

Editorial

The Impact of Advancing Technology on
Marketing and Academic Research

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Academic research in marketing often and rightfully tends to either build on well-established past research topics or follow well-established practices in industry. However, as technology advances, it might be possible to foresee some more enduring trends and focus research on future issues rather than on past issues.

One approach would be to study emerging technologies with rapidly declining costs. Each of these emerging technologies spawns myriad applications that have the potential to dramatically impact existing markets. Interesting research topics include the study of the impact of these applications on different market participants (e.g., final consumers, the seller, the seller of complementary services, intermediaries, information providers, competitors, other industries). Research topics also include the optimal structure for products and services, given these new applications, as well as which intermediary should offer particular services. Research topics also include the interactive ability to rapidly customize marketing strategy by identifying individuals at particular points in time and under particular demand conditions. Five of these technologies include enhanced search services, biometrics and smart cards, enhanced computational speed, M-commerce, and GPS tracking.

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Enduring Research Topics and Fads

The popular business trade press (and some scholarly publications as well) continues to champion the latest fads and fashions in management. A few remnants of these past fads are still found in some organizations. For example, quality circles, cross-functional cooperation, business process reengineering, management-by-objectives, one-minute management, matrix management, employee assistance programs (EAPs), T-groups, benchmarking, vision, and reengineering have all come and gone (Carson et al. 1999).

Perhaps these intriguing fads, and always exciting fashions, are merely innocuous diversions. Perhaps these fads are an integral part of Schumpeter's creative destruction (Schumpeter 1950, Chapter 7) and become the risky experimental path required for progress (i.e., the market system works by trial and error). Perhaps these fads and fashions are part of Cole's (1999) process of re-evaluation, self-examination, and "building blocks for organizational learning." Perhaps these fads are ill-conceived exper-

iments, simply relabeled well-known routines, excessively hyped thoughts, or pretentious gibberish.

Given the sometimes-unstable state of organizational practice, it is wise to use some caution when citing the popular trade press for examples of optimal behavior and ideal managerial practice (e.g., see Huber 2000). Certainly, the widely discussed failures of the early Internet companies should give us pause. Despite popular belief, the chief executive officers of failed dot.coms were middle-aged, well educated (Rovenpor 2003), and appeared quite credible. Sometimes, it is a good strategy to wait until the dust settles before forming elaborate theories and extracting surprising insights from what becomes a failed experiment.

Of course, unlike the popular trade press, academic research often tends, or at least strives, to focus on more enduring and fundamental issues. For example, scholarly journals in marketing strive to provide basic foundations and advance our knowledge of the enduring marketing functions such as improving distribution, adding value to existing products, adapting to changes in the marketplace, making advertising more effective, and designing new products. This tendency toward traditional topics might make academic research appear less relevant to practitioners. Practitioners are often unable to find the latest buzzwords, the hot new trends, and recent industry developments

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in the academic literature. Even academics often complain that academic research tends to be sluggish in capturing seemingly obvious changes in managerial practices and market structure (Vargo and Lusch 2004).

Advancing Technology: More than a Trend

Certainly, every forecasting endeavor has its perils. However, it seems likely that rapid advances in technology and the amazing growth of knowledge-based institutions will continue. Although many emerging technologies have yet to be tested, many of them have already shown their usefulness and, given impressive declines in cost, these technologies might soon be commonplace.

Historically, research in marketing has pioneered many new areas (e.g., consumer-based new product design, product positioning, price promotions, developing segment-specific strategies, targeting, entertainment marketing (e.g., Elberse and Eliashberg 2003), branding, defensive marketing, channel relationships, direct marketing, services marketing, advertising copy, and internal marketing, just to mention a few). More recently, some excellent research in marketing now focuses on problems first explored in sister disciplines (e.g., auctions, network externalities, and yield management). Of course, we can certainly provide significant contributions to these later topics by providing a marketing perspective, and those contributions are welcome at *Marketing Science*. For example, Basu et al. (2003) apply the fundamental and ingenious attribute-based marketing approach and find that network externalities are attribute-specific. Desiraju and Shugan (2001) argue that traditional yield management requires that (1) there is a specific time for service delivery; (2) consumers who arrive later are less price sensitive; and (3) sellers can credibly commit to future prices.

