

To Author
Due Tuesday, Sept. 26

Beyond The Hype: A Taxonomy Of E-Health Business Models

How to build a health data infrastructure that can deliver both a public and a private good.

by Stephen T. Parente

ABSTRACT: This paper describes a business model of e-commerce, its application to health care, and the reasons why the health policy community should monitor its development. The business model identifies the market barriers health e-commerce firms must overcome and provides perspective on opportunities for building a health care data infrastructure that is capable of delivering both a private and a public good.

INVESTMENT BANKERS PREDICT that the health care electronic commerce market will be valued at \$205 billion by 2003—a value slightly less than the size of current annual Medicare expenditures.¹ Significant e-commerce initial public offerings (IPOs) or acquisitions have become part of the health care landscape, thanks to firms such as Healtheon and Neoforma, each with IPOs exceeding one billion dollars.² Health e-commerce stocks are sold to investors as new vehicles to improve quality of care; reduce medical errors; increase the efficiency of information and reimbursement; and, perhaps most importantly, engage consumers in the process, cost, and outcome of their health care decisions.

The probability that e-commerce can revolutionize health care delivery depends on the profitability of several different and simultaneous business development activities. Obstacles in the path of health e-commerce are numerous and include future data standardization, privacy regulations, and health insurance underwriting laws, as well as the fact that a further market downturn may choke development resources.

In this paper I introduce a simple taxonomy of the health e-commerce market based on firms' market objectives and revenue sources; describe the significant technical, regulatory, and market barriers that exist; and offer health policy implications and opportunities. The business model provides perspective on opportunities for building a health care data infrastructure that is capable of deliv-

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BUSINESS

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ering both a private and a public good.

Health E-Commerce Roll Call

Ever since computers were introduced as a business tool in the 1960s, the health care industry has been characterized as slower to adopt new innovations in information technology (IT) than other service industries such as banking, finance, and telecommunications have been.³ Health care administrators found either that the technology was insufficiently advanced, in terms of both hardware and software to inform medical care production, or that managers resisted financing a large capital and labor investment without the promise of clear financial returns.⁴ In the case of e-commerce, health care has not been nearly as IT-phobic as it was in the past.⁵

In general, e-commerce constitutes all business activities on the Internet. These take four forms, each suited to a different purpose and having its own revenue and cost structure. These forms, which we explore below, are portals, connectivity sites, business-to-business applications, and business-to-consumer applications.

Health e-commerce enterprises built within the past two years populate all four models. Exhibit 1 lists examples of major firms that were publicly traded in 2000. Several could be classified in more than one model; each is classified according to the model that most closely fits its activities or revenue sources. Many are living and breathing enterprises with substantial shareholder investment as indicated by market capitalization, the current valuation of all stocks held by investors for a price at a specific point in time.

The most striking trend from Exhibit 1 is the decrease in price in all firms from March to August 2000. Market capitalization decreased in all but two firms, Medical Manager and HealthExtras, but only because these two firms issued more stock. Most of the decrease occurred between March and May 2000, when a major market correction affected nearly all Internet companies. The exhibit illustrates the depth of investment in March and the following fallout as well as the volatility of a newly emerging market.

■ **Health e-commerce portals.** The portal is the most common face of the Internet to the consumer, providing a launch point for various online activities. Examples of portals include Netscape, Netcenter, Yahoo!, AOL.COM, and newspaper Web sites. All seek to be the first source a consumer consults when searching the Internet. Portals derive revenue primarily through advertising, unless they also provide subscription services, as AOL.COM does through America Online. The costs of running a portal are generated by personnel, computer hardware to maintain the site, and advertising. Anyone can visit a portal for free, just as anyone can window-shop

EXHIBIT 1
Financial Performance Of Select Publicly Traded Health E-Commerce Companies,
March–August 2000

