Forecasting Consumer Perception of Innovativeness

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Abstract

How innovative is a new product to consumers? *Why* is it perceived to be innovative and does perceived innovativeness affect consumer intention to adopt new products? Some investigations have explored consumers' perceptions of innovativeness, but this research is fragmented and contains no comprehensive definition and examination of the construct of "consumer perceived innovativeness" (CPI — how innovative the product is from the consumer's perspective). This study proposes a new conceptualization for CPI based upon extant theory, qualitative research and two quantitative pilot studies. It then identifies and tests key causes and consequences of CPI on a national sample of consumers using a range of different innovations. This allows addressing the "so what?" (consequences) and the "how do you manage it?" (causes). The research extends work in the new product development area by i) defining CPI within its nomological net and proposing an operational measure based on psychometric testing, ii) suggesting that affect is more usefully viewed as a consequence of CPI rather than a dimension, and iii) highlighting the important, yet often overlooked role, of perceived technology newness. These findings provide managers with a useful and practical theory for understanding and influencing consumer perceptions of a product's innovativeness.

Keywords: consumer perceived innovativeness, newness, relative advantage, innovation adoption

Introduction

Scholarship in innovation has increasingly sought to understand diffusion of new products by examining individual consumer behavior processes (Alexander, Lynch, and Wang, 2008; Eriksson and Nilsson, 2007; Hoeffler, 2003), whereby an innovation is only new if it is *perceived* to be new by consumers (Rogers, 2003). But *how new is "new"?* Or, in terms of this study's focus, how innovative is an innovation? A better understanding of consumer perception of innovativeness may help to explain and forecast consumers' unanticipated and often negative reactions to new products that firms had expected would be successful (perhaps based on management's perception of the product's innovativeness), and as such, provides an important and distinct contribution to the literature on consumer acceptance of innovations and innovation management. New product and service idea screening continues to attract a significant level of research attention, and originality, uniqueness and value to the consumer remain key criteria by which innovations are assessed and judged (Magnusson, Netz and Wastlund, 2014).

The literature contains neither agreement as to how to define and measure perceived innovativeness nor an existing model of its antecedents and consequences. The limited research in the area of consumer perceptions of innovations, and its potential importance, is reinforced by Rogers (2003, p. 96), who argues that most innovation studies examine the issue of who adopts innovations, yet only a minority examine *attributes of innovations* that may lead to faster diffusion (e.g., how innovative a product is perceived to be). The purpose of this study is to address two main research questions: (1) What is perceived innovativeness and how should researchers define, conceptualize and measure it? and (2) What are the antecedents and consequences of perceived innovativeness and how can the relevant constructs be put together into a logical and useful theory to better understand consumer reactions to innovations?

This study contributes to the literature on consumer acceptance of innovations by developing a model of *consumer perception of innovativeness*, starting with introducing a conceptualization of consumer perceived innovativeness (CPI), testing alternative conceptualizations, extending that into a full model of consumer perception of innovativeness (with antecedents and consequences), and measuring and testing the CPI conceptualization and the full model. The study also is the first to show how affect is an important aspect of the innovation evaluation process. A better understanding of the consumer side of innovation may also help explain the somewhat inconsistent relationship between product innovativeness and new product success (Henard and Szymanski, 2001; Szymanski, Kroff, and Troy, 2007; Verdegem and De Marez, 2011). However, still the literature provides little consensus on *how consumers perceive innovations* (Garcia and Calantone, 2002), and specifically, little consensus on what innovativeness is, as rated by consumers. Therefore, this study contributes to the literature on innovation management by addressing calls from significant and highly cited studies in the field to "…examine the dimensions and effects of the newness of products to their prospective customers." (Danneels and Kleinschmidt, 2001, p. 371).

This article begins by distinguishing between the related concepts of product innovativeness and perceived innovativeness, and then identifies the important constructs involved in examining CPI through qualitative research. Two pilot studies are then designed to compare competing conceptual models derived from the literature and the qualitative research study (pilot study 1), and to test the stability over time of the new measures developed (pilot study 2). The findings from the pilot studies are then integrated with literature in the area of consumer innovation adoption to organize CPI and its related constructs into a theory of causes and effects. This research decomposes attitudes into hedonic and utilitarian components using the HED-UT scale (Voss, Spangenburg, and Grohmann, 2003) to show how innovations evoke affective as well as

cognitive responses. These relationships are tested quantitatively on a national sample to provide confirmatory evidence of the relationships proposed (main study), including tests of moderating links from key constructs such as perceived complexity, personal relevance and perceived risk.

Product innovativeness and perceived innovativeness

Product innovativeness

Researchers have often studied consumer acceptance of innovations in relation to product innovativeness. Products may be incrementally new, really new, or radically new, depending on whether they are marketing innovations or technology innovations and whether they are macro level or micro level innovations (Garcia and Calantone, 2002). However, this categorization does not address the issue of newness to the customer, *as rated by consumers*, and "although the consumer-oriented approach has been endorsed by some advertising and marketing practitioners, it has received little systematic research attention" (Schiffman and Kanuk, 2004, p. 520).

Product innovativeness is often related to i) key innovation characteristics (i.e., relative advantage, compatibility, complexity, trialability and observability), ii) adoption risk, and iii) the degree of change from established behaviour patterns (Danneels and Kleinschmidt, 2001). However, Danneels and Kleinschmidt's (2001) conceptualization of product innovativeness has yet to be directly tested empirically. Their exploratory analysis was based on secondary data from new product development managers, obtained through the NewProd II database from the 1980s. Other perspectives in the contemporary consumer behavior literature (e.g., Hoyer and MacInnis, 2008) typically view factors such as compatibility, trialability, and complexity as consumer learning requirements that influence the speed of diffusion, rather than as dimensions of innovativeness *per se*. Such complex relationships between a variety of closely related and often

discussed concepts remain to be empirically examined in relation to perceived innovativeness *as perceived by consumers*.

New product development researchers have worked on empirical measures of product innovativeness (see Garcia and Calantone, 2002 for a review and reconceptualization of prior studies) derived from more consumer-oriented measures. For instance, Gima (1995) provides measures of, and empirically distinguishes between, newness to the customer and newness to the firm, defining newness to the customer as the degree of effort required to adopt a new product. Other new product development researchers have defined product innovativeness as new product creativity (Moorman, 1995; Moorman and Miner, 1997), novelty (Andrews and Smith, 1996; Sethi, Smith, and Park, 2001), a combination of product superiority to the customer and adoption difficulty to the customer (Lee and O'Connor, 2003), or a combination of the extent to which the new product "…offers new benefits, incorporates new features, is superior to other products, and requires change in consumer attitude, behavior, and learning effort…" (Talke and O'Connor, 2011). Some new product development researchers view product innovativeness as a separate, singular construct consisting of three dimensions (technological discontinuity, market discontinuity, and customer discontinuity) that is distinct from related constructs such as product advantage (McNally, Cavusgil, and Calantone, 2010). On the other hand historical innovation scholars (Chandy and Tellis, 2000; Sorescu, Chandy, and Prabhu, 2003) have typically used retrospective classifications based on experts as raters (e.g., academics or information obtained from public bodies such as the Food and Drug Administration), and define innovativeness as "the extent to which the technology involved in a new product is different from prior technologies [and] the extent to which the new product fulfils key customer needs better than existing products" (Chandy and Tellis, 1998). Likewise, Sorescu and Spanjol (2008, p. 115) define breakthrough innovations as "…new products that are the first to bring novel and significant

consumer benefits to the market…" and incremental innovations as "…new products that do not deliver novel and significant consumer benefits to the market…", explicitly recognizing the role of novelty and superior consumer benefits. However, many of these studies, while acknowledging the importance and necessity of the consumer's perspective, use *managers* or *experts* as raters, not consumers. One exception, which compares the responses of expert raters with those of the general public, for a new lottery concept, found that experts were no more accurate in their predictions of the success of a new concept (Faulkner and Corkindale, 2009). As pointed out by Szymanski et al. (2007, p. 50), "…studies on product innovativeness rely almost exclusively on managers' perceptions of consumers' views of innovativeness." Furthermore, the variety of somewhat different conceptualizations is also evident.

Sorescu et al. (2003) specifically highlight the prevalence of such methodological issues, noting the limitations of managerial raters (e.g., self-report bias) and expert raters (e.g., memory and retrospection bias) in evaluating product innovativeness, but do not contrast these raters with consumer raters. Using managers as raters is typically justified on the basis of managers' collective wisdom about their customers (Lee and O'Connor, 2001). Yet pilot studies show that managers' perceptions of product innovativeness explain only 56% of the variation in consumer perceptions of innovativeness (Andrews and Smith, 1996; Sethi et al., 2001).

It is likely that some degree of correlation exists between manager and consumer ratings, but if so, it is evidence of predictive validity rather than construct validity. In fact, one study makes this point by depicting that product innovativeness leads to perceived innovativeness in their reconceptualization of product innovativeness (Garcia and Calantone, 2002). The fate of innovations such as the Segway personal transporter may be the result of managers tending to systematically overweight the value of their innovations while consumers tend to systematically underweight the value of these innovations because of loss aversion (Gourville, 2006). Perhaps

managerial overvaluing occurs especially in the case of new technology, which managers understand better than consumers. This leads to the question of what constitutes perceived innovativeness and how researchers should define, conceptualize and measure it. The perspective taken here aligns with Daneels and Kleinschmidt (2001, p.362) who state "…customers themselves are the only proper informants regarding how new they perceive a new product to be, and in what ways it is new to them…".

