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Cognitive and Emotional Processes in the Perception of Value

Judgments of value are based on an appreciation of the relations among an object's features (Mandler 1982). They are complex assessments of fit—namely, the fit between the configuration of a product's features and the configuration of features specified by the schemas used for its interpretation (Mandler 1982).[1] Arguably, individual variations in the use of available schemas can generate differences in individual perceptions of value, but in the aggregate the perceived value of a product depends on its fit with collectively held schemas such as product categories. It is important to note that the assessment of fit, and the perception of value arising from it, is based on comparing the entire configuration of product features with the configuration of features specified by the schemas. This view of perceptions of value departs from extant models in strategy and marketing that treat customer perceptions of value as based on feature-by-feature product comparisons (Adner 2002; Engel and Blackwell 1982; Griffith 1999). In contrast, this view emphasizes that a product innovation has to fit with expectations and to make sense as a whole.

A product innovation by definition exhibits some degree of misfit with existing schemas, because it modifies one or more core or peripheral product features (Griffith 1999). The degree of misfit, or incongruity, between the new product and existing schemas can vary in levels from very low (nearly total familiarity) to severe (total disorientation and discord). Different levels of incongruity have different cognitive and emotional consequences. The more novel a product is, the higher the level of its incongruity, and the more difficult it is for customers to understand and appreciate its value. Thus, incongruity is a source of cognitive challenge for customers: If they fail to overcome it, they will fail to perceive the value of an innovation. Incongruity, therefore, is an important factor influencing the perceived value of innovations.

[1] Our treatment of schemas is consistent with Mandler's (1982) notion of "generic schemas," which are social, cultural, and intersubjective. Product categories are examples of such generic schemas, because they organize consensually developed and institutionally codified knowledge about the common features that identify a product as a member of a given category (Rosa et al. 1999).

In addition, an incongruous product also stirs an emotional reaction because it interferes with customers' ability to assess its potential consequences for their well-being (Frijda 2000; Mandler 1982). The more incongruous a stimulus is, the more intense the emotional reactions that it tends to elicit. Therefore, highly novel products are likely to trigger strong emotions. Whether these emotions are positive or negative depends on attendant secondary assessments of individual ability to cope with and/or benefit from the novelty (Larsen and Diner 1992), and on the process of resolving incongruity.[2] Thus, while some customers, identified by innovation research as innovators or early adopters may have high coping potential and derive positive emotions from an innovation's novelty, other customers, identified as laggards or late adopters are more likely to experience negative emotions towards the same innovation (Moore 1991; Rogers 1995). In either case, however, customers' perceptions of the potential value of the innovation are likely to be colored by their emotional responses. In other words, cognition and emotion, comprehension and enjoyment, both contribute to perceiving the value of product innovations.

Cognition and emotion are also intertwined in the process of resolving a novel product's incongruity. When faced with an incongruity, individuals seek to resolve it by finding an appropriate schema and applying it to assess the incongruous stimulus (Mandler 1982). If available schemas do not apply readily, they need to be changed or modified. The processes of schema change and incongruity resolution require efforts, but when successful, they generate positive emotions arising from the learning accomplished and the expanded possibilities it brings (Mandler 1982). Unsuccessful efforts to resolve incongruity lead to negative emotions. Thus, emotional dynamics, which we call *learning-related affect,* accompany the process of incongruity resolution, such that cognition and emotion form a recursive cycle, in which positive emotions and comprehension reinforce each other, while negative emotions increase skepticism (Fiske and Taylor 1991).

Psychological research, therefore, suggests that incongruity and emotions are two mechanisms that affect perceptions of value but are not well accounted for in extant models of innovation adoption. In addition, the effects of incongruity and emotions are complex and dynamic: Although incongruity per se is likely to have a negative effect on perceived value, the process of its resolution (involving cycles of cognitive and emotional responses) can be rather gratifying and can have very positive effects on perceived value. This duality has two important implications for the management of product innovations. First, these effects suggest that moderately incongruous product innovations are likely to have the highest perceived value. Second, the recursive cycle between the cognitive and emotional responses provides an opportunity for innovating firm to generate an upward spiral inside this recursive cycle and to enhance customers' perceptions of the value of their innovations.

