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Financing The Health Care Internet

E-health was romanced and then abandoned by the investment community and now stands at the end of its beginning.

by James C. Robinson

ABSTRACT: Internet-related health care firms have accelerated through the life cycle of capital finance and organizational destiny, including venture capital funding, public stock offerings, and consolidation, in the wake of heightened competition and earnings disappointments. Venture capital flooded into the e-health sector, rising from $3 million in the first quarter of 1998 to $335 million two years later. Twenty-six e-health firms went public in eighteen months, raising $1.53 billion at initial public offering (IPO) and with post-IPO share price appreciation greater than 100 percent for eighteen firms. The technology-sector crash hit the e-health sector especially hard, driving share prices down by more than 80 percent for twenty-one firms. The industry now faces an extended period of consolidation between e-health and conventional firms.

NOWHERE IS THE CHASM between the old economy and the new wider than in health care. The past two years have witnessed an unprecedented flood of private capital into the health care Internet sector, as individual angels, venture partnerships, investment banks, pension funds, university endowments, and caffeinated day traders scramble to get their share of the social transformation of American medicine. The midyear market volatility trashed e-health stock prices, but the mood remains optimistic about long-term prospects for consumer empowerment, provider connectivity, and investor liquidity. Meanwhile, the old health care economy faces a capital drought of unparalleled severity. Bond underwriters have raised the red flag over the hospital sector, health insurance plans are repurchasing their own devalued shares, and the physician practice management (PPM) industry has disappeared in a firestorm of bankruptcies and leveraged buyouts.

The life cycle of the business firm conventionally begins as a narrowly held start-up bankrolled by founders, venture capitalists, and private equity funds; blossoms into a broadly owned corporation through initial and follow-up public stock offerings; and then eases through a maturity that often culminates in merger, acquisi-

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tion, or leveraged buyout. The surge of venture capital, dwarfing all historical standards, has accelerated the transition of the e-health industry from infancy into adolescence and beyond. The industry now includes vast numbers of health care content providers, consumer commerce sites, transactional clearinghouses, and supply-chain market makers that have enjoyed generous funding despite lacking established customers, suppliers, technologies, and earnings. The venture capital party has been accompanied by initial public offerings (IPOs) of unequaled scale and unprecedented short-term success. Sector crowding by too many new entrants, aggravated by the awakening of once slumbering industry incumbents, subsequently swamped the e-health sector in red ink, dragged share prices down to small fractions of their post-IPO highs, and has culminated in a painful season of mergers and acquisitions. Eventually, of course, there will be no e-health sector. All of health care will embrace Internet technologies, and even the class of 2000 will be forced to earn real profits. In the meantime, however, the financing of the Internet sector provides unique insight into the dynamics of innovation, investment, competition, crash, and consolidation that are pushing health care from a yesteryear of professional guilds and nonprofit organizations to a turbulent tomorrow of entrepreneurial start-ups and publicly traded corporations.

This paper analyzes the short and violent history of capital finance in the health care Internet industry. It begins with private equity funding, including venture capital, angel investors, and strategic investments by technology firms that seek to enter the health care sector. I present data that document the phenomenal increase in venture funding for e-health, with comparisons to other health care services, medical devices, biotechnology, and pharmaceuticals. I then shift to the public capital markets, including initial public offerings and the subsequent stock price volatility of the twenty-six publicly traded e-health firms. The third section examines capital financing after the crash in e-health stock prices, including mergers, acquisitions, and leveraged buyouts. I conclude on a cautiously optimistic note. The e-health sector was romanced and then abandoned by the investment community and now stands at a critical juncture. The incumbent firms in health insurance and care delivery are restructuring to absorb or accommodate the innovators. Soon it will be impossible to distinguish an Internet health sector from a non-

Internet sector: All health will be e-health.

Private Equity For E-Health Start-Ups

■ **Venture capital.** Venture capital represents an organizational and financial innovation of the first order in the contemporary economy.[1] Historically, investment capital was raised by firms internally or from banking institutions that favored established enterprises with assets and earnings. Venture capital partnerships invest in businesses that are privately held, in the sense of not selling equity shares on public capital markets, with the intent of accelerating the evolution of those enterprises to an IPO or sale to an established publicly traded firm. The venture funds place one or more of their partners on the board of directors of the firm and assume an active role in running it. Venture funds present themselves as "smart money," offering management expertise; links to potential suppliers, distributors, and customers; and help toward ultimate liquidity through their relationships with investment bankers. A firm may go through several rounds of venture capital funding as it expands, often followed by a round of financing from a private equity (mezzanine) fund or strategic investor (for example, a technology firm such as Intel or Cisco Systems), before reaching the stock market or sale.

