PRODUCT COMPLEMENTS AND SUBSTITUTES IN THE REAL WORLD: THE RELEVANCE OF "OTHER PRODUCTS"

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Abstract

Buyers make purchase decisions in a marketplace composed of dynamic and interacting product categories. In such an environment, demand for one product can depend directly and indirectly upon the marketing efforts involving "other products," *i.e.,* products in different categories. Hence, buyer (and seller) decision-making can be influenced by what sellers of these other products are and are not doing, as well as by actions of direct competitors. In this paper, we argue for the relevance of these "other products" by considering a wide range of possible inter-category relationships. We offer a behavioral rationale for the existence of these effects and propose a taxonomy of inter-category relationships that do not fit neatly into the conventional product complement/substitute framework. This discussion allows us to identify a number of promising new research questions.

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INTRODUCTION

Buyers make purchase decisions within a dynamic market environment, affording them choices from an enormous number of products and brands as well as influence from a diverse set of marketing programs. Buyers may also be affected by the context of previous purchases, ownership, and usage. Given such diversity, demand for a product will depend directly and indirectly upon many things, including the present or past marketing efforts involving "other products," *i.e.*, products in different, but related, categories.

Product substitutability and complementarity have long been natural ways of thinking about inter-category[1] relationships[2]. Products are considered complements (substitutes) if lowering (raising) the price of one leads to an increase in sales of the other[3] (*e.g.,* Russell and Bolton 1988; Bucklin, Russell, and Srinivasan 1998; Russell and Peterson 2000). Economic theory emphasizes the static demand effects associated with "other products" since complements and substitutes are usually defined in terms of extant cross-elasticity measures (*e.g.*, Deaton and Muellerbauer 1980). Exhibit 1 depicts this conventional framework.

[insert Exhibit 1 about here]

Unfortunately, this dichotomy does not fully consider the richness of plausible inter-product effects on buyers and their market behaviors. Consider, for example, the devices you may use for personal communication: wired phones, cellular phones, and pagers. Are they

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[1]In this paper, we use the term "inter-category" interchangeably with "inter-product." As suggested by the title of this paper, we are concerned with the cases where decisions in one product category can affect buyer and seller decisions in another. We treat technology generations (*e.g.,* 8-bit, 16-bit, 32-bit microcomputer CPU generations) and sub-divisions of a broader product category (*e.g.,* desktop computers, notebook computers, hand-held computers) as "categories" for discussion purposes. Product category boundaries can be "fuzzy" (Viswanathan and Childers 1999), but as we concentrate on the relationships between categories rather than on their composition, such ambiguity is acceptable.

[2]For example, the literature addresses product substitution via research on new product success/failure (*e.g.*, Cooper 2001) and technological obsolescence (*e.g.*, Utterback 1994; Christensen 1997). Product complementarity is addressed via research on product bundles (*e.g.*, Guiltinan 1987; Eppen, Hanson, and Martin 1991; Gaeth, *et al.* 1991; Yadav 1994). Our interest in this paper is to expand beyond these static concepts.

[3]For the sake of clarity, we will discuss inter-category effects in terms of just two alternatives throughout this paper. We recognize that in many markets there may be more than two products that interact (*e.g.,* a large screen monitor, color printer, modem, hard drive, CD-ROM, speakers, memory, *etc*. all interact in the personal computer market). Such cases need not necessarily require a separate discussion as the alternatives can be considered in pair-wise fashion. Clearly, research is needed to understand more complex cases where contingencies and interactions among categories are present (*e.g.*, slower technological development of one component of a system may handicap others; modems capable of faster data transmission speeds than the input-output devices they connect to, or the lines over which they transmit, may limit the speed of the chain).

complements or substitutes? How can the inter-product relationship between cellular phones and personal digital assistants (that are now taking on wireless communication functions) be characterized? These products and the dynamic inter-relationships between them do not seem to fit neatly into the conventional complement/substitute framework. A new product introduction is often considered as just another alternative for buyers rather than one that could change the very nature of the market structure. For example, the magnitude of inter-category effects can be highly asymmetric (*e.g.,* microwave ovens have increased sales of popcorn, but lowering the price of popcorn would have little effect on microwave oven sales). Rather, the introduction of a complement may increase sales of a target product or make it more suitable for some applications than previously, enhancing its competitiveness. More (differentiated) alternatives available also can increase the likelihood that buyers may find new uses for existing products or find added value in complements that already exist. Recognition of a new complementary entry (*e.g.,* microwave ovens) may alert the perceptive marketers of both complements to new sales possibilities (microwave popcorn; adding a popcorn function button), since greater convenience might be afforded without significant downside (*e.g.,* in taste or cost). Also, a new product introduction could possibly change market structure by creating new benefits/costs or extending the range of existing benefits (*e.g.,* Japan's entrance to the USA automobile market had an effect upon quality and reliability expectations; the availability of antilock brakes and air bag options probably had an effect upon the importance of safety in car buying decisions).

Recognition of product complements and substitutes may suggest features of one that could usefully be applied to improve the other (*e.g.,* PCs might be improved by adding capabilities previously associated with TVs such as an "instant on" pushbutton; MacMillan and McGrath 1997). Kim and Mauborgne (1999), for example, suggest that "market-driving" new businesses succeed because they incorporate strengths and reduce or eliminate weaknesses of competing alternatives. As an example, they consider personal finance alternatives before *Quicken* (*i.e.,* accounting software and "pencil and paper"). They argue that *Quicken* is successful because it is able to combine the low price and ease-of-use of the pencil with the speed and accuracy of traditional personal finance software. Knowledge of complementary relationships is also essential to identify desirable product systems (*e.g*., cellular phones with

calendars and games may be sensible, whereas cellular phones with photo capabilities may not, even though both are technically feasible). Incorporating existing complements can even legitimize a new product combination because the separate products are already being purchased by at least one segment of a market.

Despite the pervasiveness of inter-category relationships in the marketplace, most research dealing with competitive effects does not explicitly consider the effects of "other products." Such omission may limit understanding of why the marketplace is as it is and create inaccuracies in managers' abilities to predict outcomes of the marketing actions they take. Thus, a major purpose of this paper is to sensitize academic researchers and managers to the relevance of "other products." Our expectation is that by doing so, more attention will be paid to actually hypothesizing about, as well as measuring, their effects.

There have already been calls for greater realism in researching market behaviors. For example, in introducing their research into customer dynamics, Heath, *et al.* (2000) note:

> "the corpus of decision theory remains focused on single decisions...This limits our understanding of decision-making…. If we are to understand how earlier choices and ownership influence subsequent choices where competitors attack and defend turf through changes in product, price, and promotion, we will have to expand theories to recognize the many forces at work in complex settings...[p. 291]"

Day and Nedungadi (1994) go on to strongly question the widespread managerial practice of simplifying market realities. We echo such concerns by noting, for example, that the bulk of market structure analysis (MSA) research has focused only upon single category competition. Greater understanding by managers and researchers of the connectedness among products should help in the design and prediction of market outcomes.

Because market structures are ultimately determined by buyer purchase decisions, deeper understanding of the existence and nature of possible inter-category effects seems critical. This will serve to:

(1) identify categories and brands that are the key competitor and complementor influences in the market structure (*e.g.,* Brandenburger and Nalebuff 1996),

(2) identify who relevant potential customers are and why (*e.g.*, they may already be buying in related categories; Day, Shocker, and Srivastava 1979),

(3) determine the attractiveness of potential opportunities that may be revealed (*e.g.,* Lehmann and Winer 2000), and

(4) develop appropriate competitive strategies for realizing opportunities (*e.g.,* Porter 1980).

A major reason for this inattention to "other products" may be lack of a framework to think about these effects and a terminology to discuss them. Thus, another purpose of this paper is to augment the traditional complement/substitute framework by proposing a broader taxonomy that incorporates several important static and dynamic inter-category relationships. Our discussion adds to the marketing literature on competitive dynamics arising from the interaction of buyer and seller perspectives (*e.g.,* Dickson 1992; Ratneshwar, *et al.* 1999; Rosa, *et al.* 1999) and, more importantly, enables us to suggest some promising new research questions.

The remainder of this paper is organized as follows. We first provide a basis for inter-category effects at the individual buyer level because this is where they are manifest, *e.g.,* the same two products may have a different relation for different people or at different points in time. We also note how market aggregation of such individual effects may mask the underlying heterogeneity in buying behaviors. Having offered a rationale for inter-category effects, we then propose our taxonomy. The implied competitive and market dynamics are discussed, and their ensuing implications outlined. We end by outlining several promising research questions.