Type/name of company	Market capitalization (millions)			Share price		
	March 2000	May 2000	August 2000	March 2000	May 2000	August 2000
Portal						
Medscape	\$ 577.40	\$ 153.50	– ^a	\$12.88	\$ 3.44	\$ 3.19
drkoop.com	244.30	76.90	\$ 43.40	8.06	2.47	1.25
OnHealth	203.10	67.50	59.40	10.00	2.81	2.41
HealthGrades.com	36.50	37.70	21.50	2.94	1.75	1.00
Total	1,601.30	335.60	124.30	–	–	–
Connectivity						
Healthon/WebMD	4,256.90	2,898.00	2,848.00	59.00	16.50	13.00
TriZetto	1,752.50	501.80	253.30	88.50	23.69	11.88
XCare.net	297.80	96.80	57.30	19.38	6.00	3.53
Claimsnet.com	54.70	28.20	16.60	8.25	4.25	2.13
Total	6,307.20	3,496.60	3,158.60	–	–	–
Business-to-business						
Neoforma.com	3,409.90	562.70	241.80	59.00	8.69	3.50
Medical Manager	3,181.80	901.50	1,298.00	90.00	25.50	31.88
Allscripts	1,714.40	888.30	710.10	71.00	35.88	26.78
eBenX	865.40	265.60	251.50	57.50	16.50	15.50
Total	9,171.50	2,055.30	2,259.30	–	–	–
Business-to-consumer						
drugstore.com	857.20	425.90	324.40	18.63	8.19	6.22
PlanetRx	569.70	113.90	34.00	10.94	2.19	0.66
HealthExtras	205.30	120.80	122.50	7.44	4.38	4.44
Total	1,632.20	660.60	480.90	–	–	–
All companies	\$18,172.20	6,548.10	6,023.40	–	–	–

SOURCE: Market data recorded from Yahoo Finance, 11 March 2000, 17 May 2000, and 19 August 2000.

NOTE: Market capitalization equals the share price multiplied by the number of shares owned by investors.

^a Acquired.

for free. The critical goal of each portal is to establish a brand name, generating frequent return visits. The success of Internet branding is clearly evident—“Amazon” is now likely to mean more to many people than simply a river in South America.

Health e-commerce portals are the face of the medical Internet to both consumers and providers seeking medical guidance and information on new innovations. As with other portals, health care portals are financed primarily through advertising revenue.

OnHealth. This site provides consumer-oriented health information through standard medical references as well as original content from the site's writers and editors. The firm features a personal tracker designed to identify specialized content in a subscriber's area of interest. The revenue source of OnHealth is primarily advertising. However, its own advertising costs overshadow its revenues. Personnel and Web IT expenses also contribute to operating costs. The company finished 1999 with a net loss of \$21.9 million and net revenues of \$2.7 million. The firm is clearly focused on building brand-name reputation and developing a loyal customer base.

Medscape. Developed by George Lundberg, former editor of the *Journal of the American Medical Association*, Medscape provides links on health topics for consumers and providers and encourages the development of support and feedback groups. Medscape was recently purchased by MedicaLogic, an Internet connectivity firm, and refashioned into a combination of portal/connectivity enterprise. This illustrates the growth in e-commerce mergers necessitated by weak revenue streams from a firm's original business model. MedicaLogic hopes to attract providers familiar with Medscape to use the firm as a platform for electronic medical records (EMRs) and for paying medical claims.

■ **Health e-commerce connectivity.** One of the unique developments of e-commerce is businesses that link information systems seamlessly. For example, Travelocity.com links different airline reservation and pricing systems.⁶ The online auction house eBay is an infrastructure e-commerce firm that links the collective inventories of America's attics and garages. Transaction fees provide revenue for connectivity companies. For example, Travelocity.com charges a small fee for handling a reservation, just as a travel agent would for developing a travel itinerary. Revenues for eBay come from a fee charged per transaction, similar to fees charged non-account holders for using an automatic teller machine (ATM). Costs to firms running connectivity sites are generated by personnel and the hardware needed to create a smooth transaction system for multiple users.