Freestanding venture capital partnerships emerged in the 1960s but only began growing exponentially in the 1990s, expanding their asset base from $2.6 billion in 1990 to $46.1 billion in 1999. Major venture investors include pension funds (23 percent), wealthy individuals (22 percent), charitable foundations and endowments (21 percent), and corporations (15 percent).[2]

The boom in new technologies and technology-based enterprises has been both cause and consequence of an equally remarkable boom in investment by risk-tolerant venture funds. Venture capital investments in U.S. industry increased from $11.5 billion in 1997 to $14.2 billion in 1998 and then to $35.6 billion in 1999.[3] The principal beneficiaries have been technology-intensive software, telecommunications, network infrastructure, and Internet-related retail firms. The rate of growth has accelerated, with the $14.7 billion investment made in the fourth quarter of 1999 exceeding those made in all four quarters of 1998, only to be surpassed in its turn by $17.2 billion in the first quarter of 2000. Investments in 766 Internet-related businesses, which cut across industry lines, accounted for $10.2 billion, 63 percent of the total—up from $1.8 billion in 250 Internet firms a year earlier.[4]

The health care sector has followed a trajectory similar to but somewhat less striking than the technology sector as a whole, since it contains a large component of old-economy enterprises such as hospitals, insurance firms, long-term care facilities, and physician

practices that venture capital firms will not touch. Indeed, the health care sector began 1999 with a skeptical financing outlook, since returns on health investments had been poor across the industry in previous years. Share prices on new (post-IPO) biotechnology and device firms declined by 28 percent and 32 percent, respectively, in 1998, while earnings and share prices in the various health service subsectors (investor-owned hospitals, managed care companies, PPM firms, nursing facilities, and home health services) crashed and burned throughout the period.[5] However, the advent of the health care Internet and the sharp biotech revival led to revision of prospects and reversal of fortune for the sector as 1999 progressed.

Exhibit 1 presents data on 1997–1999 total industry and health care sector venture capital funding from the three principal sources: PricewaterhouseCoopers (Moneytree), Reuters (VentureOne), and the National Venture Capital Association (VentureEconomics).[6] Moneytree and VentureOne use broadly similar methods and arrive at consistent aggregate figures, while VentureEconomics includes nonequity (debt) investments in pre-IPO firms and hence presents a much larger estimate.[7] All three sources indicate growth in both the service/device (including e-health, other service firms, and medical devices) and biotechnology (including pharmaceutical) sectors, al-

EXHIBIT 1
Venture Capital Investments In Health Care And Other Major Industries, Millions Of Dollars, 1997–1999

Industry	1997	1998	1999
All industries			
Moneytree	$11,482	$14,233	$35,592
VentureOne	11,532	14,562	37,358
VentureEconomics	–[a]	19,210	48,336
Health services and devices			
Moneytree	1,653	1,886	2,683
VentureOne	2,037	1,822	2,152
VentureEconomics	–[a]	2,392	2,457
Biotech and pharmaceutical			
Moneytree	916	927	1,206
VentureOne	792	1,000	1,237
VentureEconomics	–[a]	1,030	1,182
Software	2,398	3,516	6,593
Telecommunications	1,690	1,888	5,223
Networking and equipment	987	1,487	3,619
Retail and distribution	872	793	3,591
Other	2,966	3,736	12,677

SOURCES: Alternative sources of data on venture capital investments include PricewaterhouseCoopers (Moneytree survey), Reuters (VentureOne), and the National Venture Capital Association (VentureEconomics). Unless otherwise indicated, all data here are from the Moneytree survey.
[a] Not available.

though not anywhere near the scale of venture funding growth for the industry as a whole. The discrepancy derives in part from the aggregation of e-health with traditional health care firms within these broad categories.

Exhibit 2 presents quarterly investment data for all industries, all health care, and the five major health care sectors separately.[8] No trend in overall health care investments is discernable through the first quarter of 1999, at which point a clear acceleration begins, as total health-related investments doubled from $657 million to $1.2 billion over a twelve-month period. Investments in Internet-related health firms rose from a mere $49 million in the first quarter of 1999 to $335 million in the fourth and then declined slightly to $274 million in the first quarter of 2000. This shift was made possible by a reorientation of the venture capital firms that had specialized in health care, which had seen their traditional investment opportunities wither under the combined blows of the Balanced Budget Act (BBA) of 1997 and cost containment strategies by private purchasers. They embraced Internet technology by forming joint ventures with technology-oriented venture firms, coinvesting with technology-savvy individuals, and hiring staff with expertise in information technology (IT) and technology financing. This led to a displacement of non-Internet health services projects from the venture capital horizon.[9] Venture investments in non-Internet service firms declined modestly over the two-year period but rebounded in the first quarter of 2000. Venture capital funding of medical device firms doubled during this period, and, most spectacularly, investments in biotechnology firms more than tripled. The rise in e-health, remarkable though it was, did not keep pace with the economywide surge in venture capital investment. As a percentage of total venture funding, health care declined from 21.5 percent in the first quarter of 1998 to 15.2 percent in the first quarter of 1999 and then down to 7.0 percent in the first quarter of 2000.

EXHIBIT 2
Quarterly Venture Capital Investments In Internet And Other Health Care Firms, Millions Of Dollars, 1998–2000

	1998				1999				2000
Industry	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
All industries	$3,032	$3,753	$3,789	$3,659	$4,313	$7,646	$8,941	$14,691	$17,220
Health care (total)	653	715	596	744	657	855	736	1,052	1,203
Health care Internet	3	12	8	57	49	103	143	335	274
Health care services	298	286	245	242	238	264	305	157	249
Medical devices	168	199	178	191	223	209	230	397	350
Biotechnology	153	169	197	149	146	248	285	391	585
Pharmaceuticals	32	83	89	56	12	56	16	53	108

SOURCE: PricewaterhouseCoopers (Moneytree survey).

