

“Clayton Christensen has done it again, writing yet another book full of valuable insights . . .
The Innovator’s Prescription might just mark the beginning of a new era in healthcare.”

—MICHAEL BLOOMBERG, Mayor, New York City

The Innovator’s Prescription

A Disruptive Solution for Health Care



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Introduction

In 1970 the cost of health care in the United States accounted for approximately 7 percent of gross domestic product. In 2007 it accounted for 16 percent of America's GDP. Normally, we view it as good news when an industry gains "share of wallet" in such a manner because it indicates that enterprises are making products or services that customers value and seek to purchase. At one level, therefore, we ought to be treating the fact that Americans are spending more of their income on health care as good news. They value good health. They're certainly better off spending it on health than many other diversions. But at another level this news is terrifying. We note just four frightening factors.

1. The growth in health-care spending in the United States regularly outpaces the growth of the overall economy. Over the last 35 years, while the nation's spending on all goods and services has risen at an average annual rate of 7.2 percent, the amount spent on health care has grown at a rate of 9.8 percent.¹ As a consequence, an increasing proportion of Americans simply cannot afford adequate care. Many efforts

- to contain overall costs have the effect of making care inaccessible on a convenient and timely basis for *all* of us—even for those who can pay for it.
2. Second, if federal government spending remains a relatively constant percentage of GDP, the rising cost of Medicare within that budget will crowd out all other spending except defense within 20 years.²
 3. The third factor that engenders fear is that the burden of covering the costs of health care for employees, retirees, and their families is forcing some of America's most economically important companies to become uncompetitive in world markets. Health-care costs add over \$1,500 to the cost of every car our automakers sell, for example.
 4. The fourth frightening factor, about which few people are aware, is that if governments were forced to report on their financial statements the liabilities they face resulting from contractual commitments to provide health care for retired employees, nearly every city and town in the United States would be bankrupt. There is no way for them to pay for what they are obligated to pay, except by denying funding for schools, roads, and public safety, or by raising taxes to extreme levels.³

Health care is a terminal illness for America's governments and businesses. We are in *big* trouble.

The rest of the world isn't far behind. Nationalized health systems such as those in Canada and the United Kingdom generally seem good at making everyday care conveniently accessible to most people. Some appear to maintain a better balance between general and specialty care than the United States. However, budget limitations continue to result in long lines for specialty services and technologically advanced care.⁴ The straits in which Canada's public, paid-for system finds itself, for example, prompted Chief Justice Beverly McLachlin of the Supreme Court of Canada to opine in 2005 that "access to a waiting list is not access to health care."⁵ Even in the U.K., where the National

Health Service has made impressive strides in cutting wait times and upgrading facilities, the dramatically increased cost has not been offset by improved productivity.⁶

We look to each other for answers that nobody seems to have. Even while many Americans have begun to look to a single-payer, government-controlled health system as an answer to the crisis in the United States, some governments with nationalized systems have recently introduced competing private insurance plans that offer their citizens a wider array of choices. And in developing countries, the notion of somehow replicating the systems of the developed world is simply unthinkable. Their only option seems to be adequate care for the rich and little for everyone else.

The U.S. system's cost is fueled by a runaway reactor called fee-for-service reimbursement. It has taught us that the economist Jean Baptiste Say was right, at least for this industry: when caregivers make more money by providing more care, supply creates its own demand. By some estimates, a percent of health care consumed seems to be driven by physician and hospital supply, not patient need or demand.⁷

Those fighting for reform have few weapons for systemic change. Most can only work on improving the cost and efficacy of their piece of the system. There are very few system architects among these forces that have the scope and power of a commanding general to reconfigure the elements of the system.

Perhaps most discouraging of all, however, is that there is no credible map of the terrain ahead that reformers agree upon and trust. They are armed with data about the past, and they have become accustomed to reaching consensus for action when the data are conclusive. But because there are no data about the future, there is no map available to convincingly show these reformers which of the pathways ahead of them lead to a dead end and which constitute a promising road to reform. And few have a sense for the interconnectedness of these pathways. As the prophet of Proverbs said, "Where there is no vision, the people perish."⁸

So why this book? There is little dispute that we need a system that is competitive, responsive, and consumer-driven, with clear

metrics of value per dollar being spent.⁹ Our hope is that *The Innovator's Prescription* can provide a road map for those seeking innovation and reform—an accurate description of the terrain ahead, about which data are not yet available. Much of today's political dialogue on health-care reform centers on how to pay for the cost of health care in the future. This book offers the other half of the equation: how to innovate to reduce costs and improve the quality and accessibility of care. We don't simply ask how we can *afford* health care. We show how to make it *affordable*—less costly and of better quality.

Almost every day somewhere in the United States, a group of health-care reformers convenes a conference. We've attended many of these. Almost without exception the participants talk past each other. This one focuses on the uninsured poor, that one on prescription coverage for the elderly, another on overuse of expensive diagnostics technology, and still someone else on the cost of end-of-life care. Someone decries the perversions of fee-for-service reimbursement, while someone else bewails the failings of capitation.

They talk past one another because they don't share a common language and a common understanding of the root causes of these problems. Unable to agree on the problem, and without a language for understanding one another, they find it impossible to articulate and agree upon promising solutions. We hope this book helps these reformers understand the root causes of America's health-care malaise so they can frame solutions that stanch the problems at their source. And we hope to give them a common language so that we understand one another and can work cooperatively.

The approach we take in *The Innovator's Prescription* is unique. We have not studied health care to derive solutions for health care. Rather, our aim is to examine this industry through the lenses of general models of managing innovation that have emerged from 20 years of studying these problems at the Harvard Business School and the Kennedy School of Government at Harvard. These models have been insightfully applied to industries as diverse as national defense, automobiles, financial services, tele-

communications, computer hardware and software, public education, and steel. They have been used to help entire national economies remain competitive and prosperous. They have helped companies innovate in industries that are heavily regulated, as well as in those that are not. We use these models in this book first to explain the root causes for why health care has become progressively expensive and inaccessible. With the causes of these problems defined, we then draw upon these models to show how to solve them.¹⁰

What follows is a summary of our primary assertions, in order to give our readers a road map of sorts for this book. The subsequent chapters then offer deeper analyses of the problems and solutions, from as many perspectives as possible.

AFFORDABILITY AND CONVENIENT ACCESSIBILITY

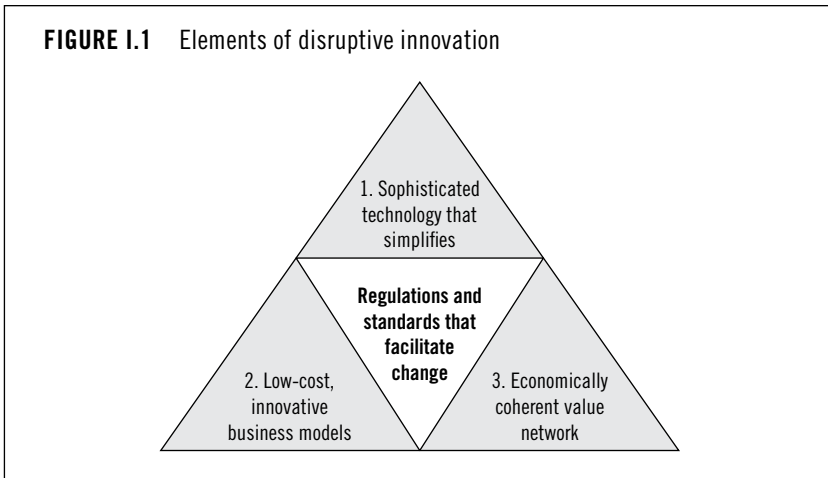
The problems facing the health-care industry actually aren't unique. The products and services offered in nearly every industry, at their outset, are so complicated and expensive that only people with a lot of money can afford them, and only people with a lot of expertise can provide or use them. Only the wealthy had access to telephones, photography, air travel, and automobiles in the first decades of those industries. Only the rich could own diversified portfolios of stocks and bonds, and paid handsome fees to professionals who had the expertise to buy and sell those securities. Quality higher education was limited to the wealthy who could pay for it and the elite professors who could provide it. And more recently, mainframe computers were so expensive and complicated that only the largest corporations and universities could own them, and only highly trained experts could operate them. (We will come back to this last example, below.)

