# Encroachment Patterns of the 'Best Products' from the Last Decade

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**Abstract**

Based on the examination of 239 "best products" (all those on *Business Week*'s annual lists from the past decade), this article tests and validates a conceptual framework identifying six ways in which new products open new markets and/or encroach on original products. Three of these six scenarios involve high-end encroachment (the new product first opens a new high-end market, or enters at the high-end of an existing market, and then diffuses down-market), and three scenarios involve low-end encroachment (encroachment starts at the low end, followed by diffusion up-market). As illustrated in a 2x3 matrix, high-end encroachment ensues when the new product enhances performance with regard to the market's core attribute (low-end encroachment ensues when this performance is diminished). The three high-end sub-types and three low-end sub-types are determined by the strength of performance along an ancillary attribute dimension. If the ancillary attribute performance is week, then the encroachment of the new product on the old market is immediate (corresponding to immediate high-end encroachment and immediate low-end encroachment, respectively). If the ancillary performance is moderate, then the new product expands the market at the high or low end (corresponding to new-attribute high-end encroachment and fringe-market low-end encroachment, respectively). If the ancillary performance is strong, then the new product first opens an entirely new market at the high or low end (corresponding to new-market high-end encroachment and detached-market low-end encroachment, respectively). The reliability and comprehensiveness of the encroachment framework is tested by asking a panel of eight judges to categorize each of the 239 products. Results show inter-judge reliability of 98%, with all products falling within one of the six encroachment categories. Each of the encroachment types has unique implications on product positioning and pricing, as further discussed in the paper. Thus the model helps firms identify and analyze the various possibly strategies that they might choose among when introducing new products.

**Keywords:** New product development, Encroachment, Diffusion, Innovation, Disruptive

**Introduction**

New products succeed by opening new markets, and/or by taking market share from (i.e., by encroaching on) existing products. For example, Apple's iPod was the most expensive MP3 player on the market when introduced almost four years after the Diamond Rio (one of the first MP3 players), and it was entering a crowded field which included electronic manufacturing giants like Sony, Philips, and Intel. Yet by April 9, 2007 a mere six years later, Apple was celebrating the sale of its 100 millionth iPod and a 73% share of the MP3 market Wikipedia (2009a). The iPod is a classic example of what Schmidt and Porteus (2000) call high-end encroachment – the item first sells at a high price to discriminating customers and then encroaches down-market. The other primary encroachment pattern identified by Schmidt and Porteus (2000) is low-end encroachment. For example, in 2003 Apple introduced iTunes selling single songs at a dollar each. The recording quality of each song was significantly lower than that found on CDs, albums of songs were cheaper, the selection was limited, and they only worked on Apple's iPod. Before April of 2003 Apple had not sold a single song or CD, yet now they are recognized as the world's leading music seller passing Wal-Mart in 2008. Low–end encroachment products typically first sell at a low price and then encroach up-market as the products are upgraded over time (iTunes songs are now higher quality and they work on every MP3 player and computer).[i]

The encroachment framework is an effective tool in helping a firm to assess the impact of a new product on existing markets – the encroachment pattern has numerous implications on product development and marketing efforts. For example, a high-end strategy may elicit an aggressive competitive response from an incumbent defending its high-margin product. Conversely, a low-end strategy may initially suffer from low margins but may catch an incumbent off-guard – Christensen (1997) finds this is how an entrant is often able to displace an incumbent (he calls this a disruptive innovation – see Schmidt and Druehl (2008) for a mapping of the encroachment terminology to that of Christensen). Based in part on an anomaly found in Christensen and Raynor's (2003) work, that of an expensive disruptive innovation, Druehl and Schmidt (2008) and Schmidt and Druehl (2008) further extend the encroachment framework by breaking low-end encroachment into three sub-types, the "immediate," "fringe-market," and "detached-market" forms.

Similarly, Van der Rhee et al. (2009b) extend the high-end encroachment work of Schmidt and Porteus (2000) by demonstrating that high-end encroachment (which Schmidt and Druehl 2008 mapped to Christensen's sustaining technologies), could be segmented into three distinct sub-types, the "immediate," "new-attribute," and "new-market" forms. Further delineating the high and low-end patterns into their sub-types allows firms to be more discriminating in determining the best strategy for introduction of a new product. For example, Van der Rhee et al. (2009b) lend insight into why it might be optimal for a firm to precipitously drop the price of its product shortly after introduction, as Apple did with the iPhone.

This article makes two key contributions to the understanding of how firms might use different encroachment patterns for their new products. First, using a conceptual 2x3 framework, the article describes

the relationship between product characteristics that lead to each of the three low-end types and three high-end types of encroachment, and demonstrates how the framework is supported by the linear reservation price curve model (LRPCM) of previous works. Second, using a panel of eight judges and 239 products, this article tests the reliability and comprehensiveness of the encroachment framework, finding a 98% inter-rater reliability per Rust and Cooil (1994), with all products fitting one of the six encroachment types.[ii] While there are a number of frameworks that categorize innovations, e.g., disruptive versus sustaining, radical versus incremental, competence-enhancing versus competence-destroying, and architectural versus modular (all of which are discussed in more detail later), to our knowledge, this article is the first to test the reliability and comprehensiveness of such a framework. The article concludes by discussing insights stemming from our encroachment framework, which can be used to enhance the abilities of product managers to assist them in using our framework to make product placement decisions.

## A Conceptual 2x3 Framework that Ties Product Characteristics to Encroachment Patterns

### *Product Performance along Multiple Attribute Dimensions*

As suggested at the outset, every new product succeeds either by encroaching on an old market (i.e., taking of market share from an incumbent product) and/or by opening a new market, selling to customers who previously were not considering a purchase. The new product is able to achieve this encroachment (or market expansion) by offering attributes or attribute levels that are preferred by customers over those of the original products, and/or through price.

For example, Kim and Mauborgne (2005) suggest that a successful (profitable) product is one that competes in a "blue ocean," free of the "bloody red waters of competition" – a product positions itself in a blue ocean by differentiating its performance along the various attribute dimensions as compared to a competitive product. Kim and Mauborgne (2005) suggest that a firm create a "strategy canvas" to show how its product performs with regard to the various product attributes as compared to competition – the more differentiated the performance levels along the various attribute dimensions, the "bluer the ocean."

The approach of Christensen and Raynor (2003) and Utterback and Acee (2005) is somewhat similar – they suggest that one can think of a product's set of attributes as consisting of a core attribute along with an ancillary (or new) attribute. Christensen and Raynor (2003) suggest that incumbents are often displaced by entrants who introduce a "disruptive" product, which is a product whose performance along the core dimension is de-rated, but whose performance along an ancillary (or new) dimension is heightened and appreciated by customers other than the firm's "best customers." However Utterback and Acee (2005) suggest that incumbents are sometimes also displaced by a product whose performance along the core dimension is heightened.

Like these authors, this article also examines differences in product performance along multiple (the core and ancillary) attribute dimensions, which was similarly the driving factor behind the model of Schmidt and Porteus (2000), who suggest that a new product can encroach on a market in one of two key ways – either

starting at the high end of the market and encroaching down-market (they call this high-end encroachment), or starting at the low end and encroaching up -market (low-end encroachment). This article builds upon Schmidt and Druehl's (2008) three types of low-end encroachment and Van der Rhee et al.'s (2009b) three types of high-end encroachment which they identify using the LRPCM, to form the basis of our conceptual framework. The analytical findings are summarized below where each of these (sub) types of encroachment is again determined by the new product's relative performance along the core and new (ancillary) attribute dimensions.

