

# Digital economics and the e-business dilemma

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**The e-business environment is placing growing emphasis on the digitalization of product and service offerings, creating a set of economic conditions that differ from those characterized by physical products. Suppliers need to compete not only on overall quality but also on “information age strategies” that can prevent them from falling into a competitive trap where they cannot recover their costs. Versioning, confounding, networking, and pricing are needed to compete effectively, but these strategies often give rise to paradoxes from the buyer’s perspective. The thinking manager can use the guidelines offered here to manage their e-business offerings more effectively.**

**T**he past few years have seen a number of debates over whether e-business requires new or different thinking about business and strategy. Regardless of the various views, the reality is that contemporary information technologies (ITs) are facilitating rapid digitalization, storage, and transfer of product and service experiences. This will not abate. So a productive exercise is to examine business strategy by looking at the economic impacts of digitalization. Here we try to take a step back and reexamine the dynamics of e-business and its potential impact on the economy from fundamental and enduring economic principles.

Our aim is to provide managers of enterprises in this digital age with guidance on key factors that will have a controlling effect on the likely evolutionary path of e-business. Moreover, these controlling factors will affect the balance of power between market participants, specifically, suppliers and entrepreneurs on the one hand and consumers on the other. We conjecture that the evolutionary path and the balance of power are intimately linked and will result in a precarious economic balancing act—precarious in the sense of generating huge benefits for the economy as a whole, but with the potential to initiate large swings in the division of those benefits between buyers and suppliers. As such, managers of companies that digitalize their offerings or use today’s Internet and other networks for business have a compelling interest to comprehend the new economic reality and leverage it to their respective advantage. The failure to do so can have dramatic negative consequences for the complacent party.

## **Framing the problem**

The pervasiveness of commerce on global, ubiquitous, and standardized networks is rapidly changing the fundamental nature of market structures and the manner in which buyers and suppliers interact. The most apparent observable effect is the reduction in coordination costs. This includes improved efficiency in the buyer’s ability to search products, compare features, negotiate prices, and conduct transactions. If we consider the economics of

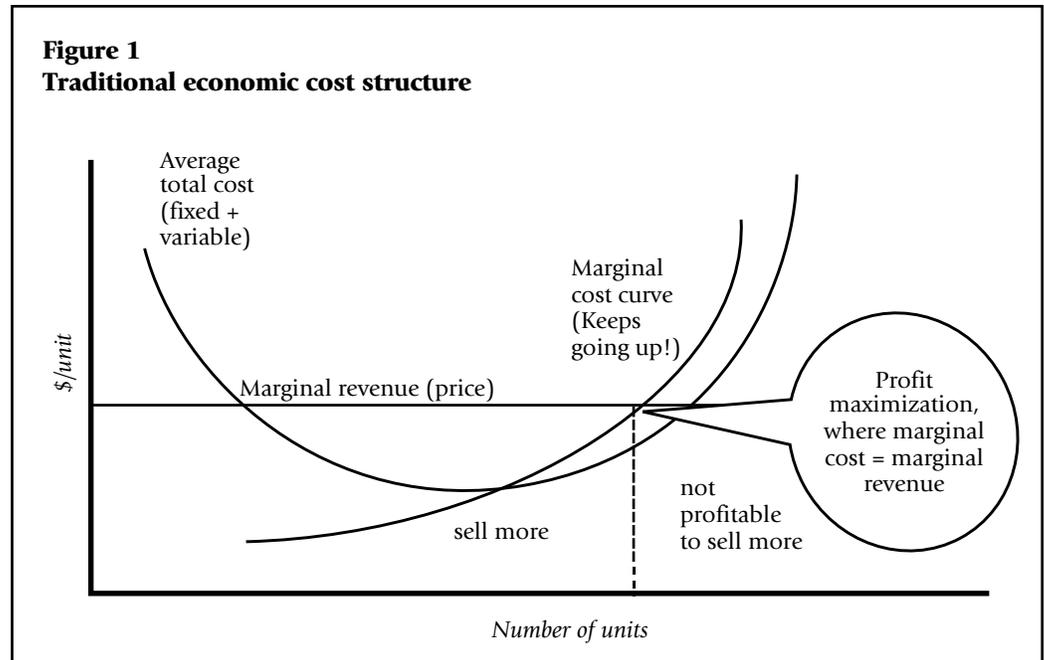
coordination costs, it can be argued that as these costs decline, the ability of buyers to shop and switch suppliers in a competitive market is enhanced. We can also argue that increased commoditization of products through the provision and processing of significant amounts of information makes it easier for buyers to compare even traditionally complex products like automobiles, computers, and medical services on the Net, thereby simplifying them and forcing comparison and competition. Thus, market effectiveness is enhanced for complex products as well.