It's the same with health care. Today, it's very expensive to receive care from highly trained professionals. Without the largesse of well-heeled employers and governments that are willing to pay for it, most health care would be inaccessible to most of us.

At some point, however, these industries were transformed, making their products and services so much more affordable and accessible that a much larger population of people could purchase them, and people with less training could competently provide them and use them. We have termed this agent of transformation *disruptive innovation*. It consists of three elements (shown in Figure I.1).

1. **Technological enabler.** Typically, sophisticated technology whose purpose is to simplify, it routinizes the solution to problems that previously required unstructured processes of intuitive experimentation to resolve.
2. **Business model innovation.** Can profitably deliver these simplified solutions to customers in ways that make them affordable and conveniently accessible.
3. **Value network.** A commercial infrastructure whose constituent companies have consistently disruptive, mutually reinforcing economic models.¹¹

In the middle of these three enablers are a host of regulatory reforms and new industry standards that facilitate or lubricate



interactions among the participants in the new disruptive industry.

To illustrate how these enablers of disruptive innovation can combine to transform a high-cost, expertise-intensive product into one that is much more affordable and simple, let's briefly review how it transformed digital computing.

The Computer Revolution

Until the 1970s there were only a few thousand engineers in the world who possessed the expertise required to design mainframe computers, and it took deep expertise to operate them. The business model required to make and market these machines required gross profit margins of 60 percent just to cover the inherent overhead. The personal computer disrupted this industry by making computing so affordable and accessible that hundreds of millions of people could own and use computers.

The technological enabler of this disruption was the microprocessor, which so simplified the problems of computer design and assembly that Steve Wozniak and Steve Jobs could slap together an Apple computer in a garage. And Michael Dell could build them in his dorm room.

However, by itself, the microprocessor was not sufficient. IBM and Digital Equipment Corporation (DEC) both had this technological enabler inside their companies, for example. DEC eschewed business model innovation and tried instead to commercialize the personal computer from within its minicomputer business model, a model that simply could not make money if computers were priced below \$50,000. IBM, in contrast, set up an innovative business model in Florida, far from its mainframe and minicomputer business units in New York and Minnesota. In its PC business model, IBM could make money with low margins, low overhead costs, and high unit volumes. By coupling the technological and business model enablers, IBM transformed the computing industry and much of the world with it, while DEC was swept away.¹²

And it wasn't just the makers of expensive computers that were swept away. The systems of component and software suppliers, and the sales and service channels that had sustained the mainframe and minicomputer industries, were all disrupted by a new supporting cast of companies whose economics, technologies, and competitive rhythms matched those of the personal computer makers. An entire new value network displaced the old network.



1. DISRUPTIVE TECHNOLOGICAL ENABLERS IN HEALTH CARE

Our bodies have a limited vocabulary to draw upon when they need to express that something is wrong. The vocabulary is comprised of physical symptoms, and there aren't nearly enough symptoms to go around for all of the diseases that exist—so diseases essentially have to share symptoms. When a disease is only diagnosed by physical symptoms, therefore, a rules-based therapy for that diagnosis is typically impossible—because the symptom typically is just an umbrella manifestation of any one of a number of distinctly different disorders.

The technological enablers of disruption in health care are those that provide the ability to precisely diagnose by the *cause* of a patient's condition, rather than by physical symptom. These technologies include molecular diagnostics, diagnostic imaging technology, and ubiquitous telecommunication. When precise diagnosis isn't possible, then treatment must be provided through what we call *intuitive medicine*, where highly trained and expensive professionals solve medical problems through intuitive experimentation and pattern recognition. As patterns in these patients become clearer, care evolves into the realm of evidence-based medicine, or *empirical medicine*—where data are amassed to show that certain ways of treating patients are, on average, better than others. Only when diseases are diagnosed precisely, however, can therapy that is predictably effective for each patient be developed and standardized. We term this domain *precision medicine*.¹³

As we'll see in Chapter 2, disruption-enabling diagnostic technologies long ago shifted the care of most infectious diseases

from intuitive medicine (when diseases were given labels such as “consumption”) to the realm of precision medicine (where they can be defined as precisely as different types of infection, different categories of lung disease, and so on). To the extent that we know what type of bacterium, virus, or parasite causes one of these diseases—and when we know the mechanism by which the infection propagates—predictably effective therapies can be developed—therapies that address the cause, not just the symptom. As a result, nurses can now provide care for many infectious diseases, and patients with these diseases rarely require hospitalization. Diagnostics technologies are enabling similar transformations, disease by disease, for families of much more complicated conditions that historically have been lumped into categories we have called cancer, hypertension, Type II diabetes, asthma, and so on.



2. DISRUPTIVE BUSINESS MODEL INNOVATIONS

In health care, however, many technological enablers have not yet been translated into lower-cost, higher-quality, more accessible services. The reason? Because of the factors we will explore in this book, the delivery of care has been frozen in two business models—the general hospital, and the physician’s practice—both of which were designed a century ago, when almost all care was in the realm of intuitive medicine.

The lack of business model innovation in the health-care industry—in many cases because regulators have not permitted it—is the reason health care is unaffordable. Chapters 1, 3, 4, and 5 describe what these business model innovations might look like and suggest pathways by which entrepreneurs and regulators can accelerate the processes of disruption that have already begun in every branch of the health-care industry.

Generically, there are three types of business models: *solution shops*, *value-adding process (VAP) businesses*, and *facilitated networks*.¹⁴ The two dominant provider institutions in health care—general hospitals and physicians’ practices—emerged originally as solution shops. But over time they have mixed in value-adding

process and facilitated network activities as well. This has resulted in complex, confused institutions in which much of the cost is spent in overhead activities, rather than in direct patient care. For each to function properly, these business models must be separated in as “pure” a way as possible.

Solution Shops

These “shops” are businesses that are structured to diagnose and solve unstructured problems. Consulting firms, advertising agencies, research and development organizations, and certain law firms fall into this category. Solution shops deliver value primarily through the people they employ—experts who draw upon their intuition and analytical and problem-solving skills to diagnose the cause of complicated problems. After diagnosis, these experts recommend solutions. Because diagnosing the cause of complex problems and devising workable solutions has such high subsequent leverage, customers typically are willing to pay very high prices for the services of the professionals in solution shops.

The diagnostic work performed in general hospitals and in some specialist physicians’ practices are solution shops of sorts. Highly trained experts amass information from imaging and other monitoring equipment, analysis of blood and tissue samples, and personal physical examinations. They’ll then intuitively develop hypotheses of the causes of patients’ symptoms. When the diagnosis is only an uncertain hypothesis, these experts typically test the hypothesis by applying the best available therapy. If the patient responds, it verifies the hypothesis. If not, the experts iterate through cycles of hypothesis testing in an attempt to diagnose and resolve the problem.

Payment almost always is made to solution shop businesses in the form of fee for service. We’ve observed that consulting firms such as Bain and Company occasionally agree to be paid in part based upon the results of the diagnosis and recommendations their teams have made. But that rarely sticks, because the outcome depends on many factors beyond the correctness of the diagnosis and recommendations, so guarantees about total costs and ultimate outcomes can rarely be made.