Taking into account the effects of incongruity and emotions in perceptions of value, in the next section we articulate how innovating firms can use product form design to influence customers' cognitive and

[2] According to Smith and Kirby (2001, p. 83), "If one is in a stressful situation in which one does not have something one wants, but perceives that with effort one can achieve one's goals (high coping potential), then a state of challenge results that motivates the person to stay engaged

emotional responses to their innovations. We examine how product form can induce cognitive change and positive emotions in order to suggest that innovating firms can influence these processes strategically by using product form and aesthetics that induce cognitive change and positive emotions.

Designing Product Innovations As Artifacts

Griffith (1999, p. 476) notes that, although much of innovation research refers to technologies in general, such general references are "convenient fictions" and technologies exist in particular "constellations of features". We extend this idea further and argue that features are organized in a particular product form through a distinct set of design choices, along parameters related to material, shape, and proportions. Such choices generate the outer form and appearance of a product (Bloch, 1995; Hollins and Pugh 1990; Lewalski 1988). We refer to these design choices as *product form design* to distinguish them clearly from those involved in technological design. Technological design, which is more commonly studied by innovation researchers, specifies how different technological components interact to generate the product's functions (Henderson and Clark 1990). In contrast, product form design specifies how surface elements are blended into a whole to achieve a particular form. Thus, whereas technological design determines what underlying component technologies will be used and how they will be organized to generate the functionality of the new product, product form design determines how materials, shapes, and proportions will be blended to create a specific object that customers will perceive, experience, and interact with. The distinction between technological and product form design resonates with research on artifacts suggesting that human-created objects (artifacts) are characterized by functional, symbolic, and aesthetic dimensions, which jointly determine how individuals respond to a given artifact (Pratt and Rafaeli 2006; Rafaeli and Vilnai-Yavetz 2004).

Product form can have systematic effects on customer perceptions of the value of product innovations, because customers respond cognitively and emotionally to the symbolic and aesthetic properties of a product. First, product form design can influence a product's novelty by emphasizing or hiding different facets of the technology that the innovation introduces (Hargadon and Douglas 2001). As an outer shell, product form may reveal, explain, or obscure the actual change in the underlying technologies that an innovating firm has deployed in a given innovation. Second, product form can provide visual cues that may activate different schemas through which the product is interpreted and meanings are attached to it. Third, product form can trigger sensory experiences, which—although not directly cognitive—influence cognitions and emotions (Rafaeli and Vilnai-Yavetz 2004).

In sum, we argue that when designing new products, firms not only design tools and devices with different functionality, but they also design visual similies and metaphors that carry cultural references to other product categories from which meaning is transferred. We emphasize two important points about the role of product form in the innovation process: (1) a product's form is not predetermined by the underlying technological change, but instead can be designed strategically to achieve specific cognitive

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and to persevere to achieve his or her goals. Even if problem-focused coping potential is low, hope might result if the person believes that

and emotional effects; and (2) the cognitive and emotional effects of a product innovation depend not only on its functional, but also on its symbolic and aesthetic properties.

Figure 1 maps how the three dimensions of product artifacts affect the cognitive and emotional processes that underlie perceptions of their value potential. The framework shows that technological change and product form design jointly determine an innovation's initial incongruity. We depict this effect as jointly produced by the underlying technological change and product form design, because the latter can hide or reveal how technologically novel a product is, thereby influencing the incongruity it presents customers with. In addition, product form design influences the process of incongruity resolution in two ways: Design choices along the symbolic dimension influence the extent to which the product stimulates analogical reasoning, which facilitates the cognitive change necessary for resolving incongruity. Design choices along the aesthetic dimension can generate positive emotions and stimulate positive affect infusion, which also facilitates cognitive change.

