

Deer in the Headlights: Response of Incumbent Firms to Profit-Destroying Innovations

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Abstract

Scholars and managers consider innovation to be the holy grail because it allows firms to sustain or enhance performance. However, contrary to the common perception, sometimes innovations go awry and threaten to destroy the incumbents' profits. Since innovation literature has largely underemphasized such innovations, this paper takes the first step in examining these innovations through a study of three industries. The paper shows that existing literature predicts two opposite reactions of incumbents to such innovations. Rationality literature suggests that incumbents would embrace such innovations whereas behavioral decision-making literature suggest that incumbents would avoid such innovations. This research finds that, in the main, incumbents avoid such innovations in line with behavioral decision-making literature. As a result, incumbents often suffer a loss of profits and loss of market share. This paper not only fills an important gap in innovation literature but also paves the way for future research on several unanswered questions about profit-destroying innovations. It also documents some key learning aspects for managers dealing with such innovations.

Keywords: Profit-destroying innovation, innovation decision-making, incumbent response, cognitive biases, innovation management

1. Introduction

Scholars have long pursued greater understanding of innovation and their enthusiasm is mirrored by that of managers who allocate enormous resources in pursuit of innovation. This enthusiasm is justified because successful innovation leads to business success. If we observe leading firms in any industry, it becomes clear that these firms became leaders due to innovation. Sometimes innovators are pioneers whereas at other times they are fast followers (Methe, Swaminathan, & Mitchell, 1996). While innovators reap the rewards of innovation, incumbents that fail to innovate lose market share and die (Banbury & Mitchell, 1995). The fact that the competitive advantage of a firm cannot be sustained over long time periods (Wiggins &

Ruefli, 2002) makes innovation an imperative. In short, innovation is the vital fluid of a business without which firms cannot survive for long and the pursuit of innovation promises profits and success.

In light of the obvious fact that innovations are desirable because they enhance firm performance, it comes as a surprise that some innovations, instead of enhancing profits for incumbents, threaten to destroy profits, even when incumbents succeed at such innovations. For example, the emerging innovation of LED lights in the lighting industry will destroy incumbent profits, even if they succeed in the innovation of LED lighting (Sullivan, 2008, 2009). The life span of an LED light is 25 times that of an incandescent bulb; if LED technology replaces incandescent technology, the total annual demand for light bulbs

will diminish significantly. Since the market is not able to price LED lights at 25 times the price of incandescent lights, the average incumbent would see a drastic reduction in its profits even if they were pioneers or fast followers in this technology. This would ensue because light bulb demand will decline by over 90% and competition in the industry will significantly increase due to dozens of new entrants. Unlike normal innovations, such as those of the cellular phone service or flat screen televisions where, if incumbents successfully embrace innovation, they witness an increase in profits, in the case of LED, the incumbents would witness a decrease in profits even when they succeed in innovating LED technology. Since such innovations threaten to destroy the profits of incumbents, this paper calls them profit-destroying innovations. Several industries have witnessed a similar phenomenon of profit-destroying innovations. For example, cultured pearls destroyed the profits of pearl divers by creating an abundance in pearl supplies (Wong, 2005). Similarly, voice over IP (VOIP) destroyed the profits for wireline telecommunication incumbents (Reinhardt, 2004). MP3 played the role of profit destroyer in the music label industry (Goel, Miesing, & Chandra, 2010).

In spite of the fact that this phenomenon of profit-destroying innovations is neither new nor rare, it has been underemphasized in the literature. As a result, we have little understanding of such innovations. We do not know where such innovations come from and how they destroy profits. We do not know whether firms find it challenging to deal with such innovations or whether firms just take them in their stride. We also do not know if the prescription from innovation literature applies to such innovations. This is a critical gap in our understanding of innovation. Furthermore, due to a lack of systemic study of this phenomenon, managers are not aware of effective ways for dealing with such innovations.

This paper takes the first step in examining the phenomenon of profit-destroying innovations. It first establishes that the phenomenon exists and explores various aspects of such innovations. It shows that our prior knowledge of decision-making literature predicts two opposite reactions of incumbents to such innovation. Using data from three industries, it examines the reaction of incumbents facing a profit-destroying innovation. As a result, it not only fills an important gap in the literature but also finds some effective and ineffective ways of dealing with such innovations.

2. The Phenomenon

Contrary to normal innovations that help improve profits and market position (share), profit-destroying innovations do exactly the opposite. Strictly speaking, *a profit-destroying innovation is an innovation that ex-ante threatens to reduce an incumbent's total profits if the incumbent successfully embraces the innovation and maintains market share in the industry.*

Such innovations threaten to reduce profits because they either lower profit margins without a commensurate increase in revenues or they lower revenues without a commensurate increase in profits, or both. It is important to note that the definition removes the impact of market share on profits by assuming the market share of the incumbent remains the same, although in reality market shares will and do change. This assumption is placed only to make the phenomenon clear. Furthermore, although innovation literature acknowledges the risks and uncertainties involved with innovation, this paper focuses on the scenario when the innovation in question would succeed because profit-destroying innovations differ from profit-enhancing innovations only when the innovation succeeds. This is also done to focus on the core differences between profit-destroying innovations and profit-enhancing innovations.

2.1 Some Commonly Seen Profit-Destroying Innovations

Custody service incumbents witnessed a decline in total profits when the industry moved from paper-based certificates to electronic certificates. Custody service firms provide several back office services to mutual fund houses. During the era of paper-based stock certificates, custodians made money by fulfilling the trades and safekeeping the stocks of fund houses. When the markets moved from paper-based certificates to electronic certificates, custodians no longer needed vaults and logistics resources but continued to need the information processing services (Rao, 2004). As the need for several core services disappeared, the price of custodial services declined by over 80%. Although the move to electronic stock led to higher trading volume, this increase in trading volume did not compensate custodians for the decline in prices. The drop in prices for custody services was so large that the incumbents witnessed a decline in their business profits.

Voice over IP (VOIP) technology also illustrates the same phenomenon. When VOIP technology emerged, it threatened to reduce the profits of wireline business incumbents through free and virtually free phone call services. Prior to VOIP technology, firms owned their private telecommunication networks, which acted as high entry barriers to the business. However, VOIP eliminated the need for an exclusive telecom network and allowed new entrants to offer telecom services using the Internet infrastructure. This resulted in higher competition and a drop in prices, thereby reducing the profits of wireline incumbents. The loss of exclusivity for the telecom networks threatened their profits (Reinhardt, 2004).

In the music distribution industry, the MP3 format for digital music was also a profit-destroying innovation (Goel et al., 2010). Music labels, such as EMI, make their profits by selling the music of various artists. They pay their artists an advance

and have to sell a minimum volume to break even on that advance. Sales above the break-even volume provide surplus profits to the music labels. MP3 format allowed users to freely copy music and consume it without paying for the music. Peer-to-peer file sharing services, such as Napster, allowed large scale music piracy over the Internet. This led to a significant reduction in music sales, making several albums unprofitable. Even after the courts shut down such services, the MP3 format changed the industry significantly. It allowed the unbundling of music albums and the sale of singles. The overall effect of the innovation was a reduction in sales, revenues and profits for the music labels.

These three profit-destroying innovations behaved differently from normal innovations that enhance profits when successfully embraced by incumbents. These innovations reduced the profits of incumbents, even if the incumbents embraced such innovations and maintained their market share. These examples illustrate an intriguing phenomenon that needs further examination.

2.2 Profit-Destroying Innovations Are Ex-ante Profit Destroying

Although profit-destroying innovations could be an ex-ante or an ex-post phenomenon, this paper focuses on ex-ante profit-destroying innovations. An ex-post profit-destroying innovation would be one that we know destroyed profits only after such an innovation became successful. An ex-ante profit-destroying innovation would be one where we can predict the profit destruction, as in the case of LED lighting. This paper focuses on ex-ante profit-destroying innovations because if incumbents cannot differentiate between a profit-destroying and a profit-enhancing innovation upfront, they would demonstrate no difference in their reaction to these two different types of innovation. As a result, such research would neither help to predict the response of the incumbents nor provide effective ways to deal with such innovations.

2.3 Profit-Destroying Innovations Are Different From the Natural Evolution of Industries

A general trend across most products is that profits tend to fall over time due to competition and other factors. Incumbent firms innovate, essentially, to prevent profit erosion over time. For example, when Apple succeeded with the iPod, Microsoft entered the market with its own media player called Zune. If Apple had not innovated, it would have been forced to reduce its prices to compete with the lower priced Zune. Such actions would have lowered the profits for Apple. However, it innovated with a touch screen iPod and the iPhone to enhance profits and protect its position in the mobile media player market.