Although it is certainly possible to pursue research topics with widespread popularity, it is often useful to, as practitioners say, stay ahead of the curve. For that reason, let us look at some emerging research opportunities (i.e., topics) corresponding to a few emerging technologies that have reached the rapid growth phase of their probably long life cycles. These emerging, and probably enduring, technologies are search services, biometrics and smart cards, enhanced computational speed, M-commerce, and GPS tracking. Finally, the marketing of the actual emerging technologies deserves some mention. These emerging technologies have produced many potentially interesting research topics in marketing (e.g., see Shugan 2003) that might change the actions of different decision makers.

There is space here only to consider the impact of a few emerging technologies on research in marketing. Compelling arguments could be made for other technologies. For example, Festervand and Harmon (2001) proclaim that “all marketing students need a basic understanding of XML, XBRL and perhaps other related XML derivatives because they will be exposed to this technology throughout their career.” Other authors strongly suggest watching nanotechnology, genomics, HDTV, photonics, IP storage, voice-over-IP, nuclear medicine, and many more.

Search Services

The Internet now provides a wide variety of search services for finding websites, sellers, services, people, product information, archived information, news, weather, messages, companionship, reviews, announcements, other search engines, and so on. There are now a variety of Web search services that enable buyers—both business and consumer—to find, at least, each other. One immediate implication is that the web search activity could vastly change the type, quantity, and cost of information.

Search engines are now becoming an important part of the distribution channel. Search engines can disseminate information about the products and services of many organizations (e.g., see Bradlow and Schmittlein 2000). Search engines can also actively enable the finding of particular products and services while making it difficult to find other products and services. In many ways, search engines are gatekeepers, similar to traditional retailers who provide selected information, narrow buyer choices to a chosen assortment, and target particular items to particular customers. Research topics include the full potential role of the Web search service, methods of influencing the search results, the impact of Web search on other marketing activities (e.g., advertising, new product development), and the study of consumer Web search behavior. Search engines, such as Google, do not currently sell placement within the search results. We might ask whether search portals should sell placement results (as some travel agents do) or whether sustaining credibility and protecting reputation are more critical to long-term profitability. On the provider side, we might ask how to market search engines, how to ensure that your site is found (i.e., the appropriate marketing strategy—assortment, size, scope, uniqueness—rather than purely technical tricks), and how to gauge the impact of search engines, using the “number of past hits” as a method of ranking search results. It is interesting that as we observed an initial shift in market power from retailers to manufacturers, we now observe a shift in market power to the portals and information providers.

As manufacturers gradually provided their downstream retailers what they wanted, e.g., providing branded variants (Bergen et al. 1996), now retailers might need to provide search portals what they want.

Moreover, our understanding of the full impact of reduced search costs on consumer behavior remains incomplete but recent research has revealed interesting findings. Mehta et al. (2003) find that consumers incur significant search costs to discover the posted prices and failure to consider that search cost seriously underestimates the consumer price sensitivity. However, Zwick et al. (2003) find that buyers search too little when they face much lower search costs. At the more microwebsite level, Chatterjee et al. (2003) find that the duration of time spent between Web visits is critical to the depth of search at a particular website.

Our understanding of the full impact of reduced search costs on firm profits also remains incomplete but recent research has revealed interesting findings. Wu et al. (2004), for example, examine free-riding of informational service in electronic commerce where the provision of information service is costly, but free-riding is possible (i.e., buyers purchase from sellers other than the information provider). They find that sellers need reputations as information service providers to make positive profits and that no seller can earn positive profits by only free-riding. Hence, reducing search costs does not necessarily reduce the number of firms in the market, so only the lowest-priced seller survives.

Iyer and Pazgal (2003) find a similar result when studying Internet retailers and their incentives to join Internet shopping agents (ISAs). They find that Internet retailers do have an incentive to join an ISA but only until the ISA reaches a particular size. We still need further research to consider the optimal agreements between Internet retailers and other agents such as ISAs, search engines, portals, and vortals (i.e., industry-specific portals). We might wonder whether conventional exclusive arrangements with traditional media stations (e.g., Dukes and Gal-Or 2003) extend to these new marketing and distribution entities. Moreover, the presentation of results, both by search engines and e-retailers themselves, remains a growing area for research. For example, Wu and Rangaswamy (2003) find that certain features (e.g., personal lists) reduce the number of products that buyers consider (i.e., consideration set size) while other features (e.g., sort) increases the consideration set size.

Bergen et al. (1996) find that manufacturers do have an incentive to decrease retail competition to avoid some retailers dropping their (progressively unprofitable) products. They argue that manufacturers create large assortments of their brands, called branded variants, so that retailers can choose subsets of their

assortment to minimize overlap with the variants carried by competitive retailers. Perhaps, price search on the Internet will be replaced by attribute searches as every Internet retailer carries its own variant of the manufacturers brand, eliminating the ability to perform simple price searches. Research is needed on other areas of differentiation that include shipping costs, delivery time, reliability, return policy, repair policy, hidden costs, multiple item discounts, and so on.

