

Disseminating Innovations in Health Care

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HEALTH CARE IS AMONG THE best endowed of all industries in the richness of its science base. Major gaps in knowledge exist, but clinical science progresses, often providing a rational basis for choosing the best drugs, surgery, diagnostic strategies, and other elements of care.¹ Yet, an enormous amount of that scientific knowledge remains unused. Too often, American health care—arguably the best in the world—fails to deliver the best care it could.² As stated in the Institute of Medicine report *Crossing the Quality Chasm*, “Between the health care we have and the care we could have lies not just a gap, but a chasm.”³

Failing to use available science is costly and harmful; it leads to overuse of unhelpful care, underuse of effective care, and errors in execution. Americans spend almost 40% more per capita for health care than any other country, yet rank 27th in infant mortality,⁴ 27th in life expectancy,⁵ and are less satisfied with their care than the English, Canadians, or Germans.⁶ Serious medication errors occur in 7 of 100 hospital admissions,⁷ and more than 80 000 unnecessary hysterectomies⁸ and 500 000 unnecessary cesarean deliveries⁹ are performed in this country each year. Only 1 in 5 elderly myocardial infarction survivors receives appropriate medications to reduce the risks of recurrence,^{10,11} and even fewer high-risk elderly individuals are vaccinated against pneumococcus.¹² Extensive waits and delays abound in health care, far more than individuals tolerate in other service sectors.

Health care is rich in evidence-based innovations, yet even when such innovations are implemented successfully in one location, they often disseminate slowly—if at all. Diffusion of innovations is a major challenge in all industries including health care. This article examines the theory and research on the dissemination of innovations and suggests applications of that theory to health care. It explores in detail 3 clusters of influence on the rate of diffusion of innovations within an organization: the perceptions of the innovation, the characteristics of the individuals who may adopt the change, and contextual and managerial factors within the organization. This theory makes plausible at least 7 recommendations for health care executives who want to accelerate the rate of diffusion of innovations within their organizations: find sound innovations, find and support “innovators,” invest in “early adopters,” make early adopter activity observable, trust and enable reinvention, create slack for change, and lead by example.

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Why is the gap between knowledge and practice so large? Why do clinical care systems not incorporate the findings of clinical science or copy “best known” practices reliably, quickly, and even gratefully into their daily work simply as a matter of course? This article explores the wider literature and theory of the dissemination of innovation to shed light on the specific case of health care. Examples of potentially constructive innovations in health care can be as simple as ensuring that an improved drug regimen published in a refereed journal article immediately becomes the norm in a practice group, or as complex as re-designing an entire scheduling system to better conform to sound principles from queuing theory.

THE EXAMPLE OF CAPTAIN JAMES COOK AND THE FIGHT AGAINST SCURVY

As it happens, health care is in good company in being slow to use new

knowledge. Diffusion of innovation is, after all, a challenge in many human enterprises. The history of the treatment of scurvy shows how variable diffusion can be.

For many centuries, scurvy was the main threat to the health of naval crews. When Vasco da Gama sailed around the Cape of Good Hope for the first time in 1497, 100 of his crew of 160 men died of scurvy. Nobody knew about vitamin C at that time, but some dietary factor was suspected. Captain James Lancaster proved it in 1601, when commanding a fleet of 4 ships on a voyage from England to India. On that voyage, the crew on one ship were given 3 teaspoons of lemon juice every day. At the halfway point on the trip, 110 (40%) of 278 sailors on the other 3 ships had

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died of scurvy, but none died on the ship with the lemon juice ration.¹³

However, no one seemed to notice; despite Lancaster's evidence, practices in the British Navy did not change. The study was repeated 146 years later, in 1747, by a British Navy physician named James Lind. In a random trial of 6 treatments for scorbutic sailors on the HMS Salisbury, citrus again proved effective against scurvy.¹⁴ It still took the British Navy 48 more years to react by ordering that citrus fruits become a part of the diet on all navy ships. Scurvy in the British Navy disappeared almost overnight. The British Board of Trade took 70 more years to adopt the innovation, ordering proper diets on merchant marine vessels in 1865. The total time elapsed from Lancaster's definitive study to universal British preventive policy on scurvy was 264 years.