■ **Other private equity investors.** The financial returns accessible to investors in technology start-ups has created a giant sucking sound (to borrow from H. Ross Perot), heard from Wall Street to Main Street, that has drawn capital from private equity funds, financial institutions, nonfinancial corporations, and wealthy individuals who traditionally focused on less risky but also less lucrative opportunities. Most importantly, in terms of the financial resources potentially available to the Internet sector, leveraged buyout (LBO) funds are readjusting their emphasis from the purchase, dismemberment, and resale of undervalued rust-belt firms toward early-stage investments. Last year buyout funds as a group earned a return on investment of 26 percent, with the subset of mezzanine funds earning 8 percent; this contrasted unfavorably with the 146 percent return enjoyed by venture funds.[10] The smart money followed the trail to riches in response. In 1999 buyout firms raised $44.6 billion, down from $61.2 billion the prior year, while venture funds grew from $28.0 billion to $46.6 billion in new cash in that same period. The displacement of buyout by venture funds is especially striking when viewed over a longer perspective. In 1993, for example, buyout funds accounted for 56 percent of total private equity raised in the U.S. economy, while venture funds accounted for only 13 percent; by 1999 those relative positions had shifted to 41 percent and 43 percent, respectively. Total private equity funds expanded dramatically over the period, from $30 billion in 1993 to $108 billion in 1999.[11]

The displacement of buyout by venture funds reflects the contrasting foci of the two principal private equity organizations on firms at the end and at the beginning, respectively, of the industry life cycle. Generalizing broadly, outside financing of business firms begins with venture capital during infancy when assets, revenues, and earnings are few; moves to the public debt (bond) and equity (stock) markets as the industries mature; and then shifts to buyout funds as the industry declines and prospects for growth shift to other sectors.[12] Buyout firms earned fame and fortune through their assaults on overbuilt conglomerates during the 1980s but lost their luster as the U.S. economy emerged from this painful makeover into the technology-driven 1990s. They are moving earlier in the enterprise life cycle by forming partnerships with venture capital firms (such as the partnership between the nation's most prominent buyout firm, KKR, and one of the most prominent venture funds, Accel Partners) or by starting their own venture funds. By the beginning of 2000, 40 percent of LBO funds had made early- or expansion-stage capital investments, double the percentage of five years ago. In 1999 buyout funds invested 36 percent of their capital in these early- and expansion-stage firms.[13]

A variant on venture investments by LBO funds is the rapid entry by banks and large nonfinancial corporations into the Internet sector. Banks historically insisted on asset-based lending or at least a demonstrated track record of profitability and probity, characteristics noticeably lacking in the contemporary speculative fever. Now, however, banking conglomerates have leaped into venture funding with both feet, starting their own early-stage funds and partnering with established Silicon Valley enterprises. The venture capital division of Chase Manhattan Bank, for example, was the largest venture capital investor in the economy in the first quarter of 2000, sprinkling $289 million across forty-five Internet start-ups.[14]

Large nonfinancial corporations, especially the "old-new" technology firms such as Intel and Cisco, have invested so heavily in Internet start-ups that their own stocks are considered in financial circles as having some of the characteristics of technology-sector mutual funds. These corporate investors expect to share in the outsize financial returns available to Internet start-ups but also seek synergistic benefits by grafting new ideas and products from the entrepreneurial vanguard onto their own comparatively stable and hence risk-averse systems.[15] Their investments are not restricted to privately held Internet start-ups but include direct investments in publicly traded firms. For example, InfoCure, a physician practice management and application service provider, in May 2000 received a $13 million investment by Microsoft and two other firms, building on a $10 million investment by Healtheon/WebMD two months earlier.[16] Healtheon/WebMD, in its turn, had received $960 million in a private placement from the Janus family of mutual funds, the largest secondary capital financing of any e-health firm.[17]

The movement by buyout funds, banks, and nonfinancial corporations into start-up enterprises has been mirrored by the eager movement of wealthy individuals into the venture arena that once was dominated by institutional investors. Venture capital partnerships, buyout firms, and other private equity funds increasingly are accepting investments by individuals and families made wealthy by the technology boom or simply bored with keeping Daddy's money in Daddy's bank. Investments by individuals and families through venture capital funds rocketed from $690 million in 1996 to $10.1 billion in 1999.[18] Individuals investing through established private equity funds often are hammered by high management fees, however, as the funds shift the fixed costs of operations onto the eager innocents to the benefit of the dominant pension and endowment funds.[19] The hottest new form of Internet speculation by individuals, therefore, is through direct personal investments into very early stage firms whose product is too ephemeral and business plan too

"While hospitals, health plans, and other old-economy firms were being shunned by Wall Street, e-health firms raised $1.53 billion."

effervescent even for the venture capitalists. The never-ending technology revolution has spawned innumerable multimillionaires with Internet expertise, disposable income, and a fascination for being part of the new new thing. These angel investors typically invest $25,000–$250,000 in concept-stage firms, allowing nascent enterprises to further develop their products and processes, and hence raise their valuations, prior to seeking formal venture capital funding. Individual angels flock together in clubs, modeled on the 100-member Band of Angels in Silicon Valley, that now are to be found in every metropolitan area with any significant technology-based industry. To the extent that these clubs invest collectively, their placements can reach $5 million and beyond, rivaling those of formal venture capital partnerships.[20] By one estimate, the angel community nationwide includes one million persons who have invested $20 billion in 30,000 technology startups.[21]