In summary, the literature suggest that performance levels of a new product along both core and ancillary[iii] attribute dimensions play a large role in determining how that product competes in the marketplace, and in determining market outcomes over time. A key contribution of our article is to provide a framework that links a product's performance along the core and ancillary (new) attribute dimension to market outcomes over time, i.e., to the encroachment pattern that the product experiences.

This framework is depicted in Figure 1, which synthesizes previous works on encroachment patterns. The two axes of the graph in Figure 1 represent the new product performance along the core and the new (or ancillary) attribute performance. The performance of the new product along these two dimensions determines the type of encroachment: the core attribute determines whether the new product encroaches from the low- or the high-end, while the impact (if any) of the ancillary attribute determines the type of encroachment (immediate, fringe/new attribute, or new/detached market).

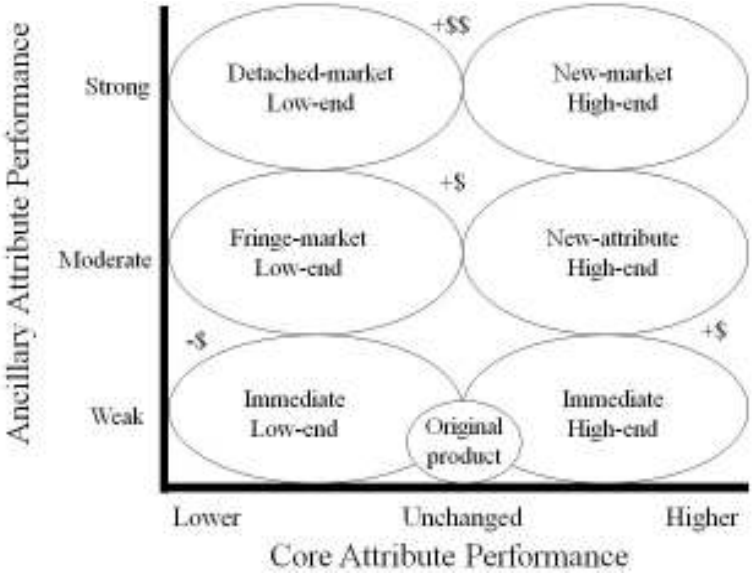


**Figure 1 – Encroachment type as determined by new product performance on core and new attribute dimensions.**

***High-end encroachment (right-hand column of Figure 1)***

As detailed in Van der Rhee et al. (2009b), high-end encroachment is characterized by a setting where the new product has higher performance (relative to the old) along the core attribute dimension. The intuition is that high-end customers are those who are most concerned about performance along the core dimension, i.e.,

they are the ones most willing to pay for that performance. When a new product comes along with even higher performance along that dimension, they are thus the first to buy. Then over time, the new product diffuses down-market as its cost comes down due to, for example, learning effects and/or as lower-end customers realize that they could also benefit from the higher core performance level offered by the new product.

The three types of different high-end encroachment types can be distinctly delineated. To illustrate, consider three examples from 1999: the IntelliMouse, the Air Zoom M9, and TiVo (for short descriptions and pictures of these please refer to Appendix B). All three products target discerning high-end customers, but each captures market share with a decidedly different high-end encroachment pattern.

Microsoft's $75 IntelliMouse uses an optical sensor to scan at 1500 times/second, offering precise placement of the cursor – but it neither offers significant new functionality nor enhanced performance along a non-traditional attribute dimension (and thus it does not substantively extend the market at the high end). It simply performs better along the traditional attribute dimension and thus immediately sells to high-end customers of the current (original) market. This is referred to as "immediate" high-end encroachment because the new product immediately steals market share at the high end of the original market. This type of encroachment is shown in the lower-right corner of Figure 1 – the product sells at a higher price relative to the original product due to its higher performance along the core dimension (this is indicated by the "+$" sign in the lower-right oval of Figure 1).

Next consider Nike's Air Zoom M9, a $120 women's soccer shoe, which offered a new feature – it would not stretch when wet, which reputedly enhances kicking control. In contrast to the IntelliMouse, the M9 offers improved performance along a non-traditional attribute dimension (in addition to performing well along the traditional dimensions of running comfort and traction) – see the middle-right oval in Figure 1. This is referred to as "new-attribute" high-end encroachment – while attracting some current high-end customers the new product also incrementally extends the high-end market (e.g., some high-end customers who were not in the market for a new pair of soccer shoes may buy simply due to the M9's new feature). The product sells at a fairly significant price premium due to its new attribute performance (as indicated by the "+$$" in the oval in the middle-right of Figure 1). In terms of impact on the original product, the market expansion at the high end may soften the cannibalization effect when both the new and original products are marketed by the same firm. The differentiating determinant between new-attribute and immediate high-end encroachment originates in the strength of a product's ancillary attributes such as the M9's reliance on non-stretching fabric to increase kicking accuracy. The M9 focuses its marketing on this ancillary attribute because this attribute expands and increases its market beyond the high-end users looking for peak performance in the core metrics of soccer cleats.

While the IntelliMouse and M9 offered precision clicking and kicking, TiVo (at $999) facilitated watching TV more precisely (e.g., pausing live TV and skipping commercials when recording shows). While one can clearly identify the original markets that the IntelliMouse and the AirZoom M9 encroached

on, TiVo offered functionality so different from any existing product that it opened up a new high-end market entirely of its own.[iv] Early TiVo customers were not deciding between TiVo and, say, a VHS tape deck but were enticed solely by TiVo's new functionality. Thus TiVo represents "new-market high-end encroachment." Before long, TiVo attracted competitors and together they effectively created a new product category, that of digital recorders, which (in combination with DVD players) ultimately did encroach on VHS tape recorders from the high end to largely displace VHS tapes. Another example of the new-market high-end strategy is Viagra, which created a new market by offering functionality unavailable previously (there was no original product of any significance to encroach upon). With new-market high-end encroachment the firm can initially act (more or less) as a monopolist (Van der Rhee et al, 2009b). See the upper-right oval in Figure 1 with the "+$$$" sign.

***Low-End Encroachment (left-hand column of Figure 1)***

Low-end encroachment is characterized by a new product whose performance is de-rated with regard to the core performance dimension (refer to the left column in Figure 1). The intuition is that high-end customers, who are willing to "pay-up" for performance along the core dimension, initially shun the new product becomes of this de-rating. On the other hand, low-end customers have lesser need for this performance and are happy to trade off performance for a lower price (See Schmidt and Druehl (2008)). With some new products (such as electronic items) it is possible to significantly improve a product over time (due to Moore's Law, for example), such that the new product becomes more attractive to high-end customers as it is continually upgraded. Thus the new product diffuses up-market over time.

Previous work has suggested three sub-types of low-end encroachment that can be identified by the impact of the ancillary attribute. In the case of immediate low-end encroachment, depicted in the lower-left of Figure 1, the new low-end product offers little in the way of new-attribute performance, but because it is de-rated along the core dimension it can be priced lower (as indicated by the "–$") and it is attractive to current low-end customers. An example is the new Eclipse corporate jet (as compared to previous jets); it is the first to cost as little as one million dollars (Armstrong 2006).

Another possibility is that the new "de-rated" product offers substantively improved performance on an alternate dimension such that it attracts new customers on the low-end fringe of the current market (as depicted in the middle-left in Figure 1) – Christensen's (1997) story of the smaller disk drive (which was de-rated in terms of capacity but offered "compactness") is a classic example of fringe-market low-end encroachment. Depending on the extent to which the core attribute is de-rated and depending on the strength of performance of the new attribute, this type of product can cost less or a bit more than the original product (from –$ to +$).