Whereas industries experience pressures on profits over time, profit-destroying innovations force profit destruction in a rather short time period. In this sense, such innovations are distinct points in the evolutionary trajectory of an industry and a distinct phenomenon. Furthermore, industries trend towards lower profits because incumbents are unable to innovate enough to compensate for the increased competition. However, profit-destroying innovations threaten to lower the profits of incumbents even when the incumbents aggressively embrace the innovation. For example, in the wireline telephony industry, although huge entry barriers (due to proprietary telecom networks) prevented competition from new entrants, the inability to innovate quickly against other incumbents was pressurizing the profits of the incumbents. However, with the emergence of VOIP (Voice over IP), even non-incumbents could enter the telecoms industry without having to build large scale telecom networks. VOIP allowed a firm to use the Internet infrastructure to provide telephone services. Since the wireline market was saturated, an increase in competition and lower prices could not have increased sales volumes. As a result, at the time of the emergence of VOIP, it was apparent that such a technology would destroy the profits

of incumbents, irrespective of whether the incumbents embraced the innovation or not.

Another fact of industry evolution is the phenomenon of price cutting at various times in industry history. Such price cutting maneuvers, whether they reduce prices temporarily or permanently, are not part of the phenomenon of profit-destroying innovations. Incumbents or newcomers sometimes cut prices to gain market share. When Barnes and Nobel introduced a new E-book reader, Nook, it entered the market with a significantly lower price compared to Amazon's Kindle. This move has probably reduced the prices of single purpose E-book readers permanently. Nook involved no major innovation that would account for a reduction in the prices of e-readers. Consequently, it reduced the margins of its competitors. At other times, companies reduce prices and take a profit hit with a view to expanding the industry.

When such pricing decisions involve expected revenues and market share decisions and do not involve any innovation that would account for a profit decline, this does not represent a profit-destroying innovation. Other than the fact that such price cuts do not involve any innovation, incumbents can, and often do, overcome such challenges from many profit-enhancing innovations and avoid price cuts.

2.4 Profit-Destroying Innovations Are Distinct from Product Cannibalization

Although profit-destroying innovations may appear similar to product cannibalizations, it is a broader phenomenon. Marketing scholars care about product cannibalization (Guiltinan, 1993; Mason & Milne, 1994; Mazumdar, Sivakumar, & Wilemon, 1996; Sundara Raghavan, Sreeram, & Scott, 2005) as it has direct implications for several marketing decisions. The term cannibalization refers to the eating of one's own kind and is often used in this context. For example, when a firm, such as Gillette, launched a 5 blade razor after being successful with a 3 blade

razor, some customers of 3 blade razors started purchasing 5 blade razors. In this sense, the 5 blade razor cannibalized other razor blades made by the same firm. When a product introduction reduces the market share of products made by other firms, it is not called cannibalization. Consequently, cannibalization literature has focused on brand and product extensions rather than the broader phenomenon of profit-destroying innovations. At times, the term is also used for one channel of distribution cannibalizing another channel (Barbara, Inge, Katrijn, & Marnik, 2002). However, such cannibalization research has not focused on innovations across product categories and technologies to examine the profit-destroying innovations.

2.5 Profit-Destroying Innovations Are Defined From an Incumbent's Perspective

A profit-destroying innovation is defined from an average incumbent's perspective and assumes that the incumbent will maintain their market share. Although some incumbents may dramatically increase their market share and show greater profits, the outcome for a single incumbent does not change the nature of the innovation. To avoid any confusion arising from changes in market share, the definition includes a no change in market share clause for an average incumbent.

Furthermore, it is important to note that profit-destroying innovations are different from profit-enhancing innovations because they lead to different business performance when the incumbent and the innovation succeed. If the incumbent fails to innovate and the innovation is successful, the incumbents are expected to lose market share and profits, irrespective of the kind of innovation faced by the incumbent (Banbury & Mitchell, 1995). As a result, the definition focuses on the impact of innovation when the incumbent succeeds in innovating and the subsequent innovation succeeds in the marketplace.

2.6 Can Profit-Destroying Innovations Be Beneficial?

The unit of analysis for this paper is an innovation and the aim of this paper is to understand the response of incumbents to a phenomenon. It is important to note that such an innovation could be a product innovation, a process innovation or another kind of innovation, such as business model innovation. In fact, the cultured pearl example shows how a change in the process of procurement/production became a profit-destroying innovation for the pearl industry. Similarly, the VOIP example shows that the product did not change but the supply chain behind the product changed to destroy the profits of the incumbents.

Although such innovations may threaten to hurt incumbents, they may or may not be hurtful to society as a whole. For example, although the Internet has been a driver of many profit-destroying changes, it has perhaps helped society in many other ways by making information accessible to the masses. Very often, such innovations may destroy the profits of the incumbents but may increase consumer value. For example, while the dematerialization of paper stocks led to the profit decline for custodial service businesses, it reduced the fund management fees for investors. Similarly, while the cultured pearl innovation destroyed the profits for pearl divers, it made cheap pearls accessible to the masses. Although, this may appear to be a great benefit to consumers, one should also consider that profit-destroying innovations often lead to massive job destruction. While dematerialization led to a reduction in fund management fees, it also led to the elimination of jobs that involved the manual processing of the securities at custodians.

Similarly, while a profit-destroying innovation may hurt one industry, it may benefit another. For example, when automobiles arrived on the scene, it destroyed the horse and buggy maker industry but led to the explosion of the automobile industry. In fact, a broad systems view of a profit-

it-destroying innovation may demonstrate overall value creation for society.

Irrespective of the fact that such innovations may be valuable for society, they are still a threat to a set of incumbents that face such innovations. The aim of this paper is to understand the response of incumbents and help firms make better decisions.

2.7 Mechanisms of Profit Destruction

Although profit-destroying innovations threaten to destroy profits, not all such innovations use the same method to destroy profits. We have identified three ways in which such innovations can destroy profits. We thank an anonymous reviewer at the International Journal for Innovation in Management for helping us to make these distinctions in the mechanisms of profit destruction.

2.7.1 Demand Destruction: The most obvious way of destroying profits is through the destruction of demand. The LED example above shows that LED lighting will reduce the demand for annual light bulb consumption by over 95% by increasing the life of a bulb by 25 times. At other times, the demand destruction is quite straightforward whereby the need for the product disappears. The earlier example of the custodial service industry shows how the need to safeguard physical certificates disappeared with the advent of electronic shares.

2.7.2 Price Point Substitution: A second major way by which some innovations destroy profits is through a change in price point in the minds of customers. Earlier, music was sold as albums that were priced at USD 15 or above. However, with the rise in digital music, Apple was able to begin selling music singles at a price point of 99 cents. This led to a change in the perceived price of a song in the minds of consumers. Earlier, a consumer had to buy an entire album in order to listen to a handful of songs. However, now consumers can buy just a handful of songs that they like. Here, demand destruction and price point substitution worked together to destroy profits.

2.7.3 Capability Commoditization: A third way in which profit-destroying innovations have an effect is by making the critical resources and capabilities of an industry commoditized. Prior to the advent of VOIP, a firm needed an extensive telecom network to compete in the telecoms industry. However, with VOIP technology, any firm could piggyback on the Internet infrastructure to offer voice calling. Since any firm could leverage the Internet infrastructure to offer voice calls, the price of voice calls began moving towards the marginal cost, which was effectively zero.

3. Literature Review

As this study focuses on the response of incumbent firms to profit-destroying innovations, we review two critical types of literature. First, since innovation literature has dealt with the response of incumbents to different types of innovation, we conduct a focused review of the innovation literature to learn about incumbent response. Second, as we are interested in predicting the response of incumbents to such innovations, we also review the relevant parts of decision theory literature.

Innovation literature has extensively focused on the response of incumbents to innovations. As a result, we now understand the pitfalls in several incumbent responses to innovation.

Early work in innovation highlighted the fact that it is difficult for incumbents to respond to innovation when the technological changes involved in the innovation are large. This literature made a distinction between radical and incremental innovations. Radical innovation involves large-scale changes in technology whereas incremental innovation involves minor changes in technology.

Early work by Cooper and Schendel (1976) found that radical innovations came from outside the industry and led to significant position loss for incumbents because the incumbents found it harder to respond to them. Tushman and Anderson (1986) found that incumbents introduced incre-

mental innovations that built on their previous capabilities, whereas newcomers and outsiders introduced innovations that used different capabilities from those of the incumbents. In effect, newcomers introduced innovations that made the competencies of the incumbents irrelevant. Utterback (1996) found similar results across many industries – incumbents were hesitant or unable to respond to radical innovations. Abernathy and Clark (1985) further distinguished innovations based on whether an innovation destroyed marketing capabilities or technical capabilities, or both.

Although early studies found that radical innovations often come from outside an industry and displace the incumbents (Hill & Rothaermel, 2003), later studies found contrary evidence. Methe, Swaminathan, and Mitchell (1996) found that, sometimes, incumbents were responsible for major innovations in an industry, and at other times, incumbents could quickly incorporate radical innovations in their product offerings. Moreover, Banbury and Mitchell (1995) showed that, sometimes, some incumbents were unable to innovate even with incremental innovations.