Advances in IT that facilitate this move to more competitive markets does not bode well for suppliers. Under such an evolutionary process, it would appear that the vast majority of gains from technological advances accrue to buyers. However, by focusing on the demand side of the e-business equation alone, we fail to recognize that there are opportunities for suppliers as well. Specifically, for products and services that have an increasingly large information (digital) component, suppliers can follow strategies that build monopolistic rather than competitive relationships with buyers. Indeed, if suppliers fail to adopt such strategies, given the economics of these global, ubiquitous, and standardized networks, their businesses will almost certainly fail.

## A tutorial on the economics of digital information production costs

**H**ow can suppliers compete in an environment that appears to afford buyers considerable advantage? Gaming is an integral part of the supplier's survival strategy, so we frame our arguments for these survival strategies within the context of the economics of information in a digital economy. Subtle aspects of the economics of digits can have far-reaching implications for market structures and balance of power between market entities.

Traditional economic assumptions of the theory of the firm draw a distinction between fixed costs (which are independent of the firm's output) and variable costs



(which depend on the quantity produced). Fixed costs typically represent investment in plant and equipment as well as research and development. For information products, this includes significant investment in developing prototypes, establishing standards, and building a customer base. Variable costs typically cover raw materials and labor expenses and are determined largely by the marginal quantity produced. For information products, this includes the cost of replicating digital data and computer code as well as the means of delivering this digitized information to the end user.

The importance of this distinction between fixed and variable costs is that under traditional economic assumptions, fixed costs are presumed sunk and are therefore irrelevant for production decisions, which are then governed entirely by variable costs. In contrast, for information products, the relative importance of fixed and variable costs is reversed. We argue that it is fixed rather than variable costs that will influence corporate business strategies. The following discussion clarifies the issue.

A key assumption in traditional economic theory is that marginal costs rise with the number of units produced. This argument is founded on the "law of variable proportions," which says that if (plant) capacity is fixed, then beyond some point, doubling of all other inputs will lead to a less than doubling of output. It's like having three lawnmowers to a football field. More than three people will not improve the output; in fact, they might get in each other's way. And coordinating their use of just three mowers is not worth the cost. In other words, the marginal cost of producing one additional unit of output will rise. For instance, as a company that makes widgets grows, it will increasingly use its fixed resources. Initially, this expansion

will generate more than proportionate profits with higher usage of the fixed asset's excess capacity. However, as the fixed resources are strained to meet higher production levels, they will become less productive and returns will diminish, thereby raising marginal cost. The firm will keep increasing production until the marginal cost equals market price. Beyond that point, it will lose money.

This cost structure is illustrated in **Figure 1**. The average total cost per unit first decreases due to use of excess capacity built into the fixed costs, and then increases due to the rising marginal costs from strained capacity constraints. In a competitive environment, the firm will continue to produce and sell the product as long as price (marginal revenue) exceeds marginal cost, since profits are increased with each incremental unit sold. Profit is maximized at the point at which price is equal to marginal cost. Production beyond that level leads to losses on each marginal unit because the marginal revenue (price) is not sufficient to cover marginal costs.

Production costs associated with information products (data, text, video, software, websites) have different characteristics from those in Figure 1. Initial development costs are high but marginal costs are extremely low. Moreover, due to the fast-changing nature of technology, fixed costs are usually non-recoverable, even if production is halted, because they involve human intellectual capital for developing software or creating information that may soon be obsolete. The marginal costs are negligible (approaching zero) because the cost of reproducing and distributing digital products is extremely small and becoming even smaller in today's IT infrastructure and capabilities. The key point here is that the "law of variable proportions" does not hold in such an environment because there are no appreciable and lasting limitations on capacity. Accordingly, marginal costs do not rise. The marginal cost for Microsoft to produce its first copy of Office XP or its millionth copy is about the same. Windows XP, with its 17 million lines of code, can be replicated and distributed for under \$1—as is the case now with movies on DVD.