Health e-commerce connectivity initiatives include Internet-accessible EMRs, assessment of provider quality based on clinical outcomes, and use of quality data in physician selection. Internet connectivity is similar to infrastructure projects in the bricks-and-mortar economy, in that the enormous initial costs are usually taken for granted once the structure is built. The federal government may not profit from building an interstate highway, for example, but many will use the new service and connected businesses will profit. Just as taxes maintain public roads, transaction fees to organizations routing information maintain the Internet. Thus, companies will exact transaction fees from the principals involved when data are moved over the Internet to health plans, physicians, hospitals, clinical laboratories, pharmacies, consumers, and other participants involved in health care financing, marketing, or delivery.

Many health e-commerce connectivity firms have emerged in the past two years. Their goal is to secure as many revenue-producing digital data links as possible to generate transaction-based revenue.

Healthon/WebMD. As of summer 2000 Healthon had an estimated value of more than \$2 billion, built by large doses of venture capital.⁷ It is the largest health e-commerce firm. Healthon's goal is to be-

come the premier transaction device for health data on the Internet. Specifically, the company seeks to provide an online "route" for all provider and insurer data transactions for claims payment, referrals, medical record attachments, benefit eligibility status, and other clinical or administrative justification for payment. The appeal of the Healtheon model is that all a provider needs is a simple Internet connection rather than a proprietary software and hardware package that requires on-site installation, maintenance, and upgrading. If the system becomes widespread, it could even substitute for an insurer's own online claims system, the same way a person may leave his or her e-mail on a university or corporate server rather than downloading it to only one computer. To date, Healtheon's primary limitation has been providers' reluctance to adopt their technology. Healtheon's most recent response has been to buy other firms with market share in the physician's electronic office. While this strategy has the merit of speed, industry analysts see the firm as being in a critical phase where it must successfully integrate its acquisitions into a seamless enterprise. In the second quarter of 2000 less than 3 percent of the 274 million claims transactions processed by Healtheon were on the Internet. To fulfill its mission as an Internet connectivity firm, Healtheon needs to move to a majority of Internet transactions by the fourth quarter of 2001, the time by which its chief executive officer, Jeffrey Arnold, forecasts that it will have positive operations-based cash flow.⁸

Abaton.com. The insufficiency of electronic clinical data slows analysis of health care quality.⁹ Data from an EMR are preferred to paper-based records because of their easy manipulation and analysis. However, these systems involve significant acquisitions of hardware, software, and personnel training. Abaton.com, a subsidiary of McKesson HBOC Inc., provides EMR data entry and an Internet analysis tool. Abaton.com allows providers to access, enhance, or analyze health data through the Internet, irrespective of computer platform. Providers may examine laboratory and imaging results, direct or support a clinical care team, make referrals, order prescriptions, and analyze outcomes in real time. At Abaton.com demonstration sites, providers are responding well to its features (for example, online pharmacy references tied to adverse drug reaction warnings). The Abaton.com model has innovated flexibility in its EMR, allowing providers to gradually adopt software features rather than assuming the complete transition from a paper to a paperless system.

XCare.net. XCare.net uses extensible markup language (XML) to process health care transactions. XML is considered a successor to the current hypertext markup language (HTML) in use on the World Wide Web. XML encodes the context of medical data more

efficiently than HTML does, so that an Internet application requires less time to access data and use them online. HTML uses data less efficiently than XML does, because HTML repeatedly uses the same data record during a transaction, whereas XML may only use it once. The use of XML also could address health data's fragmented nature by creating built-in linkages to disparate but related classification systems, such as the commonly used *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis codes and the lesser known but more clinically relevant *Systematized Nomenclature of Medicine (SNOMED)* disease classification system. The use of XML could act as hard-coded "universal translator" of related but not precisely corresponding health data classification systems, of which there are more than two dozen. Thus, XCare.net is carefully building a better mousetrap, hoping that innovative technology will help it to attract significant market share.

■ **Business-to-business e-commerce.** Business-to-business (b-to-b) e-commerce represents the sale of goods and services directly to other firms and government agencies. For example, automobile manufacturers actively use business-to-business e-commerce to order parts and materials to build cars. Revenues are generated in this model by the sale of items through the Internet. Costs for these firms are like those of any other business selling goods, with the additional cost of creating a distribution system to procure warehouse capacity and factory-to-door transportation systems.