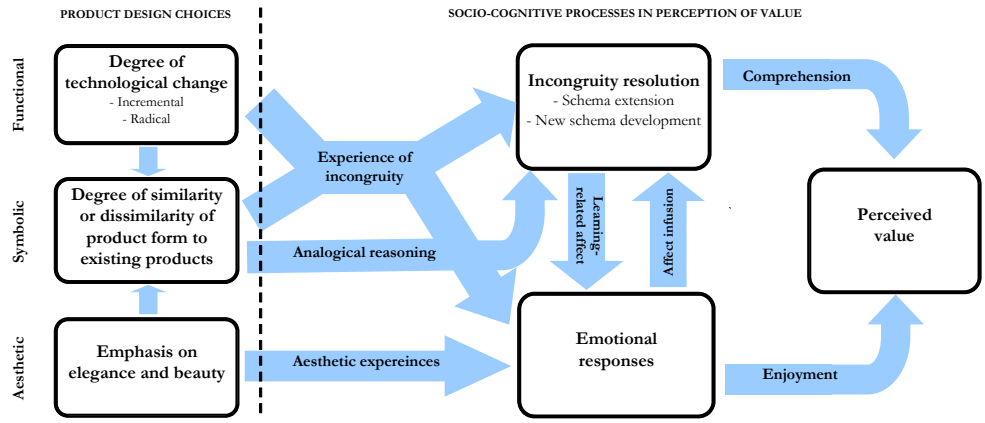

Figure 1 . Relationships between Design Choices, Customers Cognitive and Emotional Responses, and Perceptions of Value of Product Innovations

The Functional Dimension of Product Innovations: Technological Change as a Source of Schematic Incongruity

A product innovation is defined as a change in product attributes based on a modification in underlying technologies (Chandy and Tellis 1998 2000; Gobeli and Brown 1987). The underlying technological change determines a product's distance from (or proximity to) the current technological trajectory of the industry.[3] Depending on this distance, innovations have long been categorized as radical and incremental (Abernathy and Utterback 1978; Anderson and Tushman 1990; Tushman and Anderson 1986). Incremental innovations are characterized by small changes relative to the current technological trajectory, whereas radical

somehow things would work out in the end".
[3] Technological change is defined as the change in scientific methods and materials used to achieve a commercial or industrial objective (Hill and Rothaermel 2003).

innovations represent fundamental departures from it (Benner and Tushman 2003; Henderson and Clark 1990). Although for analytical purposes we focus on these two ends of the technological change continuum, we recognize that many innovations fall between the two.

The degree of underlying technological change is likely to affect how incongruous a new product is. Incremental innovations that introduce a low degree of technological change are likely to fit relatively easily within existing schemas. Even if they introduce important performance improvements, such innovations are likely to remain congruous, because schemas are flexible enough to accommodate small changes as long as the overall configuration of features is consistent with the configuration specified by the schemas (Mandler 1982). For example, technological changes such as the introduction of 32-bit architecture, multitasking capabilities, and protected mode in the Intel386 computer processor are readily comprehensible, because they continue to improve product features within an expected configuration (Botticelli, Collis and Pisano 1998). Furthermore, although some industry experts question the actual benefits that customers derive from further improvements in microprocessor speed (Kirkpatrick 2002), such improvements are schema-congruous and continue to influence positively the perceived value of such innovations.

This positive effect may be explained by the fact that such innovations present customers with situations that can be appraised as certain, safe, and requiring a low degree of effort (Fredrickson 1998). Such situations trigger low-intensity positive emotions, derived from familiarity and predictability. These emotions lead to what Mandler (1982, p. 20) calls "the most primitive kind of judgments of positive value". Therefore, emotions are likely to have positive but limited effect on perceptions of value of incremental innovations.

In contrast, radical innovations are likely to cause severe incongruity because they introduce significant change in underlying technological components and the links between them (Henderson and Clark 1990). They result in highly novel products, for which available schemas may have limited applicability. Segway—the personal human transporter—provides an example of a radical innovation that appears severely incongruous, as illustrated in the following newspaper headline: "What Has Two Motors, Two Wheels, and a Pair of Handlebars—But Isn't a Vehicle?" (Kirsner 2003, p. C1). The riddle-like framing of the headline highlights Segway's incongruity with existing schemas about vehicles.