Clayton Christensen and his colleagues (Adner, 2002; Christensen, 1997; Christensen & Bower, 1996; Christensen, Suarez, & Utterback, 1998) examined another class of innovations that Christensen termed disruptive innovations. Unlike the earlier innovation classes that focused on changes in technology involved with products and services, such innovations involved a change in the purchase criteria of customers. Christensen found that when such innovations appeared on the horizon, they were inferior to mainstream technologies for key customer purchase criteria and thus did not appeal to mainstream customers. As these innovations did not appeal to the mainstream customers but to a small segment of peripheral customers, the incumbents did not invest in these technologies. Although such innovations began as inferior technology for the key purchase

criteria of mainstream customers, they eventually surpassed the mainstream technology for the key customer criteria. Once disruptive innovations surpassed the mainstream technology, they not only provided parity performance with the mainstream technology but also provided a new benefit. As a result, mainstream customers began to value a new attribute that the disruptive innovation provided. Since the incumbents failed to invest in disruptive technologies, they were unable to match the newcomers and were displaced by them.

Christensen (1997) found that the reason incumbents were unable or unwilling to respond to disruptive innovations was that the big customers were not interested in disruptive innovations. Since organizations often focus on their biggest mainstream customers, major incumbents found that disruptive innovations did not make an impact in the beginning. On the other hand, when the innovations were sustaining innovations – the ones where the purchase criteria of the customer did not change, the incumbents proactively innovated.

The above mentioned literature showed that the scholars found incumbents unwilling or unable to respond to some innovations but eager, able and willing to respond to other innovations. While incremental and sustaining innovations posed little or no challenge to incumbents, the same incumbents found it hard to respond when the innovations involved a major new technology or a significant change in the purchase criteria of their customers. The same literature demonstrated that there were also several barriers to innovation that prevented incumbents from responding effectively.

When the change in technology was radical, it required firms to learn new technologies and incorporate them in their products. The key barrier preventing firms from incorporating radical technologies was the lack of information. Chopra (2007) found that X-ray firms, such as GE and Picker, were unable to develop their own

CT scanners because they lacked the required knowledge of a critical technology used in CT scanners. This lack of information behaves as an informative barrier to innovation that reflects on incumbents who are unable or unwilling to respond to major changes in technology.

However, the barriers involved with disruptive innovation were often of the normative kind. Christensen (1997) found that the lack of knowledge never acted as a barrier to innovation and major firms had developed early prototypes of disruptive innovations. However, the firms often discarded the prototypes and stopped working on their innovations. The key barrier to innovation in the face of a disruptive innovation was more of a normative barrier. The norms of the firms involved greater focus on core customers rather than peripheral customers. These norms eliminated disruptive innovations from being funded when the core customers showed little interest in these innovations.

Although innovation literature has examined the response of incumbents to different innovations, it has mainly focused on profit-enhancing innovation; the literature has underemphasized profit-destroying innovations. It may be instructive to examine the nature of choices involved in responding to profit-enhancing innovation and see if our understanding of these choices enables us to predict how incumbents would respond to profit-destroying innovation.

Figure 1a shows the choices that incumbents face when dealing with a profit-enhancing innovation. Literature has recognized this choice set (Mitchell, 1991) and it shows the emphasis of literature on profit-enhancing innovations. The figure shows that incumbent firms have two options when faced with an emerging innovation – embrace it or avoid it. At the same time, the innovation itself could succeed or

fail in the market. If the firm avoids the innovation and the innovation fails, the firm loses nothing; however, if the innovation succeeds, the firm may go out of business or lose significant market position (Christensen, 1997). Kraft and Unilever did not imitate P&G's innovation of fat free oil and, as a result, when the innovation failed, these firms were spared the waste of resources that P&G suffered. On the other hand, disk drive makers (Christensen et al., 1998; King & Tucci, 2002) avoided the innovation for too long and thus lost position in the market. If a firm embraces an innovation and the innovation fails in the market, the incumbent loses the resources expended on this innovation activity. However, if the innovation succeeds, the firm stands to benefit from supposedly more profitable technology. Procter & Gamble spent enormous resources on their fat free oil Olestra but the technology did not succeed in the market following which P&G lost the resources it used on this major innovation (Canedy, 1999). On the other hand, when GE embraced the CT scanner innovation, it improved its profits when the technology succeeded in the market (Teece, 1986).

Due to the uncertainty associated with innovations in the early stages, incumbents are best served when they pursue a fast second mover strategy (Christensen et al., 1998; Mitchell, 1991). This strategy prevents excessive upfront costs associated with testing the innovation concept and allows incumbents to build on the early successes of the first movers. When firms fail in the face of a radical or disruptive innovation, it is usually because they were unsuccessful in being a fast second mover. The literature shows that informative as well as normative barriers prevent firms from being successful fast movers in many cases.

		Response of firm	
		Embrace Innovation	Avoid Innovation
Fate of Innovation	Failure	Loss of resources allocated to Innovation (Olestra)	Prevent wasteful resource allocation (Kodak with printer on camera)
	Success	Profit Increase (GE in CT Scanner)	Profit / Position / Opportunity loss (Disk Drive Makers)

Figure 1: Decision set associated with profit-destroying versus profit-enhancing innovations

Figure 1a: Profit-Enhancing Innovations

Figure 1b shows how the choices associated with a profit-destroying innovation are different from the choices associated with profit-enhancing innovations. One point that stands out in figure 1b is that, unlike incumbents facing profit-enhancing innovations who see an improvement in profits when they successfully embrace innovation, incumbents facing profit-destroying innovations expect a drop in profits when they succeed in embracing the innovation. Furthermore, incumbents facing profit-destroying innovations would also legitimize the innovation and perhaps accelerate the success of the innovation, thereby accelerating their profit destruction. However, if they avoid the innovation, they could lose market position or face exit from the industry if the innovation succeeds. This is because the innovation could potentially make the incumbents obsolete.

Literature on product cannibalization (Barbara, Inge, Katrijn, & Marnik, 2002; Sundara Raghavan, Sreeram, & Scott, 2005; Sundara Raghavan et al., 2005; van Heerde, Srinivasan, & Dekimpe, 2010) has studied the impact of one product cannibalizing other products. Chandy and Tellis (1998) connected cannibalization literature with

incumbent response. They highlighted the role of the willingness to cannibalize as an important driver of incumbent response to radical innovations. However, this literature did not examine how willing the incumbents would be to cannibalize a higher profit product with a lower profit product.

A comparison between figures 1a and 1b show that as an innovation turns to profit-destroying, it changes the set of choices facing incumbents and their implications in a meaningful manner. The challenge of a profit-enhancing innovation is not just to embrace the innovation but to do so rapidly, something that incumbents often find hard to do. However, if they succeed in embracing the innovation, they witness an increase in profits. On the other hand, incumbents facing a profit-destroying innovation face only the downsides and no upside. If they succeed in embracing the innovation, their profits would decline but if they avoid the innovation and the innovation succeeds, they could be driven out of the market.

Although innovation literature does not help us predict the response of incumbent firms facing profit-destroying innovation, a review of the decision-making literature provides us with two reasonable but

opposite predictions about incumbent re- sponses to profit-destroying innovations.

		Response of firm	
		Embrace Innovation	Avoid Innovation
Fate of Innovation	Failure	Loss of resources allocated to innovation	Prevent wasteful resource allocation
	Success	Reduction in profits	Eventual loss of position / demise

Figure 1b: Profit-Destroying Innovations

The literature on decision theory has had two distinct proponents who approach decision-making from two distinctly different directions. The first branch of this literature is based on the notion of rationality whereas the second branch is based on behavioral decision theory (Goldstein & Hogarth, 1997).

The notion of rationality permeates economic theory and has been an important basis in many sciences. The classic book by Von Neumann and Morgenstern (1944) used this notion to model human behavior. It assumed that economic actors are rational beings who maximize their subjective utility. This notion eventually became an edifice of economic theory (Becker, 1976; Coleman, 1986; Elster, 1986; Hargreaves Heap, Hollis, Lyons, Sugden, & Weale, 1992).

Synthesis of this research by researchers (Goldstein & Hogarth, 1997; Payne, Bettman, & Johnson, 1993; Shafir & LeBoeuf, 2002) points to the notion of a rational decision maker who attempts to maximize subjective utility through his choices. Such a rational decision maker can not only estimate the probability of success of an innovation but also take the path leading to the greatest potential profits.

Based on probability-weighted returns of the various options, a rational decision maker would choose the option with the highest probability-adjusted returns. Such a decision maker would find that embracing a potentially successful profit-destroying innovation leads to higher returns than avoiding such an innovation. From this perspective, incumbents would tend to embrace a potentially successful profit-destroying innovation because it is much better to survive with lower profits than to exit the industry. This leads to the first proposition:

Proposition 1: When faced with a profit-destroying innovation, incumbents embrace the innovation.