Health e-commerce b-to-b models are extensions of general business e-commerce, including examples such as biotechnology Web sales directly to providers and the sale of refurbished medical equipment through online auction. Manufactured products are often sold in this way, but services, such as consulting or benefits management, are beginning to be sold as well. Physicians and hospitals may adopt this model to target health plans that are developing or renegotiating provider panels. Physicians receptive to the Internet and looking to practice medicine outside a group structure may find the direct contracting of services, possibly through an online auction mechanism, an attractive option for building practice volume.

Neoforma.com. Neoforma.com's principal mission is to sell and exchange medical supplies and services.¹⁰ It sells medical supplies and equipment and provides an online auction site for refurbished high-technology equipment such as computed tomography (CT) scanners. Clients for this venture include hospitals and other providers. Neoforma also represents an Internet "supply chain" firm, helping providers to maximize their unwanted inventories by using the Internet as a global product trafficking system.

eBenX. eBenX provides a b-to-b e-commerce service linking em-

ployers and health plans for the procurement of group health insurance. The company's group health insurance exchange provides an end-to-end solution for all aspects of the procurement process, from request for proposal (RFP) through premium payment. eBenX independently assesses health plans on behalf of employers and acts as their agent for procurement decisions. The company also facilitates employer and health plan exchanges of eligibility information throughout the benefit year and provides employees with the ability to select and enroll in a health plan online.

Business-to-consumer e-commerce. Business-to-consumer (b-to-c) e-commerce involves manufacturers and retailers selling goods directly to consumers. Like b-to-b e-commerce, this type of e-commerce generates revenue by the sale of goods and incurs costs associated with serving a large, disparate market.

A b-to-c model allows consumers to purchase health products ranging from vitamins to health insurance. Although the direct marketing of health care products to consumers is not new, the Internet can target potential consumers based on diagnosis or treatment of a medical condition. Portals already examine users' keywords from an Internet search and display related advertisements. If, for example, you search for information on minor asthma treatments, you may see PlanetRx or Walgreens Online Pharmacy advertisements.

PlanetRx. Filling a prescription through PlanetRx requires only the appropriate information from a medical provider, allowing for simple ordering over the Internet. PlanetRx takes advantage of the similar computer systems used by many health insurers to easily identify individual patients. Thus, patients can enter their insurers' information and order drugs online for home delivery. This is one of the few b-to-c sites that contain minimum barriers to market, such as provider credentialing or building a network of stores. However, the barriers are low enough for a brick-and-mortar pharmacy chain such as Walgreens to fight back with its own Web site, which has the added convenience of a traditional store. After trading at about \$13 a share at the beginning of 2000, PlanetRx is now trading at less than \$1 and in search of capital infusion to keep going.

Vivius. Vivius gives consumers the ability to design their own health plan using the Internet. This business model presumes either that consumers will self-fund their medical care or that employers will provide a health benefit contribution for employees to spend as they want (a so-called defined-contribution plan). The jury is out as to whether consumers will demand a personalized delivery system, but consumers' backlash against managed care makes this a plausible model. Similar ventures are HealthCare and HealthMarket, started by Stephen Wiggins, former CEO of Oxford Health Plans.¹¹

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Barriers And Opportunities

Significant technical, regulatory, and market obstacles stand in the way of realizing the health e-commerce marketplace. These obstacles must be addressed to build a successful enterprise. Fortunately, some obstacles also provide opportunities.

■ **Lack of data standardization.** The main technical obstacle is lack of standardized health data. Insurance companies, hospitals, clinical laboratories, pharmacies, and physicians generate large amounts of health data. With the exception of integrated delivery systems such as Kaiser Permanente or Intermountain Health Plans, no data have been combined on a real-time basis, partly because each system describes medical encounters, diagnoses, and treatments differently. Connectivity firms such as Healtheon, XCare.net, and TriZetto are committed to developing standards to exchange data.