WHY ARE "OTHER PRODUCTS"RELEVANT?

Product Categorization

Before discussing the rationale for inter-category effects, we first consider product categorization and its role in individual-level decision-making. Being a key aspect of cognitive behavior, categorization has received much attention. The psychology and consumer behavior literatures have examined cognitive representations of categories and their ensuing information-processing implications (*e.g.,* Rosch 1978, Smith and Medin 1981; Murphy and Medin 1985; Alba and Hutchinson 1987; Barsalou 1991; Viswanathan and Childers 1999). But only limited work has addressed key issues of why categories form and how they evolve (*e.g.,* Bettman and Sujan 1987; Rosa, *et al.* 1999), or how even to define and distinguish them (*e.g.*, do different generations of a high tech product belong to same or different categories; Ratneshwar and Shocker 1991). Some researchers have found it useful to just regard category boundaries (i.e., definition) as "fuzzy" (Viswanathan and Childers 1999).

Interestingly, both buyers and sellers find it useful to categorize products. For buyers, categorization simplifies information processing/decision-making and facilitates inter-personal communication. Categories provide a context where similarities and differences among brands

are can be highlighted. People are sensitive to the correlational structure of their environment and, in interests of cognitive economy, may categorize products (at least temporarily) on the basis of factors such as their physical resemblance, perceived similarity of their producers, or fit with available category labels (Day, Shocker, and Srivastava 1979). From a seller's perspective, categorization speeds up individual buyer learning about new products as well as diffusion and promotion through word-of-mouth among potential buyers. Categorization also permits easy communication between producers and distributors (*e.g.,* through SKU and billing information). Thus, product category formation and evolution is the consequence of purposeful behaviors on the part of both buyers and sellers. Rosa, *et al.* (1999), in particular, present empirical evidence that product-markets are socially constructed and evolve out of interactions between buyers and sellers. Product-markets may not be one-to-one with simple product categories - the fact that buyers and sellers each need to make sense out of the other's behaviors also accounts for the fuzziness of some category boundaries and their seemingly *ad hoc* nature (*e.g.,* Day, Shocker, and Srivastava 1979; Viswanathan and Childers 1999)[4]. An important arena for new academic research lies in investigating why buyer and seller categorizations of the same products differ, what their behavioral implications are, and the circumstances under which such differences are most likely to occur.

Strong arguments can also be made for a constructive, flexible, and goal-driven view of product categorization. First, there is considerable evidence that buyer motives and goals (*e.g.,* to lower one's cholesterol, to buy a birthday gift for one's spouse) may be important in determining buyers' mental representations of products, *i.e.*, which alternatives they attend to and which aspects are considered more important (*e.g.,* Barsalou 1985; Loken and Ward 1990; Ratneshwar and Shocker 1991; Ratneshwar, Pechmann, and Shocker 1996). Second, category representations may be surprisingly flexible because they can be contingent upon goals salient in any given usage situation or context (*e.g.,* Bagozzi and Dholakia 1999; Barsalou 1991; Ratneshwar and Shocker 1991). For example, Ratneshwar and Shocker (1991) found that category typicality judgments made in the context of specific product usage situations (*e.g.,*

[4]What exactly is a product category, how they are created (by buyers, sellers or others like media, legal writers, etc.), and how they evolve, are important questions that cannot be answered here. We assume categories exist, that they have a hierarchical structure (where super-ordinate and subordinate categories complement a main category), and that new generations may also be new categories when they are sufficiently differentiated. However, the arbitrariness of category definition should not detract from the points made in this paper.

snacks that people might eat with beer at a Friday evening party) were significantly different from judgments made in response to simpler category cues (*i.e.,* snack foods). Apparently, the contextual information framed buyers' perceptions by focusing their attention selectively on situation-relevant aspects of products (*i.e*., whether a snack is salty, crisp, divisible, and convenient for eating at a party).

In mature product-markets, many different products serving the same general need may coexist (*e.g.,* both subcompacts and pick-up trucks provide personal transportation). A key reason for proliferation of categories is that producers face technological barriers to optimally serving multiple, specific buyer goals (*e.g.,* providing both fuel efficiency and roominess in personal transportation is difficult). There also may exist heterogeneity in preferences across buyers or households in the importance they attach to different goals or desired benefits (*e.g.,* fuel efficiency vs. roominess). Given both technological constraints and buyer heterogeneity, producers create, label, and position different products to optimally serve disparate buyer goals (Ratneshwar, Pechmann, and Shocker 1996). In such cases, buyers are likely to perceive that products in the same category deliver only on certain goals and that options in different categories have negatively correlated attributes. For example, buyers may discern that subcompacts afford fuel efficiency but not off-road driving, and may perceive the opposite for four-wheel drive vehicles.

Inter-Category Effects

Russell, *et al.* (1999) identify three ways that choices across different product categories may be linked: cross-category consideration, cross-category learning, and product bundling. *Cross-category consideration* represents instances where a number of product categories (and possibly many options or brands within each) could be effective substitutes (Srivastava, Alpert, and Shocker 1984). Empirical evidence for the existence of multi-category choice sets is provided by Roberts and Lattin (1991) and Graonic (1995), among others. In Graonic's example, a buyer seeking an in-home aerobic workout may choose among alternatives from different categories such as stair climbers, exercise bicycles, rowing machines, treadmills, *etc*. While a buyer could first make a category choice followed by a brand choice, "speak out loud" decision protocols revealed that many buyers kept several brands from different categories under

consideration (in memory) simultaneously until making their choice (Graonic 1995).

An inter-category effect can also be activated by the context of earlier choices. Such *cross-category context* or *learning effects* are present when choice in one category is influenced by the prior possession of, experience with, or use of products in other categories. For example, a student completing a required computer education course may become more likely to purchase his/her own computer (and often the brand used in the course) because of added familiarity created by such training. The perceived quality of a video picture may be affected by experiences with motion pictures. Durable goods such as major appliances may be acquired, if at all, in a specific priority pattern or sequence (*e.g.,* dryers after washers, freezers after refrigerators; Dickson, Lusch, and Wilkie 1983; Bayus and Rao 1989). A buyer satisfied with a certain brand (*e.g.,* Maytag) or technology (*e.g.,* digital) in one category (*e.g.*, washing machines; pagers) may have a higher likelihood of purchasing from another category in which those same brands or technologies appear (*e.g.,* dishwashers, cellular telephones) (Erdem 1998; Kim, Chang, and Shocker 2000).

Kamakura, Ramaswami, and Srivastava (1991) use a variant of latent trait theory to show that financial instruments (such as savings accounts and stocks) are ordered along an underlying scale of financial expertise. The presence of less sophisticated financial instruments (savings accounts) in the portfolio makes the consumer increasingly likely to select more sophisticated financial instruments (stocks) in the future. In such cases, context effects can be thought of as a series of sequential choices across different categories—each choice affecting the next. Harlam and Lodish (1995) posit an explanation in the existence of a global utility function that allows different purchases (*e.g.*, different flavors of powdered beverages) to contribute to an overriding goal (*i.e.*, a desired portfolio of flavors). A string of purchases creates a temporally expanding bundle that is always under evaluation by the consumer's global utility function. Consequently, the probability of making the next purchase depends upon the set of products that have already been purchased. Although the Harlam and Lodish (1995) application appears in a single category setting, its logic can easily be extended to multiple categories.

In *product bundling***,** items from multiple categories jointly contribute to fulfill buyer wants. This leads to the selection of a number of different products (usually on the same or proximate shopping occasions). Most complementary products used together would fit into this classification even though they are not always purchased together (*e.g.,* hot dogs and buns;

computers and software). Sellers often assemble bundles that consumers can accept or reject (*e.g.,* a package of standard equipment for a new car). In some cases distributors or consumers may assemble the package (*e.g.*, a stereo "system" using complementary components from competing firms - a Sony receiver with Yamaha speakers - even though each brand offers both). Less recognized is that consumers often examine products category by category and create their own (personalized) bundles - *e.g.,* an assortment of liqueurs and brandy to serve to guests after dinner; a grocery shopping basket (Farquhar and Rao 1976; McAlister 1979; Russell and Kamakura 1997). Bundles may be items that happen to be purchased together, say because they meet a buyer's goal (*e.g.,* convenience) simply by being available from the same store or supplier. But a retailer may serve other buyer goals as well, say by pre-packaging products to be sold as gifts (saving time) or by assembling different category components (assuring compatibility and connectivity).