> As the schematic incongruity of a product innovation increases, so does customers' uncertainty about its potential impact on their ability to achieve relevant goals. The more difficult it is to assess such impacts, the more intense the emotional reactions that customers will experience. As a result, radical innovations are likely to generate emotional responses with relatively high intensity. These emotions will be negative if an innovation's incongruity results in disorientation and frustration (Mick and Fournier 1998). However, if this incongruity is successfully resolved, it will generate the highly positive emotions of excitement and enthusiasm, which will arise from the learning accomplished. In other words, radical innovations, which cause the most severe incongruity, can either frustrate or elate customers, depending on if and how their incongruity is resolved.

In sum, the more technologically novel an innovation is, the more incongruous it is likely to be, and the more difficult it will be for customers to understand and appreciate its potential value. Different levels of incongruity also trigger emotions with varying intensity and valance, and these emotions also affect how value is perceived. As the initial incongruity triggered by the innovation's novelty is resolved, the cognitive and emotional responses to it change, making the perception of value a dynamic constructive process. In the next two sections we discuss: first, how product form influences the socio-cognitive processes that lead to incongruity resolution, and next, how product form affects emotions and incongruity resolution.

The Symbolic Dimension of Product Innovations and the Socio-Cognitive Dynamics of Incongruity Resolution

Incongruity resolution processes. The incongruity of a product innovation is resolved when customers can apply an appropriate schema to understand the usefulness of its novel features (Meyers-Levy and Tybout 1989; Moreau, Lehmann and Markman 2001a; Moreau, Markman and Lehmann 2001b). For incremental innovations, available schemas may apply directly or may require only small extensions, which individuals can accomplish relatively easily (Mandler 1982). Therefore, customers can resolve the low levels of incongruity that are likely to be caused by incremental innovations through *schema extension*. Schemas are extended by broadening their domain of applicability (Mandler 1982).

For products introducing radically new technologies, however, available schemas may have limited or no applicability. As a result, initially customers are likely to have only fragmented understandings, their interpretations are likely to diverge dramatically, and many may have strong negative emotional reactions (Pinch and Bijker 1987). Although some customers may develop new understandings more easily than others, the market for product innovations based on novel technologies emerges when collective consensus is reached that something of value has been created (Dougherty 1990; Moore 1991), as well as what its defining attributes are (Rosa et al. 1999). Therefore, the resolution of the high levels of incongruity that are likely to be caused by radical innovations may require *new schema development* through social interactions and negotiations through which agreement about the configuration of attributes that constitute a "good new thing"—a car, a bicycle, or a desktop computer – emerges.

New schemas are developed at the collective level as social interactions between relevant social groups reduce the interpretive flexibility of new technological artifacts (Dougherty 1990, 1992; Rosa et al. 1999; Hargadon and Douglas 2001). These interactions involve both experimentation by technology savvy customers, such as lead users and innovators (Moore 1991; Rogers 1995; von Hippel 1986) who discover both problems and solutions associated with them, and adaptation by innovating firms (Dougherty 1992). Pinch and Bijker (1987), for example, analyzed how the schema for a "safety bicycle" emerged over a nineteen-year period during which different components and configurations were proposed and hotly debated. By the end of the period, "safety bicycle" denoted a specific configuration, including a low-wheeled bicycle with rear-chain drive, diamond frame, and air tires (Pinch and Bijker 1987, p. 39).

Technology scholars refer to the emergence of such shared schemas as *closure*, to denote that agreement is reached about what problems a new product would solve and what features provide useful solutions to these problems. Closure is reached when the essential "ingredients" of a new product artifact have become taken for granted (Pinch and Bijker 1987). Upon closure, the schema for the new technology becomes both a "cage" confining the participants in the market to a particular understanding and also a resource enabling their actions (Pinch and Bijker 1987). Closure, therefore, facilitates adoption and establishes a dominant design.

Innovating firms have incentives to speed up the process of closure in order to achieve convergent understanding of their technologies and stimulate their adoption (Rao, 1994). Innovating firms, therefore, are likely to attempt to manage this process through a variety of marketing and communication activities, such as advertising (Holbrook and Batra 1987; Preston 1982), public relations events (Rao 1994), and interactions with users (von Hippel 1988; McAlexander, Schouten and Koening 2002). These activities play an important role in the collective sensemaking process because they explain or demonstrate how a product innovation could or should be used. Because these activities are a part of the product marketing strategy of the firm, they have received extensive attention in marketing research (Moreau et al. 2001b). Much less attention has been directed to the strategic choices with regard to product form, which provides the bridge between the product and "the idea of the product" (Christensen 1995, p. 732) through its symbolic properties.