E-Health In The Public Capital Markets

■ **The initial public offering.** The decision to sell ownership shares to the investing public is a key moment of maturation in the life of the growth-oriented business. The advantages of a successful public offering are immediate and obvious; the potential disadvantages are more subtle. A successful IPO dramatically reduces the cost of capital for a growing firm, compared with the alternatives of continued reliance on venture capitalists or payment of the ever steeper risk premiums demanded by banks or bondholders. Publicly traded stock can be used as currency in its own right, acceptable in lieu of cash by managers, directors, and even rank-and-file employees made giddy by stories about Microsoft millionaires. Shares can function as currency for mergers and acquisitions and, especially in the Internet sector, may be accepted by suppliers, distributors, landlords, attorneys, and accountants. The IPO provides the exit opportunity for angels and venture capitalists, the anticipated liquidity event that brought their money and management into the firm in the first place. Perhaps most importantly, over the long term, public share ownership raises the performance bar for firms that now are subject to quarterly reports by investment analysts and daily votes of confidence by investors of every description. The disadvantages of public ownership include the nontrivial transaction costs, as the investment bankers collect 7 percent of IPO proceeds and miscellaneous

fees absorb another 2 percent. The IPO and subsequent market oversight can distract management from its core business processes and lead to an undue emphasis on short-term performance and creative accounting gimmicks to sustain price momentum. Over the long term, public stock ownership means that a firm is continually in play, always potentially subject to a friendly or hostile takeover by a competitor, collaborator, or buyout fund that believes the firm to be undervalued and its management to be expendable.

The health care sector lagged behind the larger economy in spawning Internet-based start-ups and then launching them into the public capital markets, with only one IPO in 1998, but leaped in as the market for new Internet funding became ever more frenzied. In 1999 twenty-one health-related firms (not counting biotechnology enterprises) went public, achieving stellar reception and post-IPO price growth. Exhibit 3 presents data on all e-health firms that

EXHIBIT 3
Initial Public Offerings (IPOs), Capital Raised, And Share Prices For Publicly Traded E-Health Firms, 2000

Firm	Stock ticker	IPO date	IPO proceed (millions)	IPO share price	52-week price high
Allscripts	MDRX	7/23/99	$112.0	$16	$ 89.6
CareInsite	CARI	6/15/99	102.0	18	88.0
Claimsnet.com	CLAI	4/6/99	20.0	8	19.1
Cybear	CYBA	6/18/99	48.0	16	53.0
Data Critical	DCCA	11/8/99	40.0	10	50.8
drkoop.com	KOOP	6/8/99	84.4	9	45.8
drugstore.com	DSCM	7/28/99	90.0	18	70.0
eBenX	EBNX	12/10/99	100.0	20	79.0
HealthCentral.com	HCEN	12/7/99	82.5	11	14.4
Healtheon/WebMD	HLTH	2/11/99	40.0	8	126.2
HealthExtras	HLEX	12/14/99	60.5	11	12.4
HealthGate	HGAT	1/26/00	41.3	11	15.3
HealthStream	HSTM	4/10/00	45.0	9	11.0
Landacorp	LCOR	2/9/00	35.0	10	21.8
Medscape	MSCP	9/28/99	52.8	8	17.1
MedicaLogic	MDLI	12/10/99	90.1	17	54.0
Mediconsult	MCNS	4/6/99	65.0	13	23.9
MotherNature.com	MTHR	12/10/99	53.3	13	14.6
Neoforma.com	NEOF	1/24/00	91.0	13	78.8
OnHealth	ONHN	9/2/99	64.3	21	22.8
PlanetRx	PLRX	10/7/99	96.0	16	36.5
SciQuest.com	SQST	11/19/99	127.0	16	91.6
TriZetto	TZIX	10/8/99	37.8	9	91.3
Ventro	VNTR	7/27/99	112.5	15	243.5
VitaminShoppe.com	VSHP	10/8/99	50.0	11	19.4
XCare.net	XCAR	2/10/00	90.0	18	42.0

SOURCES: PricewaterhouseCoopers Securities; SG Cowen Securities; and company documents/Web sites; all data were accurate as of September 2000.

went public in 1999 and the first half of 2000. The class of 1999 and 2000 spanned the range of business models, including consumer information sites such as drkoop.com and OnHealth, retail commerce firms such as PlanetRx and drugstore.com, supply-chain organizers such as Ventro and TriZetto, and connectivity (patient, physician, plan, purchaser) enterprises such as Healtheon/WebMD and MedicaLogic. In this period, when hospitals, health plans, and other old-economy firms were being shunned by Wall Street, e-health firms raised $1.53 billion. Even more spectacular was the post-IPO rise in share prices, as the investing public salivated at the prospect of rationalizing the nation's largest and least efficient industry. Every e-health firm experienced price surges that were respectable by historical standards, and many achieved run-ups nothing short of spectacular. Share prices increased most for Ventro (1,520 percent), Healtheon/WebMD (1,480 percent), TriZetto (910 percent), Neoforma.com (500 percent), SciQuest.com (470 percent), Allscripts (460 percent), drkoop.com (400 percent), CareInsite (390 percent), and drugstore.com (340 percent).