Integrating different databases with a standardized translation could provide enormous new data resources.¹² Insurer data now describe the timing and process details of a patient's contact with the medical system. Clinical data provide specificity on the nature of a medical problem and identify the rationale for a provider's treatment choice. Also, clinical records provide far greater detail on procedure outcomes than do insurance claims, which offer data that are limited to hospital admissions. Combining administrative and clinical data on a routine and ongoing basis would provide superior measures of health care productivity, effectiveness, safety, and cost.

■ **Uneven Internet access.** Another technical obstacle is access to the Internet. Although growth in the Internet has been explosive, it is still not everywhere. Even with new wireless Internet technologies adopted in Europe and Asia, the amount of information transmitted over wireless phones is not the equivalent of a hard-wired Internet terminal.¹³ Until Internet access is universal, it cannot be the primary vehicle for health data exchange.

Some new innovations are likely to provide the ubiquitous Internet access needed for health e-commerce. For consumers, Web appliances are just starting to be sold at an affordable price. Cable boxes for television sets are now manufactured with built-in Internet browsing capabilities.¹⁴ Since television sets are sold across a range of prices, personal computers could lose dominance as the primary Internet tool within several years. Cable and telephone companies are likely to offer Internet access as part of a minimum package as the cost of connecting to the Internet declines. The United Kingdom is experimenting with the use of the electricity power grid as an Internet link.¹⁵ This technology would allow virtually any household in the developed world to connect to the Internet.

■ **Local health insurance regulation.** Consider the barriers facing an e-commerce health insurer aspiring to national market share. The appeal of an Internet-based insurer is its operation from anywhere in the country. However, because of state-specific regulations, an insurer would need state certification to operate with a set premium. Specifically, this firm would have to contend with mandated benefits, minimum reserves, and different rate-setting requirements—all of which vary by state.

This barrier provides an incentive to develop an Internet-based insurer that is exempt from state regulations. Two approaches are possible. One is the advancement of medical savings accounts (MSAs) into Internet hybrid insurers. A new start-up firm, HealthCare, proposes to develop such a national insurance plan; however, it is tentative about dealing with multiple state regulations as well as the repeal of MSAs' tax-preferred status at the end of 2000.¹⁶ Another approach is to empower national e-health insurance start-ups by allowing the U.S. Department of Commerce to assume the role of licensee and use the Federal Employees Health Benefits Program (FEHBP) mandatory benefits as a minimum level of insurance. However, regional insurers' reluctance to create national competitors could compromise political support unless the insurers (for example, Blue Cross and Blue Shield plans) had larger market ambitions.

■ **Plug-and-comply HIPAA.** Another regulatory issue is the pending implementation of Administrative Simplification provisions under the Health Insurance Portability and Accountability Act (HIPAA) by 2003.¹⁷ The two major provisions are the standardization of health records and insurers' eligibility information and increased security of medical records. Health administrators see HIPAA as a looming short-term problem. However, HIPAA may also offer health e-commerce connectivity firms a unique opportunity to increase market share if they can claim that their transactions are HIPAA compliant. Without health e-commerce, a hospital contemplating updating its billing and medical records systems to meet HIPAA regulations must reengineer its management information systems. Internet connectivity firms present another option. A hospital could contract with a HIPAA-compliant firm to handle its administrative data over the Internet, requiring no reconfiguration other than providing Internet access at every workstation.

■ **Privacy.** Privacy legislation and perceptions of the minimum amount of privacy required by consumers and providers also are significant issues. New privacy laws could restrict a connectivity firm's ability to link clinical and financial data for a given individual. The constraint may arise because the language of current legislative initiatives primarily considers regulating the old health economy

“Privacy laws must address how a connectivity firm functions as an electronic data interchange to securely transact data.”

players such as medical provider, patient, or insurer, not the connectivity firm that is moving personal data on a national scale. In other words, the privacy laws must address how a connectivity firm functions as an electronic data interchange (EDI), permitting it to securely transact data among patients, providers, and insurers as their economic agent.