The third low-end scenario, depicted in the upper-left of Figure 1, is one where the new product is dramatically better on the alternate dimension. In fact, it is so much better that customers are willing to pay a high price for it (as indicated by the +$$), even though it performs miserably along the core dimension. The

new product opens up a new market where customer needs are quite different from (i.e., detached from) those of current customers. However, over time, the new product may improve its performance along the traditional dimension to the point where it encroaches on the original product market, but again from the low end upward (hence it is classified as low-end, and not high-end, encroachment). An example is the cell phone which first opened up a new market selling at very high prices even though the phone's coverage and reception were not very good. When cell phones did eventually begin encroaching on land lines, they did so from the low end (it was low-end customers such as students and apartment dwellers who first dropped their land lines in favor of exclusive use of their cell phones, as discussed in Druehl and Schmidt 2008). This type of low-end encroachment helps explain an anomaly in Christensen and Raynor's (2003) theory – that of an expensive disruptive innovation.

***Relationship of the encroachment framework to other typologies of innovation***

The encroachment framework is not intended to replace other frameworks that characterize innovations, but to simply offer another perspective from which to view the potential of a new product. For example, when considering a new product development program a firm might use the framework to examine different alternatives – which alternatives will open a new market? Will this new market be positioned near the high or low end of the exiting market? From which end of the existing market will the new product encroach? Given the potential rate of improvement of the new product in terms of attributes and costs, what does this imply regarding encroachment on the original product's market? Finally, what does all this imply about pricing, product positioning, and profitability? Such assessments could be done qualitatively or more quantitatively.

While our framework qualitatively describes the market segments to which a product first sells and then diffuses into over time, it says nothing directly about the diffusion rate or the substitution rate. Other models such as the Bass (1969) offer insight in this regard. Likewise, our model says nothing directly about whether an incumbent or an entrant is better positioned to succeed with the new product. Other researchers who have explored this question include (Henderson and Clark 1990) who suggest that entrants may be more likely to succeed with (incumbents may have more trouble mastering) what they call architectural innovations – these change the structure of the product and the way components interact. Finally, Tushman and Anderson (1986) suggest that incumbents are adept at pursuing competence-enhancing innovations, but less competent when innovation involves competence-destroying technologies, and Abernathy (1978) discusses radical versus incremental innovations, which coincide with our ancillary attribute (strong versus weak) performance.

The encroachment model most closely aligns with that of Christensen (1997), who also studied the reasons why incumbents sometimes get upended by entrants. He developed the notion of disruptive and sustaining innovations – suggesting incumbents generally pursuing sustaining innovations but fail to recognize the threat of an entrant's innovation when it is of the disruptive type. Schmidt and Druehl (2008) discuss the relationship between Christensen's framework and the encroachment framework – because the

encroachment framework has since been expanded to include multiple high-end types of encroachment, Table 1 below shows a new comprehensive mapping between the two typologies. The encroachment framework builds on the seminal work on disruptive innovations and helps explain some anomalies in that theory; for example the notion of an expensive disruptive innovation. Also, in our experience the encroachment terminology seems to be readily grasped – leading to a favorable level of inter-rater reliability as described in the next section of the article.

Table 1 – Mapping of the Type of Innovation to the Type of Diffusion

| Type of Innovation | Type of Diffusion to which it Maps | Description | Examples |
|---|---|---|---|
| **Sustaining innovation** | **High-end encroachment** | The new product first encroaches on the high end of the existing market, and then diffuses downward. | |
| New-market disruption | New Market high-end encroachment | These products create new market space, and encroach after a monopoly period. | TiVo (relative to VCRs) |
| | New Attribute high-end encroachment | These products open up additional high end market space in addition to encroaching on current products. | Air Zoom M9 cleats (relative to regular cleats) |
| High-end disruption | Immediate high-end encroachment | High-end encroachment begins immediately upon introduction of the new product. | IntelliMouse (relative to normal computer mice) |
| **Disruptive innovation** | **Low-end encroachment** | The new product first encroaches on the low end of the existing market, and then diffuses upward. | |
| New-market disruption | Detached-market low-end encroachment | Before encroachment begins, the new product opens up a detached market. | Cell phones (relative to land lines) |
| | Fringe-market low-end encroachment | Before encroachment begins, the new product opens up a fringe market. | 5.25-inch disk drive (relative to 8-inch) |
| Low-end disruption | Immediate low-end encroachment | Low-end encroachment begins immediately upon introduction of the new product. | Discount retailer (relative to high-end retailer) |

**The 2x3 Encroachment Framework Follows Directly From the LRPCM**

As previously implied, the 2x3 framework of Figure 1 follows directly from, and is further supported by, the linear reservation price curve model (LRPCM) as introduced in Schmidt and Porteus (2000). This section qualitatively describes the analytical LRPCM and show how it leads to the six encroachment types. For a more detailed analysis, interested readers should refer to two analytical modeling articles on which this qualitative summary is based (Schmidt and Druehl 2000 and Van der Rhee et al. 2009b).

As implied by Figure 1, each product can be assumed to be made up of two (types of) attributes: a core attribute and an ancillary (new) attribute, each with its own level of performance. The left frame in Figure 2 plots the utilities that customers get from the core attribute performance. First consider the curve (i.e., line) labeled "original product." Each point along the *x*-axis represents a different customer; customers getting high utility (high-end customers) are near the *y*-axis intercept, and as the customer type progresses to the right it eventually reaches the low-end segment of customers who get very little utility from the core

attribute. The customers are assumed to be distributed uniformly[v] from the high-end to the low-end, which leads to the linear (downward sloping) curve. Now consider a new product – one possibility is that the new product's core attribute performance will exceed that of the original product, and in such case every customer will attain higher utility from the core attribute, which leads to the steeper-sloped line in the left frame of Figure 2. Lower core-attribute performance will lead to the shallower-sloped line.

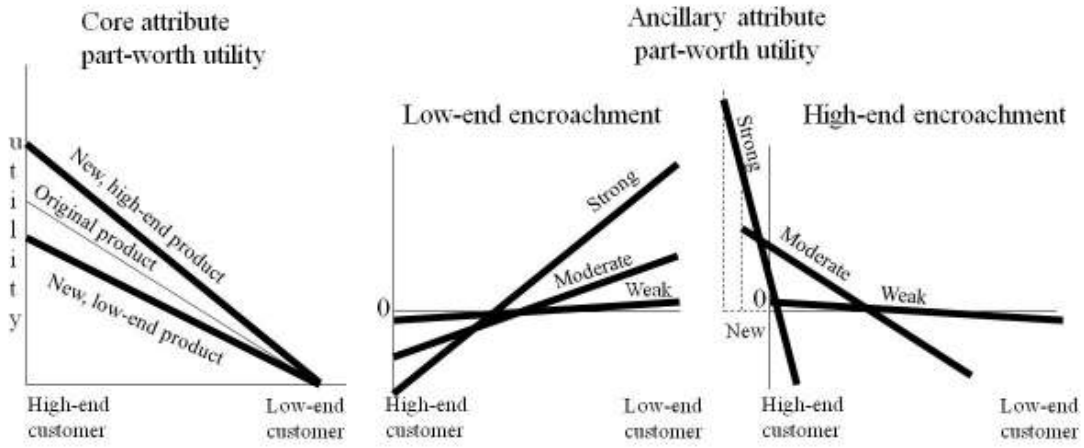


**Figure 2 – Utility (part-worth) curves for the core and ancillary attributes.**

The middle frame of Figure 2 applies to low-end encroachment, showing the part-worth utility curves for the ancillary attribute. The characteristic of a low-end encroachment product is that its core-attribute performance is diminished (as represented by the shallower curve in the left frame of Figure 2) and that its performance is enhanced along the ancillary dimension. Furthermore, high-end customers don't necessarily appreciate this ancillary attribute performance relative to the way low-end customers do. In other words, the utility that a low-end customer gets from the ancillary attribute will actually be *higher* than the utility that a high-end customer receives (which may even be negative) – i.e., the utility curve for the ancillary attribute will slope upward, not downward (see the middle frame of Figure 2). One possibility is that the ancillary performance of the new product will be weak (represented by the shallow-sloped curve in the middle frame of Figure 2), another is that it is strong (represented by the steep curve), and another is that it is moderate.