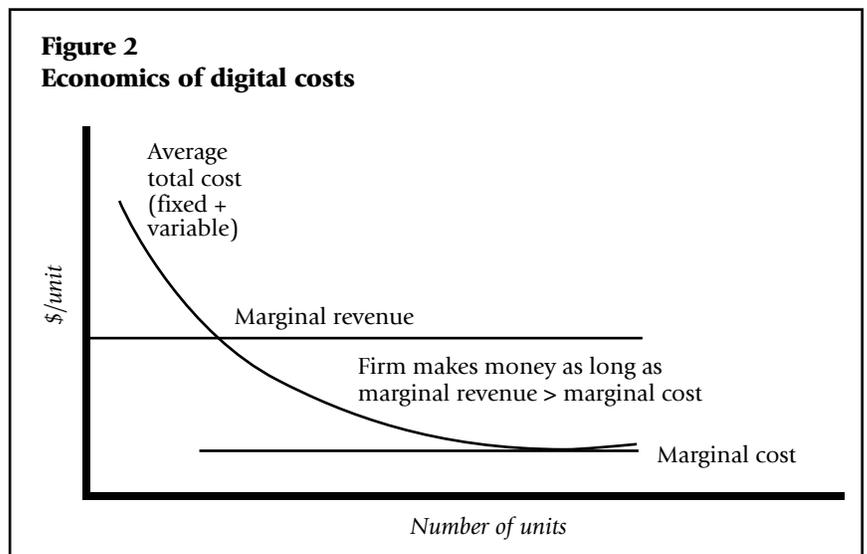
**Figure 2** illustrates the case for information products facing the digital cost structure. As units are produced, the average cost drops indefinitely because of high up-front fixed costs and low (close to zero) marginal costs that are not subject to capacity constraints. When the number of units is extremely large (say, the millionth copy of a software product), the average cost is very low—approaching the marginal cost. If the firm can sell the product at a price higher than its marginal cost, it will make money on each additional unit sold. However, in a competitive environment, it will be forced to

compete until price drops to marginal cost because each supplier will have to lower costs or lose customers to the competition. This could imply competing at a price close to zero (or the price of a blank CD for a software product or downloading off the Internet) that is economically unsustainable given the high investment in fixed costs that will be unrecoverable. In other words, firms will not enter this industry unless a means exists by which to bypass this competitive equilibrium. This is the supplier's dilemma.

In summary, the cost structure of information products in the e-business environment is characterized by the following properties:

- unlimited economies of scale
- fixed costs that are dramatically higher due to human costs of developing intellectual capital (rather than plant and equipment)
- fixed costs that are incurred early and may not be recoverable in competitive markets
- marginal costs that are approaching zero, falling successively over generations of technological development
- No capacity constraints

Whereas fixed costs in the form of plant and equipment in a traditional environment are somewhat recoverable, investments in intellectual capital in a fast-changing technological environment are often large and can seldom be recovered if the business fails. In a competitive environment, the combination of high fixed and low marginal costs makes it more and more difficult to survive. Indeed, traditional economic reasoning predicts almost certain failure. Moreover, in the digital environment, IT cycles are getting shorter and the average time to recoup investments is getting longer. As marginal costs approach zero, it becomes impossible to sustain profits and recover investments.



Accordingly, suppliers are forced to adopt strategic business practices that move them away from the competitive equilibrium caused by price competition. One way to achieve this is to leverage the very nuances of IT that put them in this predicament. These “information age strategies” are “new” ways of learning to create competitive advantage given the impossible economics of digital costs.

## Strategies for supplier prosperity

In discovering what strategies suppliers can employ to sustain competitive advantage, it is helpful to understand the extremes—the market structures they find least and most favorable. Then we can see how a supplier can take strategic actions to migrate from one extreme to the other.

*The worst case scenario* for suppliers is one with considerable comparable options for the buyer and low costs of searching and switching from one supplier to another. In such situations, buyers can easily determine which supplier offers the best price for the same product. To compete, suppliers are forced to lower prices. As we described, when the price is lowered all the way down to the product’s marginal cost (close to zero for information products), there is a problem.

In contrast, *the best case scenario* for suppliers is one in which products are not comparable, the supplier is the sole provider of the product (such as Microsoft and Windows), and/or switching costs for the buyer are prohibitively high. In this situation, the supplier can exert pricing power by charging the maximum price the buyer would be willing to pay.

It is apparent, given the digital cost structure described earlier, that suppliers must come up with ways to be closer to the best case scenario if they are to be successful. They can break the link between price and marginal cost by “forcing” buyers to price based on the value they derive from the product or service in lieu of other competing products. Today’s ITs allow suppliers to take ideas of differentiation much further in the form of four “information age strategies.” Managers who understand these strategies and their rationale will be more effective in creating an edge in the e-business environment.