Perceived innovativeness

A main approach has been to define perceived innovativeness by how new a product is. In one investigation, respondents rated perceived innovativeness by entering a value between 0 and 99 to reflect the product's relative newness (Hoeffler, 2003). Another view from prior research is that perceived innovativeness is a formative construct comprising a combination of (1) an overall measure determining how new the product is perceived to be, and (2) the extent to which the innovation would change consumption patterns (Olshavsky and Spreng, 1996). Other investigators include an item asking respondents how different the innovation is from products they currently know about (Moreau et al., 2001). More recently Alexander et al. (2008) measure perceived innovativeness using two items to reflect the benefits of the new product and two items to reflect the impact of the product on their consumption experience. Including perspectives from studies which use managers as raters of consumers' perceptions, the literature still seems unclear on this issue. In general, innovativeness from the consumer's perspective (though measured with managers) has been viewed along two broad dimensions, defined by some as novelty and meaningfulness (Sethi et al., 2001), and defined by others as superiority to the customer and adoption difficulty (Lee and O'Connor, 2003).

These studies have made a variety of contributions to our understanding of perceived

innovativeness, but they are sometimes inconsistent and the measures used have not been subject to psychometric development and testing. Specifically, the literature exhibits inconsistency on what items and response scales are appropriate to measure perceived innovativeness, inconsistency in raters, lack of clarity on whether perceived innovativeness is a unidimensional or multidimensional construct, and lack of clarity on how researchers should define perceived innovativeness conceptually. Finally, prior research contains no formal attempt at psychometrically developing and evaluating a measure of perceived innovativeness.

The literature presents a variety of different terms and definitions for what appears to be the same construct. For example, Gima (1995) measures product newness as "the extent to which the new product is compatible with the experiences and consumption patterns of potential customers", Moorman (1995) and Moorman and Miner (1997) measure new product creativity, Olshavsky and Spreng (1996) measure perceived innovativeness, Moreau et al. (2001), using measures from Olshavsky and Spreng (1996), measure innovation continuity, and Hoeffler (2003) and Alexander et al. (2008) measure perceived newness. The study here labels the construct as consumer perceived innovativeness – CPI – to acknowledge the object of the evaluation, the attribute being evaluated, and the rater.

Qualitative research: The consumer perceived innovativeness core construct

Purpose

So what is CPI? A variety of different definitions and measures have been offered in the literature. However, there is little consistency between definitions and measures, and many of the studies which stress the importance of placing the consumer at the heart of the product innovativeness continuum do not use consumers to inform their definition. To gain a deeper

understanding and to specify the domain of the construct (Churchill, 1979), the first step of this research comprised qualitative interviews with 20 consumers. Respondents were interviewed to ascertain their perceptions of a variety of new products, following a similar procedure to Bruner and Kumar (2007).

Procedure and respondents

This study specifically explored what respondents understood innovativeness to be and what makes a product innovative to consumers. As such broad, open ended questions were designed around this theme, with varying degrees of prompting, when appropriate, for reaction to existing definitions. We first wanted to understand what respondents understood by the term innovativeness, and therefore asked respondents "Consider the word "innovativeness". What does it mean to you?" However, this question was quite broad, so to avoid any difficulties respondents may experience articulating their answers and to focus their attention, a second question with a similar objective asked respondents to "Tell us about an innovative product you have purchased recently. What was this product and why do you think it was innovative?" This question focused respondents on what it was about the innovation that makes it innovative through a concrete example. The aim here was to help anchor respondents' perceptions to factors that specifically contributed towards how innovative a product was perceived to be. The final stage was to present respondents with four different new products (three real and one hypothetical) and to ask them a similar question to examine how innovative they thought these products were, and why.

Given the small sample and the exploratory nature of the study we were not interested in a particular cohort of consumers, but instead tried to contact a broad sample with a range of demographic characteristics. Nine were males and 11 were females, ages ranged from 19 to 60,

and a wide range of occupations and nationalities were covered. We do not make any claims about generalizability here but are instead interested in obtaining initial exploratory insights to test further.

Key findings and insights from the qualitative research

The findings led to some interesting insights about how consumers perceive innovations. Newness has been a key dimension of perceived innovativeness and has been offered as the only dimension in some cases (Hoeffler, 2003; Rogers, 2003). This leads to a definition whereby degree of innovativeness is not a distinct construct but simply equals degree of newness. The qualitative interviews suggest that *innovativeness is more than newness.* To clarify what is meant by newness, it will be defined here as perceived concept newness—how new or different consumers perceive the product concept to be. One of respondents' most frequent comments was that an innovation had to be new. For instance, one respondent commented that an innovation must be "new compared to other products." However, in a number of cases respondents thought that something innovative had to be more than just new. For example, one respondent stated, "It must also be useful to me," and another reacted to a new product example by saying, "The technology is innovative but what extra benefit is there for me?" This view was also apparent in other literature that considers perceived innovativeness to be a two-dimensional construct (Alexander et al., 2008) including a perceived benefit (similar to Rogers' relative advantage). Perceived concept newness seems to be a necessary, but not a sufficient, dimension of CPI. For example, a product concept might be new but might not be regarded as an innovation. A typical example of such products might be a "chindogu" (unusual tool), the Japanese term used to describe innovations with little practical value. An example of a chindogu is the "automated noodle cooler" (chopsticks with a fan). Apparently many Japanese find chindogu charming.

Thus, a true innovation not only has to be new but also must offer a significant improvement to consumers. For instance, one respondent noted that an innovation involves "changing the product or service for the better." However, this observation, along with prior literature, presents a largely cognitive perspective focused around the product's relative advantage, and does not consider any affective dimensions. Interview respondents indicated that high innovativeness would have to extend beyond a purely cognitive set of dimensions, and in fact, some respondents seemed to exhibit an affective reaction to some innovations. For instance, one participant, who perceived a product to be highly innovative, responded by saying, "Tiny enough to put on your fingertips. Wow!" indicating a degree of excitement and an affective response to the innovation. Apparently consumers not only categorize the product as either existing or new, but they also evaluate its degree of innovativeness. Only radical innovations can generate a "Wow!" response.

Deriving a definition and measure of CPI is challenging in that it requires sorting out a number of related dimensions, and individuals may weight different dimensions differently. For example, individual respondents varied widely in how innovative they perceived the new products to be. However, one respondent's comment illustrates a common theme among respondents: "On deeper reflection it was brought back down to 'what's in it for me?' It is different, new and exciting but just a watch." Another respondent commented, "Newness and usefulness will attract my attention and this [the innovation] is not useful." A different respondent commented that an innovation "must also be useful to me."

These responses demonstrate that for the benefits of newness to translate into purchase intention, an innovation cannot just be new but must also have a relative advantage and personal relevance. However, it was unclear from the qualitative research whether personal relevance was a dimension of CPI or whether relevance moderates the link between CPI and an innovation's desirability. Consideration of the desirability of the new product seems to occur automatically.

That is, in addition to considering "what is it?" people also tend to automatically consider "what use is it to *me*?" or "what of it?" (to me).

One other interesting and important finding to emerge from the qualitative interviews was how individuals might evaluate innovations in terms of their degree of technology newness. Specifically, individuals seemed to attribute innovativeness to new products that reflected some technological advance. For instance, a new chocolate bar carried a promise to contribute to carbon reduction for each one bought. After examining the bar, one respondent commented, "It's just a chocolate." The bar would have seemed more innovative had the product itself been changed or modified in some way. Possibly consumers heavily weight technological newness for innovation, as well as newness in concept and an enhanced benefit. This weighting could have been partially responsible for the success of the Dyson vacuum cleaner, which revolutionized the vacuum industry by providing bagless cyclonic vacuums. Rather than focusing only on the benefit—the relative advantage of a bagless cleaner—Dyson allowed consumers to see how the innovation worked by making the casing transparent and the technology observable.

An even broader concept may have been involved in the respondents' assessments, in that perceived technology newness may be related to the perceived difficulty of creating the innovation. Seemingly easy achievements, such as adding the carbon reduction promise to a chocolate bar, do not earn admiration as much as a difficult technological advance. The greater the sheer intellectual achievement of the innovation, the more consumers give credit for its achievement, and they have less respect for seemingly simple twists that are presented as new. This reaction might be related to the perception of difficulty of manufacture (Johnson and Folkes, 2007), which shares a positive relationship with a consumer's overall evaluation of a brand (Bottomley and Holden, 2001). Therefore, although the technology behind some innovations may not be clearly visible to consumers it appears as if consumers may form a judgment about how

technologically innovative a product is and this perception may influence their evaluations of a product's innovativeness.

This reasoning leads to the premise that *consumers see marketing innovations as easy* to accomplish, whereas they see *technological innovations as difficult* to accomplish. Some literature offers more direct support for the effect of perceived technology newness on perceived innovativeness. For example, firms may sell radical innovations on the basis of the "sophistication and complexity of their technological attributes" (Gima, 1995), and other researchers (e.g., Chandy and Tellis, 1998; Sorescu et al., 2003) have highlighted the importance of technological newness as a factor in determining *objective* measures of product innovativeness. Interestingly, literature implies that technology newness might be viewed *negatively* by consumers. For example, Sood and Tellis (2005), based on a historical analysis of 14 innovations state "Even when a new technology differs radically from an old one, firms try to facilitate consumer adoption by maintaining a uniform interface…". However, the sample size in Sood and Tellis' study was very small and this relationship was never tested on consumers. Therefore, based on the qualitative findings and the discussion above, it is expected that there will be a positive relationship between perceived technology newness and CPI. Research has yet to explore this relationship, and it is further examined in the quantitative phase of the study.