The characteristic of a product that encroaches from the high end (a sustaining innovation) is that its core-attribute performance is enhanced (as represented by the steeper curve in the left frame of Figure 2). In addition, it incorporates ancillary attribute performance that high-end customers appreciate. Customers who most appreciate the core attribute will also be the ones who most appreciate the ancillary attribute (the part-worth utility curves for the ancillary and core attributes are logically both downward sloping, see the right frame in Figure3). Again, the possibilities are that the ancillary attribute performance is weak, strong, or moderate. Note that if the performance of the ancillary attribute is moderate or strong, it can extend the market at the high end – in other words, there may be customers who were not in the market for the original product but who are willing to pay a high price for the new product because of the strength of new ancillary attribute (i.e. people who bought an iPhone upon introduction even though they did not need a cell phone).

The total utility that a customer gets from a product is called a reservation price (i.e., this is the maximum price the customer is willing to pay for the product), and it is the sum of the part-worth utilities from the individual attributes. Curves depicting reservation prices across all customers are called reservation price curves, and are shown in Figure 3. It can be assumed the original product is based primarily on the core attribute performance, so its reservation price curve is simply equal to the utility curve of the left frame of Figure 2 labeled "original product." As implied by the previous discussion, the three types of reservation price curves associated with low-end encroachment are found by taking the shallow-sloped line from the left frame of Figure 2, and adding it to one of the three lines of the middle frame of Figure 2, which yields the three left-hand frames of Figure 3 – in these figures the lighter curve (line) is the reservation price curve for the original product and the bold curve in the top-left frame is associated with strong ancillary attribute performance, the bold line in the middle-left frame is associated with moderate performance, and the bottom-left frame with weak. Similarly, the three types of reservation price curves associated with high-end encroachment are found by taking the steeply-sloped line from the left frame of Figure 2, and adding it to one of the three lines of the right frame of Figure 2, yielding the three right-hand frames of Figure 3.[vi]

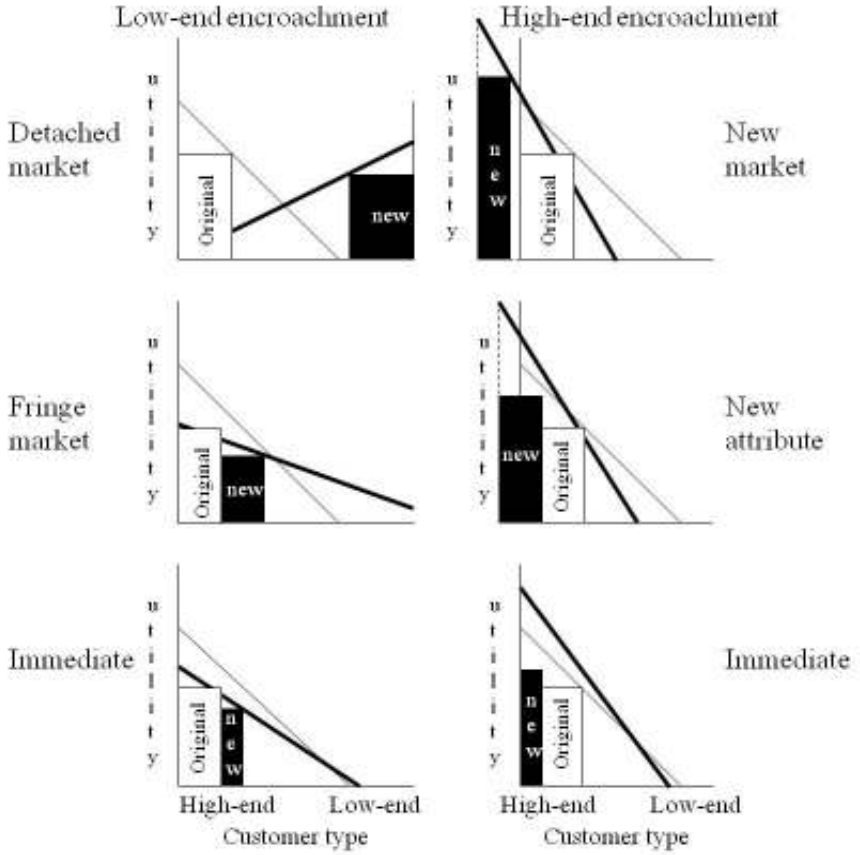


**Figure 3. The six types of encroachment as represented by linear reservation price curves.[vii]**

As given in any one of the frames in Figure 3, a pair of linear reservation price curves (one for the original product and one for the new) can be used – assuming each product's cost is also known – to determine analytically the Nash equilibrium for the prices at which each product will sell. From the jointly

optimal prices the market segments to which each product will sell, the sales volume for each product, and the profit that each product will yield can also be determined. For example, consider the bottom-left frame in Figure 3. The width of the un-shaded rectangle labeled "original" represents the sales volume, and the height represents the price (to reduce clutter costs and profits are not explicitly shown), and similarly for the shaded rectangle labeled "new." The shaded rectangle's position relative to the un-shaded one suggests the new product sells to a lower end of the market when compared to the original product. In fact, note that in all the low-end encroachment scenarios the new product sells to a lower-end market segment, and in all high-end encroachment scenarios the new product sells to the higher-end market segment when compared to the original product.

Reservation price curves and market outcomes of the type shown in Figure 3 apply at a snapshot in time. Over time, customer willingness to pay often changes (and thus part-worth and reservation price curves change), as does a firm's production cost. Thus to track (or anticipate) the diffusion (i.e., encroachment) of a product over time, one can plot a series of reservation price curves with their associated outcomes. An example of this is given in Schmidt and Van Mieghem (2005).

The value of the analytical LRPCM model is that it can yield further insights into market outcomes. For example, it can help explain: 1) the conundrum of an expensive disruptive innovation (Druehl and Schmidt 2008 and Schmidt and Druehl 2008), 2) why Apple precipitously dropped the price of its iPhone after only 68 days on the market (Van der Rhee et al. 2009b), and 3) why Intel introduced the low-end Celeron processor (Christensen 2006 and Schmidt and Druehl 2008). Also, the six types of encroachment as presented in Figure 3 map directly to our qualitative conceptual framework as presented in Figure 1.

**Testing the Reliability and Comprehensiveness of the Encroachment Framework**

Ours is one of several useful frameworks that describe the impact of an innovation. Other categorizations include describing an innovation as disruptive versus sustaining (Christensen and Raynor 2003), as radical versus incremental (Abernathy 1978), as competence-enhancing versus competence-destroying (Tushman and Anderson 1986), or as architectural versus modular (Henderson and Clark 1990). In spite of significant research, there appears to be room for possible confusion within the management community with regard to terminology and categorization. For example, (Sorescu et al. 2003) suggest it may be difficult to determine whether an innovation is truly radical. And per Anthony (2005), "The word *disruption*… has become loaded with meanings and connotations at odds with the concept…" Danneels (2004) argues that Christensen's definition of disruptive technologies is so vague that manager have different ideas of what it means. An example of this confusion occurs in *The Economist* (Briefing 2009), which lists the Tesla Roadster as a disruptive technology, whereas the price tag ($121,000), acceleration (0 to 62mph in 3.7 seconds), and other features are clearly those of a sustaining innovation. Thus this article tests whether using our framework one can readily recognize, in real-life products, one encroachment pattern from another – the harder it is to distinguish between encroachment types the more difficult it is to benefit from the framework in practice.