However, behavioral decision theory literature and organizational behavior literature have found decision makers to be less than fully rational. These literatures have found that decision makers often become influenced by their context and fall prey to several biases that veer them towards choices that may not be explained by a rational model. This literature would predict that, irrespective of what a rational choice may be, firms facing a prof-

it-destroying innovation would tend to choose the opposite course of action. It predicts that incumbents would avoid the innovation, as discussed below.

Incumbents facing a profit-destroying innovation face two choices, both of which leave them worse off. If incumbents embrace the innovation they would witness a reduction in profits. However, if they avoid the innovation they may have to exit the industry when the innovation succeeds. Scholars have found that when decision makers face two choices, both of which leave a decision maker worse off than the status quo, the decision maker tends to avoid making such a decision (Anderson, 2003; Dhar & Simonson, 2003; Luce, 1998). Consequently, this research would predict that such an incumbent would avoid making the decision and thus would appear to choose "avoid profit-destroying innovation".

Another vein of the decision-making literature provides more support for the avoidant response of the incumbent. According to prospect theory (Camerer, 2000; Hastie, 2001; Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), when a decision maker faces the choice between a probable loss and a definite loss, the decision maker systematically underestimates the probability associated with the probable loss. Incumbents facing a profit-destroying innovation also face the choice between a probable loss and a sure loss. Embracing a profit-destroying innovation is akin to a definite loss because this course of action involves voluntarily lowering a firm's own profits. Ignoring or trying to prevent the innovation is akin to choosing a probable loss because if the innovation fails, the incumbent would not lose much but if the innovation succeeds, the incumbent may lose their entire business. Consequently, prospect theory would suggest that the incumbents would systematically underestimate the probability of success of a profit-destroying innovation.

Furthermore, some organizational forces could prevent incumbents from

freely going down the rational path of embracing an innovation even if it appears likely to succeed. Power in the organization lies with the leaders of the largest businesses, and leaders maintain that power due to their business success (Pfeffer, 1981). If business profits decline, business leaders would lose credibility and power. Consequently, embracing a profit-destroying innovation would not only decrease business performance, it would also reduce the power of the business leaders. Thus, these business leaders would actively avoid embracing such innovations. Research results (Puffer & Weintrop, 1991) and empirical evidence (Lubin, 2009) show how CEOs lose their jobs when they do not deliver expected results. These results also show how difficult it is for management to take the rational path of embracing such innovations when they lead to the loss of power.

In short, the literature on behavioral decision theory and organizational behavior, taken together, leads to the second proposition:

Proposition 2: When faced with a profit-destroying innovation, incumbents would avoid rather than embrace the innovation.

In short, although rationality literature predicts that incumbents would embrace a profit-destroying innovation, behavioral decision theory and organizational behavior literature predicts that incumbents would avoid embracing a profit-destroying innovation.

In summary, although scholars have looked at innovation by incumbents and newcomers in significant detail, they have often focused on innovations that would lead to higher profits but have underemphasized profit-destroying innovations. As a result, the literature is almost mute on whether some innovations may be bad for incumbents even when incumbents succeed in imitating the innovation. Given that the literature does not sufficiently inform us about innovations that destroy, or threaten

to destroy, the profitability of incumbents, there is a compelling need to understand these innovations better. Our inability to predict the response of incumbents facing such innovations highlights the major gap in our understanding. This research attempts to fill this critical gap in the literature.

4. Data and Methods

As the research question in this study involved a lesser known phenomenon, it suggested the use of qualitative methods (Yin, 1994; Yin, 1981). As this research involved understanding the sequencing of events, the emergence of new information over time and the reaction of incumbents to such information, it was imperative to reconstruct the sequence of events in a reliable manner. Such research involves penetrating the specifics of a time and place so that findings are generalizable in an analytical rather than a statistical sense (Eisenhardt, 1989).

As a first step, this research cast a wide net over several industries to identify some of the innovations that incumbents could have perceived as profit-destroying innovations.

It must be noted that our search for innovations focused on potential innovations that appeared to be profit-destroying before they became successful. As a result, it was not important to verify how much profit was actually destroyed by the innovation. It was more critical that the innovation appeared to be profit-destroying.

This search led to a list of a dozen innovations. Furthermore, a quick research on these innovations was carried out to understand the nature of the data availability and to understand whether there were strong reasons to believe ex-ante that the innovation was perceived as profit-destroying.

The list of the dozen profit-destroying innovations included cultured pearls, custodial services, cultured diamonds, LED lights, wireless electricity, laser-based hair removal devices, consumer cameras, mutu-

al funds, quartz watches, free software, software solutions for tax preparation, and music labels. From this list, three industries were chosen based on two criteria. First, the innovation should have occurred in the past and the reaction of the incumbents should have been documented. This ruled out emerging profit-destroying innovations such as LED, wireless electricity, software services, laser-based hair removal devices, tax preparation software and cultured diamonds. Second, extensive data should have been available on the industry and its incumbents. This ruled out cultured pearls and custodial services, as data on these two industries was sparse at best. The four industries that met the criteria were digital cameras, mutual funds, music labels and quartz wristwatches.

Digital cameras involved a major change in technology, whereas quartz wristwatches and music labels involved minor changes in technology, and index funds involved no change in technology. Since there was a redundancy between wristwatches and music labels (both involved minor changes in technology), we decided to include wristwatches instead of music labels because wristwatches also enabled us to study an international context of incumbent responses. This led to the final choice set of digital cameras, quartz wristwatches and index funds.

Data on CT scanner innovation was also collected to use as a control case where the innovation was profit-enhancing in nature. However, due to space constraints, data on CT scanners is not shared in this paper.

As the next step, a massive data gathering effort was undertaken for the digital camera industry. It involved iterative searches for terms including “digital camera”, “film camera”, and several other related terms in the lexis nexis academic universe database for the time period 1979 to 2005. Since the first digital camera was announced in the early 1980s, this time period would have captured all the events related to digital cameras. This yielded

over 3000 articles in publications from across the various searches. Based on a quick review of the article title and metadata, relevant articles were put aside for deeper review. Along with these articles, all available 10-K reports, industry reports, existing case studies and web based searches were used to better understand lesser understood terms and events for carefully reconstructing the history of the industry. At times, some data made it imperative to go back further than the initially selected dates. This data collection effort took place between 2006 and 2009; additional data was collected through interviews with several subjects later on.

The camera industry research demonstrated that data closer to the emergence of the innovation provided the most valuable sources and data temporally distant from the innovation was significantly less relevant. This insight was used to collect data on quartz wristwatches and the mutual fund industry where a similar method was used but where the dates for collecting information was reduced to 1 year prior to the innovation and 10 years after the innovation.

Moreover, while both the camera industry and CT scanner industry involved fewer than 50 firms that entered the industry and competed, the Swiss watch industry as well as the mutual fund industry involved thousands of firms.

Due to large variations in the number of firms in the industries, while the data for the digital camera and CT scanner industry encompassed all firms across the entire time period, the data for quartz watches and the mutual fund industries focused on a sample of incumbents along with aggregate industry data where available.

One author undertook the entire data collection effort. Since the data collection focused not just on quantitative data but also qualitative data, such as press releases and company official statements, the focus was on recreating a timeline.

Based on the various data sources, a detailed timeline of events was recon-

structed for each industry. Since data was used from several sources, it ensured increased reliability and the validity of the findings. Furthermore, since the data was used to reconstruct the history so as to provide a contemporaneous feel for the events, it reduced the likelihood of retrospective bias. By preserving the chronological flow of the events, the detailed timeline provided a rich dataset that enabled a deeper understanding of the phenomenon and any other issues related to profit-destroying innovations. The narrative distilled from the dataset and the implications are presented in the next section.

5. Analysis of Incumbent Response in Three Industries

5.1 Incumbent Responses in the Photographic Equipment Industry

The photographic equipment industry refers to the group of firms that produce cameras, film, photofinishing services and accessories. Over the last 130 years, this industry has witnessed two major innovations. The first involved the invention of the film roll that led to a rapid expansion of the industry in the early twentieth century. The second involved the transition from film cameras to digital cameras in the early twenty first century. Prior to the film roll, the technology involved a cumbersome technique in which a coated glass plate was exposed to capture the image. Due to this cumbersome methodology, professional photographers were the core customers of the industry.

Kodak pioneered the film roll technology that replaced glass plate technology. Due to its technological and marketing efforts, Kodak had become a dominant player in the industry by the middle of the 20th century. Its innovation efforts focused on making the camera easier to use and improvements to the picture quality. By the 1950s, it had eliminated virtually all competition from the industry and in the 1970s Kodak had a 90% market share in film and an 85% market share in cameras in the US market. Its photofinishing technology had

become the industry standard. Its position outside the United States was also strong but not as strong as at home. In 1976, it had \$2bn of global sales compared with the \$2.8 billion global sales of all other competitors. Not only did Kodak have a dominant position, but the business itself was very lucrative too. By many accounts, the gross margin of the business was upwards of 50% (Porter, 1983).