The IPO fever of 1999, which extended across the Internet economy, carried over into the first months of 2000, as technology-based share prices repeatedly broke historical benchmarks. The Internet sector as a whole spawned seventy-six IPOs in the first quarter, including four e-health enterprises.[22] Venture capitalists partied harder, led by the diversified Mayfield Fund (424 percent return on investment), Goldman Sachs (412 percent), and Intel's venture division (357 percent).[23] The old health economy was financially battered and politically besieged; the new health economy was exuberant.

■ **The aftermarket.** The Internet industry bore the brunt of the market volatility that closed out the first quarter of 2000, with dramatic pricing plunges that cut enterprise values in half or more, followed by rebounds that restored some of the lost value to the leading technology firms. E-health firms followed the industry leaders down but missed the rebound. They had enjoyed rising revenues but suffered mounting losses, and the investment community could not discern a plausible path to profitability. Investors' interest had shifted from the consumer-oriented (so-called b-to-c) and intermediate business-oriented (so-called b-to-b) sectors, both of which contained many e-health firms, to the Internet infrastructure sector (for example, fiber optics, wireless, and broadband), which contained no publicly traded e-health firms. Biotechnology took a major hit but then rebounded, as investors displayed confidence that underlying scientific breakthroughs will result in blockbuster new pharmaceuticals. By the end of May 2000 Internet health care share prices were moribund, and the IPO window was closed.

Exhibit 4 presents data on growth in revenues and financial losses from the fourth quarter of 1999 through the first quarter of 2000 for twenty-six publicly traded e-health firms. Revenue growth was respectable for most firms, although inflated through mergers and acquisitions. More striking, however, was the ballooning of losses across the sector, as costs accelerated faster than income. Of particular concern was the $431 million first-quarter loss at Healtheon/WebMD, the sector's new new thing whose financial performance was beginning to resemble that of the old old stalwarts. Exhibit 4 also documents the collapse in share prices. By June 2000 twenty-one firms were trading more than 80 percent below their fifty-two-week high point, and twenty-three were trading below their IPO price. The crash spanned the spectrum of prominent names and business models, including drkoop.com (97.3 percent below high), PlanetRx (93.2 percent), Neoforma.com (89.9 percent), and MedicaLogic (85.1 percent).

EXHIBIT 4
Post-IPO Performance Of Publicly Traded E-Health Firms: Revenues, Losses, And Share Prices, 1999–2000

Firm	Revenues (thousands)		Losses (thousands)		Post-IPO price		
	Q4 1999	Q1 2000	Q4 1999	Q1 2000	Amount	As percent of IPO	As percent of high
Allscripts	$ 8,191	–[a]	$ 4,971	–[a]	$28.30	176.6%	31.5%
CareInsite	1,501	–[a]	12,120	–[a]	15.00	83.3	17.0
Claimsnet.com	201	$ 280	2,389	$ 1,934	2.70	33.6	21.3
Cybear	151	231	4,266	6,609	3.40	21.1	8.2
Data Critical	3,632	3,705	1,278	2,021	6.40	73.7	12.6
drkoop.com	5,098	4,743	19,874	24,757	1.30	13.9	2.7
drugstore.com	18,488	22,738	43,505	49,482	6.10	33.9	8.7
eBenX	5,780	5,575	2,325	1,785	13.63	85.2	17.2
HealthCentral.com	700	1,300	13,893	23,200	3.81	34.7	26.5
Healtheon/WebMD	33,241	65,881	234,749	431,465	12.56	157.0	12.7
HealthExtras	2,733	5,253	4,709	6,646	3.81	34.7	30.8
HealthGate	1,506	2,533	6,610	9,462	2.69	14.4	17.6
HealthStream	–[a]	1,445	–[a]	3,504	3.75	41.7	34.1
Landacorp	2,243	2,412	947	2,056	3.50	35.0	16.1
Medscape	4,018	6,009	23,257	23,687	8.06	–[a]	–[a]
MedicaLogic	6,615	5,608	13,137	14,726	8.06	47.3	14.9
Mediconsult	2,647	6,224	11,370	20,538	1.60	12.4	9.9
MotherNature.com	3,179	4,100	25,322	16,500	1.60	12.3	10.9
Neoforma.com	1,004	1,206	51,020	31,977	7.90	61.1	10.1
OnHealth	1,981	2,664	18,720	21,877	2.00	29.9	14.3
PlanetRx	5,101	8,773	51,204	49,636	2.50	15.4	6.8
SciQuest.com	2,639	5,103	8,677	14,260	7.00	43.7	7.6
TriZetto	11,192	17,700	5,032	–[a]	12.60	59.7	13.8
Ventro	19,279	23,288	15,259	24,100	15.00	100.0	6.2
VitaminShoppe.com	5,592	9,333	19,168	10,087	2.60	23.9	13.5
XCare.net	2,199	2,852	1,012	3,203	6.00	33.3	14.3

SOURCES: PricewaterhouseCoopers Securities; SG Cowen Securities Corporation; and company documents/Web sites.
NOTES: IPO is initial public offering. Medscape merged with MedicaLogic and has ceased being traded as an independent entity. Post-IPO share price measured at market close, 26 May 2000.
[a] Not available.