Symbolic properties of similarity and dissimilarity. Symbolic properties are those that create associations between an artifact and existing cultural schemas and categories (Rafaeli and Vilnai-Yavetz 2004). Among the potentially infinite number of associations a given object can trigger (Holbrook and Hirschman 1993), those based on visual similarity to other products affect how products are categorized and therefore, what benefits they are expected to deliver (Loewenstein and Gentner 2005; Moreau et al. 2001a, 2001b). Design choices about product form similarity to existing products, therefore, may affect customer perceptions in two ways: First, they can change the level of incongruity a product will present customers with, thereby changing their cognitive and emotional responses to it. As discussed earlier, moderately incongruous products are likely to have the highest perceived value. Therefore, higher perceived value may be achieved if design choices along the symbolic dimension that determine a product's similarity to existing products complement the technological choices underlying the functional dimension. More specifically, for incremental technological innovations, which are likely to be congruous, because they preserve the fundamental configuration of a product's features, incongruity can be increased by embodying them in product forms that appear dissimilar to existing products. Conversely, for radical technological innovations, which may be severely incongruous, incongruity can be reduced by embodying them in products forms that appear similar to existing products. Second, the specific ways in which the similarity or dissimilarity to existing products is expressed may affect how customers use specific product analogies in their categorization and interpretation. We discuss the consequences of these product form design choices next.

Increasing the similarity of radical innovations to existing products. Research on the history of technology has documented that products incorporating a significant degree of technological change are

often designed to resemble the products they eventually replace. For example, Edison designed the light bulb to resemble the kerosene lamp (Basalla 1988; Hargadon and Douglas 2001), digital cameras were designed to resemble film cameras (Moreau et al. 2001b), and the TiVo unit was designed to resemble a videocassette recorder (Hargadon and Douglas 2001). To achieve such visual similarity, product form designs often incorporate elements that were functional in the old technology but have no functional value in products based on the new technology. Product form in such cases is used to increase the apparent similarity of the innovations to familiar products, in order to tap into existing understandings (Hargadon and Douglas 2001).

The process of transferring knowledge from a familiar product category to a new product category is known as analogical reasoning (Gentner 1988; Gregan-Paxton and John 1997). Analogical reasoning is based on a structure-mapping process through which relationships between objects or features are mapped from the old, base domain to a new, target domain (Gentner 1988) and knowledge from the base domain is used to operate the target domain. Analogical reasoning has been recognized as particularly useful in situations characterized by missing data, ill-defined goals, and incomplete specification of parameters (Klein 1987). Therefore, analogical reasoning is a cognitive process that is likely to enable customers to resolve the incongruity caused by highly novel products.

Further, providing visual cues to existing product categories may facilitate the collective-level processes of incongruity resolution by fostering the achievement of a collective agreement. The visual similarity of the product to existing categories may anchor the perceptions of different relevant social groups around the same product category, thereby constricting the range of problems the innovation is expected to solve and providing criteria for evaluating the solutions it provides. For example, in the mid-1980s, Apple Computer introduced the Newton Pad—a miniature computer with a touch-sensitive screen and a pen-based interface (Kunkel 1997). The new device was meant to launch the idea of hand-held devices and to "replace the tyranny of the cumbersome keyboard" (Thomke and Nimgade 2000, p. 8). However, compared to a computer, the Newton performed poorly and was ultimately rejected by the market. In 1996, the Palm Pilot was launched to "compete with paper rather than with larger computers. Although it could just store addresses, telephone numbers, a calendar, and a to-do list, it did so rapidly and conveniently" (Thomke and Nimgade 2000, p. 8). In the case of the Palm Pilot, an agenda-book schema was evoked and applied, leading to a favorable comparison between the new device and the older alternative. Seen as an overperforming agenda book, the Palm Pilot "became the fastest selling computer product" (Thomke and Nimgade 2000, p. 8). As this example shows product form design can evoke different analogies. Depending on which analogy is evoked, analogical reasoning can be either beneficial or detrimental to perceptions of value.