Polaroid was the other major player in the industry with complete dominance in the instant photography segment, a segment that it pioneered. Its technological lead and dominance in instant photography allowed it to grow at over 25% p.a. for 30 years from 1945 to 1975. Polaroid's innovation efforts aimed to improve the image quality and to reduce the time between capturing the image and obtaining the finished photo. Although Kodak entered this segment in the 1970s, it was driven away from the segment by Polaroid's lawsuits.

Canon, Nikon, Fuji Photo, and Agfa were other important players in the industry globally. Canon and Nikon made cameras while Fuji and Agfa also made film. Although Fuji entered the US market in the 1970s and slowly nibbled at Kodak's market share through its low cost offerings, reaching a 20% share by the end of the century, Kodak remained the dominant market leader.

Throughout the century, innovations emanating from the industry enabled firms to enhance their profits. Color photos, faster and better quality film, and superior photofinishing allowed firms to maintain or increase profits. At one point, DuPont, the chemicals major, tried to enter the industry in the film segment with a better quality film roll. At that time, Kodak moved swiftly to beat DuPont in the technological race initiated by DuPont. Each subsequent product launch showed Kodak's superiority over DuPont. DuPont left the industry shortly after. This episode showed the significant capabilities and market power of Kodak and was an example of an incum-

bent reacting to a profit-enhancing innovation in this industry.

In 1981, Sony, the consumer electronics major, introduced a digital camera called Mavica that required no film. It was a sophisticated piece of consumer electronics compared to the ordinary \$50 film cameras then sold across the United States. Both Polaroid and Kodak began investing in developing a wide range of capabilities needed to compete in the digital camera domain. Kodak set up a laboratory in Japan to learn consumer electronic technologies and over the next 10 years invested over \$5 billion in digital technology. Both Kodak and Polaroid set up digital technology teams that amassed capabilities in microelectronics, IC design, image processing and software design. Kodak launched the world's first image sensor in 1986 that became the industry standard. By 1989, Kodak had launched over 50 products related to digital image capture or conversion.

The reaction of Kodak and Polaroid to Sony's digital camera allowed the firms to build impressive digital capabilities within the next 10 years. There was absolutely no hesitation or feet dragging by these firms in developing new technological capabilities and producing digital products. Eventually the senior management realized that the innovation was a profit-destroying innovation as the launch date approached. Digital cameras decreased profitability by eliminating the film and photofinishing services on the one hand and by increasing competition from consumer electronic firms on the other hand. The margins were significantly lower in the digital world.

When the management of both Kodak and Polaroid realized that the digital camera was a profit-destroying innovation, they began to resist the commercialization efforts. Many news reports and other industry observers noted that managers were resisting the digital technologies. A senior manager at Polaroid said "Why 38%? I can get 70% in film. Why do I want to do this?" upon realizing that the innovation was profit-destroying (Tripsas & Gavetti, 2000).

Similarly, Kodak's managers also lamented the profit-destroying nature of the innovation. A senior vice president and director at Kodak said "We're moving into an information based company, but it's very hard to find anything [with profit margins] like color photography that is legal". Even the new CEO, George Fisher, found significant resistance from the traditional film business and had to merge the two divisions to end the war between the digital and film based businesses.

Feet dragging by Kodak and Polaroid had a significantly detrimental effect on their market positions. Kodak lost its dominant position in the industry. Polaroid, on the other hand, became a non-player. In 2001, it filed for chapter 11 bankruptcy and its assets were sold off to another company who continued the business under Polaroid's name. In 2007, it decided to exit the instant photography market. In the case of digital cameras, the innovation was a profit-destroying innovation as the firms expected it to be. Fuji's profits declined from 13% in 1990s to 7% in 2005 and Kodak's gross margins declined from 46% in 1998 to 32% in 2005.

Canon and Nikon, on the other hand have used the opportunity of digital cameras to promote digital single reflex cameras (DSLR), which is a more lucrative market segment. SLR cameras allow users to change the lens and provide significant flexibility in photo capture. Point and shoot (P&S) cameras replaced SLR cameras a long time back because of their ease of use. With the ability to get instant results from a digital camera, a user can see the result from the various features of a SLR camera instantly. As a result, the SLR segment began expanding due to the efforts by Canon and Nikon. Due to its SLR strategy, Canon, which was a peripheral player in the industry, became one of the major competitors in the digital arena.

The photographic equipment industry showed that the most dominant incumbents dragged their feet in the face of profit-destroying innovations while commer-

cializing the innovation. However, when the same incumbents faced a profit-enhancing innovation, they aggressively defended their turf. Furthermore, peripheral players were better able to deal with the profit-destroying innovation than the dominant players. Finally, firms like Kodak and Polaroid that relied heavily on the industry for their profits had a more difficult time dealing with profit-destroying innovations than firms such as Canon who depended less on the industry for their profits.

5.2 Incumbent Responses in the Swiss Wristwatch Industry

Just as Kodak and Polaroid dominated the photographic equipment industry for the entire century, Swiss watchmakers dominated the global wristwatch industry up until the early 1970s. "Made in Switzerland" stood for excellence in wristwatch-making due to centuries of superior artisanship. Until 1957, all watches in the world were mechanical watches consisting of more than 100 small components and requiring fine artisanship to keep accurate time. Accuracy in time-keeping was the core benefit of watches and Swiss watches provided the highest accuracy.

Post World War II, Swiss watchmakers accounted for 80% of the world watch production and the industry employed 80,000 people across 2500 firms. Over 95% of Swiss watches were exported and these exports accounted for 10% of GNP. These watches were jewelry items sold at jewelers and provided watchmakers with over 50% gross margins. During the 1950s and 60s, cheaper watches of inferior quality from Japan and United States nibbled away some of the market share of the Swiss watch makers. Nevertheless, even by 1970, Swiss watch makers dominated the global industry with a 50% market share.

Quartz technology heralded a major change in the industry in 1970s. Quartz crystals could be used to keep time without the need for the more than 100 small components that a mechanical watch needed. Quartz watches were as accurate as the best Swiss watches, and were significantly

cheaper. Originally, the Swiss incumbents created the technology. This invention was the result of a research consortium set up by Swiss watchmakers in response to an electric watch that appeared in the industry in the 1950s. However, the firms decided not to commercialize the quartz technology. This was because moving to quartz would have eroded the 20% premium that Swiss watches commanded over other watches; although Swiss artisanship was difficult to copy, quartz technology was difficult to differentiate.

Japanese and American watchmakers led the way in commercializing the quartz watch category. During the 1970s, quartz watch sales increased throughout the decade and beyond. In 1975, only 3% of the watches sold worldwide were quartz watches but by 1979, this share of the quartz segment increased to 31% and by 1984, 75% of all watches sold globally were quartz watches. Since the Japanese and the American watchmakers led the way, they gained significant market share in the quartz watch segment. For example, Seiko, a major Japanese watchmaker, increased its production of quartz watches from 20% in 1975 to 72% in 1977. Timex, a major American watchmaker, introduced its first quartz watch in 1971 and priced it at 60% discount to the least expensive watch sold in the United States. The rapid expansion in the industry lured many companies to the watch industry. Over 50 companies entered the industry in the 1970s including Texas Instruments and National Semiconductors.

Since the technology required to produce quartz watches was significantly different from the technology required to produce mechanical watches, the innovation was a radical innovation. Furthermore, the key purchase criteria or benefit from a watch did not change. Consumers valued the accuracy of watches as the most important attribute to choose a watch, and they continued to value accuracy even in a quartz world. Since innovation classes are ex-ante descriptions, quartz innovation was a radical and sustaining innovation.

Quartz technology reduced barriers to entry in the industry, barriers that were earlier based on the superior artisanship of the Swiss watchmakers. Due to lower barriers to entry in the industry, the profitability of the incumbents was expected to drop as competition would lower prices. The Swiss firms saw the profit-destroying potential of quartz watches clearly. One industry observer noted, "Many doubted there was any profit to be made in selling inexpensive watches". Hayek, the man responsible for the eventual resurrection of the Swiss watch industry, said about the Swiss mindset "Why should we compete with Japan and Hong Kong? They make junk and then give it away. We have no margin there".

The most pervasive response of the Swiss firms was no response to the quartz watch competition. Instead, they ceded territory across the world in mid and low priced segments. By 1985, the global revenue share of Swiss watchmakers had declined to 30% and their volume share had declined to 10%. The total exports of mechanical watches had declined from 40 million units in 1973 to 3 million units in 1983. During this period, from 1970 to 1985, the total number of Swiss watchmakers declined from 2250 to a little over 750 and the number of employees in the industry declined from 65,000 to less than 30,000.

Swiss firms had the technology to introduce quartz watches but did not commercialize the technology. They watched a slow motion train wreck and did nothing for over a decade and a half. These firms behaved just as a deer does in car headlights – they froze without a response. This provides further evidence to support the findings from the digital camera industry that incumbents behaved in line with behavior decision theory predictions and not in line with rationality view predictions.