Internet technology can help to ensure privacy through the use of strong encryption methods when transmitting patient identifiers, such as those used to make Internet credit card purchases.¹⁸ Security also could be guaranteed through public-key algorithms that are known only to select providers.¹⁹

A critical cultural barrier related to privacy is the comfort level of consumers in entering, storing, and interacting with their health data on the Internet. Although the majority of respondents to national surveys are uncomfortable with sharing their data, another consumer majority provides credit card and other personal information over the Internet for purchases.²⁰ Consumers' attitudes toward medical information may change as they grow more comfortable and familiar with the Internet and as they witness growth in the health conveniences and safeguards that are made possible by creating and exchanging personal health data. For the moment, widescale breaches of such data are rare and not national news.

Pragmatic solutions to the privacy quagmire rest in the observation that more people are using the Internet and entering personal data than ever before.²¹ The convenience of the Internet to buy goods and services as well as to seek information has created potent Internet consumerism.²² For consumers to fully realize the benefits of health e-commerce, consumers need online medical histories to order drugs, request referrals, schedule office visits, and make treatment plans. For consumers who have already ventured into investing online, this may be no more an invasion of privacy than managing their retirement portfolio is.

■ **Venture capital.** Venture capital has breathed life into the health e-commerce market. This infusion of private capital amassed more funds to build an infrastructure than did any government or foundation initiative preceding it. However, the short-term flow of venture capital could be a risk to health e-commerce maturity. Venture capitalists like to see a return on investment in three to five years, if not sooner. As we saw in Exhibit 1, in this turbulent period

of market development a 64 percent (\$11.6 billion) loss in market capitalization among the firms profiled occurred between March and May 2000.

The connectivity market must survive for health care to realize efficiencies from e-commerce. Connectivity provides a language for the health industry to exchange goods and services and to measure gains from electronic sales and transactions. Portals and b-to-b and b-to-c firms are business models designed to entice people to go online seeking goods, services, and information. However, connectivity is the required glue permitting the health care industry to take the generation of transaction data, both clinical and administrative, to a new standard of information production. Connectivity could allow health outcomes to be measured immediately, not in days, months, or years. Connectivity could provide the information for patients to build their own health care delivery systems and then monitor the quality of their care. While having new data from connectivity firms is not a sufficient condition to create a new market space, it is a necessary one, since existing health data resources are inadequate. Fortunately, most of the aggregate market capitalization resides in firms that are directly or indirectly invested in connectivity. It is hoped that these firms will build the transaction-based infrastructure before depleting their resources.

■ **The “bricks” retaliate.** Competition from “old-economy” health care companies poses another market barrier. Many e-commerce success stories, such as Amazon.com or eBay, faced few competitors from the old economy. However, health care has a much greater degree of existing regulation and political lobbying. For example, the threat of competition from a national e-health insurance company could motivate a counteroffensive from the traditional health insurance industry.

Already old-economy health care businesses are countering new-economy companies by adding an Internet presence. A coalition of six large medical suppliers is cooperating to build a medical supply exchange to answer the start-up efforts of Neoforma.com.²³ Old-economy competition may have greatly dampened the profitability of Neoforma.com’s business model, with share prices crashing from \$78 in February 2000 to less than \$3 in August 2000.

In the case of e-health insurance, only a handful of pure Internet firms have developed, and these are largely insurance brokers with a Web presence, not actual insurance firms pooling risk or MSA hybrids. However, the innovators in e-health insurance may be large, old-economy health insurers having multistate markets that have already complied with state-specific regulations. These firms have considerable mainframe-based IT resources that could be Internet-

enabled to handle the volume of transactions generated by an e-business. Furthermore, the old-economy insurance players are aware of the benefits of e-commerce, demonstrated by their Web sites for providers and subscribers as well as their investments in e-commerce firms. For example, UnitedHealthGroup is a major backer of Healtheon/WebMD.