Unlike the rest of the British Navy, however, the great explorer Captain James Cook did not wait to make changes. The problem of scurvy obsessed him; Cook was an innovator of the highest caliber, whose travels cover the map of the world. During his 3 key voyages of discovery, from 1768 through 1780, in an era when a trip from London to Bristol could take days and most people rarely left their village, Cook rounded Cape Horn and the Cape of Good Hope and visited the Arctic and the Antarctic, Alaska, Hawaii, Tahiti, New Zealand, and Australia. He did this in wooden ships barely 100 feet long, with crews averaging 95 men, most of whom drank heavily and were not older than 25 years of age.

Cook's endowments went well beyond his seamanship and courage. As one biographer put it, "Other sailors of Cook's time might have been able technically to do what he did, but none had the degree of strength he had in . . . science and management. Cook was a first-rate scientist and an unmatched manager."¹⁵ Throughout his career, Cook developed and nurtured scientific innovation, and he put innovation promptly to use in navigation, astronomy, and botany. He was the first

sea captain to seriously test John Harrison's timekeeping apparatus, the invention that eventually solved the problem of measuring longitude.¹⁶

Cook's innovativeness included the prevention of scurvy among his crew. He did not focus on citrus, but a combination of good hygiene and sauerkraut, which also contains vitamin C. Cook included sauerkraut in the diets of everyone on his voyages and even once flogged a sailor for refusing to eat his sauerkraut. More important, Cook ordered his officers to eat it also, writing in his journal what all senior executives should have emblazoned in their minds: "To introduce any new article of food among seamen, let it be ever so much for their good, requires both the examples and the authority of a Commander." As a consequence, while other captains lost many sailors to scurvy, Cook lost only 3 men in his 3 voyages.

THE SLOW PACE OF DISSEMINATION IN HEALTH CARE

Many health care executives and clinical leaders seem to lack Cook's success and speed in getting people to "eat the sauerkraut." Their organizations and staff act more like the British Navy than like James Cook. Even when an evidence-based innovation is implemented successfully in one part of a hospital or clinic, it may spread slowly or not at all to other parts of the organization.

The problem of dissemination of change applies not only to formally studied bioscientific innovations, but also to the numerous effective process innovations that arise from improvement projects of our own, latter-day Lancasters and Linds in local settings, pilot sites, and progressive organizations. In health care, invention is hard, but dissemination is even harder.

In recent projects sponsored by the Institute for Healthcare Improvement and in other published studies, frustrating circumstances have surfaced, as evidenced by the following examples: a few pioneering obstetricians and

nurses in a community hospital were able to safely reduce their cesarean delivery rates from 26% to 15%, but rates remained high for most of the other obstetricians in the hospital.¹⁷ A large health maintenance organization supported a benchmark asthma program in one medical center, with hospitalization rates down by two thirds and drug prescribing practices almost totally consistent with the best national recommendations, but the rest of the medical centers in the health maintenance organization continued unaffected.¹⁸ In a multihospital system, the general surgeons at one hospital agreed to standardize suture materials, stapling devices, and surgical tray setups, saving the hospital millions of dollars and reducing errors dramatically, but surgeons in the other system hospitals fought against standardization.¹⁹ Randomized trials have shown that simple, cheap antibiotics are best for first ear infections in children, yet in a study of 12 000 children with first ear infections in the Colorado Medicaid program, 30% received unnecessary, expensive, and hazardous antibiotics, at an excess cost of over \$200 000 per year.²⁰

In summary, mastering the generation of good changes is not the same as mastering the use of good changes—the diffusion of innovations.