In all these ways, the *purposes* or goals of the buyer play a central role. Purpose (which is sometimes implicit in a usage or purchase situation) provides coherence for the multi-category (or even a single category) decision by helping to define the benefits being sought by the buyer (Bagozzi and Dholakia 1999; Yang, Allenby, and Fennell 2002). Defining relevant benefits is often tantamount to defining the products that may be considered. Product categories have hierarchical relations possibly because the purposes that influence their construction are hierarchical (Ratneshwar, Mick, and Huffman 2000). If one is interested in "capturing memories," a camera, film and developing process are relevant. If one is interested in "giving a gift," a camera alone may suffice. If a part of the camera breaks or "needs repair," then only that broken part may be relevant. Finally, if the camera is used for a less common purpose such as a paperweight or art object, then a host of other products may serve as substitutes. Products can serve multiple purposes because they provide "affordances" (*i.e.,* "…the potential benefits and disadvantages of a product…in relation to a particular person" which can be actualized on different occasions; Ratneshwar, *et al.* 1999, p. 194). Thus, considering product complementarity or substitutabilty, without controlling for the effects of purpose, creates ambiguity.

Ratneshwar, *et al.* (1999) provide evidence in support of three factors that affect product/service decision-making. In addition to *purpose*, they recognized that the awareness and availability of *products* and services to the decision-maker, as well as the *person*'s own tastes and preferences (conditioned by past experience and knowledge), are also important.

Additionally, the context of other products, as well as buyer tastes and preferences, may play a role in defining relevant product substitutes. Access to certain complements may permit a core product to be used in particular ways (*e.g.,* a PDA with an add-on may enable it to also function as a cellular telephone and affords synergies that may give it some advantages over more specialized products). These three Ps - *Person, Products,* and *Purpose* - provide a useful guide to think about when and why multi-category decisions occur and to predict their possible outcomes.

Choice analysis has long recognized the interaction of individual differences and product alternatives. When all members of a product category are used in similar ways and no other products provide the totality of desired benefits, single category choice should predominate. In this case, the effect of purpose will be muted since there is little variability. However, consider choice situations where many alternatives with desired benefits are available (both within and across product categories). Given information-processing demands, it is unlikely a consumer will give serious consideration to all available alternatives. Instead, much research suggests a two-stage choice process in which the consumer may rapidly narrow his/her attention to a small set of alternatives in the choice environment (Hauser and Wernerfelt 1990; Roberts and Lattin 1991), although some of these may still be multi-category (Graonic 1995). The final choice is made from this set after more detailed consideration of the alternatives, often after updating the set with new information and memory cues (Shocker, *et al.* 1991).

Given that choice possibilities encompass many product categories and the consumer follows a multi-stage decision process, Ratneshwar, Pechmann, and Shocker (1996) suggest that the likelihood of cross-category consideration depends upon the manner in which a buyer goes about constructing his/her consideration set. They demonstrate two conditions in which generated consideration sets include multiple categories. First, consumers may suffer from goal ambiguity, *i.e.,* they may recognize a general need or consumption purpose, but may not have well-defined goals and preferences at the level of specific product benefits or attributes (*e.g.,* many gift-giving situations would qualify where the recipient's tastes and preferences may not be known fully). Goal ambiguity enhances the likelihood of cross-category consideration. Second, even when consumers have clear goals, the goals may conflict (*e.g.,* a personal desire to lose weight may conflict with a desire to be cool on a hot day - leading to consideration of fresh fruit and ice cream as snack alternatives). They show that in goal conflict conditions, consumers construct heterogeneous consideration sets that include negatively correlated alternatives from

different categories, thereby deferring conflict resolution to the final choice stage.

Finally, the nature of the choice environment may also be conducive to cross-category consideration. There are at least two reasons. First, constraints on the number of available alternatives (*e.g.,* a restaurant with a limited selection of entrees) may force consumers to engage in consideration and choice across multiple categories (Johnson 1989). Second, the visual configuration of choice alternatives may juxtapose multiple, competing categories and thus prompt cross-category consideration (*e.g.,* a restaurant menu, retail store display, mail order catalog, or Web site). However, current empirical evidence on this is sparse.

Summary

We began this section by noting that categorization plays an important function in human decision-making. Product categorization by buyers and sellers is based on commonly understood sets of related products that facilitate communication. Although buyers create categories to simplify decision-making, their choice processes often span multiple product boundaries. A key reason is that buyer purposes or goals are situation specific, whereas categories remain, at least in the short run, reasonably stable. Buyers need not respect single category labels if alternatives within a particular category are not adequate to satisfy their purposes, or if products in different categories are also adequate. Sellers have similar freedom and, by offering new product alternatives, can sometimes even change category meanings (e.g., "taking an aspirin" became inadequate as a description of all pain killers when acetaminophen, ibuprofen, naproxen, and the more recent NSAIDs or Cox-2 Inhibitors entered). Situations involving negative inter-category effects encourage consideration of *substitute* products, whereas situations involving positive inter-category effects deal with *complementary* products.

WHAT ARE THE POSSIBLE EFFECTS OF "OTHER PRODUCTS?"

In this section, we provide an extended view of inter-category relationships that moves beyond the conventional framework of complementarity and substitutability to more fully consider the richness of plausible effects. In particular, a broader range of real world inter-category relationships will imply that:

- the strength of *static* (existing) inter-category effects will often differ in magnitude (*i.e.,* A's effect on B will be substantially different from B's effect on A).
- some important inter-category effects involve *neither*, or possibly even *both*, substitute

and complementary relationships. *Neither* can involve situations where there are non-sales relationships between the products (*e.g.*, physical design relationships). *Both* may occur because the same buyers may use the products for multiple purposes.

- some inter-category relationships may be *strategic* (e.g., the existence of one product may provide a reason for a new product to enter or otherwise facilitate its entrance, one category may add functionality to another that leads either to the original's improvement or the creation of a new category).
- some inter-category relationships may be *dynamic* (*i.e.,* the nature and/or strength of a relationship can change over time, buyer learning in one category affects willingness to accept/reject or influences the marketing activity in another).
- inter-category effects measured at a market level may aggregate these different types of individual-level effects and to this extent be misleading as to what is actually happening in the real world.

In Exhibit 2, we propose a taxonomy of inter-category relationships that includes both static and dynamic cases. *Static relationships* are stable and tend to persist largely unchanged. They are sustainable at an individual-level because the categories fulfill similar buyer requirements (purposes). They may also provide similar performance/price ratios (Kim, Chang, and Shocker 2000). Static relationships may also include those products that are both complements and substitutes simultaneously because they are capable of serving different purposes. Since some purposes arise relatively frequently and others only occasionally, "static" buyer behavior may also reflect the different learned responses or environmental circumstances that give rise to buyer behaviors. *Dynamic relationships* represent cases where the products and/or their relationships are in transition over time and the products may or may not ultimately co-exist. They may reflect (1) product order of entry (*i.e.*, a category that already exists and therefore serves as a context for decision-making, affecting factors such as product appreciation and access to distribution channels, and a category that is newer), (2) transitions between substitutes and complements (*e.g.*, where complement bundles become partial substitutes for the unbundled products or products originally designed as substitutes, because of their differences, come to coexist as complements), (3) transitions within complements (*i.e.*, originally "non-essential" complements becoming more "essential"), and (4) transitions within substitutes (*i.e.*, where either the new or existing product eventually dominates rather than co-exists).

[insert Exhibit 2 about here]

Exhibit 2 is framed in terms of possibilities operative at the individual buyer level (*i.e.*, what an informed buyer, knowledgeable about the relevant categories, might comprehend).

Because relationships may change with time as categories are modified and because buyers are heterogeneous in terms of their awareness, knowledge and purposes, aggregate market relationships may not always indicate the individual-level effects that underlie them (*i.e.,* aggregate inter-category relationships may represent a "netting out" or averaging of the relationships at the individual-level). Finding ways in which individual-level relationships may be identified from aggregate-level data is an important future research challenge.