Interestingly, participants in the exploratory study did not bring up perceived complexity. This absence is important, because some research has viewed product innovativeness (from the customer's perspective) as a formative construct consisting of relative advantage and complexity (Lee and O'Connor, 2003). It could be that complexity itself does not have an independent effect on consumer perceptions of innovativeness, but instead moderates the effect of CPI on other constructs such as attitude toward the innovation. This moderating effect would be consistent with theory regarding the diffusion of innovations, which posits that complexity slows down

acceptance (Rogers, 2003), and also consistent with other measures of perceived innovativeness that do not take complexity into account. As such it is proposed that perceived complexity is not part of the core CPI construct and its effect is explored further in the quantitative phase of the study. In light of these findings we now derive a definition of CPI for further quantitative testing.

A definition of Consumer Perceived Innovativeness

To integrate the various conceptualizations in the literature with the findings from the qualitative research, all these considerations are brought together by *conceptually* defining CPI as *the perceived degree of newness and improvement over existing alternatives*. More simply, CPI is perceived degree of "newer and better", or you might say "more than merely new". Though this definition is not entirely new it is useful to contrast it with other definitions within the literature. Specifically the conceptual definition of CPI presented here is most closely aligned with the view of innovativeness in Sorescu and Spanjol (2008) who define it in terms of degree of novelty and consumer benefit. However, Sorescu and Spanjol (2008) use expert raters to measure these dimensions, rather than consumers, and consequently their study does not provide a psychometrically developed survey measure which consumer researchers can use. Therefore, our study complements Sorescu and Spanjol's study because i) a similar definition emerged through independent research based on different research methods, and ii) the definition presented here emerged from consumer research, rather than experts, providing convergence and triangulation on an otherwise fragmented issue of importance in the literature.

A face validity assessment of the new definition was conducted, given the importance of semantic content (wording) for construct definition quality. Five experts who were familiar with the concept of perceived innovativeness and who had published in the area of innovation were contacted and asked to rate six definitions (the new one and five existing ones) in terms of which

most fully captures the domain of CPI. Consistent with other inter-rater reliability studies, it was concluded, based upon agreement amongst the experts (i.e., five out of five judges rated the new definition the highest), that the new definition improved upon existing definitions in capturing the breadth of the domain and represented the domain most satisfactorily.

Two alternative conceptual models

So how do all these different dimensions — perceived concept newness, perceived technology newness, perceived relative advantage, affective response (as in wow or excitement) — fit together, and what is their relationship with CPI? A big question that remains unanswered is whether and which of these dimensions and related constructs are part of the definition of an innovation (i.e., its dimensions), or are better conceived of as proximal antecedents and proximal consequences. That is, the concept of an innovation can be conceived of as a *multidimensional construct*, or a *core unidimensional construct surrounded in its nomological net by proximal antecedents and proximal consequences*. Here, both versions are presented and tested.

This is a central question of this study, whether perceived concept newness, perceived technology newness, perceived relative advantage, and excitement, as well as their related constructs, are dimensions of the definition of an innovation, or whether they are proximal antecedents and proximal consequences. That is, a concept can be either a multidimensional construct or a core unidimensional construct surrounded in its nomological net by proximal antecedents and proximal consequences. Some research has tended to view perceived innovativeness as a multidimensional construct consisting of several different measures. For example, creativity researchers (e.g., Andrews and Smith, 1996; Sethi, Smith and Park, 2001) measure "novelty" using a range of semantic differentials including dull-exciting, fresh-routine, conventional-unconventional etc. This study tests both conceptualizations.

Figure 1 presents model 1 and shows the multidimensional latent variable construct conceptualization. The measures of perceived concept newness, perceived technology newness, perceived relative advantage, and affective response (excitement) vary together with CPI and constitute dimensions of innovativeness. This would be consistent with some existing conceptualizations of the construct (e.g., Alexander et al., 2008; Moreau et al., 2001; Olshavsky and Spreng, 1996), so represents the dominant view in the literature. However, so far this view has not been empirically tested. Figure 2, which presents model 2, shows the conceptualization of overall CPI, or core CPI, with proximal antecedents and consequences. Model 2 is appealing as it presents a clear and understandable logical flow of the antecedents of CPI through CPI to consequences. This is consistent with contemporary consumer behavior theory, such as the standard high involvement hierarchy of effects model, whereby a causal chain of perceptions/cognitions lead to affect (Hoyer and MacInnis, 2008; Schiffman and Kanuk, 2004). It is also consistent with recent research that claims concepts such as product advantage are "…often bundled inappropriately with product innovativeness." (McNally, Cavusgil, and Calantone, 2010, p. 993), and is consistent with findings from the qualitative research which suggests that consumers' affective reactions such as excitement about an innovation should be viewed as consequences of perceived innovativeness, rather than as a dimension. Recent research suggests the importance of including constructs such as excitement when trying to understand innovation adoption (Jia et al., 2012). Model 2 is also more useful to managers as it presents cause and effect and therefore insight into how to improve CPI rating through bolstering its antecedents. Choosing between models 1 and 2 is the first of two steps in developing a theory of consumer perception of innovativeness. These relationships are investigated quantitatively through a survey and analysis of the structural relationships proposed within Figures 1 and 2.

Figure 1 CPI as multidimensional latent construct (model 1)

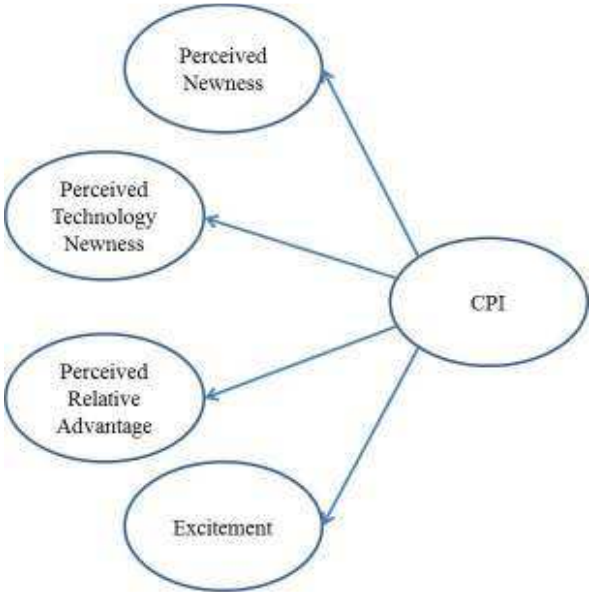
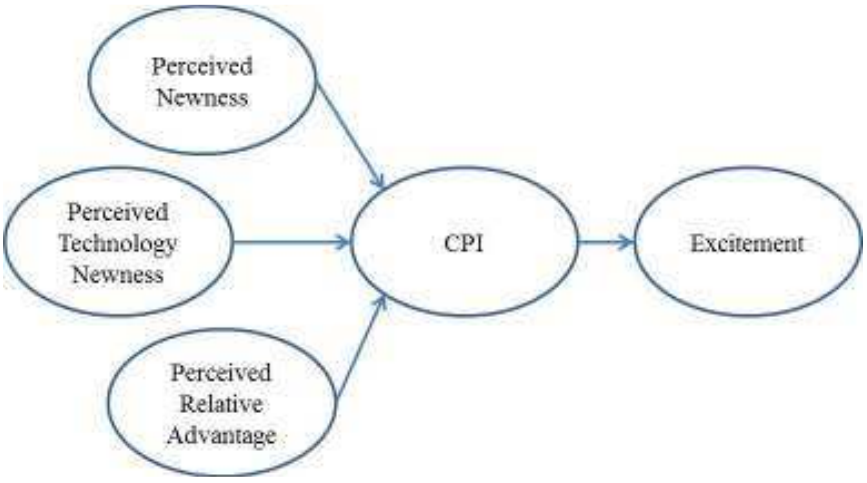


Figure 2 Core unidimensional construct with proximal antecedents and consequences (model 2)



Pilot studies 1 and 2: Measurement model validation, proximal relationships test and measure stability

Pilot study 1 was designed to compare models 1 and 2. It tested and validated scales for CPI, perceived relative advantage, perceived complexity, and perceived technology newness, and

tested, reduced, and validated the scale for perceived concept newness. One key purpose of pilot study 1 was to also assess the dimensionality of CPI through quantitative comparison of the two models. Consequently pilot study 1 both assessed the dimensionality of CPI and examined structural relationships involving its proximal antecedents and consequences. Model 1 and model 2 are each tested and compared using Structural Equation Modeling.

Procedure

Participants were students from a metropolitan university who viewed three new product concept statements, with pictures, and evaluated these products in terms of CPI, perceived newness, perceived relative advantage, perceived complexity, and perceived technology newness. While not wholly representative, a student pilot sample is consistent with other studies that have examined innovation adoption (Kulviwat et al., 2007). One hundred and four students participated in this pilot study.

A search of several well-known websites and publications publicizing new products was undertaken (e.g., Consumer Electronics Association (CES), Popgadget.net, engadget.com, *PC World*, and the *Economist*). This initially yielded a broad cross-section of innovations, which respondents from the exploratory interviews perceived to vary by innovativeness, and which represented different kinds of innovations. The three selected innovations were (1) a new chocolate bar (positioned as eco-friendly and coming with a TerraPass offset of 133 pounds of carbon dioxide reductions—the average American's daily carbon impact), (2) a new memory card for digital cameras (the card stores digital images like conventional cards but also uploads them to the web instantaneously via Wi-Fi so the user no longer has to worry about backing them up), and (3) a new fingernail watch (the watch fits ergonomically to the fingernail—one of the world's smallest watches—and can change colors based on user preferences, become translucent

or illuminate). The products were chosen to represent products that were classified by the authors and the five expert raters at the time of the research as incrementally new, really new, and radically new, following Garcia and Calantone's (2002) definitions.