Consolidation

■ **Mergers and acquisitions.** As adolescent industries approach maturity, they typically consolidate through mergers and acquisitions that increase the scale of the incumbents and decrease the number of challengers. Consolidation is driven in part by the search for efficiencies, diversification, and pricing leverage and in part by management self-aggrandizement. Mergers and acquisitions hurt rather than help if consolidation proceeds too far and results in slow-moving, unfocused, and overleveraged conglomerates, as has been illustrated recently in the hospital, physician, and managed care sectors. The Internet industry generally and the e-health sector specifically have plunged into mergers with alacrity, for the usual reasons, and have experienced in their brief maturity the usual mixed effects.

Corporate consolidation comes in three dimensions: horizontal, vertical, and conglomerate. Horizontal mergers and acquisitions between firms with similar products are designed to achieve economies of scale through high-volume units of production, lower input costs through volume purchasing, and the spreading of fixed administrative and marketing costs over a larger sales base. To the extent that horizontal consolidation narrows the field to a single player (monopoly) or a small and cooperative number of players (collusive oligopoly), it offers the additional potential for increased pricing power. In the software and Internet sector, it is widely believed that leading firms enjoy potentially insurmountable first-mover advantages as customers flock to the one leading Web site in each subsector.[24] These purported "network externalities" undergird the enthusiastic valuations for real and wannabe monopolists such as Microsoft, Amazon.com, and eBay. They explain part of the portfolio strategy of Healtheon/WebMD, which singlehandedly accounted for four of the largest twenty-five mergers and acquisitions across the entire Internet economy as it sought to acquire leading competitors such as CareInsite and Envoy.[25]

The most important form of consolidation, in e-health as elsewhere, is not merger between similar firms in similar industries but, rather, firms with different but complementary products, technologies, suppliers, distributors, and customers. Diversification through acquisition is driven in anticipation of economies of scope: the ability to produce and market multiple services simultaneously at lower cost than can be achieved by different firms offering those services independently. Historically, economies of scope were obtained by firms with physical assets or inputs that could be deployed for multiple products, such as metal stamping machinery for both cars

and trucks or petroleum derivatives for both paints and solvents.[26] Having multiple products offers the side benefit, in some instances, of revenue streams that complement each other in seasonality, volatility, and predictability, thereby smoothing the aggregate financial performance of the enterprise. In the information economy, economies of scope are to be derived primarily from the extension of existing brand names to new products and of intellectual property (whether patented or not) to new processes.[27] Most of the announced mergers and acquisitions within the e-health sector must be interpreted as efforts at diversification and hence pursuit of synergies, since they cross product and service lines with abandon. Healtheon/WebMD is the sector leader, beginning with the merger of the two title firms (Healtheon focused on plan/provider connectivity, WebMD on physician content) and extending into consumer content provision (OnHealth) and office software (Medical Manager). The merger between the electronic medical record (EMR) firm MedicaLogic and physician content provider Medscape falls into this category, as does the aborted merger between the business-to-business firm Neoforma.com and integration systems vendor Eclipsys. The third form of consolidation, vertical integration among firms and their upstream suppliers or downstream distributors, has been rare in the e-health sector, as it has been elsewhere.

Venture capitalists are generally happy to exit some of their investments through merger with or acquisition by an established firm. In 1999, 209 venture-backed start-ups were sold for a total price of $36 billion, outpacing the 269 venture-backed firms that raised $21 billion at IPO. The first quarter of 2000 saw fifty-five merger and acquisition announcements valued at $13.1 billion, including prominently featured health care deals.[28] The volatility in e-health share prices has wreaked havoc on these consolidation strategies, however. All of the announced mergers were to be financed by the sky-high shares of the acquiring firms, shares that lost four-fifths of their value in less than a month and show no immediate signs of revival. In principle, a market meltdown that reduced all firms' share prices equally would not affect stock-for-stock mergers, since relative valuations would not be affected. Not only are relative valuations typically disturbed, but precipitously declining share prices place new financial pressures on their victims, who now must pay suppliers, distributors, and managerial employees with real dollars. Most of the major e-health mergers and acquisitions have undergone public debate, and prospects are strong for their unraveling. Neoforma.com backed out of its Eclipsys and HEALTH*vision* acquisitions, TriZetto settled for a subsidiary rather than all of IMS Health, and acrimony surrounds some of the largest possible acqui-

"The e-health sector can expect a bounce after some participants boost their revenues, trim their costs, and report a profit."

sitions at Healtheon/WebMD and MedicaLogic.[29]

■ **Leveraged buyout.** Plummeting share prices create a buying opportunity for anyone who can pay with anything but now devalued stock. One of the least-expected developments in the Internet, and by extension the e-health, economy has been the creation of new LBO funds targeted at undervalued firms in the technology industries rather than their traditional clients in the rust-belt sector. Conventional wisdom in finance circles places LBO funds at the opposite end of the spectrum from venture funds, with the former focused on cash-rich but growth-limited firms in declining industries and the latter in cash-poor but growth-unlimited firms in emerging sectors. The decade-long boom in technology start-ups has produced, however, a sizable number of software and information infrastructure firms whose share prices are languishing as investors have moved on to the newer new thing. Of the 1,000 technology firms that have gone public since 1990, 200 endure price/earnings multiples below 20, which relegates them to old-economy oblivion, and 300 trade at levels below their IPO price.[30] These anomalies have not escaped attention in the private equity community.