Value-Adding Process Businesses

Organizations with value-adding process business models take in incomplete or broken things and then transform them into more complete outputs of higher value. Retailing, restaurants, automobile manufacturing, petroleum refining, and the work of many educational institutions are examples of VAP businesses. Some VAP organizations are highly efficient and consistent, while others are less so.¹⁵

Many medical procedures that occur after a definitive diagnosis has been made are value-adding process activities. These range from a nurse prescribing medication to cure strep throat after it was diagnosed by a rules-based diagnostic test, to hernia repair, angioplasty, and laser eye surgery. VAP procedures are possible only after a definitive diagnosis has been made first—quite often in a solution shop. When VAP procedures such as these are organizationally separated from those of solution shops, overhead costs drop dramatically: focused VAP clinics typically can deliver comparable care at prices that are half of those incurred in hospitals and physicians' practices in which VAP and solution shop business models are conflated. Institutions such as the Minute-Clinic, Shouldice Hospital, eye surgery centers, and certain focused heart health and orthopedic hospitals are examples of value-adding process businesses.¹⁶

VAP businesses typically charge their customers for the *output* of their processes, whereas solution shops must bill for the cost of their inputs. Most of them even guarantee the result.¹⁷ They can do this because the ability to deliver the outcome is embedded in repeatable and controllable processes and the equipment used in those processes. Hence, restaurants can print prices on their menus, and universities can sell credit hours at guaranteed prices. Manufacturers of most products publish their prices and guarantee the result for the period of warranty.

Since they operate in the realms of empirical and precision medicine, VAP businesses in the health-care industry can do the same thing. MinuteClinic posts the prices of every procedure it offers. Eye surgery centers advertise their prices; and Geisinger's heart hospitals can specify in advance not just the price of an

angioplasty procedure, but can guarantee the result. In a new and remarkable agreement with several European governments, Johnson & Johnson has guaranteed that its new drug Velcade will effectively treat a specific form of multiple myeloma that can be diagnosed with a particular biomarker—or it will refund to the health ministry the cost of the full course of therapy. J&J can do this because the treatment is undertaken after a definitive diagnosis has been made.¹⁸

Many who have written about the problems of health care decry the fact that the value of health-care services being offered by hospitals and doctors is not being measured. To them, we would explain that the reason isn't that these providers don't *want* to provide measurable value; they simply *can't*, because under the same roof they have conflated fundamentally different business models whose metrics of output, value, and payment are incompatible with one another.

Facilitated Networks

These are enterprises in which people exchange things with one another. Mutual insurance companies are facilitators of networks: customers deposit their premiums into the pool, and they take claims out of it. Participants in telecommunications networks send and receive calls and data among themselves; eBay and craigslist are network businesses. In this type of business, the companies that make money tend to be those that facilitate the effective operation of the network. They typically make money through membership or user fees.

Networks can also be an effective business model for the care of many chronic illnesses that rely heavily on modifications in patient behavior for successful treatment. Until recently, however, there have been few user network businesses to address this growing portion of the world's health-care burden.

Organizations like dLife, which facilitates the networking of people with diabetes and their families, are evolving toward models that can deal with the particular challenges in treating these chronic illnesses.¹⁹ Waterfront Media and WebMD are

building facilitating networks for patients with chronic diseases. Harnessing a vast array of patient data, they're building the capability for patients to find "someone like me." This will allow patients to compare progress in treating their disease with directly comparable patients, and ultimately enable those patients to communicate with and learn from each other. The physicians' practice business model is a horrible mismatch with the nature of care for many chronic diseases. Facilitated network business models in health care can be structured to make money by keeping people well; whereas solution shop and VAP business models make money when people are sick.²⁰

So what's the answer? The health-care system has trapped many disruption-enabling technologies in high-cost institutions that have conflated two and often three business models under the same roof. The situation screams for business model innovation. The first wave of innovation must separate different business models into separate institutions whose resources, processes, and profit models are matched to the nature and degree of precision by which the disease is understood. Solution shops need to become focused so they can deliver and price the services of intuitive medicine accurately. Focused value-adding process hospitals need to absorb those procedures that general hospitals have historically performed after definitive diagnosis. And user networks need to be cultivated to manage the care of many behavior-dependent chronic diseases. Solution shops and VAP hospitals can be created as hospitals-within-hospitals if done correctly.

The reason why this basic segregation of business models must occur from the outset of disruption is that it will enable accurate measurements of value, costs, pricing, and profit for each type of business. A second wave of disruptive business models can then emerge within each of these three types. Powerful online tools can walk physicians through the process of interpreting symptoms and test results to formulate hypotheses, then help them define the additional data they need to converge upon definitive diagnoses. This will enable lower-cost primary care

physicians to access the expertise of—and thereby disrupt—specialist practitioners of intuitive medicine. Likewise, ambulatory clinics will disrupt inpatient VAP hospitals. Retail providers like MinuteClinic, which employ nurse practitioners rather than physicians, need to disrupt physicians' practices.²¹

Hospitals and physicians' practices have long defended themselves under the banner, "For the good of the patient." Yet, for the good of the patient, do we really need to leave *all* care in the realm of intuitive medicine? Much technology has moved past this point, and health-care business models need to catch up. Two landmark reports from the Institute of Medicine—*Crossing the Quality Chasm* and *To Err Is Human*—shattered the myth that ever-escalating cost was the price Americans must pay to have the high-quality care that only full-service hospitals staffed by the best doctors can provide.²²



3. A DISRUPTIVE VALUE NETWORK: SYSTEMIC REFORM VS. PIECEMEAL INSERTION

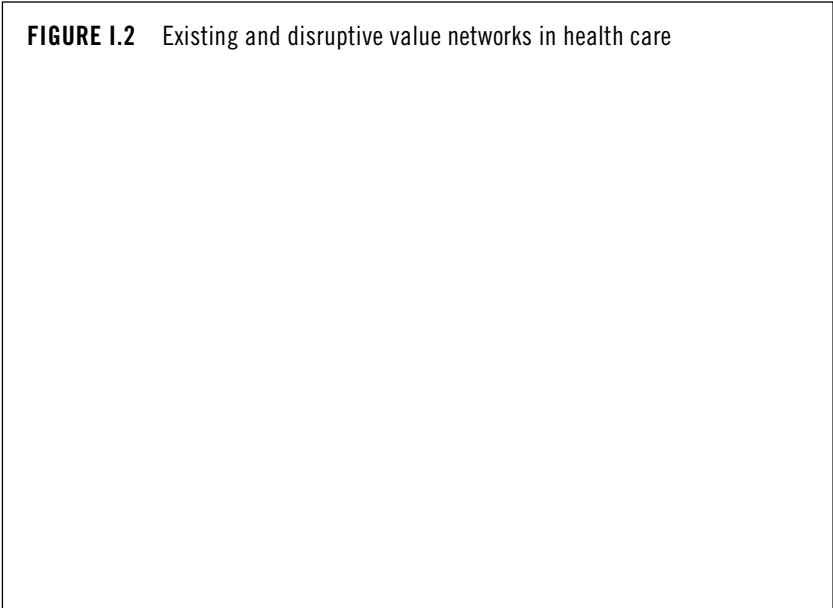
The third enabler of disruption is the coalescence of an independent value network around the new disruptive business models through which care is delivered. Disruptions are rarely plug-compatible with the prior value network, or commercial ecosystem. When disruptive innovators assume that relying on the existing value network is a cheaper, faster way to succeed, they invariably find that ensconcing their "piece" of the system into the old value network kills their innovation—or it co-opts and reshapes their disruptive business model so that it conforms to that system. Vice versa never happens.

