it is not surprising to see physical intangibility takes a less influential place in determining the level of PR than does mental intangibility. This explanation can be first demonstrated by the results of the online model, which showed a more influential effect of the physical dimension accompanied by a much weaker impact of the mental dimension on ED, and second by the difference in the causal paths

between high- and low-knowledge models, which consistently showed that prior knowledge simultaneously reduces the influence of mental intangibility and increases the influence of physical intangibility on PR in both online and offline purchasing.

In sum, the results of Experiment 2 provide further support of our framework. In addition, they provide an explanation for the asymmetric causal paths found in the intangibility–ED–PR model across purchasing modes and between high- and low- knowledge consumers.

### General discussion

This research aims to contribute to recent research in service marketing by documenting the effects of intangibility dimensions of goods/services on evaluation difficulty and perceived risk. Our findings also document significant differences across bricks-and-mortar retailers and the Internet. The results of our research suggest that these differences can be explained by the unique characteristics and functions of these two purchasing media. Moreover, consumers' prior knowledge is of critical importance in attenuating the impact of intangibility on ED and/or PR; thereby providing useful suggestions for marketing practitioners.

#### *Theoretical implications*

Our findings, together with the recent study by Laroche et al. (2001), clearly points to the importance of examining the multidimensional structure of intangibility and its consequences. Although many researchers have studied the impact of intangibility on evaluation difficulty (Murray 1991), and perceived risk (Murray & Schlacter 1990), they studied them independently and they have not investigated the relationships proposed in this research. Guided by the previous work that explored intangibility either as a unidimensional construct or as a two-dimensional construct, we were able to examine the effects of the three separate dimensions of intangibility on ED and PR simultaneously. The results of two experiments showed that mental intangibility has direct impact on both ED and PR, while generality directly influences ED and indirectly influences PR via ED. Physical intangibility was found to slightly reduce PR but not ED; therefore, the previously found effect of physical intangibility on ED (McDougall 1987; McDougall & Snetsinger 1990; Zeithaml 1981) was not supported. This is quite logical because when mental intangibility has a dominant impact on ED, the physical dimension of a good/service may not be enough to compensate for a lack of a clear mental representation. Consistent with our explanation, physical intangibility showed a weak but significantly negative impact on perceived risk in the online environment, where the impact of mental intangibility on ED was not strong.

Another important finding was obtained for the moderating effects of purchasing environments on the associa-

tion among the intangibility dimensions, ED, and PR. As expected, the Internet helps lower the impact of both mental intangibility and generality on ED and PR. This conclusion intuitively makes sense since a virtual market allows for proper access to and screening of a plethora of information available to the user, thus minimizing the impact of mental intangibility and generality associated with goods and services on ED and PR to a great extent in an online operation. Although this may make the evaluation easier for online buyers than for their offline counterparts, consumers will still perceive the transaction riskier in an online than in an offline environment. As expected, we found that the strength of the positive relationship between ED and PR in an online mode was greater than that in an offline mode.

This augmented effect of evaluation uncertainty on PR may be mainly caused by the intangible characteristics of the Internet and consumers' concerns about security and privacy. On one hand, cues like physical proximity, handshakes, body signals, and the use of the five human senses (sight, hearing, smell, taste, and touch) are not available to the parties dealing with a transaction in a virtual market to facilitate the creation of a trust-based partnership (Clarke 1997; Nohria & Eccles 1992). Consumers who do not have much Internet knowledge and experience may perceive online purchasing too mentally intangible. As a result, the uncertainty of good/service evaluation may be further amplified by the feeling of insecurity in the technology used to facilitate the transaction. On the other hand, factors other than intangibility, such as privacy and security concerns, are likely to influence perceived risks in the online environment (Miyazaki & Fernandez 2001). Yoon (2002), for instance, finds that Web site trust, which includes security and Web site properties, is significantly related to online purchase intentions and Web site satisfaction.

Finally, the exploration of the moderating role of prior knowledge was also particularly fruitful. Prior knowledge was found to be a significant moderator of the proposed model in both buying mediums, with weaker impact of mental intangibility on ED and PR for consumers who have high levels of prior knowledge. These findings are in line with previous research (Breivik et al. 1998; Zeithaml et al. 1993). Different from mental intangibility, physical intangibility is negatively correlated to PR only for high-knowledge consumers and only in the online purchasing mode. This shows that tangible physical evidence of a product, when sold online, increases perceived risk for those people who have high level of knowledge and/or experience on that product. Although intuitively surprising, this is consistent with our argument that the effect of physical intangibility depends on mental intangibility. On one hand, the lack of physical evidence of an object may push those consumers who are familiar with and have a clear mental representation about the product, when making a decision, to rely more on their prior knowledge and/or the appropriate information available through the Internet instead of assessing the physical attributes of that object. This will make the evaluation process easier and improve the consumers' confidence in their ability to make a correct purchase. On the

other hand, the physical presence of the product may involve effortful comparisons between consumers' mental representation of that product and the actual cues they are examining, which may end up with some conflicts and in turn yield more uncertainty in the evaluation process and enhance perceived risk.