Technology-oriented LBO funds are now being sponsored by traditional private equity firms in collaboration with venture capital partnerships and investment banks. The first buyout fund focused exclusively on the technology sector, for example, is raising $1 billion from an entity associated with prominent Silicon Valley venture fund Kleiner, Perkins, Caulfield, and Byers. Technology-focused buyout funds also are being established by LBO veterans such as Bain Capital, the Sprout Group (Donaldson, Lufkin, and Jenrette), and the Texas Pacific Group.[31] Prospects for a full-fledged buyout of major Internet sectors are slim, however, not merely because the industry is young but because the conventional financial instruments of the buyout specialists have their own difficulties. The high-yield (junk bond) debt market is in a slump comparable to its Waterloo of 1991, with 1999 seeing a high default rate and continued withdrawal of investment funds despite record-high interest rates. Junk bond sales declined from $140 billion in 1998 to $90 billion in 1999 and are expected to bring in no more than $60 billion in 2000.[32]

The End Of The Beginning

Normal people tend to overestimate the short-term impact of new

technologies and underestimate their long-term impacts. Angel investors, venture capitalists, investment bankers, and leveraged buyout managers are just like normal people, only more so. Their exuberant embrace of Internet technology, heralded as the greatest revolution since the telephone or the railroad or the advent of civilization, spilled over to the health care sector and created a gold-rush atmosphere in one corner of an otherwise morose industry. The Internet-wide retrenchment hit the e-health sector especially hard, driving share prices down to small fractions of last year's highs and putting a deep chill on further public offerings. The pipeline of proposed e-health IPOs is full, but most candidates are being pulled back and kept private until market temperatures rise again. Even health care firms whose venture funding levels stunned the industry in 1999, including Pointshare, eHealthInsurance.com, and medibuy.com, appear to have missed their best opportunities and must wait in capital limbo.[33] Investment pundits who touted e-health firms as carving up a monster market of $350 billion in administrative waste and unnecessary care now mutter darkly and downgrade erstwhile favorites.

As with most technology-related economic fluctuations, the e-health sector can expect a bounce after some participants boost their revenues, trim their costs, and report something that looks like a profit. The e-health rebound may come later and lack the luster of other sectors, however, because of the peculiar payment mechanisms that dominate in health care. Managed care firms have already learned, to their dismay, the difficulties in seeking to appropriate as profit the funds now subsidizing unneeded hospital beds or unjustified variations in clinical practice styles. The federal Medicare program, state Medicaid programs, and employer benefit programs have learned how to stanch the flow of dollars into the industry through administered pricing and hard-nosed negotiating. The venture capitalist's dictum, in searching for the next start-up with an unlimited upside, is to go where the pain is greatest. Health care is writhing in pain, but every patient, physician, facility, insurer, supplier, broker, and litigator feels entitled to keep what is in hand and demand full recompense for the undertreatment, underfunding, and underappreciation of years past.

THE HEALTH CARE INTERNET INDUSTRY stands at the end of its beginning. The original goals of consumer empowerment and provider connectivity remain as valid as ever, but the road to that brave new world will be longer and more circuitous than imagined. The incumbent firms in the hospital and insurance sectors have been roused by the rhetoric of disintermediation and

are restructuring themselves to repel, absorb, or accommodate the innovators. Business-to-business health care markets are being established by conglomerates of conglomerates, such as the supply exchange launched by Johnson and Johnson, GE Medical, Abbott, Baxter International, and Medtronic, and through joint ventures between new-economy and old-economy firms, such as those linking Ventro and Tenet; medibuy.com and Premier; and Neoforma.com, the Veterans Health Administration, and the University HealthSystem Consortium. The MedUnite alliance of Aetna, CIGNA, Foundation Health Systems, WellPoint, PacifiCare Health Systems, and Oxford Health Plans promises to enhance plan/provider connectivity in opposition to, or perhaps in cooperation with, Healtheon/WebMD. Hospitals, universities, multispecialty clinics, and other organizations with regional brand names are seeking to channel the flood of cyberchondriacs through their Web sites and away from drkoop.com. In very short order, it will be impossible to quantify or even conceptualize an Internet health sector separate from a non-Internet sector. The venture capitalists will have accomplished their mission and moved on.