A. Static Inter-Category Relationships (across buyers)

A1. *Substitutes-in-use* represent the case where multiple product categories compete because they serve similar purposes and thus may have similar "potential customers" (*e.g.*, Srivastava, Leone, and Shocker 1981; Srivastava, Alpert, and Shocker 1984). This instance is also illustrated in Exhibit 1. Here, all competing products deliver requisite benefits, making them suitable for the defining purpose. Gensch (1987) and others have found evidence for buyer decision-making as at least a two-stage process in which the first stage (*e.g.,* consideration) could be represented by a non-compensatory process and the second stage (*e.g.,* choice) by compensatory processes where trade-offs among the remaining benefits are possible[5]. In this case, one product does not dominate the other (*e.g.,* DVD and VHS videos offer trade-offs in picture quality and cost that have allowed them to co-exist, although as cost differences narrow that may change.) Sometimes it is price that precludes categories from competing more directly (*e.g.,* national and private label brands), so that only when the normally more expensive brand goes "on sale" does their substitutability become evident (Blattberg and Wisniewski 1989). The relationship is asymmetric in magnitude, *i.e.*, a national brand may serve a broader, more dominant set of purposes than a private label product (*e.g.,* in situations where "conspicuous consumption" is desired), so the latter may not substitute effectively even when it goes on sale. "General purpose" products (*e.g.,* clothes washing detergents) may substitute to a meaningful degree with more specialized or niche products (*e.g.,* "other products" for cleaning walls and

[5]However, even when multiple product categories can potentially substitute, given information processing demands, it need not follow that all receive serious consideration. For example, much research suggests the possibility of a process in which a decision-maker rapidly narrows his/her attention to a small set of alternatives in the choice environment (*e.g.,* Gensch 1987; Hauser and Wernerfelt 1990; Ratneshwar and Shocker 1991; Roberts and Lattin 1991; Shocker, *et al.* 1991; Hutchinson, Raman, and Mantrala 1994; Ratneshwar, Pechmann, and Shocker 1996).

floors, pots and pans) - the converse may be less true.[6]

Preferences among *substitutes-in-use* can, of course, largely be a matter of taste rather than performance quality alone. But these products have negative influence upon each other's sales. A desire for variety or redundancy (*e.g.,* to provide backup) may sometimes even motivate purchase of both substitutes (creating a kind of complementarity). Stair climbers, stationary bicycles, rowing machines, and treadmills all offer an aerobic workout and thus may also be considered as substitutes, even though some may be more suitable for certain buyer segments (*e.g.,* recumbent bicycles may place less strain on the back than conventional stationary bicycles; Graonic 1995). *Substitutes-in-use* need not physically resemble each other but could if form is essential to function. Services may substitute for products (*e.g.,* leasing rather than buying an automobile or computer) and software can sometimes perform the same functions as hardware (*e.g.,* Macintosh computers can run Windows programs either by using a software utility or by installing a hardware card). What is important is that these products are all capable of providing the core benefits dictated by buyer purpose, even though it is primarily the "person" in the Purpose-Product-Person framework that determines the extent of substitutability.

A2. *Occasional substitutes*, or what Lehmann and Winer (2000) term "budget competitors," satisfy a higher-order or generic purpose. Purpose is hierarchical in the sense that there may be general or super-ordinate purposes, with more specific ones as subordinate. The more general the purpose the greater the number of products which may provide a degree of competition (*e.g.,* a big screen television, a new wardrobe, and different vacations may all serve the general purpose of providing "pleasure," but due to budget constraints, only one will be obtained). Because of this generality of purpose, the specific alternatives and their actual substitutability may be highly idiosyncratic since a person's tastes and preferences play an important role (*e.g.,* in what one considers "pleasurable").

Even at the same level of specificity, categorization of certain new products may be amenable to cues. An overriding purpose might be suggested by the context of other products or the physical form that it assumes. For example, granola bars might originally have been credible either as candies, cookies, health foods, or even a separate snack category, but the section of a

[6] Numerous behavioral explanations for the asymmetric price competition observed between national and private label brands have been offered in the literature (*e.g*. Heath, *et al.* 2000). Dominance of purposes is meant to add to

grocery store in which they are shelved suggests a preferred positioning. New products such as chewing gum toothpaste substitutes may have their associations with teeth cleaning or decay prevention (traditional characteristics of toothpaste) strengthened by displaying them in the toothpaste section rather than with other chewing gums. Store traffic and image may be built by promoting certain brands and categories (*e.g.,* Wal-Mart as the store to go to for the best prices of toothpaste; Chintagunta 2002). Because inherent ambiguity still remains, the focal product may retain some substitutability with products in each of its plausible categories (*e.g.*, tooth cleaning gum may remain a weak substitute for regular chewing gums; granola bars may still be used in place of cookies). Packaging products in containers associated with another category may strengthen (or weaken) associations with their own or with another category's major benefits (*e.g.,* clear gel toothpaste packaged in containers associated with mouthwash may strengthen its breath freshening associations; "freeze-dried" used box-like packaging and crude granular particles to position itself as different from regular instant coffees).

A3. *Classic complements* enhance the growth prospects of each other and their co-existence is also affected by user purpose (see Exhibit 1). For example, personal computers and application software have exhibited a positive, reinforcing influence on each other for the past twenty years (*e.g.,* Gates 1998). In many cases, *classic complements* are products that essentially have little or no value without the other (*e.g.,* hardware & software; television sets & programming). In other situations, such complementary products can also be used independently (*e.g.,* peanut butter and jelly; socks and shoes) but are commonly not because a superior result can be achieved jointly. Recognizing these inter-category relationships, firms have often followed a pure (only the bundle is offered for sale, not the individual components) or mixed (the bundle and its components can both be purchased) product bundling strategy (*e.g.*, Guiltinan 1987; Eppen, Hanson, and Martin 1991). For example, airlines and travel web sites offer vacation bundles composed of air travel, lodging, and rental cars (mixed bundling), and some physicians require that their patients undergo various multi-category diagnostic procedures with their physical exam (pure bundling).

A4. *Non-price complements* offer another array of possibilities. For example, products intended to be used together exert design influences on each other (*e.g.,* the size of a briefcase or

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this list.

the trunk of a car should reflect the size and nature of the other products they are intended to hold). Prominent features of one product may also be used to describe similar features in another (e.g., light as a feather). Typically these are non-price effects. Products commonly sold in the same stores or displayed near each other may also exert weak effects on each other's sales. Seeing one product (hot dogs) may influence impulse buying of another (buns, mustard) through a kind of "reminder" promotional effect. A brand name with strong associations in one product category (*e.g.,* Johnson & Johnson baby shampoo is strongly associated with gentleness) may transfer those associations to others (e.g., bandages, talcum powder) which may be weak complements (Loken and John 1993; Russell and Petersen 2000). Co-branding or branded ingredient strategies have, as part of their rationale, such cross-category associations (Park, Jun, and Shocker 1996).

B. Dynamic Inter-Category Relationships (across time)

B1. *Product displacement* is the type of substitute relationship where "new and improved" categories come to dominate, and eventually obsolete, older ones. Notable about *displacement* is that the older product may contribute to its own demise by sensitizing customers to its deficiencies and thus speed adoption of a new one that promises relief. The same channels of distribution for the older may also be used for the newer one, once retailers recognize substitutability for their customers (*e.g.*, audio CDs are sold in many of the same outlets that formerly sold cassettes and records). Sellers may force or speed displacement by phasing out and ceasing to supply the older version as the two products appeal to similar customer bases (*e.g.*, Apple removed floppy drives from their new PC models in favor of CD or DVD drives). Successive "generations" of a product often (but not always) fit this case (*e.g.*, among PC peripherals, 3.5-inch disk drives originally displaced 5.25-inch drives because the newer disks were more durable, smaller, and offered greater data capacity at little or no extra cost).

Sometimes the displacing product "creates" a new category rather than serves as a sub-category of the older one (*e.g.,* automobiles replaced horses and buggies as basic transportation; calculators replaced slide rules). Presumably, the greater the differences that exist between the new product and the previous category (in physical appearance, technological platform, manufacturer, etc.), the greater the likelihood older category labels will no longer suffice. It may also be that when the first mover appears, initial attempts at categorizing the innovation will

evoke existing categories (*e.g.,* horseless carriage), but as more competitors enter with similar products, a new category name is created (*e.g.,* automobile). The speed and magnitude of *displacement* should depend upon whether the benefits/costs (*i.e.,* the value proposition) of the newer product dominate the older. Writeable CD-ROMs, "superdrives," "zip drives," and "portable hard drives" are categories now competing to replace many applications once handled by the floppy diskette. *Displacement* seems predestined whenever a newer product offers higher (equal) levels of all core benefits provided by the older, with little or no added costs (*i.e.*, offers a higher performance - price ratio). Usually this is not the case, so it becomes important that a manager understand customer benefit trade-offs (*e.g.*, through conjoint analysis). When displaced, older products may be scrapped or diverted to less prominent uses (*e.g.*, as collectibles, museum curiosities) or less sophisticated users (*e.g.,* given to the kids). When this happens, new purposes sometimes become relevant (*e.g.,* calculators can be used for more applications than slide rules ever could).