Analogical reasoning can also limit the perceived value of an innovation, if the preexisting schema for the old technology comes to dominate customer understandings of the innovation. As a result, its actual novelty – the new possibilities and solutions generated by the technological change – are likely to remain unnoticed, uncomprehended and underappreciated. TiVo—the customer electronic device that has become known as a "digital video recorder"—is an example of the trade-offs involved in using this design strategy. TiVo's founders created the device by employing many novel technologies with the intention of

revolutionizing the way in which viewers, networks, and advertisers interact (Hardy 1998; Hargadon and Douglas 2001). Similarly, analysts viewed TiVo as "destined to create a new market" (Rae-Dupree and Siklos 1999). Yet, in terms of its outer form, the device was designed to resemble a videocassette recorder (VCR) as closely as possible, and several of its truly novel functions were hidden on purpose. As a result, customers treated it as if it were a slightly improved VCR, and much of the potential excitement about it was lost (Zoglio and Wathieu 2001). This example suggests that by using product form to create a strong similarity with a single product category a firm prompts customers to resolve incongruity through the application and extension of an existing schema. Such incongruity resolution may preclude customers from exploring and understanding the novel functionality of the product and appreciating its value-creating potential. As a result, although using such design strategy along the symbolic dimension reduces uncertainty about customers' acceptance of radical innovations and potentially speeds up their adoption, it may also limit their perceived value.

Alternatively, a firm can use product form to suggest links to multiple available schemas. Using such an approach enables customers to draw on existing knowledge but also requires them to recombine it in order to develop a coherent new schema. Experimental research shows that, when customers are provided with references to only one product category, their categorization of a new product is strongly influenced by that category; when they are provided with limited information from multiple product categories, they recombine this information to develop a new schema (Moreau et al. 2001b). Further, drawing on multiple and more distant (in terms of similarity) categories leads individuals to recognize deeper relational similarities and to develop more complex and sophisticated understandings (Dahl and Moreau 2002; Loewenstein and Gentner 2005). Thus, providing links to multiple product categories can stimulate knowledge recombination, creative processing, and new schema development that helps customers grasp and explore the novel functionality of an innovation. Incongruity resolution through such schema development may enable customers to better perceive the value of technological innovations that incorporate high levels of change. For example, designers of mobile phones have sought high levels of visual similarity to regular phones but have also included digital displays and text messaging functions, linking mobile phones to pagers and data transmission devices. Thus, although the success of text messaging may have been unexpected by mobile phone manufacturers (Economist.com 2003), the product form design of mobile phones enabled and potentially prompted this surprise. In sum, use of product form design to stimulate incongruity resolution through new schema development rather than through direct application of a preexisting schema may be a more effective way to engender perceptions of value.

Our argument is that designing along the symbolic dimension to increase visual similarity of radical innovations with existing products enables firms to influence the extent to which customers use analogical reasoning, the specific product analogies they deploy, and the overall process through which incongruity is resolved. We note that when firms prompt incongruity resolution through schema extension, closure may be achieved faster but at the risk that a preexisting schema may come to dominate the understandings and actions surrounding the innovation. Instead, prompting incongruity resolution by

evoking multiple schemas may preserve interpretive flexibility longer but may also facilitate the development of a new schema that reflects more fully the novel functionality of the innovation.

Increasing the dissimilarity of incremental innovations from existing products. As discussed earlier, when closure is reached and a schema for the new product has emerged, its technological design becomes taken for granted. Interestingly, the outer product form in which the technology is embodied also becomes taken for granted, and both the technology and the product form tend to undergo primarily incremental changes. As we discussed earlier, the value of such incremental changes will be readily understood, but they will not excite customers. In contrast, moderately incongruous products, while still comprehensible, are also perceived as more interesting and exciting, and tend to be evaluated more positively than completely congruous ones. Therefore, increasing incongruity may enhance the perceived value of incremental innovations.