NOTES

1. For an introduction to the venture capital literature, see H. Chesbrough, "The Structure and Governance of Venture-Capital Organizations," *Journal of Financial Economics* 27, no. 2 (1990): 473–521; and J. Lerner, "Venture Capitalists and the Oversight of Private Firms," *Journal of Finance* 50, no. 1 (1995): 301–318.
2. S. Neidorf, "Pension Money Fuels VC Funds," *SiliconValley.com*, 14 May 2000, <www.mercurycenter.com/svtech> (15 May 2000); and "Venture Capital Funds Raise a Record $46.55 Billion in 1999," *Venture Economics News*, 27 March 2000, <www.ventureeconomics.com> (15 May 2000).
3. PricewaterhouseCoopers, *Moneytree U.S. Report, Full Year and Q1 1999 Results*, <www.pwcmoneytree.com> (15 May 2000).
4. PricewaterhouseCoopers, *Moneytree Current Quarter, Highlights Q1 2000*, May 2000, <www.pwcmoneytree.com> (15 May 2000).
5. "Investors Launch into the New Year Armed with Bitter Lessons of '98," *Venture Capital and Health Care* 3, no. 1 (1999): 1, 18–21; and Cain Brothers, "Is the Sky Falling? Capital Leaves Health Care; Strategies for Managers," *Strategies in Capital Finance* (Spring 2000).
6. PricewaterhouseCoopers, *Moneytree U.S. Report, Full Year and Q1 1999 Results*; PricewaterhouseCoopers Securities and Shattuck Hammond Partners, *Healthcare Venture Capital Report, Topline Results 1999*, <www.pwcmoneytree.com> (15 May 2000); VentureOne Corporation (San Francisco, Calif.), a subsidiary of Reuters, <www.ventureone.com> (15 May 2000); and National Venture Capital Association (Arlington, Va.), <www.ventureeconomics.com> (15 May 2000).
7. For a comparison of the three venture capital data sources, see M.A Mowrey, "Financial Spotlight: Inside the Dot-Com VC Billions," *Standard*, 21 February 2000, <www.thestandard.com/research/metrics/display/0,2799,11392,00.html> (15 May 2000).
8. Moneytree is the only data source that permits disaggregation by health care subsector.

9. T. Salemi, "Internet Driving Shift in Thinking among Health Care Venture Firms," *Venture Capital and Health Care* 3, no. 1 (1999).
10. "Triple Digit Returns for 1999 Year-End: Have VC's Seen the Top?" *Venture Economics News*, 1 May 2000, <www.ventureeconomics.com> (15 May 2000).
11. "Venture Capital Funds Raise a Record $46.55 Billion in 1999."
12. J.C. Robinson, "Capital Finance and Ownership Conversions in Health Care," *Health Affairs* (Jan/Feb 2000): 56–71.
13. S. Gandel, "Less Leverage: Ex-LBO Players Now Race to Fund Tech," *Crains New York* 16, no. 15 (2000): 1, 50; and C. Fanelli, "Getting Some of the Action: The IT Craze Has Led a Growing Number of Buyout Firms to Partner with VCs," *Venture Capital Journal* (1 May 2000).
14. M. Liedtke, "New Survey Shows Big Corporations Get Venture Capital Fever," Associated Press (15 May 2000).
15. J. Birger, "Intel Way Inside: How Intel Is Using Its Venture Arm to Get an Edge in the Post-PC World," *Red Herring* (June 2000): 344–352.
16. InfoCure, "InfoCure Reports Signing of Strategic Partnerhips," press release, 4 May 2000, <www.infocure.com> (15 May 2000).
17. A. Lucchetti, "Stake in Healtheon Hurts the Performance of Three Janus Funds," *Wall Street Journal*, 10 April 2000, C1.
18. Neidorf, "Pension Money Fuels VC Funds."
19. J.M. Clash, "By Invitation Only," *Forbes* (17 April 2000): 446–450.
20. "Finance," *Red Herring*, 19 April 2000, <www.redherring.com> (15 May 2000).
21. S. Lajoie, "Cities of Angels," *Forbes ASAP* (3 April 2000): 146–150.
22. M.A. Mowrey, "Q1: Powering into 2000," *Industry Standard*, 3 April 2000, <www.thestandard.com> (15 May 2000).
23. "Q1 U.S. Venture-Backed IPOs Account for Majority of U.S. IPOs," *Venture Economics News*, 10 April 2000, <www.ventureeconomics.com> (15 May 2000).
24. C. Shapiro and H.R. Varian, *Information Rules: A Strategic Guide to the Information Economy* (Cambridge, Mass.: Harvard Business School Press, 1999).
25. Mowrey, "Q1: Powering into 2000."
26. A.D. Chandler, *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge, Mass.: Harvard University Press, 1990).
27. D.J. Teece, "Capturing Value from Knowledge Assets," *California Management Review* 40, no. 3 (1998): 55–79.
28. "Q1 Venture-Backed M&A Deals Continue on Record-Setting Pace," *Venture Economics News*, 27 April 2000, <www.ventureeconomics.com> (15 May 2000).
29. R. McGough and A. Carrns, "Airling Stocks Land E-Health Companies in Sick Bay," *Wall Street Journal*, 10 April 2000, C1; and S.G. Cowen Securities Corporation, *The Week in E-Health* (weekly editions).
30. "As Technology Industry Matures, Firms See Buyout Opportunities," *Private Equity*, <www.assetnews.com> (10 May 2000).
31. Ibid.; and M.B. Grover, "Technoleverage," *Forbes* (29 May 2000): 202–204.
32. G. Zuckerman, "Junk Bonds, Like Stocks, Are Having Problems as Investors Fret over Defaults and Downgrades," *Wall Street Journal*, 17 April 2000, C23.
33. As of the beginning of May 2000 thirteen e-health firms had filed for IPOs, proposing to raise $995 million, but most were being rescheduled or were considering indefinite postponement. *The Week in E-Health* (5 May 2000); and J. Ravinovitz and M.A. Mowrey, "IPO Market Unravels," *Industry Standard*, 29 May 2000, <www.thestandard.com> (15 May 2000).