To test the framework's reliability, eight judges were asked to identify the type of encroachment associated with each of the 239 new products that *Business Week* highlighted in its special "Best Products" issues of the past decade (Furchgott 1997, 1998, 1999, and 2000 and Armstrong 2001, 2002, 2003, 2004, 2005, and 2006). These products presumably impressed *Business Week* reporters because of their uniqueness, quality, innovativeness, and potential for market success. Given our multi-pronged objectives (identified below), this data set was deemed viable in spite of *Business Week*'s somewhat ad-hoc product selection criteria[viii]. The questions the research sought to answer are: 1) Can someone readily categorize a product among the six encroachment types? 2) Will different judges reliably agree on how a given product should be categorized? 3) If judges don't agree, what is the underlying cause of their difference in rating? 4) Are the six types comprehensive in describing possible ways that new products open up new markets and/or encroach on existing markets, or do other readily-identifiable categories exist?, and 5) What encroachment types are most prevalent with "best new products"?.

***The Panel Exercise***

Our panel of eight judges consisted of Operations and Marketing Professors who have published in multiple high ranking journals and are familiar with the innovation literature to varying degrees, thus spanning a range of perspectives that might be represented in new product development. For example, one Professor's research primarily concerns supply chain management, while another is the current editor and one was the past editor of a leading marketing and innovation journal. The study began with a small pilot test consisting of our MBA student research assistants who had been exposed to the framework in class. Their reliability seemed almost too consistent, so it was determined that academically-trained professionals who had experience with innovation but who had not been influenced by our training would provide the best testing ground.

Each judge was given the figure presented herein as Figure 1, along with a concise definition of each of the six encroachment types and two examples of each type (examples were not products in the "Best Products" list), please refer to Appendix A. For each of the 239 products, the judges were asked to identify which encroachment pattern it exhibited (or would be expected to exhibit in the future) – and the judges were also given the option of classifying any product into an "other" category if it did not seem to fit any of the six encroachment types. For each product, each judge was given a paragraph description and a picture, directly taken from the *Business Week* articles. The encroachment definitions as given to the judges and the list of product descriptions and pictures can be obtained at http://www.business.utah.edu/humis/docs/person_1150_1215088710.pdf.

As an initial assessment, the panelists were asked to rate the 20 products from 2006 (these can be found in Appendix B). This exercise suggested two key reasons for discrepancies between judges. First, different judges may categorize a new product in "vertically adjacent" categories. For example, referring to Figure 1, the immediate high-end type (in the lower-right) is vertically adjacent to the new-attribute type (in the

middle-right). In 2006 Panasonic introduced a new digital camera with a greater zoom capability and more megapixels, which might suggest immediate high-end encroachment. The same camera might also add minor new feature such as having a wider view screen or longer battery life. The question then becomes, when are the new features significant enough to suggest it is new attribute (rather than immediate) high-end encroachment? When judges reported vertically adjacent patterns, the discrepancy was called Type I.

The second major cause of discrepancies between judges was found to occur when judges choose different products against which to compare the new product (the original product that the new product encroaches upon will be referred to as the "encroachee product"). For example, in 2006 Phillips introduced the Bodygroom. It is an electric shaver for men, intended to be used to shave non-facial hair. It was priced at $40, well below Phillips' high-end electric face shavers. Some panelists rated this shaver against other electric shavers and identified it as exhibiting low-end fringe market encroachment. Other panelists rated this product against disposable razors (the razors which had probably been used by many of those shaving non-facial hair) and categorized the product as high-end new attribute encroachment. These types of "discrepancies" are labeled as Type II, and actually point out a desirable feature of our model – our framework can be used to describe how a new product may simultaneously impact multiple original product markets, and encroach on each in a different fashion.

Together, Type I and II discrepancies accounted for the vast majority of disagreements between judges. The remaining disagreements included Type III discrepancies, caused when judges see products as encroaching upon similar markets but the judges have vastly different expectations regarding the product's ability to create new markets. For example, in 2006 Merck introduced Gardasil, a new vaccine for fighting cervical cancer. While most of the judges labeled the product as high-end new market, one judge labeled it as high-end immediate. Unlike a Type I discrepancy where the judges are only one "vertical" category apart in Figure 1, with Type III discrepancies the judges are two categories apart in their predictions of how the product will expand the marketplace (but still rate the product the same in terms of high-end or low-end). Finally, in some infrequent cases the cause of a judge's discrepancy results from something other than a Type I, II, or III discrepancy, and these discrepancies were labeled as Type IV. Examples of Type IV discrepancies are where a judge was simply uncertain as to what the encroachee product might be, or as to the products' relative performance.

After the panelists rated the 20 products from 2006, the rating exercise was redesigned to be able to detect whether differences in rating were caused by Type I, II, III, or IV discrepancies. Thus from here on the data set is referred to as having 219 products instead of 239. Before asking the panel to rate the 219 products, two of the coauthors first agreed upon what will be referred to as the "baseline" encroachment pattern for each product. If a judge categorized a product as exhibiting the same encroachment patterns as the baseline, s/he was asked to continue to the next product. However, if s/he categorized it differently from the baseline, then the judge was asked to give a second choice. If the second categorization matched the baseline, the judge was again asked to continue to the next product. If the judge's secondary rating did not

match the baseline, then the judge was asked to identify the encroachee market. This sequence of answers allowed us to determine the type of discrepancy.

***Reliability measures using the first categorization only***

In this section determines the macro reliability measures by using the judges' first categorizations, while using the second to determine the type of discrepancy in the next section. Since the low-end detached market type of encroachment was never selected as the panel's modal choice, only five product categories are used in the calculation, which is a conservative measure, since the overall level of agreement can be inflated by adding categories that are seldom or never chosen (Kolbe and Burnett 1991).

Similar to Zhou et al. (2005), and as recommended by the content-analysis literature (Krippendorff 2004), the study followed a three-step approach. In step one, the three authors identified the six categories of new products. Similar to Meuter et al. (2000), in the second step, two of the authors categorized all the products on the *Business Week* lists. In the few cases where they did not immediately agree, they reached a consensus. In the third step, the eight judges categorized the 20 products from 2006, and then, after a small refinement in the process as discussed above, they categorized the other 219 products. Similar to Ferrier (2001) and Kirca et al. (2005), the study used academic judges who were familiar with the new product development literature, but who had not previously been involved with the categorization.

As suggested by Krippendorff's (2004) two-step procedure, the judges' mode was compared to the authors' baseline categorization. In the second step, the reason for the discrepancies were determined (see below). For 70% of the products, the judges' individual categorizations coincided with the authors' baseline, while the panel's mode did so for slightly over 80% of the products. Using Perreault and Leigh's (1989) reliability formula, for a situation involving two judges (the panel's mode and the co-author's baseline), five categories (the six encroachment types minus the detached-market low-end type, since this did not surface in the ratings), and 219 items, this coincides with an 87% reliability measure.