Measures

Past research provided measures for each of the proposed dimensions, with four items for perceived relative advantage (Gima, 1995), three items for perceived complexity (Gima, 1995), and two items for perceived technology newness (Garcia and Calantone, 2002). Item wording in the pilot study was the same as in the main study and appears in Table 1. An initial 11 item scale for perceived concept newness was based on the semantic differentials provided by Moorman (1995), Moorman and Miner (1997), and Sethi et al. (2001). This scale later became a shorter, more manageable, and less repetitive set of items. The overall CPI measure was a simple, two-item measure: "How innovative is <brand name>? on a seven point scale of 1 = not at all innovative to 7 = extremely innovative, and "<Brand name> is an innovative product?" on a seven point scale of 1 = strongly disagree to 7 = strongly agree. This proposed wording for CPI measurement items is new to the literature, since it is more focused and takes newness out of the overall CPI measure itself. Many similar prior items that purported to measure innovativeness may actually have measured only or mostly newness. For example, Olshavsky and Spreng (1996) had a very similar question wording of "How innovative is it?" but with anchors of "Minor variation of an existing product" to "Completely new product," which seems more a measure of newness. Also, other measurement items in the literature included other dimensions into the CPI measure (e.g., "required a major learning effort," "spawned ideas for other products,").

Results: Dimensionality of consumer perceived innovativeness

The dimensionality of CPI is tested using confirmatory factor analysis (CFA) of the five key constructs following the procedure in Hair et al. 2010. The measurement model produced an acceptable model fit according to standard model fit indicators for measurement models with this number of indicators and this sample size (χ^2 = 307.20, *df* = 120; CFI = .948; TLI = .942; PNFI = .602; RMSEA = .071).

All Cronbach's alpha values were above .74 and most were above .8, suggesting that the items were reliable measures of their respective constructs. The factor loadings indicated that all items loaded clearly on their respective factors. Comparing the variance extracted estimates for each factor with the squared inter-construct correlations associated with that factor tested for discriminant validity (Hair et al., 2010). The average variance extracted (AVE) for each factor was higher than the respective inter-construct correlation, suggesting discriminant validity between the constructs, and all AVEs were above the recommended minimum of .50 (Bagozzi and Yi, 1988), providing further evidence of reliability.

A second pilot study (pilot study 2) replicated pilot study 1 four weeks later. Of the original 104 participants in pilot study 1, 71 participants responded in pilot study 2. The results indicated stable measures with test-retest correlations between constructs above .70.

Examination of the correlations between each of the sub-dimensions and the overall measure of innovativeness assessed nomological validity. As predicted on the basis of prior research, CPI shares a strong correlation with perceived concept newness and the affective response of excitement (perceived concept newness, r = .81, p = .000; excitement, r = .65, p = 000), and moderate correlations with perceived relative advantage and perceived technology newness (perceived relative advantage, r = .46, p = .000; perceived technology newness, r = .53, p = .000). Interestingly, the correlation between CPI and perceived complexity is low (newness, r = .09, p =

.199). Coupling the findings and discussion from the qualitative study with the quantitative results from the pilot study here, the low correlation between perceived complexity and innovativeness could suggest that complexity has more of a moderating influence on perceptions of innovativeness, rather than a direct influence. Consistent with Rogers (2003) products which are more complex may inhibit adoption, but perceptions of complexity may not translate directly into perceptions of innovativeness.

Consumer perceived innovativeness and its proximal relationships

AMOS 22.0 was used to examine CPI and its proximal relationships, to facilitate a comparison of models 1 and 2 (Figure 1 and 2 respectively). The fit statistics for model 2 meet or exceed recommended levels (Hair et al., 2010), providing evidence of good model fit (χ^2 = 108.16, *df* = 48; CFI = .976; NFI = .959; TLI = .962; PNFI = .590; RMSEA = .063). However, the fit statistics for model 1, while acceptable in some cases, do not reach the required cut offs to illustrate good model fit (χ^2 = 199.76, *df* = 52; CFI = .942; NFI = .920; TLI = .913; PNFI = .616; RMSEA = .096), suggesting that model 2 is a better underlying representation of the data. Further comparison of the models by Akaike's information criterion (AIC) indicates that model 2 is a superior model to model 1 (model 1, AIC = 275.76; model 2, AIC = 192.16).

Discussion

These findings provide evidence for the causes and dimensionality of CPI. In particular, evidence supports CPI as a distinct unidimensional construct, explained largely by the three proximal antecedents of perceived concept newness, perceived relative advantage, and perceived technological newness. This model of CPI had a reasonably good fit to the data. This finding suggests, contrary to some studies in the literature, that perceived newness alone does not explain perceived innovativeness, although newness is clearly important. The newer the product concept,

the more consumers are likely to see the product as innovative. But also the newer consumers perceive the technology to be—that is, the more they see it as a technological breakthrough—the more they perceive the new product to be innovative. Additionally, the greater the relative advantage consumers perceive the product to have, the more they will perceive the product to be innovative. A useful avenue for managers seeking to increase the affective response—excitement—is by offering products that are more innovative, rather than by trying to boost the perception of innovativeness by more advertising simply saying "new".

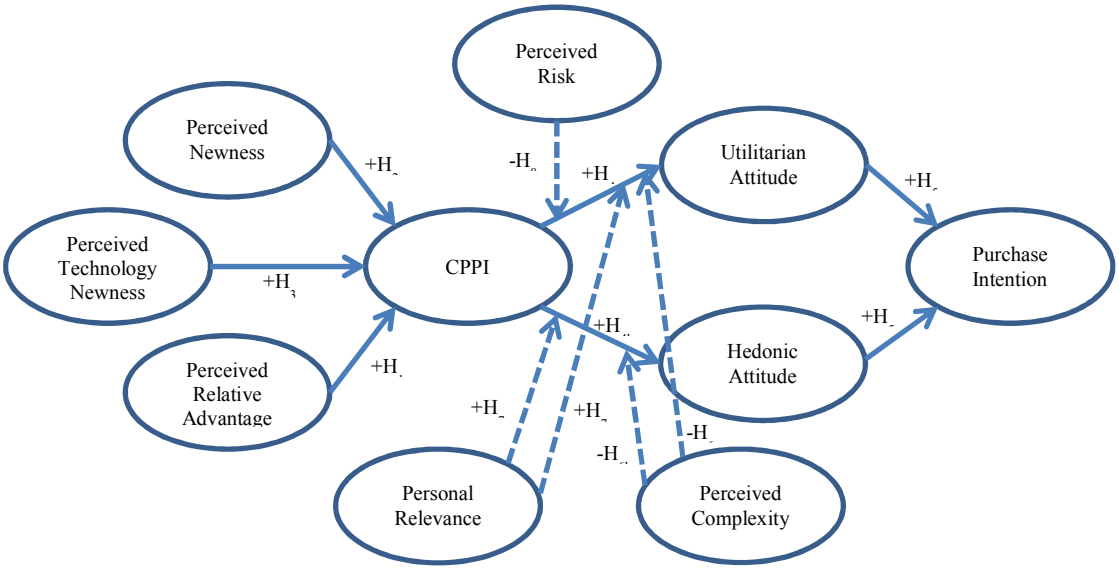
Therefore, the results support conceptualizing CPI in terms of its proximal antecedents and consequences. The results of pilot study 1 highlight the potential importance of affect in consumers' evaluation of innovations and suggest that perceived complexity is a construct that does not have an independent effect on CPI. Instead, perceived complexity might be better modeled as a moderating variable, affecting the extent of the impact of CPI on other variables further down the hierarchy of effects. The main study explores this issue as well as others.

The full model: A theory of consumer perception of innovativeness

The initial model (Figure 2) can be extended to provide a more complete understanding of the key antecedents and key consequences of CPI and key moderating factors, leading to a more comprehensive theory of consumer perception of innovativeness. This conceptualization of the CPI construct was based on a range of literature, some of which viewed affective constructs such as excitement as a dimension of CPI, rather than a consequence. The subsequent analysis of the data from pilot study 1 suggested that affective constructs (such as excitement) were best viewed as consequences of CPI, rather than dimensions. However, consumers' affective response to products is more than just how excited they feel about a product, for example. So to extend the

analysis, consumer evaluations of innovations were modeled by decomposing attitudes into their hedonic and utilitarian components, following Voss et al. (2003). To complete the hierarchy of effects, the effect of attitudes upon the end-variable, purchase intention, is also examined. Voss et al.'s HED-UT (hedonic-utilitarian) conceptualization of attitude is highly cited, exhibits good psychometric properties, and provides a clearer and well-structured representation for dividing up utilitarian and hedonic response to innovativeness. It also relates well to existing innovation adoption literature because it comprises utilitarian evaluation, which is consistent with more cognitive concepts such as perceived relative advantage, and hedonic evaluation, which is consistent with consumers' affective responses as were highlighted in the qualitative research and the pilot studies. Therefore, this study builds on prior literature by measuring consumers' affective response to innovative products using an established measurement framework (HED-UT), and by viewing these affect variables as a consequence of perceived innovativeness, rather than a dimension of perceived innovativeness as has been the dominant view in prior, yet untested research. In addition, Figure 3 shows how other key constructs such as personal relevance, perceived complexity and perceived risk moderate these linkages.