### *Managerial implications*

First, the study affirmed that there are significant differences in the offline and online retail mediums. Although the Internet is recognized as an ineffective means of communicating physical cues (Berthon et al. 1999), it does not necessarily make the purchase of goods/services any more difficult to evaluate. In purchasing physically intangible goods/services, people tend to rely on experiential cues to make a choice. Therefore, it might be profitable for service providers to offer customer testimonials to help consumers develop a sense of knowledge toward the good/service. Second, our research also revealed that the impact of mental intangibility and generality on ED and PR could be lessened by the Internet. This suggests that online retailers have to pay attention to the volume, style, categorization, and access of the information presented on their Internet Presence Sites (IPS-corporate Websites). Online retailers can make their IPS an appealing alternative to the bricks-and-mortar storefronts by enabling consumers to access a good/service unavailable in their local markets, gather real information about merchandise at a low cost, efficiently screen the offerings of a broad cross-section of suppliers by avoiding unwanted alternatives and unimportant features, and easily locate the lowest price at which a specific item is offered.

Third, we found that despite the wider acceptance of the Internet, online purchases are still perceived as riskier than offline purchases. The research would suggest that the unknown properties of the Internet and consumers' privacy and security concerns, not the actual medium itself, make online commerce more intimidating. Thus, the focus of online retailers must be to facilitate the first few online purchases. On one hand, online marketers can utilize the interactive nature of the Web to facilitate communications with prospective consumers, by either providing "virtual advisors", or offering customer testimonials. On the other hand, online marketers need to convince the potential consumers of the policies, methods, equipment, and specific remedies applied by their companies to protect consumers' privacy and to assure security of the transactions. If retailers can facilitate the first interaction, they may be able to lessen the negative impact of the intangible medium, and foster a trusting relationship (Ratnasingham 1998).

Furthermore, one of the implications for both online and offline marketers is that they should apply appropriate strategies to each good/service individually according to its intangibility levels. The individualization of intangibility is necessary in the sense that each good/service is different, especially when taking virtual products into consideration.

Some virtual goods (e.g., electronic games) follow almost the same pattern as very intangible services on physical intangibility, while other virtual products (e.g., CDs) are more characterized as a traditional form in this respect. The same variance also exists among services. Therefore, marketers should acquire an understanding of how physically intangible, mentally intangible, and general their goods/services are. It will be helpful for them to position these goods/services on an intangibility map before any marketing promotion campaign or strategic planning is implemented. In addition, our study also suggests that retailers perhaps should place much more attention on minimizing the effects of mental intangibility than on minimizing the effects of physical intangibility of a good/service. Mental intangibility plays a more dominant role in determining evaluation difficulty and perceived risk than does physical intangibility. Nowadays, consumers are faced to a larger extent with physically intangible products and services (e.g., information products) that are also very new and difficult to conceptualize. As such, adapting to this trend, and mentally tangibilizing their physically intangible goods and services may better serve marketers in the future.

Lastly, this study indicated that prior knowledge plays an important moderating role on the effect of intangibility on ED and PR. Hence, retailers should utilize marketing promotions to establish and increase the mental representation of the merchandise in the consumers' mind, thus diminishing the evaluation difficulty and risk that consumers will experience when making a purchase. Free trials for new purchasers, imaginary or vivid information cues, customer testimonials, and/or salespersons' advice are good approaches in this respect since they can help consumers develop a sense of knowledge and experience through a direct or an indirect channel.

### **Limitations and future research**

This study invites further examination of potential effective moderators and more powerful variable measurements that may influence the examination of the relationship among intangibility, ED, and PR. Of these issues, some of them are particularly interesting.

One issue that was not examined in the current research was the measure of the perceived intangibility of the Internet. Although respondents may have similar scales about how physically intangible it is, they may rate its mental intangibility differently because of their knowledge of the Internet. Knowledge of and experience with the Internet make the information search much less time and effort consuming, freeing up cognitive resources needed to make an informed and appropriate decision (Roberts & Nedungadi 1995; Sambandam & Lord 1995). Bezjian-Avery, Calder, and Iacobucci (1998) also find that experience with the Internet may play a significant role in determining the level of success that the implementation of an interactive format would have with online advertising. Therefore, it would be worthwhile

to investigate the influence of this variable on the proposed model in future research.

A second issue concerns the pencil-and-paper survey method used for testing online purchasing in Experiment 2. Further research should look at testing the intangibility–ED–PR relationship using an online questionnaire, and measuring a number of potential moderators such as privacy and security concerns. Moreover, with the assistance of a well-designed computer-based game, we may record the length of time the subjects will take to make decisions for several products with varying degree of intangibility dimensions.

A final issue is the use of a convenience sample. Although it is acceptable for this exploratory research (Calder, Phillips, & Tybout 1981), our sample of students does not amply reflect the consuming population. It is conceivable that students may only represent medium to strong Internet users. Therefore, a more realistic environment could involve households with some Internet knowledge who have a more precise representation of certain goods and services.

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