Because eight judges were used in study, the inter-judge reliability measure of Rust and Cooil (1994) was also used to measure the results. This measure was developed as an extension to Perreault and Leigh's (1989) measure for two judges, similar to Pateli and Giaglis (2004). The inter-judge reliability as the proportion of pair-wise agreements was 56%[ix], which is associated with a PRL value of 98% given the number of judges (eight), items (219), and categories (five). In other words, for the 219 products, on average six of the eight judges agreed on the type of encroachment pattern.

The results from both tests (comparing the judges' mode against the baseline, and comparing the judges against each other) are well above the 70% threshold, put forward as a standard for agreement amongst judges in exploratory work (Boulding et al. 1993) and the inter-judge reliability is also well above the 90% minimum acceptable PRL value for advanced practice (Rust & Cooil, 1994). These results provide confidence that the framework can be effectively used to classify the encroachment patterns of new products. Additionally, in zero cases did any judge categorize any of the products with an encroachment pattern that

was different then the six identified, offering evidence that the qualitative framework of Figure 1 and the analytical model comprehensively cover the possible patterns.

***The Causes of Discrepancies***

The results demonstrated by far that most of the discrepancies (64%) were Type I in nature where the two different ratings were vertically adjacent encroachment patterns. That is, the judge's second categorization matched the baseline and was a pattern in the same "end" of the market (high or low end) and vertically adjacent to the judges original categorization.

Recall that Type II discrepancies result when the judge identifies a different encroachee than is identified for the baseline. It can be inferred that there are two ways a Type II discrepancy might result. Type IIa is defined as one where the judge did not initially agree with the baseline categorization, but agreed in the second assessment after "switching markets" (i.e., from high-end to low-end or vice versa)[x] This accounted for 14% of the discrepancies. Thus, after two tries the judges' categorizations coincided with the baseline in 93% of the products on an individual basis (70% in the first attempt plus 78% of the remaining 30% in the second attempt).

The Type IIb discrepancy occurs when both the judge's first and second categorizations are based on the same encroachee product, but this encroachee differs from the baseline encroachee. Because the baseline encroachee is not match the panelist includes more information, which allows us to see the market they were comparing it against. Type IIb represented 9% of the total discrepancies.

The Type III discrepancies (where the initial assessments were both high-end or both low-end but were not in vertically adjacent categories) occurred in 9% of the total discrepancies. In making their second assessments, the judges simply chose a category that was vertically adjacent category to their initial choice, and thus were not in agreement with the baseline in either the first or second assessment but their categorization was in the same "end" of the market as the baseline categorization.

Finally, the Type IV (other) discrepancies represented less than 5% of the total, occurring in less than 1.5% of the products. In summary, Type I, IIa, IIb, III, and IV discrepancies accounted for (rounded off to whole percentages) 64%, 14%, 9%, 9%, and 5% of the total discrepancies, respectively.

***Most Products Exhibited High-end Encroachment***

Of the 219 products, 202 encroached from the high-end versus 17 from the low-end (based on the mode rating of the panel). It is important to note that high-end products are not necessarily the most expensive products – early cell phones and digital cameras were high-priced products when they were introduced but as discussed in Druehl and Schmidt (2008), their performance was initially dramatically inferior on the key performance dimension of the original market (a key attribute for the land line telephone market was reception quality, and a key attribute for the camera market was picture quality). Instead, when using the term high-end it referrers to the high-end of the original product market, and not to the high-end of any new market that the new product might create. It is also no surprise to find that the majority of products did

encroach from the high-end. It was assumed going into the exercise that it would be impossible to find a completely unbiased sample of all innovations, and thus the key objective was to test the applicability of the framework rather than find an unbiased sample size for each category.

Of the 17 new products that exhibited low-end encroachment, eleven were of the immediate type, six were fringe-market, and none were detached-market. Since previous works comprehensively described low-end encroachment, the focus of our remaining attention is on the 202 high-end products. Our panel found 22 of these encroached immediately, achieving high-end status primarily because of significantly improved performance along the core attribute dimension(s). Schumpeter (1942) predicted that large firms would have an unmitigated advantage in research and development of new products because of their size and monetary resources – similarly, the study finds that 82% of the immediate high-end type came from firms with over seven billion dollars in sales. These products would most likely be categorized as sustaining (Christensen 1997) and incremental (Chandy and Tellis 1998) innovations. Examples include Microsoft's 1999 IntelliMouse, 3M's 2003 super sticky Post-it notes, and BMW's 2000 Z8.

Of the 202 high-end products, 157 exhibited new-attribute high-end encroachment, being touted for some new dimension of performance (or significantly improved performance along what was previously a secondary dimension); Utterback and Acee (2005) refer to this as ancillary performance. For example, in 2002 Dutch Boy introduced a paint can with a unique twist and pour top. Consumers were quite enamored with this more functional way of getting paint from the can. The Dutch Boy paint is the same, but now it is competing not just in quality and color but also in ease of use. Products exhibiting new-attribute high-end encroachment have as good or better performance along the core dimension as current products, but are primarily touted for some new functionality (e.g., Air Zoom M9). They incrementally increase the potential market by pulling in customers that were not previously interested in the product, or by enticing past original-product customers to replace their original product. For example, when Sara Lee introduced a new whole grain bread product in 2005 that tasted and felt like white bread, it brought new customers into the whole grain bread market. It encroached on the white-bread market by appealing to nutrition-conscious parents of children who preferred the taste of white bread.

Of the 202 high-end new products, 21 were categorized as not encroaching on any existing market at the point of introduction. Instead, they were able to create new market space, thus representing new-market high-end encroachment. These products include new pharmaceuticals (like Gleevec from Novartis), which treat diseases that have few, if any, drug therapy treatments before their arrival. The category also includes fad products (like the Furby), which initially were very successful but within a relatively short time became irrelevant. Finally, this segment includes new technologies (like TiVo), or novel uses of existing technologies (like the Razor scooter), which are products that naturally open up new market space because of their uniqueness. It is important to note that while these products initially flourished with little or no competition, over time they either began to encroach upon existing markets from the high-end, or they "flamed out" like the Furby. See Van der Rhee et al. (2009b) for further discussion of high-end

encroachment patterns.

It is somewhat subjective as to whether the new product opens a new market or merely expands the original market – there is not a clean boundary between the new-market and new-attribute high-end encroachment types. One consideration is whether the new product can seemingly command a monopolistic price – if its price is dramatically higher than that of the original product, and if it sells to customers who would not have otherwise been buyers of the original product, then it is new-market high-end encroachment.

***Potential Biases***

While the judges were assumed to be objective in making their assessments, it is possible there were some potential biases. This was not a random sample of successful products – it seems plausible the sample is biased toward products exhibiting high-end encroachment, since these are often "flashier" or "more exciting" products. In turn, the Business Week descriptions may have been biased toward over-emphasizing new product features; the writers may not have described the products in a way that represented the views of potential customers. And given that many products were high-end, panelists could have been biased toward rating any given product as a high-end product, thinking this might increase the probability of "getting it right." On the other hand, a judge may have thought the sample should include a good number of all encroachment types, and thus (for a sample that included mostly high-end types) be biased toward rating a product as a low-end type. There was only one control of biases in the study, and it was indirect. Recall that if the judge's rating for a product differed from the baseline then the judge was asked to make a second rating, and if that rating still differed from the baseline then the judge was asked to identify the encroachee product. Thus if a judge had a consistent bias (relative to the bias of the baseline rating) the judge might eventually become aware of that bias.