■ **Free riders.** The race for usable standards to make systemwide Internet connectivity a reality poses a free-rider problem that could dampen innovation. The investment costs to build a connectivity platform to handle the majority of electronic health data transactions is not trivial. For example, Healtheon acquired firms with conflicting computer languages that are difficult to synthesize for a common purpose. In contrast, XCare.net is seeking to build a system of universal translation through the use of XML code. Large database vendors such as EDS are waiting to observe which connectivity firm devises the winning technology before exhausting its market capital. Free-rider firms are ready to adopt the technology at the innovator firm's developmental expense. Although being first with a technology garners praise from engineers and scientists, the business community confers greater rewards on the firm best able to profit from a technology.

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Health Policy Implications

A health information infrastructure will only be achieved by the successful navigation of many new- and old-economy firms through market fluctuations, venture capital swings, regulatory speculation, and rabid competitors, to profitability. The health policy community can influence and support the technical, regulatory, and market development of health e-commerce to yield a public good. Practically, this role means that local, state, and federal governments should evaluate laws and statutes that unnecessarily restrict the development of new-economy business opportunities. Three immediate opportunities exist for policymakers.

■ **Incentive for early innovation.** The first opportunity is to provide a financial incentive to the early innovators of connectivity standards. A consortium of federal agencies with health care delivery responsibilities such as the Health Care Financing Administration (HCFA), the Department of Defense, and the Department of Veterans Affairs (VA) could solicit a demonstration of an operational standard. This is familiar ground for HCFA, which has set standards for administrative data. Bidders must preserve the existing claims-based architecture for transitional purposes but primarily offer an operational platform to routinely collect meaningful clinical and financial data. This would spur firms that have decided

to wait for a connectivity standard to compete for their share of transaction-based revenues. The advantage of an interagency consortium is that the clinical details of health care delivery dealt with by the VA would fit a system capable of tracking administrative data, which is HCFA's strength. This initiative could precede full HIPAA implementation in 2003, provided that final HIPAA rules are followed, and provide an additional incentive for connectivity firms to build a working infrastructure on a delivery system-wide scale.

■ **Standard rates and benefits.** The second opportunity is for the federal government to investigate the creation of a national health insurance rate-setting and benefits standard allowing an e-health insurer with national market ambitions to apply to one agency for health benefit package approval. One starting point for such a proposal would be to apply the FEHBP benefit standards as the basis for a waiver of state-specific regulatory requirements. Although this is not the only barrier to success for a new e-health insurer, it would reduce the time and effort required for market entry and would attract greater private investment if an Internet business model could be applied on a national scale. This investigation could be initiated by either Congress or the executive branch.

■ **Data privacy laws.** The third opportunity is the enactment and enforcement of health data privacy laws. The 106th Congress generated three medical data privacy bills in the Senate and four in the House.²⁴ For health e-commerce to succeed, consumers need to know that their health data are as secure as their personal financial information is. National surveys suggest that achieving high consumer confidence will be an uphill battle. Responsible companies can police themselves, but unauthorized transfers of medical data must be penalized by heavy fines and possible jail time to discourage hackers and data-savvy opportunists. Buyers of "illegal" medical data must face penalties as well.

THE DAWN OF HEALTH E-COMMERCE presents intriguing opportunities and formidable market barriers. The information infrastructure that connectivity companies create could provide a platform for lowering transaction costs and creating the data necessary to generate quality and outcome information for consumer and provider portals. To create a new health economy, firms must create new enterprises fueled by information from existing sources and business practices. Policymakers could see private-sector investments in health e-commerce yield the infrastructure originally conceived as a public-sector investment. However, regulatory adjustments and opportunities would help to ensure that health e-commerce becomes a viable enterprise with benefits for all.

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 This paper benefited greatly from comments by Jon Christianson, J. Michael Fitzmaurice, Eileen Peterson, Michael Finch, Jennifer Dunbar, Carrie Parente, and two anonymous reviewers. It was completed with excellent research assistance from Melissa Johnson and Bradley Schipper. All errors and erroneous interpretation of market forces are the sole responsibility of the author.

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