The Swiss watch industry also gives an example of a firm which successfully dealt with a profit-destroying innovation. Instead of following the Japanese in mak-

ing watches an everyday item, Swatch repositioned the wristwatch from being a jewelry item to being a fashion accessory. It used its Swiss origins to demand a premium and used its design skills to create watches for different moods, clothes, occasions and events. This provides more evidence that, irrespective of whether the innovation is eventually profit-destroying or not, the incumbents behave as a deer in headlights when they perceive the innovation to be profit-destroying. Moreover, it shows that some incumbent firms can respond to profit-destroying innovations effectively.

5.3 Incumbent Responses in the Mutual Fund Industry in the United States

The common theme between digital camera innovation and quartz innovation was that they both involved a radical technology needing significantly new knowledge. However, the innovations in the mutual fund industry involved no new technology and thus the mutual fund industry is a welcome addition to the data set used for this research.

The mutual fund industry is a part of the broader financial services industry and plays an important role in providing investment products with different risk profiles and liquidity. The three major categories of mutual funds are equities, bonds, and money market funds. A mutual fund takes money from investors and uses it to buy and sell financial instruments to generate returns in line with the fund's objectives. The fund company makes money by charging for investment management and sometimes takes a percentage of the profits. The key drivers of profitability in the industry are the size of the assets under management and the management fee.

Until 1976, all mutual funds were actively managed funds. Managers of such funds buy and sell instruments, such as equities, to beat a benchmark index, such as the S&P 500 index. Fund managers of active funds use research staff, and incur enormous expenditure when buying and selling financial instruments. Such funds

charge close to 1.5-2% of the assets under management as a management fee from the investors. History shows that more than 50% of all funds underperform their benchmark index.

In 1976, Vanguard introduced the first index fund, called the Vanguard Trust 500. Unlike actively traded funds, such a fund is a passive fund that replicates the benchmark index and undertakes no buying and selling except when the index composition changes or to honor fund redemptions. However, it guarantees index performance that is at least as good as the universe of all actively managed funds. Such a fund also charges a significantly lower management fee compared to actively managed funds; Vanguard's fees were estimated to be almost a sixth of the fee charged by equivalent active funds.

Index funds were a profit-destroying innovation for the mutual fund incumbents because it reduced the management fee significantly. In fact, if all assets were moved to index funds, the overall management fee charged by all funds would reduce by over 80%. Irrespective of how profitable the index fund business could be, with an 80% reduction in revenue, the incumbents would see a reduction in profits. As a result, mutual fund houses quickly realized that this innovation could destroy profits. However, the industry participants believed that such an innovation would not succeed as no one would want to achieve such a mediocre performance. Vanguard was even criticized for being un-American by providing mediocre returns. However, the innovation succeeded. By 1990, 2% of the assets under management in equity funds belonged to the index category and by 1998 it had increased to 7.3%. By 1998, 33% of funds flowing into equity mutual funds went into the index fund category.

Fidelity, the market leader, did not respond to this threat for over 15 years during which time Vanguard played in a largely uncontested field. Moreover, even when Fidelity and Dreyfus launched their own index funds they did not promote

these funds in a meaningful manner. As a result, more funds continued to flow to Vanguard index funds than to Fidelity and Dreyfus. Due to this delayed reaction by the incumbents, Vanguard's market share of the mutual fund industry had increased to 5.5% by 1992. From 1987 to 1992, while Fidelity's share of direct marketing assets declined from 30.5% to 28%, and Dreyfus's share of this asset class fell from 13.9% to 10.6%, Vanguard's share increased from 15% to 20.7%. By 2007, Vanguard had become the clear leader of the index fund category with 46% market share, a remarkable achievement in a fragmented industry.

The mutual fund industry did not need new technology to launch index funds. In fact, any fund house could have launched such a fund in a very short period because they had all the knowledge required to do so. Nevertheless, the incumbents did not respond, even when large amounts of new assets were flowing to Vanguard.

A key difference between the outcomes for mutual fund incumbents and incumbents in the industries covered earlier was that in this industry, Fidelity was not displaced by Vanguard. In fact, Fidelity's overall market share did not decline in a meaningful manner due to the rise of Vanguard. So why did Fidelity not lose its leading position, even when it demonstrated a weak and indecisive response to the threat? The answer lies in the fact that mutual fund incumbents had significantly stickier client relationships than incumbents in the camera or watch industry had. In the pension plans category, employers often administer the plan wherein they choose a menu of funds to be provided to employees for investment of their retirement savings. These plans tend not to change very often. Similarly, for self-directed IRAs, investors had to open new account relationships with a fund family, which is a switching barrier. Moreover, financial advisors who advise clients on which funds to add to their portfolio are often paid by active funds whereas they do

not get sales commission on index funds. Finally, selling and buying in taxable accounts has a tax implication that may make such moves expensive. Overall, these barriers in the mutual fund industry made it harder for assets to be switched from actively managed funds to index funds but did not prevent new funds from flowing to index funds.

In 1993, the mutual fund industry witnessed a second profit-destroying innovation that competed directly with the index funds. The American stock exchange launched the first exchange-traded fund (ETF), which is similar to an index fund but costs even less and provides several advantages over index funds. The lower cost of such funds is a result of less administrative work required to run such funds. As a result, an ETF is an index fund with lower costs because of the elimination of some of the value activities. Barclays, a non-player in the mutual fund industry, provided a major commercialization impetus to this product category. From the year 2000 onwards, the total flow of assets to ETFs surpassed the share of funds flowing to non-ETF index funds and the ETF category had increased to over \$422 billion by 2006. The rise of ETFs was akin to the rise of index funds.

While other players in the mutual fund industry, including Merrill Lynch and State Street, moved into ETFs, Vanguard, the leader in index funds showed the same behavior as Fidelity demonstrated in response to index funds. In fact, when the Vanguard managing director Gus Sauter proposed that Vanguard should launch ETFs, the chief executive of Vanguard, Jack Brennan, responded, "I think that's the worst idea you have ever had". Vanguard had become a deer in the headlights in response to a profit-destroying innovation. It finally responded in 2001 with its first ETFs but did not advertise those ETFs to any great extent. In this sense, its response was no different from Polaroid's commercialization efforts of its digital cameras. Just as Vanguard rose to prominence with a

profit-destroying innovation, so Barclays also succeeded with ETFs. By November 2007, Barclay's had a 57% share of the ETF segment; State Street had a 21% share, while Vanguard had a mere 7% share.

The fact that financial service firms that could have quickly imitated any new product took 15 years to respond to a profit-destroying innovation provides further evidence that, in the face of profit-destroying innovation, incumbents tend to behave as deer do in the headlights of a car. This finding is similar to the findings in the previous two industries.

6. Synthesis of Findings from this Research

A common theme emerging across all profit-destroying innovations described above is that the incumbents behaved as deer in headlights do when faced with a profit-destroying innovation. They continued with this avoidance response even in the presence of significant evidence that the innovation would succeed. The evidence suggests that the mechanism proposed by behavioral decision theory research was working rather than the mechanism proposed by rationality theory. On the other hand, in the case of a profit-enhancing innovation, incumbents were spurred into action, as was shown by the response of Kodak to DuPont.

The incumbents in the digital camera industry did not hesitate to invest aggressively in the radically new technology but did not demonstrate the same force when commercializing the innovation. Similarly, the Swiss watch incumbents and the mutual funds incumbents continued to avoid the innovations in the face of mounting evidence that the innovations were succeeding.

Figure 2 summarizes the results across the three industries studied in this paper.

Figure 2: Summary of results from the analysis of four industries

Industry / Innovation	Common Incumbent response	Impact on Incumbents
Mutual Funds / Index Funds	Delayed and indecisive reaction	Rise of Vanguard / No incumbent displacement
Mutual Funds / Exchange Traded Funds	Delayed and indecisive reaction	Rise of ETF players / insignificant displacement
Camera / Digital Camera	Spurred into action when investing in technology. Dragged feet when commercializing	Significant market share loss and exit of dominant incumbents. Peripheral players rose to dominance.
Wristwatches / Quartz Watches	Ceded territory to quartz players/ delayed action on quartz	Loss of profits/ market share, exit of many players
Camera / Film roll innovations (faster, color)	Spurred into action when faced with better film innovation	Improved position / profits. Drove out challenger

7. Discussion and Lessons for Managers

When we asked senior managers how they would respond if they were faced with a profit-destroying innovation, we were told that they would rather survive with lower profits than exit while trying to maintain profits in a losing scenario. However, this research shows that even very successful firms fail to make this choice. The incumbents in this study behaved as deer in headlights do when faced with profit-destroying innovations. These incumbents did not miss the innovation facing them and they did not refuse to invest in the technology. However, when it came to commercializing the innovation, they just dragged their feet, did not commer-

cialize the product fast enough, did it tentatively, or behaved in a self-destructive manner. On the other hand, when the innovation was profit-enhancing, the incumbents were spurred into action.