### **Versioning: Create multiple versions of the information product so buyers cannot compare**

A unique characteristic of digital products is the ability to sell them again and again without diminishing their value. It is also easy to create different forms of the same infor-

mation. Such *versioning*, say Shapiro and Varian (1999), allows suppliers to target different customers according to their willingness to pay. Economists refer to this as price discrimination, whereby competition is inherently reduced in smaller and smaller segments of the market. If buyers are targeted with a highly customized version of the product, they cannot easily compare it across multiple suppliers or market segments. Thus, the supplier can power price rather than accept competitive pricing.

Versioning as a strategy is becoming more and more feasible with digital products for one important reason: Beginning with the original product with the maximal set of features, innumerable versions can be created by simply “switching” features on or off digitally at virtually no cost. By capturing customer profiles on the Web, or inferring customers’ preferences through their self-selection of products and buying behavior, suppliers can modify and customize digital products aimed at the targeted audience at minimal or no additional cost. As an example, some investment sites version on time by providing real-time stock quotes at a premium and delayed quotes for free. Similarly, software often comes in limited academic versions while the full business version is sold at a premium.

### **Confounding: Make it difficult for buyers to directly compare alternate information products**

Another characteristic of IT is its ability to manipulate digital product information easily. Using IT to present information in a manner that inhibits product comparison is what we refer to as *confounding*. It involves information processing used in a way that is rarely discussed: to confuse and distort. The intent is not to purposely provide wrong information in order to deceive, but rather to provide and withhold relevant information in a manner that makes it difficult for buyers to assess alternate products. The reason is straightforward: If suppliers provide all available information to facilitate buyer comparison of competing products, the dilemma prevails in which price is determined by cost considerations. However, if buyers cannot compare products, or if they gain distorted or biased perceptions of price/performance trade-offs (*vis-à-vis* competitors), they are forced to value products not based on cost but on the satisfaction derived from their usage.

It is this change in the basis of comparison that suppliers hope to achieve through the strategy of confounding. Monopolistic pricing and/or price discrimination can occur because of the difficulty of establishing competitive prices when product comparison is difficult. For instance, *Consumer Reports* has raised serious issues about potential bias in the display of flight information on travel sites that might reflect the ownership of these sites by certain airlines.

### **Creating network effects: Foster a large consumer base in which product value grows with base size**

*Network effects* refers to value creation through the existence of a large consumer network in which each consumer derives value from other consumers being part of the network. These effects reflect a positive feedback cycle, whereby adoption by one consumer creates an incentive for others to adopt as well. For instance, the value of a telephone grows exponentially with the number of users that have telephones. Similarly, the larger the customer base, the more valuable digital products often become for buyers.

For this reason, consciously building these effects should be a major thrust of suppliers. Once the effects are established, buyers may be forced to pay a non-competitive

*In versioning, suppliers are price discriminating; in creating network effects, they are charging for value derived from those effects.*

price for an information product depending on the value they derive from the network effect. A supplier can raise prices without fear of losing customers so long as there is no competing product that offers a similar network effect. Again, the supplier has broken the linkage between the price of the product and its marginal cost. Instead, price is determined by the value consumers derive from use of the product. In this case, the value depends on both the direct use of the product and the benefit the network affords.

An obvious example of network effects is the market for Windows and Microsoft Office. The prevalence of these products creates a positive feedback resulting in a network effect that takes several forms. Not only does it become convenient for multiple users to use the same platform to work on the same set of documents, but other companies can invest in setting up support and training facilities for these products and, in many cases, build new ones on the Microsoft platform. Microsoft reaps the benefit of these effects. Pricing can reflect the value consumers derive not just from the use of Microsoft products but also from all the other products that run on that platform. This pricing mechanism again de-links what customers pay for the product from its marginal cost, which is essentially zero. Instead, price is based on the value consumers derive.

### **Pricing: Do not rely on fixed pricing; have a preemptive pricing approach**

Pricing strategies we are all familiar with involve classic competition, in which one supplier lowers its price in order to draw additional customers. In response, another supplier may further lower prices to achieve the same outcome. The process continues until prices are set at the minimum suppliers are willing to accept (the competitive price, equal to marginal cost). This form of competition assumes that while one supplier reduces prices, all other suppliers hold their prices fixed. In an e-business environment, particularly for digital products aided by IT to uncover a competitor's strategy, this is not necessarily true. Pricing strategies could involve both dynamic responses and preemptive behavior to changes in a competitor's prices. An astute supplier can stay one step ahead of its competitors by (a) being aware of the way consumers make choices on price and (b) keeping abreast of competitive pricing moves.

A common strategy among stock market dealers in US securities markets such as the NYSE and NASDAQ is the practice of matching prices. In other words, no dealer lowers a price, but all agree to match the lowest price in the market. This is, in effect, a preemptive pricing strategy—if one dealer lowers his price, then all dealers lower theirs simultaneously and instantaneously. The result of this preemptive behavior is subtle and onerous. It discourages any dealer from cutting prices because the intended effect of drawing additional customers can never be achieved. Thus, the low price competitive equilibrium is avoided.