Displacement is one outcome of competitive rivalry. Co-existence, implied by *substitutes-in-use*, is another. *Product survival* (discussed below) is a third. What makes these cases dynamic is the method and time frame in which such competition occurs. Using an ecological analogy, the term "predator-prey" characterizes a class of such dynamics (Moore 1993). Targeting similar customer needs, a new product (the predator), usually equipped with a higher level of technology than existing ones, enters the market and encroaches upon the incumbent products' (the prey) market potential (*e.g.*, Berryman 1992; Moore 1993). The incumbent firms, facing new threats, either disappear or are able to react by enhancing their competitiveness. These firms' efforts may take the form of product or process improvements, a lowering of price, and/or a product repositioning (*e.g.,* targeting new uses and/or new users).[7] For example, plastic containers have largely displaced fiber cans for motor oil because of their ability to be opened without use of a tool and to integrate a pouring spout. Clear plastic has also largely displaced glass bottles (*e.g.*, for ketchup) because of their lighter weight, squeezeability, and greater resistance to breakage, all while maintaining slightly higher cost. But in the case of all-plastic containers (the predator) threatening paper cartons (the prey) for refrigerated juices and milk, the paper containers were able to fight back by adding plastic coating and pouring

spouts with screw-on caps to improve their functionality, leading to co-existence.

B2. *Product survival* is a substitution type wherein the newer product fails in its efforts to displace the older category. While many factors have been offered to explain new product failure (including the possibility of an inadequate marketing program rather than a "bad" product), "failure to adequately meet customer needs" is a frequently cited reason. A manager may misjudge whether the benefits of the new exceed the old or, because it is a new product, fail to understand the full range of added costs its purchase or use necessitates. For example, in the personal computer industry the first hand-held PDAs (*e.g.,* Apple's *Newton*, Sony's *Magic Link,* Motorola's *Envoy*) did not fare well against incumbent products (*e.g.,* laptops, paper-based organizers) even though a later variant (the Palm *Pilot*) has been very successful. A new product with poor underlying technology can impede the success of later products based upon that same technology (*e.g.,* Microsoft chairman Bill Gates stated that the Apple *Newton* fiasco hindered development of the hand-held product category; Bayus, Jain and Rao 1997). As noted, buyers may be sensitized to those aspects of the product (*e.g.,* handwriting recognition) that were troublesome in failed versions, creating a ready market for a promised improvement. In addition, a brand may be unable to re-introduce its improved version of a failed product (*e.g.,* Apple eventually killed its *Newton* division because management felt the company was not strong enough to resurrect the brand) despite later evidence of turnaround in the category.

Analogous to the predator-prey relation is one we term prey-predator (Moore 1993). A prey-predator multi-category relationship can be characterized as a kind of competitive role reversal. The new product enters the market because it sees opportunity in the limitations of existing products but, by exposing those limitations, awakens the existing product that then becomes the victor. An example lies in the history of DuPont's *Corfam* (see Hounshell and Smith 1988). After years of development and heavy R&D expenditures, the introduction of *Corfam* in 1964 was heralded as the technological product substitute for leather. Targeted at the high-end shoe market, *Corfam* had proven itself in tests to be the equal of fine leather. In some ways, *Corfam* was even better since it was unaffected by moisture, weighed a third less, kept its luster, and did not have to be broken in. Although DuPont initially did face retailer and

[7]This phenomenon has been termed the "sailing ship effect," named after the sailing ship industry in which faster clipper ships with sails were developed in response to steam-powered vessels; see Gilfillian (1935).

consumer resistance to *Corfam* shoes[8], the critical factors that spelled its death knell were the entry of European fashion shoes made of many different styles of leather and the promotion by the leather industry of glove-like leathers that *Corfam* could not duplicate. Being pushed out of expensive shoes, *Corfam* had to compete with vinyl in cheaper shoes. Although *Corfam* was superior to vinyl, DuPont could not earn a profit given *Corfam*'s high manufacturing costs. Eventually, the plant and process were sold.

B3. *Enhancing complements* represent a situation in which a newer product enhances sales of an existing one by improving its functionality (*e.g.,* making it more available, more convenient to use, improving its quality). Generally, enhancing complements lead to higher benefit levels for the existing product with which it is used in combination, rather than providing new benefits (Kim and Mauborgne 1999). For example, the availability of clipart and animated pictures has made presentations more interesting. Such well publicized uses for the newer product increases the likelihood that many buyers will perceive the enhanced relationship in similar fashion. In this case, the newer product (clipart) positively influences sales of the existing (and more essential) one (presentation software) by virtue of derived demand, but the reverse effect is often much smaller (*i.e.,* lowering the price of clipart packages should not have great effect upon presentation software sales). Enhancing can also occur because of "training or learning." Owning a tricycle may create "the feeling of freedom" as a benefit that will subsequently be enhanced by bicycle and/or automobile purchases later in life. In such relationships, the interfaces between product components (*e.g.,* the seating and steering of a tricycle and a bicycle) can be especially important and sales of the enhanced products furthered by a common standard to assure compatibility and interchangeability (Shapiro and Varian 1999). Sometimes the interface itself becomes another product needed to make a product system function better (*e.g.,* modems enable communication between the internet and PCs; a car kit lets a portable CD player play through the existing automobile radio).

B4. *Augmenting complements* add new benefits not present in an existing product (*e.g.*,

[8]Conventional wisdom holds that consumers refused to buy *Corfam* shoes since they did not breathe properly. Actually, only about 15 percent of *Corfam* shoe wearers complained of having hot feet. Moreover, DuPont researchers were able to establish scientifically that *Corfam* in fact breathed better than leather. Since *Corfam* shoes did not stretch, a proper fit was essential to comfort (which usually meant buying a larger size shoe than usual). Thus, some DuPont insiders linked the problem to bad fitting by retail shoe clerks. See Hounshell and Smith (1988) for further details.

combining a radio with a clock not only permitted an alarm of varying content but programmed the radio). Often *augmenting complements* are synergistic and represent cases where an existing product has a major sales effect upon its newer complement because its limitations have created reasons for a complement to exist or legitimized it. For example, having e-mail capability (existing product) positively affects the desirability of obtaining a digital camera (newer product) to enable photographs to be sent in addition to words. There may also be "priority patterns" that determine the order in which related products are purchased, *i.e.*, more basic purposes may be satisfied before less basic (*e.g.,* a washing machine purchased before a dryer; a savings account opened before a mutual fund investment is begun; *etc.*). Again, common purpose may influence the purchase sequence of many people (Harlam and Lodish 1995). Marketers can influence sales of *augmenting complements* by the ties with older products they emphasize in rationalizing or positioning their newer one. This can help buyers better understand the fuller range of product benefits, *i.e.,* the combined benefits of both products (Eppen, Hanson, and Martin 1991).

Sometimes a relationship between products may be both that of substitute and complement, *i.e.,* two products may be complements for one purpose, yet be substitutes for another. In this case, individual-level effects may net out so that an aggregate inter-category relationship may distort the individual-level reality. (Research has not generally recognized such dual possibilities because most cross-elasticity measures are based only upon aggregate data.) Different users may purchase products for different reasons or the same users may use the product differently at different times or contexts. The multiple uses such products serve may even be their major (possibly unrecognized) competitive advantage. For example, a VCR is a complement when it provides an additional tuner to enable picture-in-picture capabilities or the ability to preserve a television show, but it is also a substitute input for an antenna, cable or satellite dish. TV news, news-radio, newsmagazines, the daily newspaper, and the internet may be complements because they are differentiated by timeliness and depth of reporting (*e.g.,* some are immediate, others delayed; some offer analysis in addition to headlines). Yet these products can also be part of a substitute portfolio of products purchased by someone desiring only limited detail (McAlister 1979). Consuming a diet soft drink may allow a buyer to rationalize the consumption of a high calorie hamburger (so, in this limited sense, the soft drink is a substitute as well as a complement). Depending upon economics, the combination may continue to

compete with the separate complements that comprise it (*e.g.,* a clock radio may compete effectively with dedicated clocks and radios). Product bundling or other product complexity sometimes allows the resulting product to play multiple roles in terms of its relationships with other products.