The rational approach of incumbents would have been to assess the probability of success of the innovation and then make an investment decision based on the risk-adjusted net present value of the investment. Although the uncertainty associated with an innovation is very high early on (Mitchell, 1991), it is still possible for firms to take a real option approach (McGrath, 1999). While wristwatch makers and camera manufacturers did this because the technology was radical, mutual fund incumbents did not have to take a real option approach to the technology as it was not new.

The literature mentions several factors that contribute to incumbents reacting to innovation at a slower pace than required. However, none of those traditional factors were at work here. First, the speed at which innovation displaced mainstream technology was not an issue (Christensen, 1997). In all three industries, the innovations took between 15 to 25 years to displace the mainstream products. As a result, lack of time is not a reasonable explanation for an incumbent's response. Second, a lack of cash flow and resources also do not explain this anomaly because the incumbents had significant resources at their disposal (Tripsas, 1997). Third, the degree of technological change does not explain the behavior because the photographic equipment incumbents spent enormous amounts of money and the Swiss watchmakers had all systems ready to go to produce and commercialize the innovation (Anderson & Tushman, 1990; Tushman & Anderson, 1986). In fact, the three innovations across three industries had different degrees of technological change (low, medium and high) and there was no difference in the incumbents' responses in spite of differences in technological change. Fourth, the blind spot argument that the incumbents

did not see it coming also does not work because of the long time periods over which the incumbents witnessed a displacement of their position (Christensen, 1997).

Tripsas and Gavetti (2000) have examined Polaroid and suggested that Polaroid suffered from the inertia of dominant logic due to the fact that the firm did not aggressively commercialize its capabilities. Although dominant logic (Bettis & Prahalad, 1995; Prahalad & Bettis, 1986) clearly played a role in Polaroid's failure, this was not the case in the other examples because for mutual funds and wristwatches the business model didn't change much. Furthermore, within the photographic equipment industry itself, other incumbents behaved somewhat differently from Polaroid, as we saw earlier.

This research provided evidence that the mechanisms proposed by behavioral decision theory rather than rationality theory were at work when incumbents were faced with profit-destroying innovations. Not only did the incumbents behave as deer in the headlights, the more central incumbents behaved more in this way. Kodak and Polaroid continued to drag their feet in commercializing the technology but a peripheral player, such as Canon, aggressively moved in with SLR technology to claim a larger market share. It stands to reason that the deer in the headlight response would be strongest for the most dominant players in the industry because the leaders of such firms would have the most to lose. It appears that the stronger the market position of an incumbent facing a profit-destroying innovation, the more such a firm would stand to lose by embracing the innovation. On the same lines, when Vanguard dragged its feet in embracing ETFs, smaller index fund players moved aggressively towards the ETF market. Similarly, Japanese and American watchmakers, peripheral players in the global watch industry, embraced the innovation aggressively while Swiss watchmakers ceded territory to these firms.

This research also suggests that the more a firm depends on the industry facing a profit-destroying innovation, the more it behaves as a deer in headlights. Firms such as Canon had revenue sources from several industries whereas Kodak and Polaroid were completely dependent on the camera and film industry. Vanguard was dependent on the index fund market for its revenue whereas Fidelity and others had several actively managed products. Again, this shows that firms tend towards a more rational approach when they are less dependent on an industry for profits and revenues. Such firms can cover their decreasing performance in one industry with an enhanced performance in another industry. On the other hand, a firm entirely dependent on one industry may find it risky and difficult to create new sources of revenues in other industries. In short, not only did the incumbents behave as deer in headlights do, the most dominant incumbents and those most dependent on the industry behaved even more so. As a result, they lost position or had to exit the industry.

This research provides some key lessons to managers dealing with innovation decisions

1. *Some innovations can destroy profits instead of enhancing profits:* A key lesson for managers is not to view all innovations as good. Managers are urged to examine their own innovation pipeline and assess if some of these innovations may potentially be profit-destroying innovations. At the same time, it shows how peripheral firms can use the opportunity of a profit-destroying innovation in the way Vanguard did.
2. *Watch out for decision-making biases in innovation decisions:* Decision-making for innovation takes the decision makers into the realm of high uncertainty and sometimes into loss domains, as shown in this paper. The fact that decision makers assess uncertainty and probability differ-

ently when in a gain domain than in a loss domain is a key reason why they sometimes fall into certain decision traps. Not being aware of this cognitive bias may lead decision makers to make the same mistakes that managers facing profit-destroying innovations make. Although an awareness of decision-making biases would help decision makers in many situations, Vanguard's response to ETFs showed that mere experience may not be sufficient for decision makers to avoid cognitive biases.

3. *Don't envision the future through the rosy lens of current capabilities:* A key mistake that firms often make when facing such innovations is that they view the future through the rosy lens of their current capabilities and consumer understanding. Kodak believed that the future of photography was a convergence between chemical science and microelectronics. As a result, it created dozens of products that would help customers in the converged end state. These products involved expensive photo CD players (priced at \$500) and Kodak CDs to convert film to digital pictures. Polaroid, on the other hand, believed that the future of photography involved the need for small printers on the top of digital cameras. As a result, it spent an enormous amount of resources developing such a printer and camera combination. Similarly, Swiss watch firms believed that consumers would loathe cheap watches that didn't include fine Swiss artisanship. They perhaps thought the market for cheap watches would remain separate from the market for fine watches and didn't imagine that the segment boundaries would blur. All these firms were deluding themselves to a great extent. They were creating a future through the rosy lens of their current capabilities and thus missed out on the greatest threat to their ex-

istence. To some extent, one can understand why firms can get into the trap of believing that what made them successful will continue to make them successful. One way to overcome this challenge is to deliberately avoid envisioning the future through the lens of current capabilities. This would force managers to envision challenging future end states and the ways to deal with them.

4. *Don't miss out on major and minor trends in the industry and its adjacent spaces*: In hindsight, one can question why these firms didn't do several obvious things. Why did Kodak not notice the significant penetration of personal computers and the rise of the Internet? Why did camera incumbents not attempt to dominate image manipulation software, online picture manipulation and sharing, social networking around images and online printing? Why did Swiss watch firms not come up with the idea of a watch as a fashion accessory before most of the firms exited? Why did mutual fund firms not come up with active ETFs as a way of dealing with Vanguard's plain vanilla index funds? This line of questioning highlights the fact that firms can miss the key trends since they do not look out for them. Firms can create several opportunities if they focus on these minor and major trends.
5. *Create an option C*: All the firms that succeeded in dealing with profit-destroying innovations did so by getting out of the false dichotomy of embracing or avoiding the innovation. Swatch transformed the watch into a fashion product to create an option C. Canon brought back the idea of the SLR camera and rapidly created a prosumer segment for the SLR camera. Unfortunately, some of the firms that failed also attempted to create option C. Kodak thought that convergence products would create an

option C. Firms such as mutual fund incumbents tried to create an option C by repositioning the index fund category as a low payoff category.

This was not very different from how diamond incumbent De Beers has been dealing with the threat of cultured diamonds. So far, De Beers has been successful in creating an image that cultured diamonds are inferior to natural diamonds. This brings out the key challenge of a profit-destroying innovation, i.e. not all option C's will be successful. As a result, firms need to have a portfolio of option Cs to deal with profit-destroying innovations.

This research took an important first step in understanding a class of innovation that is not only counterintuitive and challenging for firms, but also one that innovation literature has underemphasized. Since this is the first step in uncovering the details of such innovations, this research used a qualitative method. Scholars have proposed that when examining a relatively less understood and less studied phenomenon, qualitative methods are very powerful (Eisenhardt, 1989). This research paves the way for quantitative research in the future.

Although this is a small step in a greater understanding of this phenomenon, it shows there is a rich set of possibilities for research in this direction. Therefore, this paper is also a call to scholars to investigate profit-destroying innovations in more detail.

This research not only fills a gap in the literature but also helps practitioners deal with such innovations. As many industries are facing such innovations today, or will soon face them, this research would greatly benefit managers. Microsoft has been facing such an innovation from Google in the office productive software market. Similarly, the music industry has faced a profit-destroying innovation from the new format called MP3 format and newspapers are facing the problems pre-

sented by blogs and other informational sources on the Internet. In the near future, it is likely that the shaving industry and the chemical-based hair removal industry will face this innovation in the form of laser-based hair removal technology. Similarly, the alkaline battery industry will probably face this type of innovation in the form of wireless electricity. Practitioners can learn from the examples raised by this study and not only become aware of the challenges ahead but also use this learning to handle such innovations better. Thus, this research would not only advance the literature but also help practitioners in a meaningful manner.