We propose that an innovating firm can increase the incongruity of incremental innovations by increasing their dissimilarity to existing products along the symbolic dimension. In other words, a firm can reinvigorate the interpretive flexibility of a product by changing its outer form, even in the absence of substantive technological change. For example, Apple's iMac, introduced in 1998, featured relatively minor technological improvements (Gore 1998) but was embodied in a product form that radically departed from the typical desktop computer form that had been taken for granted since the mid-1980s. With its fruitlike colors and shapes, the iMac became "the most interesting PC to hit the market in several years" (Wildstrom 1998, 18) and only six weeks after its introduction it became the best-selling computer in Apple's history (Kwak and Yoffie 1999).

As this example indicates, embodying an incremental innovation in a product form that is dissimilar to the established one may generate sufficient incongruity to require customers to extend existing schemas. The iMac's new product form suggested that it was a computer intended for play and not just for work. When schemas are extended, their domain of applicability broadens (Mandler 1982), and a broader range of customer experiences becomes feasible and appropriate. As a result, new patterns of customer demand may emerge even in the absence of fundamental shifts in customer needs (Rindova and Fombrun 2000). For example, Apple reported that 33 percent of iMac purchasers were first-time buyers (Kwak and Yoffie 1999). Increased incongruity is also likely to elicit positive emotional responses such as customer excitement related to the surprise and the new possibilities implied by the novel product form. For example, the iMac was praised as "the coolest personal computer on the planet" (Needham 2002, p. 10) and as a "technological wonder" (Gore 1998, p. 17).

However, embodying incremental innovations in novel product forms may backfire if the change in product form creates a level of incongruity that can be seen as unwarranted. That is, customers may see less value in a product innovation that is incremental in terms of technological change but appears very different from functionally similar products in its category. The G4-Cube (introduced in 1999) was Apple's attempt at creating a computer that looked "entirely unlike a computer" (Manes 2000, p. 186). It was designed with all of

its ports hidden from view (Manes 2000). Although its product form design was praised as "science fiction" and as having the "instant gee-whiz factor our younger selves expected from Tomorrowland" (Taylor 2000, p. 68), customers ultimately rejected the G-4 Cube, because they found its hidden ports an unwarranted hassle (Manes 2000; Taylor 2000). Thus, increasing visual dissimilarity as a design strategy is effective when it causes moderate incongruity, thereby generating a surprise, but also ensures that the incongruity created does not interfere with the taken-for-granted functionality of the product.

Our arguments so far suggest that design choices along the symbolic dimension may increase or decrease the similarity of the new product's form with that of existing products. This formal similarity or dissimilarity affects the product's apparent novelty and influences the levels of incongruity that customers may experience, as well as the ways in which they resolve the incongruity. In sum, the design choices along the symbolic dimension combine with the technological choices underlying its functional dimension to affect how customers perceive and interpret a product.

The Aesthetic Dimension of Product Innovations and the Emotional Dynamics of Incongruity Resolution

Product form design can be used strategically not only to emphasize or deemphasize the technological change an innovation incorporates, but also to create an object that influences customer perceptions through its aesthetics properties, based on its color, shape, proportions, materials, and craftsmanship (Bloch 1995). The aesthetic properties of an artifact determine the sensory reactions it stimulates (Rafaeli andVilnai-Yavetz 2004). These sensory reactions then trigger additional cognitive and emotional responses that are distinct from those based on the functional and symbolic attributes of the product artifact (Christensen 1995; Wagner 1999). For example, the new iMac that Apple introduced in 2002 had a floating screen, surrounded by a translucent plastic frame and attached to a chrome pipe neck (Quittner 2002). These design choices created aesthetic properties that triggered sensory responses, such as playing with its floating screen by pulling it in and pushing it away, as well as motional responses, such as comparing the experience to interacting with a "sunflower" (Quittner 2002, p. 48).