Such preemptive behavior can result in yet other strategies. Some suppliers may wish to preempt others by learning of their pricing actions ahead of time while making every effort not to disclose their own. This can result in short-term gaming between suppliers using IT to selectively disclose and impede the flow of pricing information. All this can allow suppliers to alleviate the problem of competition in information products described earlier. If done dynamically, preemptive pricing strategies can even be sustainable over longer durations.

## **The management of e-business paradoxes**

**T**he four information-age strategies—versioning, confounding, network effects, and pricing—can and should be enacted by suppliers to avoid the problems of digital costs. They are not mutually exclusive and can be enacted concurrently. Moreover, they can impose paradoxes on e-commerce that allow suppliers to extract economic rents from buyers. For example, buyers' actions that appear to be in their self-interest end up hurting

**Table 1**  
**Supplier strategies and e-business paradoxes**

<b>PARADOX ▼</b>	<b>Versioning</b>	<b>Confounding</b>	<b>Network effects</b>	<b>Pricing</b>
<i>If buyers bypass intermediaries, they may not benefit.</i>		Intermediaries are giving rise to infomediaries, which are not unbiased. They often direct customers to suppliers with which they have special arrangements, resulting in the inability to really compare across all products.	Infomediaries that gain stature by bringing large numbers of buyers and suppliers together have significant channel power.	
<i>Buyers don't really get what they want with personalization.</i>	With personalization costs close to zero, suppliers can create a monopoly for a personalized product. This allows them to charge much higher prices based on profiling buyers and personalizing the digital experience.			
<i>Suppliers benefit as buyers shop around.</i>	In some cases there is no comparable product due to segmentation of the market through versioning. Shopping doesn't help.	Buyers might be able to search for free, but they are captive to the information suppliers are willing to make available. Often this forces buyers to value rather than compare products, allowing suppliers to charge a premium.		
<i>Bigger markets may result in less competitive markets.</i>	By versioning suppliers can cater to a larger buyer base (specific needs). Customers are not benefiting from the larger market because it allows suppliers to differentiate buyers (through the choices they make) and their valuations.	Driven by profit motives, suppliers may not be fully open in disclosing valuable information on the network when it may be used instead to gain strategic advantage.	Suppliers can charge higher prices due to network effects.	
<i>Low price guarantee can lead to high price fixing.</i>				Complete transparency in buyer/supplier information flow (on prices) under low price guarantee conditions allows suppliers to fix prices higher (more aligned with customer valuation). There is no incentive to decrease prices—new customers are not drawn to that supplier.
<i>Paying for product bundles might result in paying a bundle.</i>	Bundling could serve as a means to create different versions of products and information services segmenting the consumer.	It is very difficult to compare individual components (make price/value trade-offs) of the product in bundles. Unit is the bundle.	Products that suppliers wish to build a network effect for are bundled in as a free addition.	Inferences about individual component prices are not possible. And consumers may be forced to pay more for components they value less.

them. And suppliers' actions professing to work in the interest of buyers turn out otherwise. These "paradoxes" reflect the idiosyncrasies of the e-business environment, in which buyers often *perceive* that they are better off when in fact they are not. And the supplier strategies, though pervasive and effective in their ability to extract consumer rents, are not readily apparent to these buyers. Such paradoxes can profoundly affect the balance of power between buyers and suppliers in a networked environment.

In discussing the several paradoxes that emerge when suppliers implement these information age strategies, we argue that economic benefits can be derived from their emergence. **Table 1** summarizes these arguments.

### **Paradox: If buyers bypass intermediaries, they may not benefit**

An oft-discussed impact of the Internet is the ease with which intermediaries and their margins can be bypassed as buyers go directly to suppliers or manufacturers. However, a buyer often requires an information search to locate the appropriate supplier. With the rapid proliferation of both buyers and suppliers on the Net, the sheer volume of market participants makes it increasingly difficult to match these entities. Hence, we are seeing the growth of a new kind of intermediary, or "infomediary," that provides information on matching suppliers with buyers. These infomediaries exist in the form of magnet sites (industry sites, topic sites, knowledge bases), search engines, or corporate-sponsored central repositories of information (like the MSN or AOL home pages).