Related to enhanced search technology are the expanding presence of third-party evaluators such as professional reviewers (e.g., Eliashberg and Shugan 1997), user reviews (e.g., Novak et al. 2000), and interested third parties who provide “free ink” (i.e., free announcements of new products or new marketing strategies in the form of current news or popular entertainment).

Research topics include how buyers use third-party reviews, the motives of buyers to provide reviews, the importance and formation of credibility and reputation (Shugan and Winner 1999), the impact on marketing communication decisions, and the impact on new product development. It is also possible that reviews can be an important source of market research information. Buyer reactions are also important. For example, Fitzsimons and Lehmann (2004) find that unsolicited advice that contradicts initial impressions can lead to a behavioral backlash that results not only in consumers ignoring the reviewer’s recommendations but also in buyers intentionally contradicting recommendations. Indeed, research has only begun to explore the possible role of evaluative information sellers and influence of evaluative information sellers on traditional marketing functions (e.g., new product development, advertising, differentiation, and positioning). For example, more rapid communication might intensify seasons and change the nature of product introductions across different international markets (e.g., Tellis et al. 2003). Perhaps more rapid communication causes more rapid diffusion, but that expectation might depend on the nature of the information being diffused and the quality of the product.

Finally, it is important to note that beyond search engines, other advancing technologies have the potential to also dramatically reduce search costs. New communication devices allow buyers to exchange information about purchasing opportunities. E-mail communication allows sellers to very rapidly contact targeted buyers with temporary offers. Global positioning systems (GPS) allow identification of nearby buyers and sellers.

Biometrics and Smart Cards

Biometrics is the automated identification or verification of a person made by comparisons of physical, physiological, or behavioral traits to a stored

digital template. Like other emerging technologies, early hype and unreasonable expectations have led to disappointing sales (Harbert 2004). Every technology must develop real value-added applications before profits are possible. Perhaps firms have a greater need for research in marketing than for additional research in perfecting the technology.

From a marketing viewpoint, one clear potential benefit from biometrics is the mitigation of arbitrage. In many situations, arbitrage vastly decreases the advantage from potentially profitable targeting strategies. For example, amusement parks that sell annual passes can use biometrics to discourage buyers from lending their cards out or to prevent someone from using a lost or stolen card (Lorek 2004). Of course, some very fundamental pricing strategies—such as yield management—would be impossible, were arbitrage costless. If early buyers could resell discounted tickets at a subsequent date to late buyers, airlines and other service providers would have less ability to raise prices as the flight time grows near. Perhaps the eagerness of the airline industry to identify passengers was driven as much by the need to discourage arbitrage as by the need for security.

Xie and Shugan (2001) and Shugan and Xie (2004), for example, study the common situation when buyers make advance purchases for later consumption and their future consumption states are unknown. For example, an advance buyer of a concert ticket might not know his or her state (i.e., health, mood, general situation) on the day of the concert. When consumers are uncertain about their future valuations or future price-sensitivity, sellers can profit from advance selling that can resemble, but is quite different from, traditional yield management. When future states are unknown, buyers have uncertain evaluations and sellers can increase profits by advance selling. However, arbitrage can greatly diminish that potential profit.

Whether it is annual passes, uncertainty about future consumption states, customized menus, quantity discounts, or almost any form of segmented offerings, the seller usually gains from diminishing the buyers' ability to arbitrage. Biometrics might provide an effective tool for countering undesirable arbitrage. It might also provide the ability to obtain buyer identities from only physically observing the buyer.

Finally, unlike biometrics that can identify users without their knowledge, smart cards allow users to both identify themselves and communicate private information. Smart cards are credit card-sized cards that contain chips with individual information. Many creative applications exist. For example, a restaurant could pre-sell a \$25 meal for \$10 if the meal is consumed within a month on particular days for particular times and record the transaction on a smart card. A grocery store could sell \$25-off cards good for five

consecutive future weeks of purchases for \$100. After each transaction, the smart card is quickly reprogrammed to reflect the current credit balance.

Enhanced Computational Speed

Remarkable increases in computing power have obviously spawned an enormous number of new products and services. Computer chips are now functioning in an extraordinary range of electronic devices, including automobiles, biomedical equipment, electrical monitoring equipment, distribution devices, communication systems, building security, fire systems, elevators, traffic control devices, street light systems, automated heating systems, basic office equipment, door chimes, and refrigerators (Wald 1995). Product placement might take on an entirely new meaning.