C. Dynamics Between Complements and Substitutes

There are not only dynamics within substitute categories or within complements but, importantly, also between the two. Changes in buyer demands may result in a gradual shift from non-competitive inter-category modes (*i.e.,* complements) to competitive ones (*i.e.,* substitutes) and *vice versa*. We term these *reincarnation* and *rejuvenation*, respectively. As an example of *reincarnation*, we offer the relationship between Microsoft's *Windows* operating system and Netscape's *Navigator* web browser. The web browser was initially an *augmenting complement* that eventually served to "re-awaken" *Windows*. *Windows* then became the predator after incorporating its own web browsing capability (Gates 1998). Another example is the relationship between wired and wireless telecommunication technologies. Initially, the cellular phone was an *enhancing complement* to regular wired phones (*i.e.,* to be used for different purposes). Recently, in many Asian countries (and increasingly in the USA because of "free" long distance and other pricing practices) it is common for cellular phones to displace wired phones for regular use at home due to dramatically decreasing subscription fees, consistent quality improvements, and the long delays required to obtain wired phone installation.

As an example of *rejuvenation*, consider the early days of video entertainment. When television was first introduced, it was presumed to represent a major threat to motion pictures since one could watch movies at home instead of traveling to the theater. Both were forms of entertainment, but they had different uses, users, and occasions for use. Television's small screen, inconsistent reception quality, and the initial absence of color were major hurdles. Yet because of its perceived threat, movie studios refused to allow their facilities to be used to produce television shows and ran large-scale promotional campaigns urging consumers not to purchase TV sets (Boddy 1990). But television persisted, and the two entertainment modes co-exist today. Eventually movie studios joined in the production of television shows, which became an even bigger business for them than movie production. They belatedly realized that so long as first-run movies were not aired contemporaneously with their showing in theaters,

television could serve as a complementary entertainment medium.

There is often a strong incentive for an existing product to incorporate features that previously were complements (*e.g.,* witness the evolution of the Microsoft *Windows* operating system as it adds features such as hard drive management, zip file capability, virus protection, media player, web browsing, *etc.*). As this happens, the category itself may get redefined as the new one becomes a substitute to its former complement. *Augmenting complements* may evolve into a competitive mode as a newer product encroaches upon the existing one (*e.g.,* the digital convergence of "appliances" such as the PC, television, and video game console that replaces separate machines; self-service has largely made only full-service gas stations minor players; ATM machines have taken the place of human bank tellers). Practically every major university is considering the role of multimedia technologies and internet applications in higher education and distance learning (Matthews 1999). The issue being debated by university administrators is less whether these technologies are complements, but rather whether these technologies offer viable substitutes for face-to-face education in the future.

In some industries, technological progress and market restructuring is so fast that inter-category relationships may even oscillate in a relatively short-time period. An example of this case is the wireless telecommunications market in Hong Kong (Kim, Chang, and Shocker 2000) and elsewhere. When analog-type cellular phones were first introduced to Hong Kong in 1986, most cellular phone users came from the existing pager user group. At that time, individuals usually owned both a pager and a cellular phone because of the unstable communication quality of the analog phone (these products were *enhancing complements*). With continuous technological improvements to the cellular phone however, it began to substitute for the pager. Interestingly, from the late 1990s on, we observe that the relationship is evolving back into a complementary one again where many cellular phone users also own pagers for the purpose of checking incoming calls while they have their cellular phones turned off. In addition, by adding some *augmenting complementary* accessory functions (*e.g.,* games, calendar, travel information, *etc*.), the pager has developed its own market niche that is reasonably stable in terms of its performance/price ratio.

FUTURE RESEARCH DIRECTIONS

In this section, we draw from our discussion so far to highlight several promising research questions. Space constraints permit only brief discussion of each.

Under which circumstances are inter-category effects most (least) likely to occur?

Inter-category effects may be a consequence of differences in category definition between buyers and sellers (recall earlier discussion of ambiguity due to the hierarchical nature of categorization). Research is needed to better understand the level of categorization that different decision-makers use and to identify the circumstances and levels where cross-category consideration/choice are most (least) likely to occur. For example, consider the work of Graonic (1995) who investigated choice processes of experts and novices among aerobic exercise equipment alternatives from different categories (*e.g.*, stationary bicycles, stair-climbers, treadmills, *etc.*). More than two-thirds of respondents in his study made category choices first, followed by brand choices from that single category. But the remaining 30+% kept multi-category alternatives under consideration until their final choice. Novices were more likely than experts to retain multi-category alternatives until the final decision. Generalizability of these results remains to be determined, as only one choice decision was studied. Whether stage of the product life cycle, the nature of "other category" effects, individual differences (*e.g.,* experts versus novices, different personality types), purpose, or other factors matter more, has not been investigated. Ratneshwar, Pechmann, and Shocker (1996) also provide empirical evidence that the individual characteristics of goal ambiguity and goal conflict lead to multi-category consideration. But the possibility of still other explanations (*e.g.,* involving economic factors) needs to be clarified through further research. Managers should also be interested in findings that can provide guidance as to how inter-category effects could best be used to their advantage. But, no research has examined how easy or difficult it is to encourage single category decision-makers to consider other relevant alternatives.

It seems that economy (*i.e.,* price), brand reputation, design, and perhaps versatility are examples of product benefits that can be readily measured across multiple categories. It may turn out they are "general" dimensions because they are closely related to super-ordinate buyer purposes or goals (*e.g.*, buyers will only consider "other product" alternatives within acceptable price ranges or possessing acceptable brand names or offering sufficient versatility because of

who they are or the purposes such products serve). The importance of goals in decision-making has been well established (Bagozzi and Dholakia 1999). Whether there are special kinds of goals (*e.g.*, gift-giving) that favor multi-category over single category consideration would seem worthy of further investigation.

How do models of "inter-category" differ from "single category" decision-making?

Benefits/costs seem desirable for representing product alternatives in the modeling of multi-category decision-making (they may be the "abstract attributes" found important by Johnson and Fornell 1987). Johnson (1989) suggests that physical features are often unique to particular categories and thus often infeasible for comparing alternatives across categories (unless the utility of each purchase alternative was measured in terms of its own unique features and these utilities were then compared). But this research indicates that modeling decision-making in terms of abstract attributes is more appropriate than assuming buyers make overall utility comparisons. Corfman's (1991) research also provides evidence that many buyers appear to use benefits to compare alternatives even in single category choice where features could have been used. Features, of course, possess the important advantage of being actionable and thus more meaningful to managers and product designers.

Benefits/costs, however, may be even more insightful than features. If a new product has similar purposes to others and its benefit levels are known, an informed marketing manager may be able to predict product success or failure. For example, if "whitening ability," "safety to clothes and environment," and "economy" are understood as the major benefits desired when washing clothes, then a product offering higher or equal levels of these benefits (assuming no additional cost) can be expected to be a success (*product displacement*). Similarly, a dominated new product can be perceived to have problems with *product survival*. Research is needed to find the best way of identifying all core benefits, since it is their totality that determines a product's market success. This problem is complicated when a product is not dominant (or dominated) or different market segments emphasize different benefits and costs.

Attempting to model decisions in terms of benefits and costs rather than physical characteristics raises questions of trust and credibility, as well as validity. Benefits are, after all, inferred by buyers and suggested by sellers (with possible bias). Thus, if just the benefits of an alternative are described to a buyer, that buyer must ordinarily assume the actual product will deliver those benefits. And, if a desired product is described to a seller, the seller must know

how to create that bundle. Product analogies may prove useful in successfully describing benefits that may otherwise be ambiguous. Some benefits may be abstract (*e.g.,* as safe as an airline) or involve sensory characteristics such as taste, touch, and smell for which well-developed vocabulary does not exist (*e.g.,* tastes like fine *Belgian* chocolate; as soft as a luxury hotel's plush towel). Research is needed to determine how well prominent characteristics of highly familiar products can serve as useful analogies for communicating benefit levels accurately (and which do it better). This is very important for internet commerce where certain goods may not be able to be sold successfully against "brick and mortar" competitors unless their sensory characteristics can be validly described.

"Voice of the customer" research has emphasized that there are interactions between features and benefits (*e.g.*, Griffin and Hauser 1993). Features may also map into more than one benefit and a given benefit may be affected by several features. Some econometric models may be particularly useful for such features to benefits mapping, but this application has not been pursued aggressively in the literature. Furthermore, as "reference values" and "state dependence" have proven useful in modeling the role of price in buyer decision-making (Hardie, Johnson, and Fader 1993; Seetharaman, Ainslie, and Chintagunta 1999), such concepts could also be applied to the modeling of additional benefits (*i.e.*, price may merely be an exemplar of benefits/costs generally). Modeling inter-category decision-making could give new impetus to such research.