What is subtle is that many of these infomediaries derive revenue from the deeper pockets of the suppliers that sell and promote their products on the infomediary's site. Suppliers in turn benefit from this relation by having their products/sites at the top of the list of any query conducted by the consumer. This *confounding* (bias) is not apparent to buyers who view the infomediary as initiating an unbiased search on their behalf. In many cases, the level of commitment by a consumer to an infomediary can be exploited through higher prices charged by the suppliers.

● **Managerial guideline:** *Be careful to ensure that the infomediary strategy for your firm includes relationships with key companies that would facilitate buyers locating and prioritizing your firm and its products in the vast morass of the Internet. This is particularly important if your brand equity is insufficient to draw customers directly to you. To prevent commoditization of your product through the infomediary, highlight attributes that compare favorably with those of your competitors.*

### **Paradox: Buyers don't really get what they want with "personalization"**

Suppliers working with infomediaries may also target consumers by *versioning*, which is achieved through profiling.

By accumulating large amounts of diverse information on consumer habits, preferences, and buying patterns, suppliers through infomediaries can target their intended audience with tailored search results that are apt to have the biggest impact on influencing buying decisions. Information products have the unique characteristic of close-to-zero costs of personalization. In the physical world, the cost of a tailored *Wall Street Journal* is prohibitive; in the digital world, it merely involves moving digits. If personalization is done well, suppliers can power price because they have a monopoly in the personalized product.

Yahoo! offers personalized search engines for individual customers that search and filter results based on the customer profile captured by Yahoo! (sometimes through the search process and words themselves). The service might be valuable to the consumer, but it allows Yahoo! to enable suppliers to target specific customer segments with customized products at higher prices. Similarly, by offering "free" services like customized chat rooms, Yahoo! can continue to build its profiling ability. Similarly, Books.com adopted a price discrimination strategy whereby different Internet shoppers paid different prices for the same good depending on their shopping behavior. It uses its Web design to separate price-sensitive shoppers from others by allowing the sensitive segment to compare prices from other suppliers like Amazon, Borders, and Barnes & Noble. Meanwhile, it extracts higher margins from the nonprice-sensitive segment.

● **Managerial guideline:** *Define aspects of the buying process (product information, selection, purchase, service) that are in bits and amenable to low-cost personalization. Define a personalization strategy for your product that includes customer profiling and translation of profiling data to value. Extract tangible value (price) or intangible value (loyalty) by personalizing.*

### **Paradox: Suppliers benefit as buyers shop around**

We generally presume that because search costs are declining, buyers have the advantage of being able to shop around, readily compare products, and buy the one that provides the best price/quality trade-off. This is true in theory. In practice, however, it is just as easy for suppliers to control the flow of information related to specific products and services as it is for consumers to access this information. In other words, we would expect gaming by suppliers in an attempt to impede and divulge information according to the purpose it serves. A simple example of this is the message "Call for latest price" in lieu of a numerical price for highly competitive products. While it may be easy for the buyer to call and obtain the latest price, it is far more difficult for competing suppliers to obtain it and compete accordingly. Often this leads to mimetic behavior in which other suppliers withhold price information. The result is reduced price competition.

In other cases, suppliers can actually *confound* buyers by presenting information in ways that inhibit direct product comparison with those of competitors. Because information can be presented in different ways at no incremental cost, these confounding strategies can be enacted dynamically in response to information presented by competitors. Avon.com presents an incentive program that can confound buyers. As shoppers view their basket, Avon tells them how close in dollar spending they are to receiving a free gift. With the gift bundled in the product, and with dynamic pricing, it may be very difficult for buyers to evaluate the real price of individual products. Similarly, each online electronic store on MySimon offers different financing, shipping, and warranty options. By bundling in different levels of service and unique options, companies can make it hard to compare one similar product to another.

With *versioning* strategies, buyers might have free shopping but are unable to make direct product comparisons. In the extreme case in which the market is segmented to the extent of bundling products to meet specific needs, no alternative exists for comparison purposes. An agency like Expedia.com, which markets travel services on the Web, uses profiles obtained from previous customer choices to package products that meet the customers' specific budget and travel profiles. These include airlines and hotels in which the potential traveler has a vested number of frequent usage points. Buyers are then forced to make value judgments on such products rather than search among competitors. As noted previously, value judgments allow suppliers to deviate from the competitive price.

● **Managerial guideline:** Profile your product offerings and identify which ones should be commoditized and which should not. For each product, develop an information confounding and versioning strategy that is dynamic and requires monitoring of both buyer and competitor information.