Figure 3 Consumer perception of innovativeness



Antecedents of CPI. Perceived relative advantage is "…the degree to which an innovation is perceived as superior to the idea it supersedes" (Rijsdijk and Hultink, 2009, p. 27), and is a key innovation attribute (Rogers, 2003). Consistent with prior studies which measure perceived innovativeness (e.g., Alexander et al., 2008), and the qualitative research, it is expected that the higher the perceived relative advantage, the higher the CPI. Perceived concept newness is defined as the *overall novelty of the idea manifested within the product offering*. The most important characteristic of perceived concept newness is that the idea behind the product must be *perceived* to be new by customers. Therefore, a product with a new design that repackages an existing technology might be considered by customers to be a new concept, even though the technology may not be new. Newness is often closely associated with innovativeness, so the higher the perceived concept newness, the higher the CPI. Likewise, perceived technology newness, which captures the degree of difficulty of technical achievement, is the degree to which a new product employs a new technology to deliver its benefit, as perceived by consumers. In some cases this technology may be visible and emphasized to consumers (like the Dyson cyclonic vacuum), yet in other cases it might be more obscure, or even hidden (like a mirrorless camera). Based on the qualitative research and the findings from pilot study 1, which suggest that consumers respect and are impressed by amazing technical accomplishments, it is anticipated that perceived technology newness is positively associated with CPI, contrary to some views expressed in the literature (Sood and Tellis, 2005). Indeed, the real task is conceptually and empirically avoiding the simplistic definition that innovativeness equals perceived newness. This reasoning leads to the following hypotheses:

H_1: *The greater the perceived relative advantage, the greater the CPI.*

H_2: *The greater the perceived concept newness, the greater the CPI.*

H_3: *The greater the perceived technology newness, the greater the CPI.*

Consequences of CPI. Pilot study 1 suggests that excitement differs from perceived concept newness. That is, pilot study 1 empirically distinguishes the affective item of excitement as a separate and distinct construct from perceived concept newness. Including a more comprehensive examination of affective constructs in consumer adoption decisions reflects consumers' desires to interact with products for reasons other than the utilitarian benefits provided (Batra and Ahtola, 1990; Venkatesh, 2000). One way to capture affective response is to define attitudes in terms of their hedonic and utilitarian components (Voss et al., 2003).

Utilitarian attitude relates to consumer evaluations of a product or brand based on perceptions of its functionality, and hedonic attitude relates to consumer evaluations of a product or brand based on its affective and sensory attributes (Batra and Antola, 1990; Voss et al., 2003). Products deemed as providing a high functional benefit will elicit a high utilitarian attitude. Therefore, an innovation with a high perceived relative advantage, one of the more cognitive antecedents, is likely to elicit a high utilitarian attitude. On the other hand products with a higher level of perceived newness, one of the more affective antecedents, are likely to elicit a higher hedonic attitude. While with existing products there need not necessarily be a relationship between utilitarian and hedonic attitude (e.g., Batra and Antola [1990] cite smoking and a trip to the dentist as examples of products and services which are low/high on utilitarian attitude and high/low on hedonic attitude, respectively), we anticipate that innovative products are likely to be high on both utilitarian *and* hedonic attitude, although to differing relative degrees depending on the nature of the innovation. Our qualitative findings suggest innovations need to be new, but also to offer a higher relative advantage and this will be reflected in higher CPI. Thus CPI mediates the relationship to hedonic and utilitarian attitude. This study tests the link from higher utilitarian and hedonic attitudes to higher purchase intention (Voss et al., 2003) for comprehensiveness and for further replication in an independent study with a different context.

H_4: *The greater the CPI, the greater the (a) utilitarian attitude and (b) hedonic attitude.*

H_5: *The greater the (a) utilitarian attitude, and the greater the (b) hedonic attitude, the greater the purchase intention.*

Moderating relationships. We now turn to investigate three individual difference variables that might moderate the consequences of CPI. Perceived complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rijsdijk and Hultink, 2009). Figure 3 shows perceived complexity moderating the effect of CPI upon utilitarian and hedonic attitudes. Perceived complexity is negatively related to adoption such that an innovation perceived to be more complex will be less likely to be adopted (Rogers, 2003). Perceived complexity should not have an independent effect upon CPI, because a product's complexity does not necessarily indicate *how innovative* the product is, contrary to the implicit assumptions of prior research (Lee and O'Connor, 2003). A holographic projector, for example, may be perceived as very complex to use, yet consumers may still rate it as innovative because it is perceived to be a new concept with a relative advantage. Thus, perceived complexity is not necessarily a dimension of CPI.

Given perceived complexity is defined in terms of difficulty of comprehension, and therefore less confidence in usability, then we expect that products which are high on complexity are likely to be products which are low on perceived functionality and this will translate into lower levels of utilitarian attitude. However, we also anticipate that products high in perceived complexity will be associated with a low level of pleasure (indeed, may be perceived as stressful trying to figure them out), which will negatively impact hedonic attitude. Alexander et al. (2008) found it appears consumers are less likely to form positive intentions for new products that they do not understand how to use. As Arts et al. (2011, p. 137) note, "…the more complex the innovation and thus the higher its perceived costs, the less feasible behavior change becomes…". Consequently we expert

high levels of perceived complexity to weaken the relationship between CPI and hedonic/utilitarian attitude. Therefore:

H_6: *Greater perceived complexity will attenuate the positive relationship between CPI and (a) utilitarian attitude, and (b) hedonic attitude.*

We also examine the role of personal relevance following findings from Arts et al (2011). Personal relevance is "the perceived importance of the stimulus" to the consumer (Mittal, 1995). Figure 3 suggests that consumers can evaluate and form a perception about an innovation's relative advantage, concept newness, and technology newness in general. However, as with perceived complexity, personal relevance is not a dimension of CPI, because if something is perceived to be more relevant to a consumer this does not necessarily confer innovativeness. The qualitative research illustrated the importance of personal relevance and also indicated that respondents could perceive a product to be innovative even though they did not have a favorable attitude towards it for other reasons and would never buy it. Thus, personal relevance is a construct separate and distinct from the other core constructs in the model and ultimately moderates the impact of a high CPI on hedonic and utilitarian attitude, taking into account consumer heterogeneity as with other adoption research (Arts et al., 2011; Tsai, 2013; Wang et al., 2006). The model (Figure 3) predicts that higher levels of CPI are associated with higher levels of utilitarian and hedonic attitudes ($H_{4a/b}$). We would expect the relationship between CPI and utilitarian attitude to be stronger when a product was more personally relevant (e.g., important) to a consumer because the importance of this increased functionality would lead to a greater individual benefit to the consumer. Likewise we would expect the relationship between CPI and hedonic attitude to be stronger when a product was more personally relevant because its affective characteristics would be more meaningful to that consumer. Therefore, a consumer can perceive a product concept as new and the technology as new, and can understand an

innovation's relative advantage, but if personal relevance is low the consumer is less likely to form a favorable attitude to the product and consequently adopt it.

H_7: *Greater perceived relevance will strengthen the positive relationship between CPI and (a) utilitarian attitude, and (b) hedonic attitude.*

Perceived risk is also an important element of consumer response to innovations (Ostlund, 1974; Herzenstein, Posavac, and Brakus, 2007). Perceived risk is "a subjective expectation of loss; the more certain one is of this loss, the greater the risk perceived by the individual" (Stone and Grønhaug, 1993, p.42). In some research perceived risk has been shown to be a dimension of consumer involvement (Laurent and Kapferer, 1985). Mittal (1995) argues that perceived risk is associated with, and leads to personal relevance, but is not personal relevance per se. As such we would anticipate that the attenuating influence of perceived risk upon the relationship between CPI and utilitarian attitude would be congruent with that of personal relevance. However, risk is more cognitive (Stone and Grønhaug, 1993) and would have a larger cognitive than affective effect. An example might make this clearer. A proposed new technology superfast plane for dramatically reducing flight time might get a wow affective response but a lower utilitarian attitude because consumers might see it as too risky for themselves.

H_8: *Greater perceived risk will attenuate the positive relationship between CPI and utilitarian attitude.*

These hypotheses are now tested within the main study using a national consumer survey to quantitatively analyze the proposed relationships in Figure 3. It uses a larger and broader sample, and a greater number of products to provide a stronger test than the pilot studies.

Main study: Testing figure 3

Method

Participants. A commercial market research firm (Qualtrics) with a consumer panel was asked to provide a generally representative sample. It provided a total of 826 completed responses. The mean age of respondents was 37 (ranging from 18–63), 49.6% of respondents were male, the median income was between $50,000 and $59,999, and 89% of respondents had educational qualifications from high school level to a four-year college degree. These characteristics represent a broad cross-section of the population for generalizability.

Procedure. To examine the conceptual model in Figure 3, participants responded to three innovations embedded within a questionnaire. After exposure to each new product, respondents answered questions relating to the constructs in Figure 3. For greater external validity, the questions tested consumer perceptions of nine different innovations. Three groups of participants responded to three innovations each, with each set of three including an innovation the authors had classified as incrementally new, really new, and radically new following Garcia and Calantone (2002). After exposure to each innovation respondents then evaluated the innovations in terms of CPI, perceived innovation characteristics, hedonic and utilitarian attitude, purchase intention, personal relevance, and other personal characteristics. Randomized exposure order of the products prevented order effects in the data.

Product selection. Scanning the same websites as in pilot study 1 generated an initial list of over 40 new products. The final list of products was selected to be relevant to a broad range of consumers (rather than products relevant to a particular niche) and included a stapleless stapler, an email signature that raises money for charity, a pocket size printer, a new clothes washing system that saves 90% of water consumption, a chocolate bar with a carbon offset pass, a wireless fitness tracker, a unique keyboard cleaner and a Wi-Fi enabled photo memory card.

(These were innovations at the time of testing.) The selected products also reflected variations in the different dimensions being tested. For instance, products varied on product innovativeness and could be physical products (e.g., the staple-less stapler), services (e.g., the email signature for a cause-related advertising concept), or a mixture of both products and services (e.g., the digital camera memory card that automatically uploads images and videos to the web), and they could be highly technological innovations (e.g., the fingernail watch) or less technological innovations (e.g., the eco-friendly chocolate bar). Products were represented in the survey by concept statements based on the actual products and their marketing communications, and followed typical prescriptions for a concept statement. Each concept statement consisted of text with a concept description that included product benefits and the uses one might have for the product, as well as a picture of the product to enhance realism.