Past research has shown that the aesthetic properties of products, especially those of beauty and elegance, trigger a complex set of sensory, cognitive, and emotional reactions, including spontaneous emotions (Rafaeli and Vilnai-Yavetz 2004) and "a sudden expansion, recombination, or ordering of previously accumulated information" (Csikszentmihalyi and Robinson 1990, p. 18). Csikszentmihalyi and Robinson (1990) refer to these reactions as *aesthetic experiences*. In general, aesthetic experiences are associated with strong positive emotions such as delight, joy, and awe (Csikszentmihalyi and Robinson 1990). Thus, aesthetic properties can be seen as a source of what psychologists call *affect infusion*—"the process whereby affectively loaded information exerts an influence on, and becomes incorporated into, a person's cognitive and behavioral processes" (Forgas and George 2001, p. 9). In other words, the aesthetic properties of an artifact can infuse the sensemaking process about it with positive emotions. Positive emotions In turn can influence perceptions of value directly as well as by influencing the process of incongruity resolution.

Positive emotions and incongruity resolution. In her "broaden-and-build" theory, Fredrickson (1998 2001) identifies three major effects of positive emotions on information processing, sensemaking, and action. First, positive emotions broaden the scope of attention and prompt the use of broader cognitive categories (Derryberry and Tucker 1994; Isen 1987 2000). According to Isen (1987, p. 222) positive emotions "give rise to an enlarged cognitive context", because persons experiencing positive emotions tend to offer more unusual associations (Isen, Johnson, Mertz and Robinson 1985), create and use more inclusive categories (Isen and Daubman 1984; Isen, Niedenthal and Cantor 1992), and perform better on tasks that require creative thinking (Isen, Daubman and Nowicki 1987). Experiencing positive emotions also leads to increased preference for variety and acceptance of a broader array of behavioral options (Kahn and Isen 1993). Such patterns of broader and more creative cognitive processing affect positively the likelihood that customers will find an applicable schema to interpret a given innovation. More importantly, the extent to which creative information processing is stimulated can affect whether customers will find one or multiple schemas applicable and whether they will perceive only close or also more distant associations with existing products as relevant. As discussed earlier, these categorization processes affect how incongruity is resolved and whether the novel functionality of a product innovation is understood and appreciated.

Second, positive emotions also affect behavioral tendencies toward an object (Petty, Desteno and Rucker 2001). Specifically, positive emotions are found to trigger playfulness, willingness to approach and explore new objects, and envisioning future achievements (Fredrickson 1998, 2001; Watson et al. 1999). For example, joy triggers the willingness to play, push the limits, and be creative. Interest, another positive emotion, creates the urge to explore, take in new information and experiences, and expand the self. Even contentment, a lower-intensity positive emotion, creates the desire to savor current life circumstances and integrate these circumstances into new views of self and of the world (Fredrickson 2001). Overall, positive emotions have been found to stimulate exploratory behaviors (Watson et al. 1999), to broaden the scope of action, and to lead to trying out new ways of doing things (Isen et al 1987; Kahn and Isen 1993). Therefore, customers experiencing positive emotions may feel more predisposed to try new things and may perceive them as having higher value potential. They may also feel more energized to cope with the product's novelty and ultimately resolve incongruity more easily.

In addition to their effects on information processing and approach behaviors (leading to creativity and exploration, which are critical to resolving incongruity at the individual level), positive emotions may also contribute to the collective-level processes of new schema development. Research on emotions consistently finds that people experiencing positive emotions tend to exhibit more extroverted behaviors, such as taking more exuberant and more visible actions, sharing their experiences with others, and engaging in helping and supportive behaviors that facilitate the actions of others (Fiske and Taylor 1991). For example, early buyers of Sony's AIBOs self-organized into groups that conducted Robot Clinics, held AIBO birthday parties, and arranged AIBO soccer matches (Moon 2003). Such public, collective, and supportive behaviors are likely to contribute to incongruity resolution at the collective level, because they

facilitate the development of a new schema by providing specific, vivid, positive examples of how the new product is used and creates value.

In sum, to the degree that positive emotions can increase customers' flexibility in perception and preferences, they are likely to facilitate incongruity resolution through flexible and associative information processing and sustained exploration and learning. Because the aesthetic properties of artifacts tend to generate positive emotions, they are a source of positive affect infusion and may provide innovating firms with additional means of fostering processes that lead to incongruity resolution.

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