Extraordinary increases in computational speed allow sellers to use more sophisticated tools to quickly analyze traditional databases and to continuously improve targeting strategies. For example, Steenburgh et al. (2003) determine the optimal number of prospects to contact using an algorithm based on the Monte Carlo Markov chain output from parameter estimation. Toubia et al. (2003) provide an estimation algorithm and general method that allow rapid estimation of parameters while questioning respondents that optimizes the information from the next question.

Computation speed also allows a rapid change in a seller's menu of product and services as well as allowing more complex offerings (e.g., bundles, quantity discounts, forward sales). Research topics here include how to rapidly customize the menu of product and services available to a particular customer, (in the case of a web page), or to a customer currently in the facility, in the case of a brick-and-mortar seller. Sellers have the capability of changing their menus over time. Airlines, for example, can change prices from hour to hour. Other sellers can also implement changes in price, the composition of product bundles (e.g., a discounted DVD when purchased with a DVD player), and temporary quantity discounts (e.g., a 20% discount on a second book). However, we need to develop specific theories and methods to understand how and when to use these capabilities to enhance profits.

Beyond more complex menus, interactivity is now possible in a variety of contexts. Obviously, buyers can now explore only desirable options and navigate a website or in-store terminal as they would a retail store—by only visiting aisles of interest. However, interactivity can go much farther. It is possible to do mechanized interactive negotiations. It is possible to create virtual sales assistants as well as interactive consultants. It is also possible to allow consumers to provide direct input into product development.

Of course, research is required to determine the desirability of these capabilities (for all parties) as well as the impact on traditional marketing activities. In any case, more research is required to investigate the desirability, objectives, and methods for conveying far more complex and interactive persuasive information. The short- and long-term impacts on buyers, sellers, competition, marketing activities, third-parties, and market structure await future research.

At one time, product and service lines consisted of different products and services designed for different segments of customers or for different usage situations. Now, a product or service line might consist of the same basic service (e.g., an airline flight, a theatrical performance, a college education) that varies across different points in time (e.g., hours, days, years). Time is now an important dimension in the product line (e.g., different offerings at 3 P.M. and 6 P.M.).

Future research might explore how and why the service line might vary across times, i.e., the time the consumer makes the purchase as well as the time when the service is consumed. Finally, the ability to perform rapid computations allows product lotteries, rapid adaptation to unexpected demand conditions, complex loyalty programs, the use of complex interactive dynamic pricing mechanisms, and the selling of opaque products (i.e., products with deliberately hidden attributes such as their brand name); for an example, see Fay (2004). Future research might develop strong theories that would guide these activities.

M-Commerce and GPS Tracking

Mobile commerce (a.k.a. M-commerce) is the use of various information and communication technologies that allow the mobile exchange of information. It includes a variety of products, including mobile communication devices, wireless Internet, personal digital assistants (a.k.a. PDA), global positioning system (GPS), and so on.

Certainly, M-commerce has fallen far short of the lofty expectations of the original advocates. As usual, remarkable technology was confused with genuine buyer benefits. Moreover, the technology fell short as well. Small screens, tiny keypads, limited bandwidth (i.e., communication speed), and other problems thwarted many potential applications. However, M-commerce-related technologies still have great potential.

For example, consider GPS technology. As with most emerging technologies, the cost of GPS devices continues to rapidly decline. With GPS devices, users can determine their precise location and, when linked to communication and computational components, they can transmit locations and do location-based computations.

GPS technology has numerous applications, including monitoring (e.g., spying on, protecting, guiding) others (e.g., the location of trucks in a fleet) and quickly determining the optimal route to a particular destination. One application, of particular interest to researchers in marketing, is locating products and services. A consumer in an automobile can use a GPS device to locate the nearest gas station, hotel, or restaurant; a particular retailer; or some other destination (e.g., see Louderback 2004).

Current devices (costing under \$1000) can access an internal hard drive to provide the user with required information. Here an internal search engine finds desired destinations (e.g., hotels, restaurants) based either the estimated shortest travel time or the computed shortest travel distance.

Many research topics related to search engines are also relevant to GPS technology as well. Here, however, the organization and presentation of information to users is of particular importance. Research could examine the optimal types of channel arrangements between GPS manufacturers and service providers. Research could examine the organization of data (e.g., by brand, by category, by location with brand preference, by price range).