THE SCIENCE OF DIFFUSION OF INNOVATION

The study of diffusion of innovation has a long history in social science, with important modern contributions by Everett Rogers (especially his landmark text, *Diffusion of Innovations*²¹), Andrew Van de Ven²² (especially his leadership of the Minnesota Innovation Research Program), and many others. These students of the dissemination of innovation focus on 3 basic clusters of influence that, in descriptive studies, correlate with the rate of spread of a change: (1) perceptions of the innovation; (2) characteristics of the people who adopt the innovation, or fail to do so; and (3) contextual factors, especially involving communication, incentives, leadership, and management.

Perceptions of the Innovation

Perceptions of an innovation predict between 49% and 87% of the variance in the rate of spread.^{21(p206)} In particular, 5 perceptions or properties of the change as possible adopters understand it seem most influential.

First, and most powerful, is the perceived benefit of the change. Individuals are more likely to adopt an innovation if they think it can help them. This is a more complicated idea than it appears, however, because for most people who accept or reject an innovation, benefit is a relative matter—a matter of the balance between risks and gains and of risk aversion in comparing the known status quo with the unknown future if the innovation is adopted. The relevant calculation of value involves risk and benefit. The more knowledge individuals can gain about the expected consequences of an innovation—leading to what Rogers calls “reduction in uncertainty”—the more likely they are to adopt it.^{21(p168)} Most individuals are not like James Cook; they do not go looking for trouble and calling it “adventure.” They look for ways to stay out of trouble, especially unfamiliar trouble. They tend to therefore avoid novelty, and unfamiliar changes bear an extra burden of proof.

Second, to diffuse rapidly, an innovation must be compatible with the values, beliefs, past history, and current needs of individuals. For example, only a minority of physician groups routinely use formal, scientific protocols and guidelines in their practices.²³ This may be due in part to stubbornness, but it may also involve the guidelines’ lack of compatibility with current processes. Even a scientifically reasonable guideline may simply not work well in the current context. In addition, to spread quickly, a change must resonate with currently felt needs and belief systems. Surgeons are not interested in finding new ways to arrive in the operating room on time if they do not care when the surgery starts, or if they know that operations do not start on time. Obstetricians are not interested in exploring ways to reduce ce-

sarean delivery rates if they believe that current rates are clinically acceptable or necessary to avoid malpractice suits.

A third factor affecting the rate of diffusion is the complexity of the proposed innovation. Generally, simple innovations spread faster than complicated ones. Individuals who develop an innovation often are not its best salespeople, because they usually are at least as invested in its complexity as in its elegance. They tend to insist on absolute replication, not adaptation. However, innovations are more robust to modification than their inventors think, and local adaptation, which often involves simplification, is nearly a universal property of successful dissemination. In fact, the Minnesota Innovation Research Program found that innovations always change as they spread.²² In a successful diffusion process, the original innovation itself mutates into many different but related innovations.

The word “spread” is a misnomer; a better word is “reinvention.” The way children learn language is a good analogy.²⁴ The process of language acquisition is much more than copying; it involves interactions between children’s brains and the words they hear. In fact, children who only repeat what they hear are not good learners; they are autistic. Individuals in organizations are learners. They do not merely repeat what they hear; they change it. This universal reinvention process may be related to Gerald Nadler’s Uniqueness Principle, which states, “No two problems are the same.”²⁵ Neither are any 2 solutions.

One common adaptation is to simplify the change. A successful clinical improvement project at Intermountain Health Care’s Latter-Day Saints Hospital reduced the rate of pressure sores in vulnerable patients by 80% or more through the adoption of one of the clinical guidelines published by the Agency for Health Care Policy and Research (now called the US Agency for Healthcare Research and Quality).²⁶ When asked how this was accomplished, the leader of the improve-

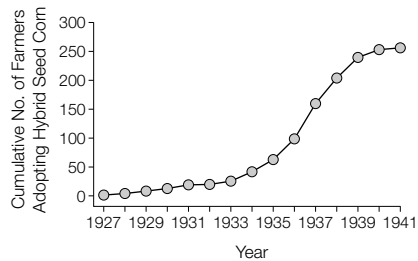
ment project reflected that she and her colleagues had actually adopted the guidelines only in the most general sense of the word. They found that the 30-page guideline book contained 2 changes with especially high leverage: calculate a decubitus ulcer risk score via the Braden Scale²⁷ and turn high-risk patients every 2 hours. Those 2 simple innovations, not the whole detailed, complex guideline, however scientific its pedigree, produced the lion’s share of the result. In fact, one might say that the Intermountain team actually failed to adopt the guideline; instead, they invented their own, locally adapted version of the innovation and put it to work.