### **Paradox: Bigger markets may result in less competitive markets**

Conventional reasoning holds that as market size grows, more suppliers and consumers interact, resulting in more product choices and lower prices for consumers. In information-intensive markets, however, suppliers can cater to the bigger market in more complex ways. For example, they can increase their product offerings and cater to a larger set of consumers in ways that appear as if the buyers have more choices, when in fact the suppliers are segmenting and catering to smaller market units with targeted customized products. Only one of a large selection of choices is appealing to a subgroup of consumers, for which a premium is charged and all remaining choices are effectively moot for that subgroup. In effect, suppliers are adopting *versioning* strategies to cater to larger markets.

The cost of implementing these strategies is infinitesimal, given today's IT. However, buyers are not benefiting from

the larger base because versioning allows suppliers to differentiate among customers by capturing and processing information and estimating consumer valuations of products. Weyerhaeuser, the forest product company, uses the Web to help mine customer information, price products, and measure demand. By doing so, it knows which customers are willing to pay a premium and which ones are not. Through this learning process, it can shed consumers that demand too much of its time and resources and consume too little.

The key issue with versioning products and segmenting a large market is the difficulty in figuring out how consumers will assess price/quality trade-offs across versions. Accordingly, consumers are targeted based on their "value assessment," which is more akin to monopolistic pricing and/or price discrimination. Consider the way Intuit versions its popular financial software product Quicken. If Intuit chose to market a single version to the largest number of consumers, it could consider one with only the most popular features, such as personal expense tracking, online bill payments, and links to financial websites. Less

*The fact that the market is segmented does not remove the positive network effects the supplier can manipulate by having standardized interfaces on all products where it counts.*

sophisticated consumers who wish to pay bills the traditional way, by mail, will be unwilling to pay for the online billing feature and therefore may forgo purchasing the product. More sophisticated consumers who want complex and detailed investment advice, which the product does not offer, may also forgo purchasing it. The problem with offering a single version of the product is that it fails to discriminate between customers. Offering multiple versions costs Intuit nothing because some digital features can be turned on and off. By doing this, Intuit can price discriminate between consumers and get higher prices in the process.

Moreover, as discussed earlier, the positive feedback of *network effects* that might exist for larger markets allows higher pricing. As in the Quicken example, the fact that the market is segmented does not remove the positive network effects the supplier can manipulate by having standardized interfaces on all products where it counts.

● **Managerial guideline:** *Identify buyer segments that you may not typically target. Consider targeting a scaled-down or scaled-up version of your digital product or service to induce these new buyers. The buyers provide incremental revenue at low cost. Retain features that provide network effect benefits to buyers and to your company.*

### **Paradox: Low price guarantees can lead to high market prices**

In an effort to draw consumers, suppliers commonly assure them that they will obtain the best terms—not by attempting to offer the lowest price in the market but by offering to match the best price among all competitors. Buyers can easily search for the lowest price in the industry and be assured of that price from their supplier. In a highly networked environment, this search can be done without cost, suggesting that the ease of comparative shopping would impose intense competitive pressures on suppliers to the benefit of consumers.

However, a highly networked environment offers the same benefit to suppliers that it affords buyers. Just as buyers can learn the prices offered by all competing suppliers, each supplier can easily learn the prices set by all its competitors. If one supplier offers the low price guarantee, then all will be forced to offer the same guarantee or risk losing buyers, which can have a perverse impact on competition. First, customers will be indifferent to where they shop; they can go to any supplier and get the lowest price in the market, making price competition ineffective. Second, the key inducement that gives rise to competitive forces is lost—lowering price will not result in drawing more customers because, in effect, with a low price guarantee all suppliers do so simultaneously. Third, this simultaneous movement of prices can have a perverse impact on competition not only by removing the incentive to lower prices but by actually creating an incentive to raise them. For the same reason that no customers can be gained by lowering prices, collectively raising prices will not result in a loss of customers. Thus, if the supplier with the lowest offer in the market raised its price, all suppliers would benefit as a result. Indeed, this can lead to a succession of price raises until all suppliers set a price equal to that of the highest offer in the market.

While this is also true of physical markets, networked environments are characterized by much lower switching costs and no information asymmetry among suppliers. This makes the gestalt movement of prices far more efficient and difficult for the consumer to detect. In a study that tracked the price of a single best-selling book from four different Internet-based booksellers, Barnes & Noble and Amazon responded to each other's price changes, ultimately resulting in a higher price.

A highly networked environment can therefore assist suppliers to implicitly collude and adopt a *pricing strategy* that

results in significantly higher prices than those that might be attained in a competitive equilibrium. Of course, price collusion between parties is subject to antitrust considerations. However, in a networked business environment, preemptive and dynamic pricing strategies can facilitate movement away from competitive pricing.