Measures. Measures for CPI, perceived concept newness, perceived technology newness, perceived relative advantage, and perceived complexity came from pilot study 1. In light of this study's conceptualization of CPI and its affective proximal consequences, the HED-UT scale (Voss et al., 2003) served to measure the hedonic and utilitarian components of attitude. Five semantic differentials on a seven point scale each measured hedonic and utilitarian attitude. To test the full model, the other remaining constructs in Figure 3 were also measured. Measures for personal relevance came from Mittal (1995) and included five semantic differentials on a seven point scale. Perceived risk was measured based on a four item, seven point Likert scale, adapted from Sweeney, Soutar and Johnson (1999). Purchase intention was measured using a three item semantic differential from Urbany, Bearden, Kaicker, and Smith-de-Borrero (1997), which asked respondents how likely, certain, and probable they were to purchase the product if the price seemed reasonable to them.

Common method bias. To minimize any common method bias threats, the pragmatic

suggestions outlined in Podsakoff, MacKenzie, Lee, and Podsakoff (2003) were followed. For example, measures of the constructs used different response formats (e.g., measurement of hedonic and utilitarian attitudes was by semantic differential scales and measurement of perceived relative advantage relied on Likert scales). Also the introductory statement assured respondents that their responses would be anonymous, that the items had no right or wrong answers, and that the analysis would be free of any identifying information. To estimate the extent of common method bias, the survey also included a marker variable (Lindell and Whitney, 2001), which was the respondent's interest in reading food nutritional labels (Moorman, 1998). A correlation matrix for each of the constructs in the model was constructed, including the marker variable. After adjustment of all correlation matrix coefficients for correlation with the marker variable (Lindell and Whitney, 2001), 90% of correlations in the model's correlation matrix remained significant. Four of the 45 coefficients lost significance after adjustment but these were for relationships that were not the focus of this research, so common method bias did not appear to be a significant issue.

Analysis

Measurement model. A CFA was run using the constructs in Figure 3 to assess internal consistency and discriminant validity of the measures. Typical diagnostics indicated that the measurement model fitted the data relatively well (χ^2 = 2126.3, *df* = 612; CFI = .964; TLI = .949; PNFI = .811; RMSEA = .055). Cronbach's alpha and AVE assessed internal consistency. As Table 1 shows, all alphas were above the recommended minimum of .70, and most were above .90. The AVEs ranged from .630 to .910 and all were well above the recommended minimum of .50 (Bagozzi and Yi, 1988). Taken together, these findings provide strong support for the internal consistency of the measures in the main study. Table 1 shows the standardized item loadings for each construct, and Table 2 shows the interconstruct correlations. All of the factor loadings

exceeded .70. Comparison of the AVEs from Table 2 with their respective squared interconstruct correlations revealed that all were higher, showing evidence of discriminant validity.

Table 1 Factor loadings, reliabilities, and descriptive statistics (main study)

Factor	Indicator	Mean	SE	Loading/ Weight	α
CPI	How innovative is <product name>?	5.71	1.33	.922	.923
	<product name> is an innovative product			.929	
PCN	<product name> is new	5.60	1.48	.927	.975
	<product name> is different			.980	
	<product name> is unique			.966	
	<product name> is original			.934	
PRA	<product name> offers unique benefits	4.79	1.34	.807	.889
	<product name> is higher quality than the competition			.811	
	<product name> solves problems I had with competitor products			.785	
	<product name> replaces a vastly inferior alternative			.771	
PTN	This product's technology is new to me	5.14	1.42	.883	.843
	How new is this technology to you			.831	
HedAtt	<product name> is Not fun – Fun	4.64	1.55	.881	.966
	<product name> is Dull – Exciting			.912	
	<product name> is Not delightful – Delightful			.950	
	<product name> is Not thrilling – Thrilling			.907	
	<product name> is Unenjoyable – Enjoyable			.938	
UtAtt	<product name> is Ineffective – Effective	4.84	1.50	.891	.939
	<product name> is Unhelpful – Helpful			.924	
	<product name> is Not functional – Functional			.899	
	<product name> is Unnecessary – Necessary			.789	
	<product name> is Impractical – Practical			.852	
PI	How willing would you be to buy this product if the price were reasonable to you?	5.25	2.14	.845	.936
	How likely is it that you would purchase this product if the price were reasonable to you?			.972	
	How certain is it that you would purchase this product if the price were reasonable to you?			.818	
	How probable is it that you would purchase this product if the price were reasonable to you?			.966	
PC	<product name> is likely to require a major learning effort	3.35	1.72	.847	.917
	It will require a long time before I fully understand the advantages of <product name>			.948	
	The concept behind <product name> is difficult for me to understand			.869	
PR	For me <product name> is Unimportant – Important	4.35	1.82	.947	.980
	For me <product name> is Means nothing to me – Means a lot to me			.974	
	For me <product name> is Does not matter – Matters to me			.980	
	For me <product name> is Insignificant - Significant			.964	
	For me <product name> is Of no concern to me – Of concern to me			.904	

CPI = Consumer Perceived Innovativeness, PCN = Perceived Concept Newness, PRA = Perceived Relative Advantage, PTN = Perceived Technology Newness, HedAtt = Hedonic Attitude, UtAtt = Utilitarian Attitude, PI = Purchase Intention, PC = Perceived Complexity, PR = Perceived Relevance

Table 2 Construct correlation matrix with adjustment for common method bias

	1	2	3	4	5	6	7	8	9	10	11
1. Perceived technology newness	**.74**	*.68****	*.56****	*.58****	*.51****	*.46****	*.45****	*.24****	*.46****	*.19****	*.16**
2. Perceived concept newness	.70**	**. 91**	*.57****	*.74****	*.57****	*.53****	*.49****	*.05*	*.50****	*.05*	*.14**
3. Perceived relative advantage	.58**	.59**	**. 63**	*.59****	*.75****	*.78****	*.75****	*.04*	*.75****	*-.13****	*.20****
4. CPPI	.60**	.75**	.61**	**. 86**	*.55****	*.54****	*.49****	*.02*	*.47****	*-.03*	*.15***
5. Hedonic attitude	.53**	.59**	.76**	.57**	**. 84**	*.80****	*.77****	*.06**	*.77****	*-.09***	*.17***
6. Utilitarian attitude	.49**	.56**	.79**	.56**	.81**	**. 76**	*.83****	*.02*	*.84****	*-.22****	*.17***
7. Purchase intention	.47**	.52**	.76**	.52**	.78**	.83**	**. 82**	*-.01*	*.86****	*-.19****	*.20****
8. Complexity	.27**	.09**	.09*	-.03	.10**	.03	.03	**. 79**	*.08***	*.49****	*.00*
9. Personal relevance	.48**	.52**	.76**	.49**	.78**	.85**	.86**	.12**	**. 91**	*-.14****	*.21****
10. Perceived risk	.23**	.09**	-.08*	.02	-.04	-.17**	-.14**	.52**	-.09**	**.77**	*.00*
11. Nutritional interest	.20**	.18**	.24**	.18**	.21**	.21**	.23**	.13**	.24**	.04	–

NB: Values below diagonal represent correlations between constructs, values on the diagonal represent AVE and values above diagonal represent the correlations between constructs adjusted for the marker variable.
$^{***}p< 0.001$ $^{**}p< 0.01$ $^{*}p< 0.05$

Structural model. Because the measurement model exhibited good measurement properties, the hypotheses derived from the structural model shown in Figure 3 were then examined using Structural Equation Modeling. The structural model fitted the data relatively well according to typical model fit criteria (Hair et al. 2010): χ^2 = 1140.98; *df* = 275; CFI = .969; TLI = .963; PNFI = .812; RMSEA = .062. Consequently the path coefficients, which appear in Table 3, were examined further for hypothesis testing.

The impact of perceived relative advantage on CPI is positive (β = .389; p< .001), the impact of perceived concept newness on CPI is positive (β = .358; p< .001), and the impact of perceived technology newness on CPI is positive (β = .161; p< .001), supporting hypothesis 1, hypothesis 2, and hypothesis 3 respectively. CPI has a positive impact on utilitarian attitude (β = .196; p< .001) and a positive impact on hedonic attitude (β = .659; p< .001), supporting hypothesis 4a and hypothesis 4b. The impact of utilitarian attitude on purchase intention is positive (β = .562; p< .001) and the impact of hedonic attitude on purchase intention is positive (β = .343; p< .001), supporting hypothesis 5a and hypothesis 5b. We tested to see if the relationship between CPI and purchase intention was mediated by hedonic and utilitarian attitudes using the Preacher-Hayes

procedure. When CPI leads to purchase intention through hedonic/utilitarian attitudes, the direct effect of CPI on purchase intention was significant for both utilitarian ($t = 19.59$, $p < .001$) and hedonic attitude ($t = 20.14$, $p < .001$), and the mediated paths (CPI → utilitarian/hedonic → purchase intention) were significant and positive (95% confidence interval: utilitarian .4381, .6165/hedonic .2051, .3708). These results indicate complementary mediation (Zhao, Lynch and Chen, 2010). R^2 for CPI (67.6%) was also high, indicating the predictors explained a large amount of variation and suggesting that a useful and parsimonious set of predictors predict CPI.