Figure I.2 depicts the systemic change inherent in the new disruptive value network for health care. This diagram is a simplification of a complicated system whose details are explained in the chapters that follow. Nonetheless, it highlights how many elements of the new system will need to change in concert in order for any of the individual elements to have the desired effect. Disruption means that many distinctly different business models providing care. But this is important across all of the dis-

ruptive transformations we have studied, two common characteristics stand out: cost is in overheads, and quality comes from correct integration. The benefit of these focused models will be a dramatic reduction in overhead cost, and quality improvements that are grounded in better integrations. Personally controlled electronic medical records and significant reform of the reimbursement and insurance systems are essential in this new value network because they will connect the constituent providers and lubricate the functioning of the system.

Many of the elements of the new disruptive value network depicted on the right side of figure I.2 have been attempted. The problem is, innovators typically have followed a strategy of individually exchanging, or “hot swapping,” themselves for the established institutions in the current value network—the system on the left. And they just don’t fit. One by one these reformers have faced a losing battle in their attempts to disrupt the incumbent system from within it. The history of disruption speaks powerfully and unambiguously on this topic: in order to succeed,

FIGURE I.2 Existing and disruptive value networks in health care



disruptive solutions need to be knit together in a new value network. When this is accomplished, as with all disruptions, patients and providers will be drawn one by one from the old system into the new.

AMASSING THE POWER TO EXECUTE DISRUPTION

In Chapter 6 we will explore how to “make it happen.” Disruption can take decades if independent disruptive companies rely on other independent companies to put in place, piece by piece, the other components of the value network depicted on the right side of Figure I.2. Companies that aspire to a faster solution to these problems will need to *integrate*—combining, through a coordinated effort, the business models that must comprise the disruptive value network.²³ This requirement for corporate integration will not be a mandate forever, but it is crucial now. If the generals lack the scope and power to reconfigure today’s disparate troops, the forces of reform will remain mired with incompatible agendas, fighting with one another and working on their individual pieces of the problem.

The current health-care system generally is modular. Specialized companies operate hospitals, process paperwork, negotiate blanket service contracts, and manage outpatient and retail clinics. Most doctors’ offices are set up as independent businesses. Each can improve its piece of the system, but that’s all. When there are interdependencies among the elements of the disruptive value network—meaning that one cannot occur unless others do—the speed of disruption is significantly accelerated if an integrated entity wraps its arms around all the elements in order to orchestrate the changes. As an illustration, when color television was invented, nobody would buy color TVs because no network was broadcasting in color. And networks would not broadcast in color because nobody owned color televisions. It took David Sarnoff—whose company, RCA, acquired NBC—to implement color television in that chicken-and-egg situation. Similarly, health-care systems will need to integrate so they can

wrap their arms around all the pieces of the system that must be interdependently reconfigured.

The key dimension of integration will be the creation of integrated fixed-fee providers—companies that own hospitals and employ doctors and, most importantly, do not operate on a fee-for-service basis. Rather, they charge their members a fixed annual fee to provide all the care they will need. These organizations—of which there are a few, such as Kaiser Permanente—are structured to profit from members' wellness, rather than their sickness. Their structure gives them the incentive to create and direct patients to lower-cost business models.

Where providers do not create an integrated fixed-fee system to oversee this systemic overhaul, we can expect more and more major employers to integrate backward and begin providing the primary level of health care for their employees. This trend has already begun, and will accelerate. Employers make money when their employees are healthy and productive. Even though many of them *say* they want to be freed from the burden of paying for employees' health care, if you watch what major employers *do*, they invest heavily to attract, train, and retain the best employees possible. As a result, employers increasingly are integrating backward to contract directly with hospitals and clinics themselves, cutting insurance companies out of the decision-making loop. This integration enables them to direct employees to those providers—be they solution shops, value-adding process clinics, or networks—whose capabilities and costs are best-suited to the problem.

Some dismiss the potential of this backward integration as an activity that is far from the “core competence” of these corporations. But such integration is in fact quite common. Chapter 6 shows that business history is replete with examples of companies that integrated backward in order to ensure a reliable, cost- and performance-effective supply of critical inputs. The notion of sticking with your “core competence” is actually a recent—and alarmingly backward-looking one. Many of history's most successful companies followed a much more forward-looking

mantra: if it's a critical problem to solve, we'd better develop the competence to solve it. It is in this tradition that more and more employers are backward-integrating into providing health care.

This need for integration exists only when reliable, cost-efficient providers of critical inputs are not available, and when there is a need to change the system's architecture. Once the business models of the new system become ensconced and their interactions become predictable, the system will dis-integrate, and companies will specialize once again.



CHANGES IN THE INFRASTRUCTURE AROUND HEALTH CARE

Clearly, there is no silver bullet that can cure what ails health care. As depicted in Figure I.1, the cure involves three enablers: technology, a business model, and a commercial ecosystem that we call a value network. Putting them together can best be done by integrated companies. But with enablers come constraints. Even the most integrated and powerful entities in the industry will find their progress impeded unless additional innovations that attack these infrastructural constraints are put into place. These were depicted as the middle triangle in Figure I.1, and we will explore them in Chapters 7 through 11. Together with the enablers, these comprise the best map we can draw of the terrain of reform ahead.

Reforming the Reimbursement System

Most discussions about reforming our health-care system hit a dead end when the participants realize that the reimbursement system will simply not allow it. The prices at which reimbursement occurs determine which products and services are profitable, and which are not. Because people will predictably do more of what is profitable and less of what isn't, the system of reimbursement in the United States constitutes one of the most powerful and pervasive schemes of macro- and microlevel regulation that humanity has ever devised.

Health insurance emerged in the 1920s—alongside fire, life, disability, and auto insurance—as a self-purchased product to protect against the unlikely possibility of a disastrously expensive health problem. After legislation in 1943 made health benefits a tax-free form of compensation, employers increasingly used health insurance as a tool for attracting and retaining the best possible employees.²⁴ Through the 1960s and 1970s, employer-provided insurance against catastrophic events evolved into comprehensive coverage that paid for all health-care costs, large and small. We show in Chapter 7 that the “job” for which employers use health insurance is to attract and retain the best employees possible. Although employers complain about the costs of health care and make noises about wishing to unshackle themselves from that burden, it’s unlikely they would ever choose to do so—because health coverage is a key weapon required to win the war for talent. That’s the good news.

The bad news is that the insertion of massive insurance/reimbursement firms between patients and caregivers over the last three decades has obfuscated all sense of whether the value of services offered is a good deal or a bad one. The dominant payment mechanism today remains fee for service, which defines a simple formula by which providers can prosper: the more services you provide, and the higher the price of these services, the more money you make. It encourages providers not to offer as much care as is needed, but to offer as much care as possible. It is akin to spraying jet fuel on the explosion in health care costs.

The lubricants of efficiency in free-market capitalism are prices that provide accurate, autonomous signals about where, when, and how to create and deploy value-creating innovations. But not only are these prices invisible to most patients and purchasers, most of the prices that claims processors pay are not set by market forces at all. Rather, they are administered prices calculated by Medicare and the insurance industry using pricing algorithms similar to those used in communist systems. The most deleterious effect of these pricing mechanisms is that it’s

difficult to implement disruptive innovations, which are the key to ushering in affordable health care.

In Chapter 7 we'll discuss a combination of two major interdependent streams of innovation—high-deductible insurance coupled with health savings accounts on the payments side, and disruptive business model innovations on the provider side—that would be a far more effective system for governments and employers to make quality health care affordable. Unless both sides of this reform are done in concert, however, both will fail because consumers will find themselves paying out of pocket for inconvenient, expensive options that far exceed what they can afford or are willing to pay.