Another area of research importance lies in what might be termed "transfer of preference" or "affect." "Transfer of preference" is presumably what makes brand extension effective (Broniarczyk and Alba 1994; Bhat and Reddy 2001). The literature establishes that the characteristics of a parent brand are more likely to be transferred to the extension than will overall liking. However, not examined is the possibility that modeling buyer preference in one product category would allow such models to be used to predict choice in a substitute or related category (*e.g.*, one with benefit/cost similarities). Such a capability would be important in predicting demand for new products (so long as they were close substitutes). Currently, commercial research calibrating decision models like conjoint analysis emphasizes data for decisions in a single category. It may prove possible, say with appropriate scaling of weights, to preserve some information collected in one study of decision-makers or segments for use in (or to approximate decision-making in) another study in a related category. Several researchers have

noted there are similarities across certain categories in the importance of similar product characteristics (more likely with benefits than features) to decisions by the same individual (*e.g.*, Russell and Kamakura 1997; Ainslie and Rossi 1998; Andrews and Currim 2001). Research may find that all benefits need not necessarily be identical between the categories. Such findings could enable firms to save on future market research costs and aid a firm's managers in becoming more market-oriented. In any event, conjectures such as these suggest opportunity and direction for new decision research.

Consideration of inter-category effects could also lead to certain products or combinations that provide substantially different levels of less important benefits. Research might usefully examine the value buyers place upon the ancillary benefits (*e.g.,* in *augmenting complements*) since they may have to pay a higher price to obtain them. Also, does ownership of a product that was purchased for one purpose or use increase the likelihood that other purposes for which it is suitable will subsequently be pursued? For example, is an "all-in-one" device considered along with dedicated printers, because value (if any) is placed upon the extra benefits they provide? Do product benefits not important at the initial purchase decision become more so later (similar to what Nobel laureate, Herbert Simon, once labeled "the importance of the artifact" in referring to the observation that ownership of a computer led users to pursue new uses for it)? Will the all-in-one product be deemed to provide a higher level of an existing benefit (*e.g.,* "opportunity to learn new skills," greater "versatility") in its competition with items in the dedicated category or will these potential benefits (Ratneshwar, *et al.* 1999) simply be ignored at time of purchase and discovered only later? Research is needed to better understand what makes multi-category different from single-category decision-making.

How do "other products" affect product-market definition and structure?

We posited earlier that marketing actions in one category could affect buyer decisions in another. More needs to be known about when and how this happens. For example, when do existing products provide a context that affects the evaluation of new substitutes and when will the first mover in a category be able to set its own norms? Carpenter and Nakamoto's (1989) research shows that first movers can establish norms, but does not establish the circumstances under which it would or would not occur. Can a failed or limiting technology in one category inhibit the potential of other products based upon that same technology and can success expand their potential? When might limits in one category actually enhance the appeal of another

product (*e.g.*, the pager may have aided acceptance of the cellular phone over what might have occurred if the cellular phone had been introduced without a pager preceding it)? The history of substitutes and the existence of complements may be necessary for a category to evolve similarly within different countries. If a firm introduces only the latest generation of a successful product (say in the USA) into another country, its rate of diffusion and eventual success may be different (*e.g.*, analog pagers and cellular telephones may have been necessary to fully appreciate the digital versions). Research using differing product sales evolution experiences in different countries may provide insight into the role that the existence of *substitutes-in-use* or *enhancing* or *augmenting complements* play in the sales of a focal category.

To understand market effects upon their brand and to seek planning guidance, managers typically begin by jointly identifying the substitutes facing their brand and buyers that are prospects for them (Bucklin, Russell, and Srinivasan 1998). Such product-market definitions might desirably include usage situations (Bucklin and Srinivasan 1991) and the plausible "other products" which may be considered (Day, Shocker, and Srivastava 1979, Elrod, *et al.* 2002), including not only commercial products and bundles, but also products customers create for themselves, combinations that retailers create, *etc*. Bucklin and Srinivasan (1991) propose a survey-based approach to overcome some of the data problems and limitations of secondary (panel) data. Their approach deals with a single major category (coffee), but further study may demonstrate it is extendable to a multi-category context. Research could help discover circumstances where including or ignoring these "other-category" substitutes and complements affects the usefulness of a market structure analysis (MSA). Statistical logic argues that the ability of MSA (based upon an internal analysis perceptual mapping exercise) to reveal underlying competitive benefits and costs should be affected by variability in the set of products chosen for inclusion (Srivastava, Leone, and Shocker 1981). For example, if "used" products are considered in addition to new ones, the importance of "high quality" or "durability" might be better revealed. Analyses including the products that buyers design for themselves may reveal benefits missing from commercial alternatives. Research could compare the market structures revealed when "other products" are included with that revealed when they are not.

In dealing with such multi-category effects, new methods for implementing MSA are clearly needed (see Elrod, *et al.* 2002 for a discussion of related challenges and some research suggestions). There are likely to be important problems of aggregation due to factors such as

heterogeneity in perceptions and the multiple purposes or contexts in which different products compete (Bucklin and Srinivasan 1991; Yang, Allenby, and Fennel 2002). The relative incidence of such purpose-defined sub-markets, different selections of substitutes and complements in each sub-market, *etc.* complicate the aggregation process. Different brands within a category may be important competitors for some purposes (*e.g.,* gift giving) but not others (*e.g.,* ingredients), also posing aggregation problems. Research may usefully examine the value of controlling for purpose (*e.g.,* creating separate MSAs for each major purpose and then finding appropriate ways to integrate them). It could be valuable not only to find out how different the market structures are across the different purposes, but also the extent to which multiple purposes account for the heterogeneity that was formerly part of a single MSA. Buyer-relevant combinations consist of branded complements, often from different sellers, created either by buyers (*e.g.,* either end users or distributors). Since such product combinations often effectively compete with integrated multi-purpose products (*e.g.,* CD player, radio, tuner, and speaker combinations may compete with integrated "boom boxes" for some applications), there may be advantage to market structure analyses that consider them together. For example, buyer-created complements offer a way of incorporating the effects of prior purchases, particularly when such items are not purchased concurrently. Even when multi-product combinations compete only with other multi-products, it may be desirable to consider the competitive set as different combinations rather than as outcomes of a sequence of single category product-market decisions. Additional research can determine whether their inclusion makes it easier to identify relevant decision purposes, customer segments, major product benefits, and the circumstances under which this knowledge is better obtained.

How do inter-category relationships evolve?

The dynamics of product category evolution provide an important opportunity for future research. Inter-category effects seem particularly important when examined as processes over time. For example, buyer perceptions of product quality can change, possibly due to changes in the environment of "other products" (*e.g., enhancing complements* may suggest quality improvements, making current customers less satisfied; *augmenting complements* may add new criteria by which to judge quality). Quality perceptions often vary with user purpose (because purpose in large measure affects the benefits attended to by buyers and sellers). But, purpose may also change as a consequence of "other product" availability (*e.g.*, a carrying case or

smaller sized, lighter weight components may make an item portable and allow it to be taken to surroundings different from its original ones – bringing different characteristics into prominence for judging its quality). Whether there can be generalization regarding what quality means to consumers and how it may vary for different purposes may or may not make this a fit subject for academic research. It may be possible to generalize about the determinants of quality from "other products" (substitutes, but possibly also complements) used for similar purposes. Research needs to establish if this is so.

Customers purchase from different categories for reasons – reasons that, when better understood, could provide important guidance to marketing action. For example, potential customers for a given brand may currently be buying in substitute categories. But, if firms recognized this substitutability, these customers might be persuaded (via advertising, price, product redesign) to buy the firm's brand in the "other" category. Or, there may be purposes that normally lead only to occasional substitution. Research may provide insights into the ease with which buyers change category consideration or ways in which occasional substitution may be increased (*e.g.*, an exciting new product may encourage more gift giving). Positioning a product against a specific usage (*e.g.,* "nighttime" cold remedy) or changing its legal categorization (*e.g.,* moving a prescription drug to non-prescription status) may change its competitive positioning and possibly result in its dominating that new category because the original positioning provided increased credibility of its effectiveness. Different product design, changes in distribution channels or merchandising strategy, new packaging, or pricing might influence the incidence of inter-category substitution. Some targeted marketing efforts may even be better able to switch buyers' preferences for items across categories than between brands in a single category. New product combination with complements may lead to a distinct new category whose positioning can be more affected by marketing action simply because it is less familiar to potential buyers (*e.g.*, the idea of a chewing gum form has permitted a new positioning for an existing dentifrice and probably changed the circumstances under which it will be used). The idea that "other products" influence what purposes are evoked or the frequency with which purposes occur seems to be a useful topic for further research.