Now, add real-time communication capability to these devices. In that case, product and service providers can transmit information directly to buyers within a particular location. Hence, proximity search engines with GPS devices could incorporate direct input from product and service providers. Consequently, users might obtain current information from sellers within a particular proximity including inventory availability, hours of operation and current promotions.

For example, a restaurant or hotel suffering from unexpected cancellations might transmit an updated special price to users within a particular proximity. The updated price would appear in specialized searches only by users who are actively searching for the particular service with a defined proximity.

Also, once linked with inventory systems, a buyer might be able to find the closest outlet for a particular item (e.g., a specific DVD) among competitive retailers. Some related research questions might involve the desirability of providing this information, the form the information should take, the impact of this information on competition, and the optimal strategies to adopt once these devices become commonplace. This technology, as well as other emerging technologies, suggests an entirely new mix of marketing variables for retailers and other service providers. Of course, given that GPS systems can also identify buyers allowing a specific offer (e.g., price discrimination or a precustomized set of services), there are the usual issues involving privacy,

confidentiality, fairness, and impact on reputation. For example, will consumers be willing to reveal their location? Moreover, although the marketing literature contains numerous articles on consumer behavior, few articles focus on how to rapidly customize (at the individual level) a bundle of services and products to meet the needs of a consumer in a particular state. Most of our research on consumer behavior focuses on similarities between consumers, rather than on rapidly identifying differences.

Finally, within the area of M-commerce, some sellers are selling intangible knowledge or information. Of course, this business is risky because information can be highly perishable, very easy to copy, and very costly for the first seller to collect. The marketing issues surrounding the selling of knowledge are just beginning to be explored (Iyer and Soberman 2000).

Marketing Emerging Technologies

Finally, not only are many marketing issues related to new applications of emerging technologies but also there are marketing issues related to the marketing of emerging technologies themselves. As new and different technologies emerge, the potential benefits—used as the foundation of any marketing campaign—might not be immediately apparent and might eventually evolve in profoundly different directions. Most technologies that fail do so because no value-added benefits emerge. Hence, the old boring marketing concept built on consumer benefits continues to steal the glamour of many gee-whiz technologies. Perhaps tools for monitoring usage to discover new benefits might trump the traditional marketing research tools for firm-based R&D.

Rather than developing marketing research tools to optimize known applications (i.e., the applications of the technology that are readily apparent), industry might require market research tools to discover genuine value-added applications. For example, Friar and Balachandra (1999) study three radically new technologies (i.e., massively parallel processors (MPP) supercomputers, error-free systems development, and fiberoptic biosensors) and discover that current users who are familiar with these technologies are often the people who find completely new and unexpected applications of the technology rather than the developers of the technology. Research might also integrate the market potential and market position of firms with the development of new technology. For example, Ofek and Sarvary (2003) find that the market leaders who gain advantage from reputation should invest less in R&D than in the leaders who gain from R&D competence. Moreover, being a leader has a particular advantage for products and services that are sold online, because large-share online products apparently enjoy more brand loyalty than products and services sold offline (Danaher et al. 2003).

Conclusions and the Future of Marketing Models

Academic research in marketing often and rightfully tends to build either on well-established past research topics or to follow well-established practices in industry. However, as technology advances, it might be possible to foresee some more enduring trends and focus research on future issues rather than on past issues.

Several emerging technologies that inspire possible research topics include enhanced search services, biometrics and smart cards, enhanced computational speed, M-commerce, and GPS tracking. There are common aspects to the research topics inspired by each of these emerging technologies. In each case, research topics involve how to structure new products and services, given entirely new capabilities. In each case, research topics include the impact of new capabilities on a variety of market participants (e.g., final consumers, the seller, the seller of complementary services, intermediaries, information providers, competitors, other industries). In each case, research topics involve projecting the demand for possibly very divergent applications of a common technology whose cost is rapidly declining but might depend on all applications. Also, in general, research topics include new marketing-mix variables that require integration. Remember that although many modern marketing management textbooks organize marketing activities around the four independent P's (i.e., price, promotion, place, and product) of McCarthy (1964), McCarthy credits Neil H. Borden, who introduced the concept of the marketing mix at his presidential address to the American Marketing Association (AMA) in 1953 (e.g., van Watershoot and Van den Bulte 1992). However, rather than emphasizing four independent decisions, Borden follows Culliton (1948), who argued that marketing was the blending together of myriad marketing decisions that must all be simultaneously set to create a consistent strategy or mix of ingredients. Given that perspective, the research issues surrounding emerging technologies should finally overcome the severely limited view that marketing primarily involves only four independently determined decisions.

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