**Choosing an Encroachment Strategy**

Our conceptual framework is intended to help managers in thinking about how to create new product opportunities, and in determining how to position new products. Tesla (the firm introducing the expensive electric car described earlier) perceived an opportunity to introduce a car at the high end of the market, with the clear goal of introducing lower-priced vehicles and moving down-market as they progressed down the learning curve and reduced the cost of battery-power. On the other hand, the Eclipse 500 was positioned to immediately encroach from the low-end. While the focus of the article is on delineating possible strategies and testing the reliability of the framework rather than specifying when each strategy is appropriate, it is possible to infer that there are some situations that might favor one encroachment strategy over another, as discussed below.

As depicted in Figure 1, high-end new-market encroachment relies on having strong ancillary attribute performance, and as such it may require having access to a new technology or being able to configure a feature in a way that competitors cannot (or do not, for some reason). For example, Pfizer was able to open a new market with Viagra after discovering and patenting a new drug. Apple was able to open a new market

with the iPhone because its designers were able to create an easy-to-use personal digital assistant (PDA).

Somewhat similarly, new-attribute high-end encroachment is appropriate when you are able to identify a new feature or otherwise create ancillary attribute performance that exceeds that of a competitor, although the strength of ancillary performance is not as strong as in the new-market scenario. For example, Dutch Boy came up with a unique twist and pour lid for paint cans; a feature that competitors had not thought of or had not introduced.

Immediate high-end encroachment relies on being able to increase performance along the traditional core dimension. As such, it requires that (high-end) customers remain less than fully satisfied with performance of the conventional high-end product. When the Pentium IV chip was introduced, it immediately took sales from the Pentium III at the high end of the market, and then moved down-market as its price came down; customers appreciated increased computing power and speed. Markets ripe for immediate high-end encroachment thus might include situations where the product is relatively earlier in its life cycle and technology has not yet advanced to meet customer needs and wants – and may benefit from the firm having relatively strong technological capabilities or a strong market position.

In contrast with high-end strategies, low-end strategies are appropriate when technology has advanced to a state where low-end customers are "overshot" by the current product. That is, some customers do not require all the performance of the core attribute (or they are at least willing to sacrifice some of that performance in favor of strong performance along an ancillary dimension).

The detached-market low-end type is similar to the new-market high-end type in that it is feasible when there is some new technological capability that the firm can capitalize upon – it may even be that the new technology is not all that well-developed but rather it holds the promise for improvement over time. For example, digital technology made feasible early digital cameras, which sacrificed picture quality for the convenience of picture "portability" (being able to email pictures, for example). Likewise early cell phones sacrificed call quality (reception) for the convenience of portability. Some customers were willing to pay an exorbitant price for these conveniences, in spite of sacrificed performance along the traditional attribute dimensions of picture quality and phone reception. Over time, however, picture quality and phone reception improved (and price came down due to learning effects), and the products ultimately encroached upon older technologies.

Somewhat similarly, the fringe-market low-end strategy is appropriate when some of the lower-end overshot customers have a strong need for an ancillary attribute – but with fringe-market low-end encroachment the new product sells at a relatively lower price (in contrast to early digital cameras and cell phones which sold at a high price). The lower price and new ancillary performance expand the market at the low-end (i.e., they create a fringe market at the low end). A good example is the Wii gaming system, which catered to lower-end customers who had a need for an easy-to-use controller.

The "immediate" form of low-end encroachment is appropriate when customers simply want lower price, and/or can accept slightly lower quality or less "frills." Wal-Mart encroached on department stores by

selling name-brand products at lower price (and possibly some non-branded products having lowered performance), but offered lesser service. This can also be an appropriate strategy when your brand is relatively unknown, but you plan to enhance quality over time with an eye toward moving up-market. For example, Samsung Electronics was not known as a high-quality brand when founded in 1969, but it started out selling at relatively lower prices and moved up-market, surpassing Sony as the most popular electronics brand in 2005 (Wikipedia 2009b).

The rating exercise revealed that a product may have the ability to encroach on more than one market at a time. This observation helps answer Henderson's (2006) question of whether the theory of disruption can always appropriately describe the diffusion of a new product – she singled out an example of a health-food bar. In our framework, the bar encroached from the low end on the candy bar market and from the high-end on the firm's own product line. Our panel's ability to spot this dichotomy demonstrates there may be unmet hidden markets for a number of products, which a firm can take into account when determining a marketing strategy.

In summary, a couple of general points regarding encroachment strategies are as follows. First, products entering from the low end can be particularly deceptive in that the new product's impact does not seem threatening at first, but later the new low-end product may move up-market to eventually displace the old high-end product. And second, note that in four of our scenarios the new product immediately takes sales away from the original product when it enters, and in two it does not. Specifically, in the new-market high-end and detached-market low-end types it does not – but over time, even products exhibiting these types of encroachment may eventually have an impact on an original product (and thus strategies are labeled as "encroachment" strategies).

**Discussion and Summary**

The categorization of a new product per our framework has significant implications on numerous aspects of a firm's new product development efforts, and its ensuing marketing strategy. For example, as alluded to in this article, the decision of which encroachment pattern to pursue has implications on the specific attributes to design into the product, the performance levels to set for each attribute, the customer segment(s) that should be targeted in the marketing of the new product, the product features that should be emphasized (or de-emphasized) in an advertising campaign, the pricing of the new product, and the aggressiveness at which it pursues cost reductions and product improvements over time. Of course, our framework and our associated reservation price model do not directly answer all these types of questions, but instead are simply intended to help a firm frame its strategic choices and help it anticipate the impact of its product development decisions.

A specific example of how a product development/marketing manager might benefit from our framework is suggested by our findings regarding the causes of discrepancies between judges. When judges disagreed as to the encroachment pattern created by a specific product, they did so, among other reasons,

because the judges did not compare the new product against the same original product. Generating these discrepancies is actually desirable in the sense that they help identify how a new product may simultaneously encroach on multiple product markets. For example, a new product might immediately encroach on one market from the high end, and on another from the low end. Thus product development and marketing managers may want to have multiple judges and even potential customers categorize a new product in order to pick up these "desirable discrepancies" and gain insight into how customers view the product and into how they might position the product in marketing efforts.

As previously discussed, a new framework is only valuable if it is reliable in that different people agree on how to categorize new products. On average six of eight judges agreed when asked to identify the encroachment pattern exhibited by a new product. To our knowledge, this article is the first to test the reliability of a framework describing different types of innovation, using a panel of researchers and a large set of new products. The inter-judge reliability rating was found to be 98%, per Rust and Cooil's (1994) PRL measure, and in no case did any judge feel that our array of six encroachment patterns was incomplete.

Our finding of high-end encroachment in over 90% of the cases appears contrary to Christensen and Raynor's (2003) assertion that most new products that displace incumbents do so from the low-end. This study does not disprove his assertion – *Business Week*'s product-selection criteria appear somewhat ad-hoc and the research's purpose was not to assess whether the innovations originate from incumbents or entrants – however, our finding emphasizes the continued importance of high-end products. Of the high-end encroachment patterns, 10% were new-market, 78% new-attribute, and 12% immediate. That is, most of the best products made the list due to continued strong (or stronger) performance along the core dimension in conjunction with inclusion of a new attribute (or enhanced performance along a secondary attribute dimension).

In conclusion, the encroachment framework offers managers a concrete way of thinking about how a new product can impact an existing market, as a function of whether product performance is enhanced or diminished along the core and new (ancillary) attribute dimensions. Given the simple 2x3 matrix which summarizes the framework, and given its high inter-rater reliability (suggesting the relative ease with which encroachment patterns can be recognized), the framework is relatively simple and convenient – both characteristics of a "disruptive" innovation. As such our conceptual framework might itself be described as "a disruptive framework for categorizing innovations."

**Appendix A – The page of instructions as given to the panel of judges**

Step 1: First define what "original product" you are comparing the new product against.