● **Managerial guideline:** *Formulate a careful pricing strategy for your product portfolio. For differentiated products, identify the premium price and information revelation strategy. For nondifferentiated products, set preemptive pricing and monitor competitor reactions. This way, any implicit collusion does not force you into the competitive price for these products.*

### **Paradox: Paying for product bundles might result in paying a bundle**

Desperate to distinguish themselves from competitors, vendors design and represent products in increasingly different ways, making it virtually impossible for consumers to make straightforward comparisons. Thus, price-based comparative shopping becomes difficult. For physical products like electronic devices, vendors may take, say, a DVD player and change its model number, color, and a few marginal features to allow major retailers to differentiate their offerings from those of other retailers. For information products on the Web, such strategies are not only easier for suppliers to implement but far less apparent to consumers because of the ease of manipulating information. In many cases, product bundling is a *confounding* strategy that is more effective for information products.

Suppliers prepare bundles of information products, which usually include a target product (one the consumer really wants) and some less popular or newer product (that the supplier wants to promote). Bundling makes it more difficult for consumers to assess the value of each product independently. Thus, if the target product is of significant value to them, they are not likely to complain about paying a premium for the bundle, accepting the newer attached product as a free good. From the supplier's perspective, the premium received is the value extracted from the buyer for the attached product that the buyer might not otherwise have purchased.

Bundling inhibits direct product-for-product price comparison, forcing buyers to pay based on perceived value rather than on competitive market pricing. Ultimately, this *pricing* strategy could result in consumers paying more for products that they value less. Bundling can also serve as a means to create different versions of products and services, thereby segmenting the market and pricing each version in the corresponding segmented market higher than the competitive market price. The online florist Flowerbud.com has an instant order feature that asks two quick questions before a buyer makes a purchase: (1) What is the customer's price range? and (2) Does the buyer want a vase? These seemingly innocuous questions then dynamically form the

basis for customized versions (and bundles) of flowers and vases offered to the buyer.

● **Managerial guideline:** Assess a bundling strategy that combines digital products into attractive bundles at minimum cost. The incremental revenue generated from the bundles will be higher, particularly if some of the bundled products would not sell at their "regular" price. Also, consider bundling physical and informational products in an attempt to increase value and inhibit similar product price competition.

**T**he common theme in all these paradoxes is readily apparent as suppliers use IT in an information-intensive environment to generate premium prices unlinked from costs. Many of these strategies are not new and not even rare. However, they are becoming more and more feasible in an e-business environment. The thinking manager who appreciates the economics of digits can find the underlying rationale useful in viewing e-business and competition. By engaging in versioning, confounding, network effect leveraging, and predatory pricing strategies, suppliers are not necessarily doing anything illegal but are attempting to survive and thrive in an environment in which the conventional competitive equilibrium is unpalatable. Strategies to raise prices in the face of intensive competition and lower barriers to entry become the only viable options.

It is important to note that these strategies are particularly useful in evaluating pure plays that have digital products (news), places (websites), and processes (buying). However, we believe these arguments are useful for firms that provide any kind of digital experience to customers. While physical products themselves are not subject to digital economics, information about their characteristics, configuration, operation, selling, support, and so on is, thereby allowing consideration of versioning, confounding, network effects, and pricing strategies.

Intervention due to antitrust issues, consumerism, and market forces might inhibit the use of some of these strategies. Regulatory and antitrust issues might come into play when supplier actions (a) are predatory and involve proactive leveraging of market power in order to drive competitors out of business and (b) impinge on personal privacy as advocated by consumer groups. The infomediary Google is currently under intense scrutiny by Google-Watch.org, a nonprofit group dedicated to informing the public about the search giant's inner workings, particularly as it relates to bias in its indices and privacy. Moreover, companies like Epinions focus on reducing confounding information on products by providing unbiased

comparison services. However, it is our contention that firms that are not vigilant in developing an infomediary, personalization, profiling, segmentation, pricing, and bundling approach to their digital offerings will not succeed. In the milieu of the Web, the quality of a firm's offering is paramount, but so are the information age strategies needed to prevent competitive demise.

We are in the midst of an e-business battleground with three major sets of players: buyers, suppliers, and regulators. Suppliers typically have greater IT capitalization, but face new economics of digital costs. This makes it impossible for them to compete at marginal costs approaching zero in a highly competitive environment that demands a higher infusion of fixed costs. Therefore, they must engage in ways to reduce the competition despite a growing buyer ability to shop and compare products. Versioning, confounding, leveraging network effects, and pricing strategies are four complementary ways to leverage their IT capitalization to do this. It is good economic sense. ○

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