Reformers who focus solely on how to pay for rising health-care costs fail to address the root problems of why care is so costly to begin with. Overcoming this interdependent nature of reimbursement requires integration and the development of a congruent value network. If we don't address the inseparability of this challenge, we run the risk of setting up a system that in fact constitutes coverage without care.²⁵

Perhaps more important, this payment system aligns consumer incentives, both financially and behaviorally, giving consumers the freedom to participate in their care or to outsource the decision making to a medical home or health advisor. Regional or national markets set up to encourage and inform consumer choices will help foster these critical decisions.²⁶

Role of Information Technology in the Disruption of Health Care

Information technology will play two crucial roles in facilitating the emergence of disruptive business models. First, IT will be the enabling mechanism that shifts the locus of care, when this is desirable and feasible, from solution shops to user networks. It will enable doctors, nurses, and patients to help each other; and provide the enabling fuel for primary care doctors to disrupt specialists, and for nurse practitioners to disrupt doctors. Second, the transition from medical records based on pen and paper to ones that are portable, easily accessible, and interoperable will not just substantially reduce the costly paperwork that burdens today's

caregivers. It will be the primary mechanism of coordination among the providers in the disruptive value network, as depicted in Figure I.2. These will make it easier to avoid costly mistakes, and will enhance the involvement of patients in their own care.

IT and Facilitated Networks

There are two levels in many disruptive transformations of industries. In most disruptions, companies with lower-cost business models emerge at the bottom of a market in simple applications and gradually move up-market to disrupt the established competitors. Toyota did this to General Motors. Canon did it to Xerox. Sun Microsystems did it to Digital Equipment. Disruptions such as these transform markets with expensive, complicated products that could be used only by a few people with a lot of money and a lot of skill, into markets where far more people with less money and skill can own and use the products. In this stage of disruption, however, the *type* of business model remains the same. In these examples, the disruptees and the disruptors both made their cars, photocopiers, and computers in value-adding process business models.

A second level of disruptive transformation comes when not just *buying* and *using* the product become affordable and simple, but *developing* the product becomes inexpensive and simple as well. When this happens, the type of business model shifts from a solution shop or value chain business to a facilitated network business. For example, it used to be very complicated to produce and sell albums in the music recording industry. Production and distribution were value-adding process businesses in which only a limited number of companies participated. MP3 technology, however, made it so simple to record and distribute music that any band with a basement or garage can do it. YouTube led to a similar change in the development and distribution of video: anyone armed with a webcam can do it.²⁷ In both these industries, networks have emerged so that the participants can exchange content and items of value with each other.

The Internet is enabling the emergence of facilitated networks in health care as well. As mentioned previously, Web sites like

dLife.com and Crohns.org enable patients to teach each other how to live with their diseases. Professional networks enable physicians to share insights from patient case studies with each other, without enduring the cumbersome rules and delays entailed in conventional academic publishing. And through expert systems, content and judgment previously available only to specialist physicians become easily accessible to generalist physicians, their assistants, and their patients. As these networks grow, the center of gravity for the care of many chronic diseases will increasingly shift from solution shop business models to facilitated networks.

Evolution of Patient Health Records

The second role for IT in transforming the cost and quality of health care is through the enhancement of medical records. In its most basic form, an electronic medical record (EMR) is simply the electronically stored version of what has always been recorded with pen and paper. However, as the EMR movement gains ground, a medical record known as personal electronic health record (PEHR) has come to the fore. The ability to customize and focus the PEHR on consumer involvement may allow it to overcome many of the hurdles that have slowed the adoption of EMRs.²⁸

In some countries, such as Denmark, EMRs are pervasively kept in a standard format so any physician in any facility can instantly access the medical records of any patient. We suggest in Chapter 4 that, for good reason, we can expect the major integrated health-care organizations in the United States only to create and employ proprietary EMR systems. The reason is that when software is implemented in complex, established health systems, the power of the existing organizational structures and processes will force the records system to conform itself to them, rather than vice versa. Standard-format EMRs will flourish, however, in a new system of disruptive business models, because the processes and structures of those businesses are in flux and can therefore conform to the architecture of the EMRs.

A more flexible format may have already arrived in the form of the above-mentioned PEHRs, whose growth mirrors the expo-

ponential growth rate of adoption that characterizes all disruptive innovations. Rather than using data provided and controlled by independent hospitals and physician practices as its foundation, the EHR collects data from all providers and shifts control of the medical record to patients. In bypassing the integrated structure of the existing value network and storing the data in open-source formats, the EHR facilitates connections among the new business models that will comprise the new disruptive value network in health care.

New EHR tools have recently been launched by Microsoft and Google, and innovators like Docvia have enabled patients anywhere in the world to manage their health using the Internet or their mobile phones for less than 10 cents per encounter. The potential changes that consumer involvement can bring are striking. For example, this technology has contributed to a substantial reduction in the mother-to-child HIV transmission in large areas of sub-Saharan Africa. Most significantly, this technology appeals to all levels of society, both the very rich and very poor, paving the way for the much anticipated and long overdue transformation of medical records.

The Future of the Pharmaceutical and Medical Devices Industries

Five significant changes loom in the future of the pharmaceutical industry.

The first is that the advent of precision medicine heralds product-line fragmentation in pharmaceuticals. Volumes per therapeutic compound will drop significantly, as the number of therapeutic compounds expands. Blockbuster drugs will become rare. This will necessitate a reshaping of the business model of today's major pharmaceutical companies because—to borrow words from oil exploration—in the future there will be fewer big gushers to cover the costs of drilling a lot of dry holes.²⁹

The second of the significant change we foresee is that the trend already apparent on television, in which drug companies market their products directly to patients rather than through doctors and hospital formularies, is likely to become more widespread.

Provided also with sophisticated information and decision-making tools, empowered patients will make self-diagnosis an increasingly common point of entry into the health-care system.

The third and fourth changes are related. In contrast to the past, when diagnostic products were regarded as unattractive stepchildren, in the future diagnostics will become quite profitable relative to therapeutics. In other solution shop businesses, customers are willing to pay high prices to firms like McKinsey & Company for precise diagnoses of their problems—because the value of defining and solving the right problem is immense. The modest profitability of diagnostic products and services has been an artifact of today's reimbursement system. This will change as the disruptions described above are implemented.

The fourth change is that because it appears to be a profit-maximizing move based upon data from the past, most of today's leading pharmaceutical companies are dis-integrating—choosing to out-source, step by step, drug discovery and development, the management of clinical trials, and the manufacture of their products. What drives this “shedding” of activity after activity is that revenues are unaffected by this outsourcing, while profits seem to improve. We show in Chapter 8 however, that where, in the past, sales and marketing muscle was the unassailable strength of major pharmaceutical companies, this is rapidly becoming commoditized by massive distribution and pharmacy benefit management companies like Medco.. And what was a complex cost center to pharmaceutical executives in the past—the management of clinical trials and the concomitant development of precision diagnostics—is likely to become the core of profit generation in the future. The major companies, in summary, are exiting the wrong part of the business.

Fifth, and finally, generics competitors are disrupting companies that develop, manufacture, and market patented drugs. It's well known that generics manufacturers move in the day after the patent protection of drugs expires. Often, the price of these drugs will drop by as much as 80 percent, literally overnight. What is not widely appreciated, however, is that several major

generics manufacturers, primarily in Israel and India, are moving up-market, developing their own proprietary products as they pursue greater profitability.

The reason they can do this is that the U.S. government allows our pharmaceutical companies to price their proprietary products high enough not just to recoup the cost of developing those specific drugs, but the cost of developing and testing all of the drugs that failed to make it to market as well. Most other governments—including that of Canada—have few pharmaceutical companies they must assist in this way. As a result, their national health systems negotiate much lower prices for patented drugs than those that are allowed in America. This constitutes a very real tax that American consumers pay to subsidize pharmaceutical research for the world. There is some evidence that this practice of subsidizing pharmaceutical companies' R&D costs in fact has allowed their work to become relatively inefficient. Disruptive, formerly generic competitors whose governments do not offer these subsidies of research costs seem able to develop new proprietary drugs at a cost 40 percent lower, on average, than that of U.S. companies.