Two other perceptions predict the spread of an innovation: trialability (whether or not a proposed adopter believes he or she can find a way to test the change on a small scale without implementing it everywhere at first) and observability (the ease with which potential adopters can watch others try the change first). Changes spread faster when they have these 5 perceived attributes: benefit, compatibility, simplicity, trialability, and observability.

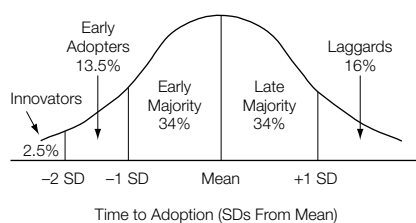
Characteristics of the Individuals Who May Adopt the Change

A second cluster of factors that helps explain the rate of spread of an innovation is that associated with the personalities of the individuals among whom spread might occur, ie, the potential “adopters.” The prevailing model of population stratification derives from a 1943 study of the rate of adoption of a new form of hybrid seed corn among Iowa farmers (FIGURE 1).^{21(p258),28} This Iowa study has been replicated for numerous other innovations. Its authors found that the curve of adoption of the innovation among 300 farmers had an S shape, with an early slow phase affecting a very few farmers, a rapid middle phase with wide spread, and a slow third phase with incomplete penetration in the end. It looks much like the epidemic curve of a contagious disease.

Over time, students of innovation came to classify the underlying popu-

Figure 1. Cumulative Number of Adopters of Hybrid Seed Corn in 2 Iowa Communities

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Figure 2. Adopter Categorization on the Basis of Innovativeness

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lation of adopters into 5 categories (FIGURE 2).^{21(p262)} Because these categories were defined statistically, based simply on the number of SDs from the mean adoption time, the classification is somewhat artificial. Nonetheless, the resulting labels have entered conventional use and have proven helpful as a model of variation in adoption behaviors.

The fastest adopting group (by definition, ≥ 2 SDs faster than the mean rate of adoption, and therefore, by definition, about 2.5% of those involved) are called “innovators.” They are distinguished from the rest of the population by their venturesomeness, tolerance of risk, fascination with novelty, and willingness to leave the village to learn. Rogers calls them “cosmopolite.”^{21(p299)} They belong to cliques that transcend geographical boundaries, and they invest energy in those remote connections. Innovators who were studied in traditional Colombian villages left on trips to cities about 30 times a year, while the average resident left 0.3 times a year.^{21(p274)} Innovators tend to be

wealthier than average or otherwise able to accept the risks and costs inherent in innovating. Locally, socially, they tend to be a little disconnected. They are not opinion leaders; in fact, they may be thought of as weird or incautious. In health care, physician-innovators may be thought of as mavericks or may appear to be heavily invested personally in a specialized topic.

The next group, called “early adopters,” (by definition between 1 and 2 SDs quicker to adopt than the average, and therefore about 13% of individuals) are different from innovators. They are opinion leaders; they are locally well-connected socially, and they do not tend to search quite so widely as the innovators. They do, however, speak with innovators and with each other. They cross-pollinate, and they select ideas that they would like to try out. They have the resources and the risk tolerance to try new things. Such people are generally testing several innovations at once and can report on them if asked. They are self-conscious experimenters. Most crucially to the dynamics of spread, early adopters are watched. In health care settings, they are probably often chosen as elected leaders or representatives of clinical group, and they are the likeliest targets of pharmaceutical company detailing.