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References

- Abernathy, W. J., & Clark, K. B. (1985). Innovation: Mapping the winds of creative destruction. *Research Policy*, 14(1), 3-22.
- Adner, R. (2002). When Are Technologies Disruptive: A Demand-Based View of the Emergence of Competition. *Strategic Management Journal*, 23(8), 667-688.
- Anderson, C. J. (2003). The psychology of doing nothing: Forms of decision avoidance result from reason and emotion. *Psychological Bulletin*, 129(1), 139-167.
- Anderson, P., & Tushman, M. L. (1990). Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change. *Administrative Science Quarterly*, 35(4), 604-633.
- Banbury, C. M., & Mitchell, W. (1995). The Effect of Introducing Important Incremental Innovations on Market Share and Business Survival. *Strategic Management Journal*, 16(S1), 161-182.
- Barbara, D., Inge, G., Katrijn, G., & Marnik, G. D. (2002). How cannibalistic is the Internet channel? A study of the newspaper industry in the United Kingdom and The Netherlands. *International Journal of Research in Marketing*, 19(4), 337-348.
- Becker, G. S. (1976). *The Economic Approach to Human Behavior*. University of Chicago Press Economics Books.
- Bettis, R. A., & Prahalad, C. K. (1995). The Dominant Logic: Retrospective and Extension. *Strategic Management Journal*, 16(1), 5-14.
- Camerer, C. E. (2000). Prospect theory in the wild. Evidence from the field. In D. Kahneman, & A. Tversky (Eds.), *Choices, values, and frames*: xx, 840. New York, Cambridge, UK: Russell sage Foundation; Cambridge University Press.
- Canedy, D. (1999). Olestra not the liquid gold P&G divined: How could a company like Procter & Gamble, which introduced the world to Tide, Pampers and Crest, invest half a billion dollars and 25 years in an amber-coloured fake fat that came up so short?, *National Post (Canada)*: July 22.
- Chandy, R. K., & Tellis, G. J. (1998). Organizing for Radical Product Innovation: The Overlooked Role of Willingness to Cannibalize. *Journal of Marketing Research*, 35(4), 474-487.
- Chopra, A. (2007). Inter-temporal Effect of Technological Capabilities on Firm Performance: a Longitudinal Study of the U.S. Computed Tomography Industry (1972-2002), *electronic resource Thesis (Ph. D.)-Duke University*, 2007
- Christensen, C. M. (1997). *The innovator's dilemma : when new technologies*

- cause great firms to fail. Boston, MA: Harvard Business School Press.
- Christensen, C. M., & Bower, J. L. (1996). Customer Power, Strategic Investment, and the Failure of Leading Firms. *Strategic Management Journal*, 17(3), 197-218.
- Christensen, C. M., Suarez, F. F., & Utterback, J. M. (1998). Strategies for Survival in Fast-Changing Industries. *Management Science*, 44(12, Part 2 of 2): S207-S220.
- Coleman, J. S. (1986). Individual interests and collective action. Public Choice (Vol. 1). Cambridge: Cambridge University Press.
- Cooper, A. C., & Schendel, D. (1976). Strategic Responses to Technological Threats. *Business Horizons*, 19(1), 61-69.
- Dhar, R., & Simonson, I. (2003). The effect of forced choice on choice. *Journal of Marketing Research*, 40(2), 146-160.
- Eisenhardt, K. M. (1989) Building Theories from Case Study Research. *Academy of Management Review*, 14(4), 532-550.
- Elster, J. (1986). Rational Choice. (J. Elster, Ed.). New York: New York University Press.
- Goel, S., Miesing, P., & Chandra, U. (2010) The Impact of Illegal Peer-to-Peer File Sharing on the Media Industry. *California Management Review*, 52(3), 6-33.
- Goldstein, W. M., & Hogarth, R. M. (1997) Judgment and decision research: Some historical context. In W. M. Goldstein, & R. M. Hogarth (Eds.), *Research on judgment and decision making: currents, connections, and controversies*: xii, 750. Cambridge, U.K.; New York, NY: Cambridge University Press.
- Guiltinan, J. P. (1993) A strategic framework for assessing product line additions. *The Journal of Product Innovation Management*, 10(2), 136-147.
- Hargreaves Heap, S., Hollis, M., Lyons, B., Sugden, R., & Weale, A. (1992). The Theory Of Choice. Oxford: Blackwell.
- Hastie, R. (2001). Problems for judgment and decision making. *Annual Review of Psychology*, 52(1), 653-683.
- Hill, C. W. L., & Rothaermel, F. T. (2003). The performance of incumbent firms in the face of radical technological innovation. *Academy of Management Review*, 28(2), 257-274.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory - Analysis of Decision under Risk. *Econometrica*, 47(2), 263-291.
- King, A. A., & Tucci, C. L. (2002). Incumbent Entry into New Market Niches: The Role of Experience and Managerial Choice in the Creation of Dynamic Capabilities. *Management Science*, 48(2), 171-186.
- Lubin, J. S. (2009). CEO Firings On the Rise As Downturn Gains Steam. *The Wall Street Journal*: 13 Jan.
- Luce, M. F. (1998). Choosing to avoid: Coping with negatively emotion-laden consumer decisions. *Journal of Consumer Research*, 24(4), 409-433.
- Mason, C. H., & Milne, G. R. (1994). An approach identifying cannibalization within product line extensions and multi-brand strategies. *Journal of Business Research*, 31(2), 163-170.
- Mazumdar, T., Sivakumar, K., & Wilemon, D. (1996). Launching new products with cannibalization potential: An optimal timing framework. *Journal of Marketing Theory and Practice*, 4(4), 83-93.
- McGrath, R. G. (1999). Falling Forward: Real Options Reasoning and Entrepreneurial Failure. *Academy of Management Review*, 24(1), 13-30.
- Methe, D., Swaminathan, A., & Mitchell, W. (1996). The underemphasized role of established firms as the sources of major innovations. *Ind Corp Change*, 5(4), 1181-1204.

- Mitchell, W. (1991) Dual Clocks: Entry Order Influences on Incumbent and Newcomer Market Share and Survival When Specialized Assets Retain Their Value. *Strategic Management Journal*, 12(2): 85-100.
- Payne, J. W., Bettman, J. R., & Johnson, E. J. (1993). *The adaptive decision maker*. New York, NY, USA: Cambridge University Press.
- Pfeffer, J. (1981). *Power in organizations*. Marshfield, MA: Pitman Pub.
- Porter, M. E. (1983). *Cases in competitive strategy*. New York, London: Free Press; Collier Macmillan.
- Prahalad, C. K., & Bettis, R. A. (1986). The Dominant Logic: a New Linkage Between Diversity and Performance. *Strategic Management Journal*, 7(6), 485-501.
- Puffer, S. M., & Weintrop, J. B. (1991). Corporate Performance and CEO Turnover: The Role of Performance Expectations. *Administrative Science Quarterly*, 36(1), 1-19.
- Rao, K. (2004). India - Decade Of Reform - India's Securities Went From Third To First World In Record Time. But Is T+1 A Step Too Far, *The Banker*.
- Reinhardt, A. (2004). Net Phone Calls, Free -- And Clear. *BusinessWeek*.
- Shafir, E., & LeBoeuf, R. A. (2002). Rationality. *Annual Review of Psychology*, 53(1), 491-517.
- Sullivan, F. (2008) Strategic analysis of energy efficient lamps market in North America, Vol. N3C0-19.
- Sullivan, F. (2009) Emerging lighting technologies, *Technical Insights*, Research Report, Vol. D1B1-01
- Raghavan Srinivasan, S., Ramakrishnan, S., & Grasman, S. E. (2005). Identifying the effects of cannibalization on the product portfolio. *Marketing Intelligence & Planning*, 23(4), 359-371.
- Teece, D. J. (1986). Profiting from Technological Innovation - Implications for Integration, Collaboration, Licensing and Public-Policy. *Research Policy*, 15(6), 285-305.
- Tripsas, M. (1997). Unraveling the Process of Creative Destruction: Complementary Assets and Incumbent Survival in the Typesetter Industry. *Strategic Management Journal*, 18(S1), 119-142.
- Tripsas, M., & Gavetti, G. (2000). Capabilities, Cognition, and Inertia: Evidence from Digital Imaging. *Strategic Management Journal*, 21(10/11), 1147-1161.
- Tushman, M. L., & Anderson, P. (1986). Technological Discontinuities and Organizational Environments. *Administrative Science Quarterly*, 31(3), 439-465.
- Tversky, A., & Kahneman, D. (1992). Advances in Prospect-Theory - Cumulative Representation of Uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297-323.
- Utterback, J. M. (1996). *Mastering the dynamics of innovation*. Boston, MA: Harvard Business School Press.
- Van Heerde, H. J., Srinivasan, S., & Dekimpe, M. G. (2010). Estimating Cannibalization Rates for Pioneering Innovations. *Marketing Science*.
- Von Neumann, J., & Morgenstern, O. (1944). Theory of Games and Economic Behavior. Princeton University Press (Vol. 2, p. 625)
- Wiggins, R. R., & Ruefli, T. W. (2002). Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance. *Organization Science*, 13(1), 81-105.
- Wong, J. (2005). China makes the world its oyster. *The Globe and Mail (Canada)*: December 10.
- Yin, R. (1994). *Case Study Research*. Beverly Hills, CA: Sage.
- Yin, R. K. (1981). The Case Study Crisis: Some Answers. *Administrative Science Quarterly*, 26(1), 58-65.

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