Medical Devices and Diagnostic Equipment

We show in Chapter 9 that the use of devices and diagnostic equipment will *decentralize*—playing out a typical pattern of innovation. At the beginning stages of most modern industries, the initial products are so complicated and expensive that things become *centralized*: we take the problems to the solution.

By way of illustration, in the formative years of the telecommunications and photocopying industries, we took our messages to the Western Union telegraph office and our originals to the corporate photocopy center. Activity in the industry subsequently became centralized to economize on the high fixed costs of the equipment and the operators. While the vendors of those expensive, centralized products work to make them even better, disruptive innovators, by making the products simpler and more affordable, drive a decentralization of the industry—bringing the solution ever closer to the problem or the need.

For example, in telecommunications, the telephone made it possible for people to communicate over long distances from their homes rather than the telegraph office. With mobile phones, we don't have to be home; we can communicate from our pockets and purses. Canon brought photocopying to the closet around the corner; and the Hewlett-Packard ink-jet printer put it on our desktops. A new company, Zink, is now bringing photocopying to our briefcases. This pattern of centralization-decentralization characterizes the history of innovation in most industries.

The same pattern has begun to play itself out in medical devices and diagnostic equipment. Blood and tissue testing, and most imaging services, are at present centralized industries. Great opportunities for disruptive growth are arising as companies focus on point-of-care diagnostics and on in-office imaging technologies. This is a key technological enabler that will fuel professionals to do ever more sophisticated procedures in lower-cost venues of care, and it will enable lower-cost caregivers to disrupt their higher-cost colleagues.

Developments in medical devices will change the essence of expertise in certain branches of medical practice. Interventional radiology, for example, is driven by such new diagnostic imaging technologies. Historically, the domain of radiologists was the operation of X-ray machines and interpretation of the images they generated. However, imaging technologies such as ultrasound and CT scanners have become so good that radiologists can get shockingly clear images not just of bones, but of deep tissues and organs. These imaging modalities had primarily been used diagnostically. Increasingly, however, radiologists and other nonsurgeons are using these techniques to guide minimally-invasive surgical tools. Because the doctor can clearly see the tools and target tissues on a television screen, executing a perfect procedure becomes much easier.

Already this is beginning to blur the boundaries between certain surgical specialties whose boundaries have generally been drawn around parts of the body, and it will undoubtedly change the nature of training required to perform surgery—obscuring

the line between surgeons and nonsurgeons. As an example, in the past, most hysterectomies were done by gynecologists. Now, interventional radiologists, using ablation techniques to treat uterine fibroids, are more and more obviating the need for total hysterectomies.

Changes in Medical Education

Today's medical training reflects three realities of the early 1900s, when the basic architecture of our medical schools' curricula was put in place. The first of these realities was that medical practice in the first decades of the twentieth century was an intuitive art, not a science—meaning that the ability to deliver care was embedded in the caregivers, not in rules, processes, and equipment. Hence, medical training was organized to train doctors to work individually and intuitively. The second former reality was that students finished their work on the farm in the fall, and therefore needed to start their schooling in batches. The third was that when the architectures of today's medical school curricula were established, most diseases were acute, so the full course of many diseases could be observed within the hospitals where the doctors-in-training worked.

The future world in which today's medical students will practice will be substantially different from the world for which medical schools are preparing them. One dimension of difference is that many diseases that are in the realms of intuitive and empirical medicine today will have migrated toward the domain of precision medicine 20 years from now. As a result, many diseases will eventually be diagnosed and treated by nurse practitioners and physician assistants. Organizing and supervising the work of paraprofessionals will be a major dimension of most physicians' jobs.

Another difference is personal versus process expertise. There will always be a need for deeply experienced, intuitively expert physicians to do the work of solution shops. Many diseases will continue to defy precision medicine, and new diseases will emerge. Today's methods of preparing medical students to

work as individuals are generally appropriate for those who will work in solution shops—though we will likely need fewer such physicians 30 years from now than are needed today. But most physicians in the future will work in settings where much of the ability to deliver care will be better embedded in processes and in equipment, rather than exclusively resident in individuals' capacities. No medical school that we know of has yet established a course in which students can learn how to design self-improving processes that prevent mistakes from occurring.

We note in Chapter 10 that because today's reimbursement schedules make specialist careers much more lucrative than the careers of primary care physicians, the graduates of U.S. medical schools are moving decisively “up-market,” choosing training to become specialists. As a result, about half of all new primary care doctors that begin practicing in the United States today were trained in foreign medical schools—primarily in the Caribbean, Latin America, and India. Those schools are getting very good, and they are disrupting the U.S. schools, starting in the tier of the market that is economically least attractive to the incumbents.

The reason why this is a serious development for our medical training establishment is that a host of technological enablers will fuel the disruption of specialists by primary care physicians in the future. In addition, these same technological advances will enable nurse practitioners and physician assistants to disrupt primary care physicians. And yet we have a chronic shortage of nurses in the United States too—which again is filled primarily by immigrant nurses trained in places like the Philippines. A key driver of this shortage is the limited faculty capacity of U.S. nursing schools. In sum, this means that the United States is shifting its medical education resources to train more of the professionals we'll need fewer of, and training fewer of those we will need more of in the future.

The Impact of Regulation on Disruption Innovation in Health Care

In the final chapter we consider the regulatory barriers to disruptive change, identify seven categories of regulations that now

impede disruption and must be changed, and propose a model for how these changes can be made. As with many of the findings in this book, we show that health care honestly isn't that different from other industries: the pattern of regulation in health care matches that of many other industries in which the public interest may not be addressed through normal market mechanisms. Regulation in these industries typically goes through three stages:

1. **Foster.** Subsidize the creation of the industry.
2. **Stabilize and assure.** Strengthen the participants; ensure that all who should have access in fact do; and make sure that the products are safe and effective.
3. **Afford.** Encourage competition that will reduce prices.

A major class of government subsidies of America's health-care system occurs directly through the National Institutes of Health, and indirectly through the high prices that our government allows on patented drugs in order to fund ongoing research and development within our pharmaceutical companies. Together, these subsidies fund a large share of the research that has begun transforming medical practice from intuition to precision. This subsidy of basic and applied research, and of product development and testing, truly constitutes an extraordinary gift to the people of the world.³⁰ We recommend one change in how this subsidy is administered. In fields in which breakthroughs are needed, research at the *intersection* of scientific disciplines, and not just research that deepens knowledge within disciplines, needs its separate channel of review so such projects can more readily receive funding.

The Centers for Medicare and Medicaid Services (CMS) set the prices at which Medicare will reimburse providers of products and services, as mentioned previously, thus exerting powerful regulatory control over what providers will and will not do. In addition, CMS by law can at the end of each year rewrite the price of all transactions with its providers to the lowest price that those providers charged to any nongovernment customer during

the year. While this ostensibly ensures that CMS automatically pays the lowest-in-market price for everything it buys, its inadvertent effect is to make discounting extremely expensive for providers of health-care products and services. It instills extraordinary pricing “discipline” amongst competitors in the hospital, pharmaceutical, and medical device industries that executives in other industries—airlines, for example—can only dream about.

Much of the government’s regulatory energy currently focuses on ensuring that providers and products are safe and effective. When medicine is in the intuitive realm, the best mechanism for accomplishing this is to regulate *who* can provide care. Regulatory focus is on the inputs or resources used in the process—primarily the training and qualifications of the doctors who provide the care. When care of a disorder has moved into the realm of empirical medicine, the emphasis of regulation needs to focus less on the qualifications of the providers and more on *how* they do their work—on the processes being followed. This is because following best-practice processes is the key to getting the best outcomes most consistently, when medical practice is empirical. Finally, when a disorder has advanced into the realm of precision medicine, regulation most productively focuses on *what*—on the outcomes—rather than on inputs or processes.