Individuals who watch the early adopters, the next third of the distribution, are the “early majority.” Whereas the early adopters maintain bridges to the outside through innovators by traveling, the early majority are quite local in their perspectives. They learn mainly from people they know well, and they rely on personal familiarity, more than on science or theory, before they decide to test a change. They are more risk-averse than early adopters. Those in the early majority are readier to hear about innovations relevant to current, local problems than general background improvements. Dairy farmers are more ready to accept innovations in dairy farming than in general animal care. Physicians in the early majority are readier to try those innovations that meet their immedi-

ate needs than those that are simply interesting ideas.

The next group, another third of the population, is even more conservative: the “late majority.” While the early majority look to the early adopters for signals about what is safe to try, the late majority look to the early majority. They will adopt an innovation when it appears to be the new status quo (for physicians, the standard of practice), not before. They watch for local proof; they do not find remote, cosmopolite sources of knowledge to be either trustworthy or particularly interesting.

Members of the final group are sometimes called “laggards”: the 16% of the individuals for whom, in Rogers’ term, “the point of reference . . . is the past.”^{21(p265)} The term “laggards” probably misstates this group’s value and wisdom. They should perhaps be called traditionalists, sea anchors, or archivists, to emphasize that they are often making choices that are wise and useful to the community or organization. They are the physicians who swear by the tried and true.

Contextual Factors

A third cluster of influences on the rate of diffusion of innovations has to do with contextual and managerial factors within an organization or social system that encourage and support, or discourage and impede, the actual processes of spread. For example, organizations may be nurturing environments for innovators, offering them praise, resources, and security for their inevitable failures, or they may discourage innovators by asking all employees not to rock the boat and by regarding those who propose change as troublemakers. Similarly, because the early majority tends to learn about innovations best from local and social interactions with early adopters, organizations that foster such social exchanges may see faster dissemination of changes than organizations that develop habits of isolation or whose buildings have architectural features that discourage hallway chats.

Rogers also points out that leaders have several styles of spread, making

“innovation decisions” of 3 types: “optional,” “collective,” and “authoritative.”^{21(p372)} No one style is best in all circumstances or for all innovations. The managerial task, and art, is to fit the strategy to the change and to the social context. By the same token, organizations with an impoverished stylistic repertoire—for example, always using authoritarian approaches or always seeking consensus before acting—may be puzzled that some changes spread quickly, while others, not at all.

The Dynamics of Diffusion

The curve that describes the dissemination of innovation has a tipping point, after which it becomes difficult to stop a change from spreading further. Changes appear to acquire their own momentum somewhere on the ascending portion of the adoption curve, often between 15% and 20% adoption.^{21(p259)} This empirical finding makes theoretical sense in view of the social dynamics in the population model of adoption. Once innovators and early adopters have embraced a change, the model asserts that the early majority will follow their lead if they can interact with them, and, once those in the early majority have done so, the late majority will discover that the majority has changed direction and will feel comfortable changing, too.

This dynamic implies that successful diffusion depends more on how an organization or social system deals with its innovators, early adopters, and the interface between early adopters and the early majority than with any other groups or phases.

FROM DESCRIPTION TO PRESCRIPTION

The literature on diffusion offers some rich ideas about the factors that promote the spread of change or hold it back, who gets involved and how, the time course of spread, and contextual factors that help or hurt. It is important to recognize, however, that the vast majority of this research is descriptive and observational, not experimental, and that therefore prescription of in-

terventions based on it rests on a narrow foundation of inference and extrapolation. Nonetheless, the research does support some educated guesses about what might help leaders to better nurture the dissemination of good changes. Following are some rules, admittedly speculative, for disseminating innovations in health care.