The dynamics of change will cause migration between the inter-category relationships of Exhibit 2. Analytically, these inter-category dynamics may end up with either co-existence of related products or survival of some selected products. Bayus, Kim, and Shocker (2000) provide

a review of the conditions that eventually lead to a single-survivor or co-existence of related products. Empirical studies based on different multi-category markets should increase our understanding of the characteristics of market and technological environments that affect these equilibrium conditions. Further research efforts may usefully examine the role that "other products" play in determining the probable equilibrium from multi-category competition (*e.g.*, the dominance of the new entrant, the speed of entry of facilitating complements, *etc.*).

What are the managerial implications of "other products?"

Given that research into aspects of inter-category effects may be new, most pressing is the need to investigate rigorously its basic implications. An important consequence of inter-category effects may be that a given product's potential market size may not be a constant but depend on what is happening or could be made to happen with related "other products." Rather, market potential may be a dynamic variable which can vary not only with the marketing decisions of a firm and its direct category competitors, but also possibly with decisions made (or not made) by managers of "other products" (Peterson and Mahajan 1978; Bayus, Kim, and Shocker 2000). Previously we noted that buyers may sometimes apply preference criteria learned in the context of one product category to decisions made about another. Kim, Chang, and Shocker (2000) offer a means of measuring the magnitude of these effects. But, their model has only been tested with two data sets. While these results are encouraging, the benefits of incorporating inter-product effects to improve forecast accuracy need to be confirmed by additional research with other multi-category market data sets.

We are not aware of similar models for packaged goods or low-tech durables. Given the wide availability of multi-category scanner data for frequently purchased grocery and drugstore products, the feasibility of such measurement and forecasting models might be investigated. When products are early in their life cycles demand is particularly difficult to forecast, but it is here (in the transition from an older product and related patterns of buyer behavior to a newer one) that multi-category effects on sales may be more evident. It may be that models explicitly incorporating historical sales of complements and substitutes could improve forecasting accuracy at this critical take-off stage.

Study of "other products" may afford insights not otherwise available. Some buyers may be proactive, making choices from a broader set because they recognize single category options as too limiting (*e.g.,* due to inadequate convenience, affordability, accessibility). For example,

baking a cake from scratch may be preferred to buying one ready-made or baking it from a mix because it permits a purchaser to individualize it more to his/her tastes. If some buyers are actively making choices from a broader set of category alternatives than are others, knowledge of this set can increase the likelihood of discovering important buying criteria that may not have been revealed in a single category context. For example, men's jackets normally have sleeves but sweaters are found both with and without sleeves. By recognizing substitutability between these categories, a sleeveless jacket may be more readily contemplated. If it is discovered that *substitutes-in-use* deliver somewhat different benefit levels or benefit combinations, insights into the future evolution of the category might be obtained.

While identification of multi-category effects and forecasting their evolution and impact are important research objectives, so also are attempts to learn what managerial efforts may be more or less effective in controlling or influencing this evolution. Merger and acquisition efforts and strategic alliance formation would seem to be better guided by greater awareness and knowledge of multi-category effects. But an additional research challenge lies in helping managers learn to better coordinate their brand decisions with the marketing actions of possible complementors. "Integrated marketing communications" long ago recognized the value of a coordinated program for the various promotional options used by a single brand, some of which are not perfectly controllable (*e.g.,* word of mouth, press commentary). The same integrative idea may also be valuable to the design of marketing strategy within the context of "other products," *e.g.*, a firm in one category may have incentive to assist those in another to develop *augmenting complements*. Once improved forecasting or market structure models are appropriately formulated and calibrated, they may be used to help coordinate marketing strategy. Models that incorporate known multi-category effects could prove useful in both training managers and in predicting the outcomes of plausible decision alternatives. Recognition of such possibilities could lead to the development of new decision aides.

CONCLUSIONS

We summarize our discussion with several observations.

- Substitutes commonly exist for many products in the form of other products and/or services. These may differ in their degree of substitutability and their attractiveness to different buyers.
- Complements exist for most all products. They arise out of the efforts of both buyers and sellers to improve the functionality and value of existing products.

- Purpose and other products of which s/he is aware affect the benefits sought from products by any buyer. Thus, a buyer may value the same products differently for different purposes.
- Consideration of inter-category effects raises basic questions of "just what is a product?" and "how or why did it become that way?"
- Actions by both buyers and sellers affect inter-category relationships. Sellers do so via their market offerings. Buyers purposefully choose or otherwise influence most usage situations they face. Buyers may usefully be thought of as "bundles" of usages or purposes.
- Aggregate or market-level effects (*i.e.,* market structure) may mask what is happening at the individual-level. The relative importance of each individual-level relationship in determining market-level effects can change over time.
- "Other products" can be relevant without having a major sales impact. What are originally minor sales effects can also become more important over time.
- Inter-category relationships are dynamic. As a result, it is important to understand the evolution of product-markets and their underlying buyer behavior.
- Order of entry matters in terms of what products get created and how they evolve. Earlier products provide both opportunity for, and constraints upon, later ones. Existing complements can sometimes legitimize a new product or combination because the separate products are already being used together by at least one segment of a market.
- Complements sometimes redefine a product-market structure and possibly also add new benefit considerations to buyer decision-making in the category. ("Other products" may even be necessary for consumers to recognize the improvement.)
- Complements differ in their degree of essentiality to any given product. This degree of essentiality can change over time (via *enhancing complements*), sometimes even reversing itself (*i.e.,* from non-essential to essential, and possibly back again).
- Changes in complementary relationships are important to the understanding of inter-category substitutability over time - and it may be that the converse is also true.

In this paper, we argue that the demand for a product category often depends upon its relationship with "other products." Our discussion of inter-category relationships strongly suggests that market potential is dynamic, *i.e.*, it can change based upon what has happened and what is happening in related categories. Inter-category relationships change evolving product designs, marketing mixes, buyer purposes, usage contexts, *etc*. Relationships between complements and substitutes can also be dynamic and thus affect the very definition of a product category. Individual-level buyer behaviors often provide strong clues to the possible effects of "other products" and their trends.

The idea that demand can be interconnected across product categories is a powerful one. Awareness of these interconnections should sensitize academic researchers and managers to the possibilities of "other products," possibly rendering inter-category effects more controllable or

perhaps identifying the circumstances when these effects cannot effectively be controlled. This paper will, hopefully, stimulate further research to enhance our understanding of such effects. Improved understanding holds great promise for helping managers accomplish what is already a difficult job.

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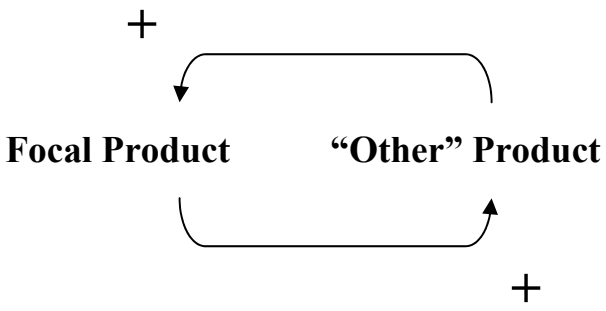
Exhibit 1
The Conventional Framework of Product Complements and Substitutes

Complements



Substitutes

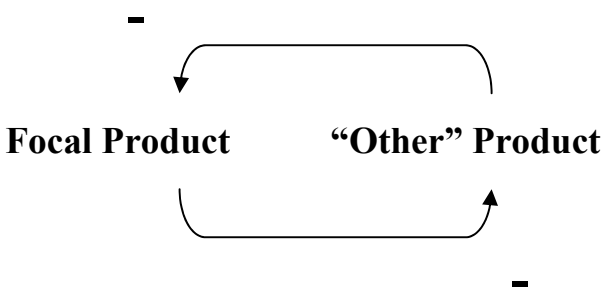


Exhibit 2
An Extended View of Inter-Category Relationships

A. Static

Level of Purpose	Substitutes	Complements
Specific	*1. Substitutes-in-Use*	*3. Classic Complements*
Generic	*2. Occasional Substitutes*	*4. Non-Price Complements*

B. Dynamic

Order of Entry	Substitutes	Complements
Newer Affects Existing	*1. Product Displacement*	*3. Enhancing Complement*
Existing Affects Newer	*2. Product Survival*	*4. Augmenting Complement*

C. Dynamics Between Substitutes and Complements