Table 3 Standardized path coefficients for structural model

Path	Standardized *β*	S.E.
Perceived relative advantage → CPI (H_1)	.358***	.034
Perceived concept newness → CPI (H_2)	.389***	.045
Perceived technology newness→ CPI (H_3)	.161***	.034
CPI → Utilitarian attitude (H_{4a})	.168***	.032
CPI → Hedonic attitude (H_{4b})	.526***	.040
Utilitarian attitude → Hedonic attitude	.748***	.029
Utilitarian attitude → Purchase intention (H_{5a})	.562***	.100
Hedonic attitude → Purchase intention (H_{5b})	.343***	.088
CPI → Purchase intention	-.022	.069

$\chi^2/df = 4.277^{***}$, CFI = .967, TLI = .963; PNFI = .812; RMSEA = .063
$^{***}p < .001$ $^{**}p < .01$

Moderating factors. To examine hypothesis 6a and hypothesis 6b, the dataset was split based on perceived complexity. Respondents below four on the summated perceived complexity scale comprised the low complexity group and respondents above four comprised the high complexity group. To perform the moderation analysis the Chi-square value was calculated for the baseline model where all paths were unconstrained between the two groups. The Chi-square value for the baseline model was then used to compare against the Chi-square value from alternative models where the paths were constrained to be equal between the two samples. A Chi-square test of difference was calculated to test for equality of the relevant path between groups. If perceived

complexity moderates the relationship between CPI and utilitarian/hedonic attitude, then a statistically significant difference in the Chi-square statistic between models indicates a change in model fit between the baseline model without any constraints and the constrained model.

Table 4 shows the results of the moderation analysis. Consistent with hypothesis 6a, the impact of CPI on utilitarian attitude was significantly lower ($\Delta\chi^2 = 10.85$; $\Delta df = 1$; $p < .001$) in the high complexity group ($\beta = .103$; $p < .01$) than the low complexity group ($\beta = .223$; $p < .001$). The same pattern occurred between CPI and hedonic attitude. That is, supporting hypothesis 6b, the impact of CPI on hedonic attitude was significantly lower ($\Delta\chi^2 = 4.97$; $\Delta df = 1$; $p < .001$) in the high complexity group ($\beta = .414$; $p < .05$) than the low complexity group ($\beta = .610$; $p < .001$).

To examine hypothesis 7a and hypothesis 7b, the dataset was split based on personal relevance, creating a low relevance group below the median and a high relevance group above the median. Again the relevant paths were constrained and these were compared with the Chi-square statistic from the base line model. The impact of CPI on utilitarian attitude was significantly higher ($\Delta\chi^2 = 2.99$; $\Delta df = 1$; $p < .1$) in the high relevance group ($\beta = .260$; $p < .001$) than in the low relevance group at the 10% level ($\beta = .147$; $p < .001$). The same pattern occurred for the moderating role of personal relevance on the link between CPI and hedonic attitude. In support of hypothesis 7b, the impact of CPI on hedonic attitude was significantly higher ($\Delta\chi^2 = 3.19$; $\Delta df = 1$; $p < .1$) in the high relevance group ($\beta = .776$; $p < .001$) than the low relevance group ($\beta = .603$; $p < .001$). Therefore, personal relevance appears to strengthen the link between CPI and hedonic/utilitarian attitude.

To examine hypothesis 8, the dataset was split based on the median value of perceived risk, creating a low perceived risk group below the median and a high perceived risk group above the median. The impact of CPI on utilitarian attitude was significantly lower ($\Delta\chi^2 = 2.80$; $\Delta df = 1$; $p < .1$) in the high perceived risk group ($\beta = .214$; $p < .001$) than the low perceived risk group ($\beta = .280$; $p < .001$) at the 10% level of significance, providing support for hypothesis 8.

Table 4. Results of the Moderation Tests for H_6 to H_8

Hypothesis	Path Coefficients in Unconstrained Model	χ^2 Test Results
		Baseline model: χ^2 (550) = 1537.57
H_{6a}	CPI → UtAtt $\beta_{(LC)}$[a] = .223***[b] (.050)[c] $\beta_{(HC)}$ = .103** (.039)	Equal paths model: χ^2 (551) = 1548.42 Test of H_{6a}: $\Delta\chi^2(1) = 10.85$ $p < .001$
H_{6b}	CPI → HedAtt $\beta_{(LC)}$ = .610*** (.052) $\beta_{(HC)}$ = .414*** (.059)	Equal paths model: χ^2 (551) = 1542.54 Test of H_{6b}: $\Delta\chi^2(1) = 4.97$ $p < .05$
		Baseline model: χ^2 (551) = 1374.61
H_{7a}	CPI → UtAtt $\beta_{(LR)}$ = .147*** (.063) $\beta_{(HR)}$ = .260*** (.040)	Equal paths model: χ^2 (552) = 1377.60 Test of H_{7a}: $\Delta\chi^2(1) = 2.99$ $p < .1$
H_{7b}	CPI → HedAtt $\beta_{(LR)}$ = .603*** (.030) $\beta_{(HR)}$ = .776*** (.045)	Equal paths model: χ^2 (552) = 1377.80 Test of H_{7b}: $\Delta\chi^2(1) = 3.19$ $p < .1$
		Baseline model: χ^2 (551) = 1504.1
H_8	CPI → UtAtt $\beta_{(LRi)}$ = .280*** (.042) $\beta_{(HRi)}$ = .214*** (.037)	Equal paths model: χ^2 (552) = 1506.9 Test of H_8: $\Delta\chi^2(1) = 2.80$ $p < .1$

[a] The subscript "LC" refers to the low complexity subsample, and the subscript "HC" refers to the high complexity sub-sample. The subscript "LR" refers to the low relevance subsample and the subscript "HR" refers to the high relevance subsample. The subscript "LRi" refers to the low perceived risk subsample and the subscript "HRi" refers to the high perceived risk subsample.
[b] Standardized coefficient
[c] Standard error
Notes: CPI = Consumer Perceived Product Innovativeness, UtAtt = Utilitarian Attitude, HedAtt = Hedonic Attitude

Cluster analysis. Finally, a cluster analysis was performed to reveal clusters that exist within the sample with respect to the variables in the model and also consumer innovativeness, another construct of interest to innovation researchers in understanding differential consumer group response to innovations (Mudd, 1990; Verdegem and Marez, 2011). Consumer innovativeness was measured using the Global Consumer Innovativeness six item, seven point Likert scale adapted from Tellis, Yin and Bell, (2009). Following the procedures of Hair et al. (2010), a two-

step clustering procedure (hierarchical clustering and K-means clustering) was used to identify clusters. The analysis revealed three distinct clusters and these are shown in Table 5.

Table 5. Cluster Profiles

Cluster Attributes	Cluster 1 (n=311) "Interested onlookers"	Cluster 2 (n=151) "Detached skeptics"	Cluster 3 (n=363) "Enthusiastic adopters"
Perceived relative advantage***	4.38	3.06	5.85
Perceived concept newness***	5.29	4.04	6.51
Perceived technology newness***	4.93	3.65	5.94
CPI ***	5.41	4.41	6.51
Utilitarian attitude***	4.45	2.69	6.05
Hedonic attitude ***	4.27	2.49	5.85
Purchase intention ***	4.74	1.97	7.04
Perceived risk**	4.30	4.26	3.96
Personal relevance***	3.91	1.61	5.85
Consumer innovativeness***	4.60	4.45	5.43

***$p < .001$ **$p < .01$

The results of the cluster analysis follow a similar pattern to that of the main model, as might be expected. Specifically, cluster 3, the "enthusiastic adopters", represent a large segment of consumers which seem to be highly positive in their perceptions of innovations (e.g., perceived relative advantage, perceived concept newness etc.) and are likely to purchase such products. The innovations tend to have a high level of personal relevance to them, and they perceive a relatively low level of risk involved in adopting these innovations. Consequently, these consumers also exhibit high levels of consumer innovativeness and might be most akin to Rogers' (2003) "early adopters" segment. Cluster 1, the "interested onlookers" seem to be the next most positive, but to a lesser degree than cluster 3. These consumers appear to be reasonably positive about the innovations within this study but exhibit lower levels of purchase intention and a higher level of perceived risk, moderate personal relevance and a moderate degree of consumer innovativeness. These consumers might be similar to what Rogers' terms the late majority. Finally, cluster 3, the

"detached skeptics" seem to exhibit very little interest in the innovations and are very unlikely to adopt them. They perceive a moderate level of risk in adopting the innovations (but not a very high level), do not perceive the innovations to have a high level of relevance to them and exhibit a moderate level of consumer innovativeness. These consumers might be similar to those identified by Rogers as the late majority. Overall these results highlight the key themes that emerged from the main model but provide more detail about the impact of consumer personal characteristics. In a recent meta-analysis on the topic of innovation adoption Arts et al. (2011) note that demographic characteristics do not seem to be good discriminators of consumer adoption segments. We find similar results in our data with demographic characteristics providing an inconsistent picture.

General discussion

To date, despite a plethora of research examining adoption of innovations, little consensus exists on what perceived innovativeness is, how to measure it, and what its antecedents and consequences are. As a result of the literature review, qualitative research, and our own analysis, this paper develops a *conceptual* definition of CPI as *the perceived degree of newness and improvement over existing alternatives.* Extending on from that, the paper puts together all the key elements into a theory of consumer perception of innovativeness (Figure 3). This theory is supported through the three studies reported here, in particular the findings from the national panel. Furthermore, Figure 3 provides a new *operational* definition for CPI, defined as *consumers' overall innovativeness assessment, resulting from perceptions of product concept newness, technology newness, and relative advantage, and influencing consumer utilitarian (cognitive) and hedonic (emotional) response*. In short, this study contributes to the literature by

defining the construct and showing how it can be measured, and fits it into a logical and practical theory of consumer perception of innovativeness to better understand and predict consumer reactions to innovations. This includes four contributions that we now detail.