In many areas the progress of medical science now calls for the body of medical regulation to shift focus toward reducing costs. We show in Chapter 11 that economists-turned-deregulators are often guided by too simple a model when they attempt this, in that they believe that simply intensifying competition will bring about lower prices. In reality, when regulators try to intensify *sustaining* competition in an industry, the result typically is *higher* prices. Regulations that provide an incentive for general hospitals to compete more intensely against other general hospitals, for example, will send them rushing up-market toward ever more profitable services. It has been a *disruptive* competition that has reduced costs dramatically—in literally *every* historical instance in which regulators have sought to reduce prices.

A key reason why regulatory change persistently lags behind the progress of medical science is that those who would be dis-

rupted by the shift in regulatory focus have a lot to lose, and for the good of the provider they adroitly preserve regulations that initially had been adopted for the good of the patient. Our research has shown that the power of those ensconced behind the protection of these regulations almost *never* yields to a direct assault on the regulation. Rather, the regulations are toppled only when disruptive innovators find applications or markets beyond the reach of the regulators. They succeed in that context—and the regulation ultimately succumbs to the evidence. We give case histories in this final chapter of instances in which regulations that barred lower-cost health-care providers from entering a market were toppled through this strategy.

SUMMARY

The challenge that we face—making health care affordable and conveniently accessible to most people—is not unique to health care. Almost every industry began with services and products that were so complicated and expensive to provide and consume that only people with a lot of skill and a lot of money could participate. The transformational force that has brought affordability and accessibility to other industries is disruptive innovation. Today's health-care industry screams for disruption. Politicians are consumed with how we can afford health care. But disruption solves the more fundamental question: How do we make health care affordable?

Most disruptions have three enablers: a simplifying technology, a business model innovation, and a disruptive value network. The technological enabler transforms a technological problem from something that requires deep training, intuition, and iteration to resolve, into a problem that can be addressed in a predictable, rules-based way. Diagnostic abilities are the technological enablers of disruption in health care. Precise definition of the problem, in this and in every industry, is a prerequisite to the development of a predictably effective solution.

In the past, business model innovation was common in health care. When the technological enablers for the diagnosis and

treatment of infectious diseases emerged, most patient care was transferred away from hospitals to doctors' offices, and away from the doctors to the nurses. However, business model innovation has stalled in the last three decades. Regulations and reimbursement systems currently trap in high-cost venues much care that could be provided in lower-cost, more convenient business models. Other disruptions fail because they lack new value networks that combine business models into a coherent ecosystem that allows them to disrupt their predecessors.

Three key lessons from the history of disruptive innovation are particularly important in the disruption of health care. The first is that while the technological enablers almost always emerge from the laboratories of leading institutions in the industry, the business model innovations do not. Almost always these are forged by new entrants to the industry. Regulators must beware, therefore, of attempts by the leading institutions to outlaw business model innovation. Regulation should facilitate it. What is in the interest of society most often does not coincide with the self-perceived interests of the leading institutions.

The second key lesson is that disruption rarely happens piecemeal, where stand-alone disruptions are plugged into the existing commercial ecosystem of an industry. Rather, entirely new value networks arise, disrupting the old. Hence, disruptive business models such as value-adding process clinics, retail clinics, and user networks must be married with disruptive innovations in insurance and reimbursement in order to reap the full impact in cost and accessibility. At the outset, knitting all these pieces together will require a much higher degree of integration than has been the norm in the health-care industry. Difficult though it will be, these providers need to disrupt themselves. Employers will need to play a more proactive role in orchestrating the emergence of this new value network, compared to the reactive posture they have taken in the past.

Finally, we have seen a pervasive pattern in *every* industry that has been transformed through disruption. This same pattern characterizes what has happened to date with disruptive initiatives

in health care. The energies, talent, and resources of the leading organizations in an established system *always* are absorbed in improving their best products, which are sold to address the most demanding applications in the industry. Why? Because the high end of most markets is where the most attractive profits are made, serving the most profitable customers. When a disruptive technological enabler emerges, the leaders in the industry disparage and discourage it because, with its orientation toward simplicity and accessibility, the disruption just isn't capable of solving the complicated problems that define the world in which the leading experts work.

Always, the technological enablers of disruption are successfully deployed against the industry's simplest problems first. They then build commercial and technological momentum upon that foothold and improve, progressively displacing the old, high-cost approach application by application, customer by customer, disease by disease. Apple sold its Apple IIe personal computer as a toy to children, not to the accounting departments of major banks. Nucor cut its teeth on concrete reinforcing bars, not the sheet steel that fed Ford. Cisco deployed its switches to route data, not voice—because data didn't care about the router's four-second latency delay, whereas voice telecommunications did. Target started by selling things like paint, hardware, and simple kitchen supplies, not designer clothing. JCB transformed the digging of big holes not by aspiring to use hydraulics technology to excavate massive underground parking garages upon which skyscrapers would be built. JCB started by digging one-foot trenches to run water lines from homes to the pipes under the street. Toyota's launch vehicle was a Corona, not a Lexus.

Health care is no different. An illustration: angioplasty has transformed the interventional care of coronary artery disease—making it *much* more affordable and *much* more convenient for *many* more people to receive effective treatment.³¹ It was initially deployed against partially occluded, easy-to-access coronary arteries. Luckily, angioplasty wasn't blocked from the market just because it couldn't beat the gold standard of open-heart

bypass surgery, which was unquestionably the best way to resolve intractable blockages in complicated locations. But step by step, stent by stent, the minimally invasive approach has improved to the point where fewer and fewer people need bypass surgery. Now, pharmaceuticals, including lipid-lowering agents such as Lipitor, are disrupting angioplasty in the same manner. They were not withheld from the market because they couldn't dissolve defiant arterial blockages. But deployed as prevention, patient by patient, these "statins" demonstrate reabsorption of atherosclerotic plaques that can obviate the need for angioplasty.

Doctors and hospitals, regulators, and policy makers need to convert to this religion because it isn't myth: it is true. The fact that cost-lowering, accessibility-enhancing disruptive enablers can address only the simplest of problems at the outset is indeed a gospel of good news. It frees physicians and hospitals to focus their energies on what they do best—tackling complex medical problems and moving more and more problems along the spectrum from intuitive toward precision medicine. However, in the history of health care, industry leaders have repeatedly lobbied for legislation and regulation that block disruptive approaches from being used anywhere until they are certifiably good enough to be used everywhere. This traps the industry where it began, in the expertise-intensive world of high costs.

Generally, the leading practitioners of the old order become the victims of disruption, not the initiators of it. But properly educated, the leaders of the existing systems can take the lead in disrupting themselves—because while leaders instinctively view disruption as a threat, it always proves to be an extraordinary growth opportunity. Hence, IBM played a huge role in creating the personal computer industry; the department store Dayton-Hudson launched Target; and Hewlett-Packard created and grew to dominate the disruptive ink-jet printer business. When they follow the rules we've described in our research, the leaders in the old indeed can become the leaders of the new.

The forces of health-care reform have had no credible map of the terrain ahead. Our hope is that this book can serve as

the map. We hope this map inspires some of you to step to the front and become leaders in a coordinated revolution, because the reforms that make health care affordable and accessible are indeed possible.