Step 2: Next identify which of the 6 encroachment types (shown in the Figure and description below) best describes how the new product encroaches on that original product. Or classify the product as having a unique encroachment type, if its encroachment pattern does not match the six presented below.

(Figure 1 as shown in this article was given here.)

**Low-end**
**Initially performs WORSE with regard to original product's core attributes.**

1 **Immediate low-end: No better, no new attributes; key selling point is lower price.**
Examples from 2006: Starbury One basketball shoes; and Victor and Ralf wedding dresses.

2 **Fringe-market low-end: Performs worse on (original product's) core attribute, but offers new functionality desired by a new fringe market. Costs less (or at least no more).**
Example from 2006: Wii – Less power than the Xbox but more fun for the non-gamers.

3 **Detached-market low-end: Performs worse on the (original product's) core attributes but offers new functionality that is very highly valued in a new market. Costs more.**
Example from 2006: None, but early Cell Phones fit this category. They performed much worse on reception but offered portability, and were very expensive ($3,000). Only with time did price drop and performance improve; cell phones are now encroaching on land lines from the low end upward (lower-end cell phones users such as apartment dwellers are dropping land lines).

**High-end**
**Initially performs BETTER (or at least as good) with regard to original product's core attributes.**

4 **Immediate high-end: Performs BETTER on (original product's) core attributes, but offers no significant new functionality Costs more.**
Example from 2006: Pentium 4 (it immediately stole sales from the Pentium 3, and then encroached downward as its price was reduced).

5 **New attribute high-end: Performs as good as (or better) on core attributes AND offers new functionality. Costs more but still competes with original product.**
Examples from 2006: Santos 100 – left handed watch and Martha Stewart Homes.

6 **New market high-end: Performs as good as (or better) on core attributes (if you are even able to identify an old market) and offers DRAMATIC new functionality; or achieves fad status. Costs more (monopolistic pricing).**
Examples from 2006: Tesla Roadster and Gardasil vaccine which might be described as "new to the market" products. Also, fad products like Tickle Me Elmo (initially priced monopolistically but price falls as fad status fades). Another example is the iPhone, which created a frenzy and a new "monopolistic" market but after 68 days price dropped precipitously to compete in the old market.

**Appendix B – Six examples of best products used in the text: see all the best products used in the study at http://www.business.utah.edu/humis/docs/person_1150_1215088710.pdf**

**52. TiVo "Replay's the Thing"**

We now interrupt this broadcast...because we can. The TiVo digital recorder puts a tv broadcast on hold and picks up where you left off, even as the show is being aired. It learns and automatically records shows you watch regularly. TiVo holds 14 hours ($499) or 30 hours ($999) of shows. The subscription fee for computerized program listings is either a one-time $199 or $9.99 a month.

**57. Microsoft – Intellimouse "The Mouse That Roars"**

The Microsoft IntelliMouse with IntelliEye has no roller-ball mechanism to wear out. An optical sensor that scans 1,500 times a second detects movement of the mouse to position the cursor precisely where you want it. The $75 IntelliMouse Explorer comes with silver finish and a nifty red taillight. The $55 version isn't as fancy but works just as well.

**73. Nike – Air Zoom "Custom Kickers"**

The Air Zoom M9 was designed with women, for women. Nike created the $120 women's cleats with soccer superstar Mia Hamm. Her request: shoes that won't stretch when wet. The result is the first women's soccer shoe with the KNG-100 synthetic upper, reputed to give more kicking control.

**135. Dutch Boy's – Twist and Pour "Look Ma, no drip"**

Imagine a paint can that doesn't take a screwdriver to pry open and a hammer to bang closed. Dutch Boy's new TWIST & POUR plastic container is a square gallon with screw top, integrated handle, and spout. It's lighter in weight than a can and rustproof, too. Why did it take so long for paint manufacturers to come up with this?

**220. Telsa – Roadster "Best Earth saver"**

Burn rubber, help the environment. This electric-powered two-seater does 0 to 60 mph in four seconds, can hit 130, and has better torque than cars with gas-guzzling combustion engines. The motor is eerily quiet and goes 250 miles between charges. Tesla promises 100,000 miles of battery life. Order '08 models over the Web or at one of five Tesla outlets. But move fast--just 1,000 are planned.

**221. Eclipse Aviation – 500 Jet "The Best Way to Go"**

Now even the merely somewhat rich can travel like the very rich. The first "Very Light Jet" to win Federal Aviation Administration approval, the five-seater 500 Jet made by Eclipse Aviation already has 2,500 orders. It weighs less than standard *business* jets, boasts a price tag about half as much as the next cheapest jet, and, the company says, costs much less to maintain. The planes could become staples of air taxi fleets.

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## Endnotes

[i] In theory, a new product might open a new market and never impact an original product market – we will still use the term "encroachment" to connote the diffusion process of such a product (e.g., if it diffuses down-market it is high-end encroachment). Also note that the analysis may be at the individual product level (as with the iPod example) or at a category level (MP3 players encroached on CD players which encroached on cassette players which encroached on record players), or at the firm level as with Toyota, or even at the country level as with China's manufacturing encroaching upward into higher value-added items. In this article we focus on encroachment at the product level.

[ii] The panel-rating exercise involved all six encroachment types, as the authors' analysis of the products and their identification of the three high-end and three low-end sub-types preceded the ratings by the panel members.

[iii] There may be more than one core attribute and/or more than one new (or ancillary) attribute; however we will refer to the core and new attributes as if they are singular.

[iv] Technically, Replay TV introduced a DVR two months before TiVo, but Replay TV went into bankruptcy.

[v] This is a standard assumption in the marketing literature – for example, conjoint analysis makes this assumption, see e.g., Louviere and Woodworth, 1983, as well as analytical modeling papers, see e.g., Moorthy 1988.

[vi] Van der Rhee et al. (2009a) effectively show that it is not rational for a firm to take a product with diminished core attribute performance, as represented by the shallower-sloped line in the left frame of Figure 2, and add to it heightened ancillary attribute performance of the type represented by a curve in the right frame of Figure 2, nor is it rational for a firm to take a product with heightened core attribute performance, as represented by the steeper-sloped line in the left frame of Figure 2, and add to it heightened ancillary attribute performance of the type represented by a curve in the middle frame of Figure 2. Thus these possible combinations are ignored.

[vii] In generating Figure 3 we truncate the curves at a utility of zero (we do not show negative reservation prices). Also, we assume that if the new product extends the market at the high end (as it does in the right frame of Figure 2 when the ancillary performance is moderate or high) then the customers in this high-end extended market have a high latent willingness to pay for the core attribute performance.

[viii] For example, Armstrong (2003) simply states "Innovation, big and small: That's what we're looking for in picking the winners for 2003."

[ix] Each judge's categorization was compared pair-wise with every other judge's choices. Thus, we had 28 tests of agreement (7+6+5+4+3+2+1) for each product. If, for example, two judges do not agree with the other six, this results in 15 (54%) or 16 (57%) agreements depending on whether those two agree with each other or not.

[x] Say a judge first "incorrectly" categorized a product (such as the Eclipse 500 jet) as a type of high-end encroachment, but then given a second chance, categorized it as a low-end type. While we cannot definitively say why the judge switched ratings, we believe that in this case the most plausible explanation is that the judge first compared the product against a lower-end competitor (e.g., she compared the Eclipse 500 against commercial travel) but upon further contemplation she compared the product against a higher-end product (e.g., she compared the Eclipse 500 against larger, more luxurious personal jet travel). Similarly, we infer that a switch from an initial low-end rating to a later high-end rating is also due to a switch in the encroachee product.