Firstly, the findings from this research suggest that CPI is a unidimensional abstract concept, not a multidimensional concept as much past research implies. Prior research has been fragmented and seems to have viewed CPI as unidimensional, defined by constructs such as new product creativity (Moorman, 1995; Moorman and Minor, 1997) and perceived newness (Hoeffler, 2003), or as a multidimensional formative construct consisting of dimensions such as newness and impact (Olshavsky and Spreng, 1996), product superiority over existing alternatives and adoption difficulty (Lee and O'Connor, 2003), or difference from other products, change in behavior and perceived newness (Moreau, Lehman and Markman, 2001). Given that none of these studies psychometrically developed the scales and assessed their dimensionality, the research presented here contributes to this debate by showing that CPI is best viewed as unidimensional.

A second key contribution of this research relates to the antecedents of CPI. One theme in the literature is that innovativeness equates with newness, generally defined (Hoeffler, 2003). The findings from our study show that the more sharply defined perceived "concept newness" is indeed a key proximal antecedent of CPI, although newness is not a sufficient condition. Other constructs, including perceived relative advantage and perceived technology newness, are also important, and these three constructs together offer a richer explanation of variance in CPI, suggesting the proximal antecedents in this study provide a good, yet relatively parsimonious set of predictors for changes to CPI. Therefore, the model in this study also implies that managers can try to manage or influence CPI through their marketing communications by attempting to raise CPI's antecedents. Though the current paper is more basic research it provides a clear path

for applied research as a next step. Further research might use the model and measures to examine how different types of advertising messages can affect CPI to lead to more favorable attitudes and higher purchase intention.

The importance of perceived relative advantage is relatively well documented in the literature. However, the effect of perceived technology newness is less well known, and the research presented here suggests that its relationship with CPI is positive, contrary to some views in the literature (e.g., Sood and Tellis, 2005). While the concepts of perceived newness and perceived relative advantage have attracted much attention in the literature, the concept of perceived technology newness has attracted far less attention. Advertisers and marketing managers may influence CPI by increasing the consumer's perception of technology newness. For example, a recent innovation in contact lenses by Ciba Vision allows people with astigmatism to use daily disposable contact lenses (previously only monthly disposable contact lenses could assist with the condition). Yet the product's website stresses concept newness ("The world's first daily disposable lens for astigmatism") and relative advantage ("Focus DAILIES TORIC All Day Comfort combines excellent visual acuity with the comfort, convenience and hygiene of wearing a fresh, new pair of lenses everyday"), without mentioning the pioneering technology that led to the innovation. According to this research, emphasizing technological newness may also enhance CPI and hedonic/utilitarian attitudes. Companies may hesitate to explain technology newness for fear the complexity of the technology will lose the attention of consumers—thus the challenge to clearly overview the technology without confusing, mystifying, or boring consumers.

A third contribution from this research suggests that affect is best viewed as a consequence of CPI, rather than a dimension. Prior research which has viewed CPI as a formative concept consisting of dimensions such as novelty and meaningfulness (Sethi et al., 2001), seems to have included affective components such as excitement and interest as part of their definition of

novelty. The results in this research further show that consumers evaluate innovations along affective dimensions such as how exciting and how fun the innovation is, rather than solely along rational dimensions such as how much time and money it saves (e.g., relative advantage), as past research suggests, and that both dimensions are important influencers of purchase intention. However, utilitarian attitudes seem to be a stronger predictor of intentions to purchase than hedonic attitudes. This is consistent with prior research in the area of internet shopping which has shown that consumer intentions to search and buy online are most strongly affected by their utilitarian rather than their hedonic motivations (To, Liao and Lin, 2007). Given that two meta-analyses have shown a weak correlation between *product innovativeness* and new product success (Henard and Szymanski, 2001; Szymanski et al., 2007), these results, which focus on *consumer perception of innovativeness*, emphasize the importance of understanding individual consumer behavior processes to evaluate innovations.

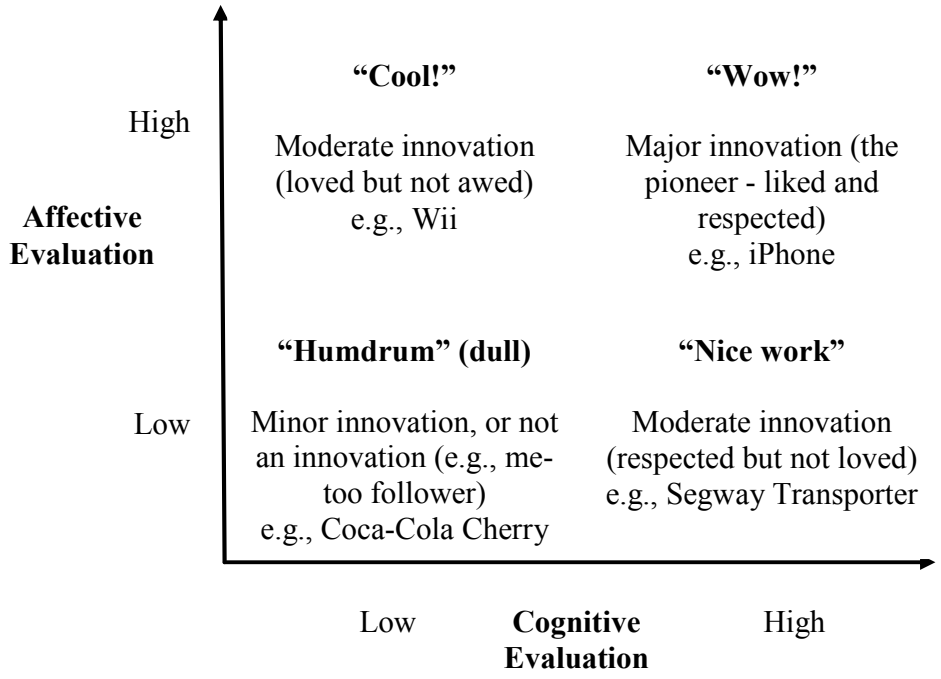
A fourth contribution, relates to key moderators of the relationship between attitudes (hedonic and utilitarian) and intention. Prior research has suggested that perceived complexity is a dimension of CPI (Lee and O'Connor, 2003). However, the results of this investigation provide evidence that perceived complexity is not a dimension of CPI, but serves as a moderator of the link between CPI and hedonic/utilitarian attitude. That is, according to the insights gleaned from the qualitative study and pilot study 1 and 2, more (less) complex products do not necessarily confer lower (higher) levels of CPI. Instead, based on the results of the main study more (less) complex products attenuate (strengthen) the link between CPI and hedonic/utilitarian attitude. This research also finds that personal relevance and perceived risk are key moderators of the link between CPI and hedonic/utilitarian attitude, such that higher levels of personal relevance strengthen the link between CPI and hedonic/utilitarian attitude. It is important for managers to understand individual differences among consumers as this is likely to affect how they design

marketing communications for target markets. Though demographic characteristics did not seem to have much of an effect in this research, consistent with other research in the area (e.g., Arts et al. 2011), this could be because a number of products were tested and the effect of demographics is likely to be product specific. It is likely that demographics will have an important effect for individual products so managers ought to understand their impact on a case by case basis.

Classifying Innovations

In summary, prior studies have examined innovations almost entirely in terms of cognitive dimensions (i.e., relative advantage and benefits: "this processor is faster"), and to a lesser degree, affective dimensions (i.e., excitement: "Wow! That's amazing"). Few published articles have included affect in the examination of innovation adoption, and where it has been included this related to post-consumption attitudes (e.g., Kulviwat et al., 2007), whereas the present research examines pre-consumption evaluation. The wow factor is important to understand and model from a managerial perspective, as managers want to know how to generate excitement. Furthermore, different degrees and types of affect can be conceived. If consumers evaluate an innovation on the broad cognitive and affective dimensions, then consumers' responses to innovations may differ on these dimensions. This evaluation may give rise to four main classifications of innovations from the consumer perspective. As Figure 4 shows, high–high innovations are "Wow!" Low–low innovations might be humdrum or dull. High affect but low cognitive innovations are "cool!" (but not "Wow!"). High cognitive but low affect innovations are simply nice work. How products fit in this classification might depend upon an individual's subjective reaction and the personal relevance of the product. However, the classification emphasizes that an innovation evokes both a rational and affective response.

Figure 4 Classifying innovations by affective and cognitive evaluations



Limitations and future research

The findings for this investigation may pertain only to the products evaluated in the main study, so future research should examine generalizability with a greater array of products and situations. Specifically, the products in this study were tangible innovations, and further testing should include more services and other less tangible forms of innovation, such as ideas and experiences. This research is also limited in that it uses stated purchase intentions as a proxy for actual adoption. (But as respondents were shown new products they had not yet seen, actual adoption was not a possible measure.) Future research could examine the model across Rogers' (2003) well-known innovation adoption segments (innovators, early adaptors…) to see whether or not the basic model differs by these segments. Furthermore, future research could use more closely

matched samples such that respondents viewed products that they said were personal relevant to them.

Conclusions

In sum, this article presents a theory of consumer perception of innovativeness, starting with introducing the term consumer perceived innovativeness, defining it, and testing two alternative conceptualizations of CPI; the multidimensional representation (Figure 1) versus a model of core CPI with proximal antecedents and proximal consequences (Figure 2). Pilot study 1 supported the model in Figure 2, and the stability of the scales used was supported in pilot study 2. The conceptualization of CPI was extended to a more comprehensive model (Figure 3) that was tested using a questionnaire from a large representative sample collected by a commercial market research agency. Structural equation analysis of the data supports the model. Steve Jobs, the entrepreneurial architect of Apple, loved to create "insanely great" (his words) innovations which were "cool" and had a "wow factor" for consumers, and that may explain part of Apple's phenomenal success at its start and in the last decade.

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