NOTES

1. According to the Kaiser Family Foundation and the Centers for Medicare and Medicaid Services, the average annual growth rate in national health expenditures was 9.8 percent in nominal terms between 1970 and 2005. The nominal growth rate of GDP was 7.4 percent over the same period. See *Health Care Costs: A Primer*, Kaiser Family Foundation, August 2007.
2. David Walker, comptroller general of the United States, estimates that the federal government would have to set aside \$23 to \$28 trillion today to meet the underfunded promises of Medicare. Walker was interviewed on *60 Minutes* on July 8, 2007, about the future effects of Medicare on the nation's economy: <http://www.cbsnews.com/stories/2007/03/01/60minutes/main2528226.shtml>.
3. Unfunded and unrecognized pension obligations.
4. Schoen, Cathy, et. al., "Toward Higher-Performance Health Systems: Adults' Health Care Experiences in Seven Countries, 2007," *Health Affairs*, vol. 26, no. 6 (2007), 717–34.
5. "Unsocialized Medicine," *Wall Street Journal*, June 13 2005, A12.
6. "NHS Audit: Big Spender, Unwise Spender," *The Economist*, September 13, 2007.
7. Brownlee, S., *Overtreated: Why Too Much Medicine Is Making Us Sicker and Poorer*, Bloomsbury USA, September 2007.
8. *Holy Bible*, Book of Proverbs, 29:18.
9. The leading and most articulate spokesperson for consumer-driven health care is Professor Regina Herzlinger of the Harvard Business School. Her books on this topic include *Consumer-Driven Health Care: Implications for Providers, Payers, and Policy-Makers* (San Francisco: Jossey-Bass, 2004); and *Who Killed Health Care?: America's \$2 Trillion Medical Problem—and the Consumer-Driven Cure* (New York: McGraw-Hill, 2007). See also Porter, M., and Teisberg, E., *Redefining Health Care: Creating Value-Based Competition on Results* (Boston: Harvard Business School Press, 2006).
10. In this book we do not describe the data and the analytics through which these models were derived, because they have been thoroughly documented in a range of books and academic publications. In this book we *illustrate* the workings of these models and theories by drawing on examples that are familiar to many readers. These illustrations aren't offered as proof of the validity of these models, however. Readers who want further documentation and analysis should first study Christensen, Clayton M. (1997), *The Innovator's Dilemma*, and Christensen, Clayton M., and Michael Raynor (2003), *The Innovator's Solution* (both published by the Harvard Business School Press, Boston). Footnotes in those books can lead curious readers even more deeply into the academic papers through which these models were originally published.
11. Stabell and Fjeldstad describe the value network or commercial system a "system of inter-linked chains" (Stabell, Charles. B., and Fjeldstad, Ø. D., "Configuring Value for Com-

- petitive Advantage: On Chains, Shops and Networks.” *Strategic Management Journal*, May 1998), which Porter labels the value system (Porter, Michael, *Competitive Advantage*. New York: the Free Press (1985):34).
12. We refer interested readers to Christensen, Clayton M., *The Innovator's Dilemma*, op.cit.
 13. It is important to keep in mind that the progression from one end of this spectrum to the other is an incremental process. There remains a significant number of patients—16 to 20 percent, according to Groopman, J., *How Doctors Think*, Houghton Mifflin Company (March 2007)—who still require intuitive care to reach a definitive diagnosis. However, by applying rules of thumb and other heuristics, the work that many physicians do today has actually progressed through the intuitive and empirical phases and is very nearly precision, or rules-based, medicine.
 14. We are deeply indebted to our friend Øystein Fjeldstad of the Norwegian School of Management, who developed and taught us this framework. We explain these concepts more deeply in later chapters. Those interested in Fjeldstad's framework should also read Stabell, C. B., and Fjeldstad, Ø. D., “Configuring Value for Competitive Advantage: On Chains, Shops and Networks.” *Strategic Management Journal*, May 1998.
 15. Most concepts of strategy were derived from the study of VAP businesses. See, for example, Porter, Michael, *Competitive Advantage*. New York: the Free Press (1985). More recently, Professor Tom Eisenmann at the Harvard Business School has done similarly insightful work on strategy in Network businesses. There has been much less Porter- and Eisenmannesque work done on strategy in solution shop businesses.
 16. Our colleague Regina Herzlinger, building upon earlier work by Harvard Business School professor Wickham Skinner, has written extensively on the value of focus. See Herzlinger, R., *Market-Driven Health Care: Who Wins, Who Loses in the Transformation of America's Largest Service Industry*. Reading, Massachusetts: Addison-Wesley (1997).
 17. Abelson, Jenn, “Shift in Health-Cost Focus Is Said to Show Promise.” *New York Times*, July 12, 2007.
 18. The treatment of this specific form of multiple myeloma isn't yet in the realm of *precision* medicine—but it is solidly in the empirical world. Johnson & Johnson therefore cannot guarantee that *every* patient will be healed. But the biomarker diagnosis is unambiguous, and Velcade is efficacious a high enough percentage of the time so that J&J can build into its product pricing the probability of Velcade not working with a small percentage of patients.
 19. dLife at <http://www.dlife.com>, provides newsletters, recipes, forums, a national weekly television show and radio station, and online educator-customized interactive tools for providers and patients.
 20. Revolution Health recently merged with Waterfront Media. Together they offer online communities of blogs, forums, groups, and people with similar goals. Members are encouraged to start a new group.
 21. Bohmer, Richard, “The Rise of In-Store Clinics—Threat or Opportunity?” *New England Journal of Medicine*, vol. 356, no. 8 (2007): 765-68.
 22. Committee on Quality of Health Care in America, *Crossing the Quality Chasm: A New Health System for the 21st Century*, Washington, DC: Institute of Medicine, National Academy Press, 2001; and Kohn, Linda T., Janet M. Corrigan, and Molla S. Donaldson, eds., *To Err Is Human: Building a Safer Health System*, Washington, DC: Committee on Quality of Health Care in America, Institute of Medicine, National Academy Press, 1999.

23. The term “integrated” likely has different meanings to our readers who are physicians and those who are businesspeople. To physicians, an integrated approach in health care entails mustering a team of caregivers from many potentially relevant specialties in order to give the patient every dimension of care he or she might need. To a businessperson, integration involves operationally knitting together insurance, hospitals, physician-employees, outpatient surgery centers, and retail clinics under one corporate umbrella. Our usage of the term is in the business sense.
24. Special Ruling, October 26, 1943, CCH Federal Tax Service, vol. 443, paragraph 6587.
25. A phrase originated by Dr. Marcia Angell, former executive editor of the *New England Journal of Medicine*.
26. Committee for Economic Development Report, October 2007.
27. The first level of disruption in the movie industry occurred when Pixar and similar studios, using digital animation, disrupted traditional animation studios like Disney. Both were value-adding process businesses, however. YouTube shifts the business model to a facilitated network.
28. Raymond, Brian, “Realizing the Transformative Potential of Personal Health Records,” Kaiser Permanente Institute for Health Policy, Oakland, CA, 2007. See also Mandl, K. D. and I. S. Keohane, “Tectonic Shifts in the Health Information Economy,” *New England Journal of Medicine*, vol. 358, no. 16, April 17, 2008, 1732–37.
29. This will not always be exactly the case, as we describe in Chapter 8. New types of blockbuster drugs will arise. For example, the Elan Pharmaceutical drug Tysabri, marketed by Biogen-Idec, has been shown to effectively treat patients with multiple sclerosis, Crohn’s Disease, rheumatoid arthritis, and certain other diseases. The reason seems to be that these are different symptomatic manifestations of the same fundamental causal disorder, which is a particular type of inflammation in the nervous system.
30. This subsidy is akin to what was done in telecommunications. For nearly half of the twentieth century the government intentionally kept the prices of long-distance telephony high—in part to subsidize local phone service, but also to cover the cost of AT&T’s Bell Laboratories. A great number of the technological and scientific discoveries in the history of microelectronics were developed at Bell Laboratories and then licensed to the world at extraordinarily low prices.
31. Some recent studies purport to show that angioplasty is just as costly on a per-patient basis as open-heart surgery. We contend that even if these studies are accurate, it is simply the result of pricing and profit distortions of the present reimbursement system.