Rule 1: Find Sound Innovations

This is almost too obvious to say, but too important to leave unsaid. Unlike those in other industries, health care innovators do tend to publish their work. Professional journals abound with their stories. Yet, in many health care organizations, no formal mechanisms exist for identifying changes that should be deployed, such as assigning responsibility for routine, high-level surveillance of key scientific journals or for attending key scientific meetings and reporting back reliably to the organization on ideas that should be spread. Instead, senior leaders appear to leave this process to an imagined, latent professional culture that they assume is constantly scanning for new ideas. Unfortunately, that culture, at a system level, does not do such combing.^{29,30} Medical communities are primarily local in their orientation, are dominated numerically by early and late majority groups, and do not trust remote and personally unfamiliar sources of authority. The counterweight ought to be a formal, deliberate, organized system of search for innovations.³¹ Large medical organizations can arrange this. Smaller physician practices may benefit from joining networks or professional societies that help them with the task, such as the highly innovative Vermont Oxford Neonatal Network,³² or the Federation of Practice-Based Research Networks of the American Academy of Family Physicians (available at www.aafp.org).

Rule 2: Find and Support Innovators

Novel answers to chronic, local problems tend to come from outside the current system, and therefore individuals

who search widely for innovations are crucial to a positive future. Senior leaders who mean to foster change should identify and value these scouts and should give them the slack and resources to look in distant places. For physician-innovators, this may mean a little time off and money to travel to unusual settings. Innovators will not be the easiest individuals to deal with in their organization; they may be abrasive, not invested in local networks, and demanding of latitude. If they were not, they would not be innovators. A dated, although still highly regarded, review of 61 major inventions across a variety of industries since the year 1900 found that 40 came from individuals acting alone, not from corporate research and development efforts.³³ Innovators are diamonds in the rough.

Rule 3: Invest in Early Adopters

Leaders may decrease resistance to the spread of innovation if, instead of insisting always on compliance with current practices, they start investing heavily in the curiosity of a few early adopters who want to test changes. Even organizations that want clinical guidelines to be used reliably can encourage prudent physicians to suggest or test evidence-based changes from the guidelines, as long as it is done openly and the results tracked and reported. This switch, from compliance to support, is crucial to effective diffusion. It is therefore important to know who the potential early adopters are. They may be obvious, but formal tools also exist for finding them.³⁴ Like innovators, early adopters need the slack time and resources to try out new things and to reduce their uncertainty through small-scale trials. Some health care systems could formalize this role in designated, part-time “improvement fellowships” or by creating forms of sabbatical for early adopters to explore their interests.

Early adopters obtain their news from innovators. Some diffusion researchers call this factor “the strength of weak ties,”³⁵ emphasizing the value of relatively nonlocal, socially weak relation-

ships in supplying early adopters with ideas they can play with. Leaders who want to accelerate change should help increase the ease and frequency with which early adopters meet and interact with innovators. Some meetings should be used to help innovators report on their work. The building architecture should favor casual interactions among individuals from different disciplines and clinical areas.

Rule 4: Make Early Adopter Activity Observable

The early majority watch the early adopters, but they cannot watch them if they cannot see them. The communication channels that work well between these groups are not media channels, they are social channels. The crucial interface between the early adopter and the early majority cannot be effectively supported by memoranda or publications. Spread requires social interaction. Robert DeMott, an early adopter obstetrician in Green Bay, Wis, who helped lead that community's cesarean delivery rates down from 18% to 8%,³⁶ has said that what mattered most was "talking to people . . . to every single obstetrician . . . one on one . . . addressing their questions" (oral communication, 1995).

This is also the answer researchers find when they try to explain the great success of one of the most successful innovation-spread programs ever seen in this country—the Agricultural Extension Service (AES).²¹(pp337-364) Moving knowledge to the farmer for use, the AES relies heavily on an extension apparatus of closely integrated tiers, reducing the social distance at each interface and relying more and more on local, face-to-face networks as they move information into the field. The AES refers to the notion of "a spannable social distance" throughout the chain, ensuring that at every stage between the university and the field, each person hears "the news" from someone socially familiar enough to be credible. Closer to medicine, the pharmaceutical industry has long recognized

the power of one-on-one "detailing" of new drugs to physicians and, consequently, continues to invest huge resources in this method of spreading its pharmacological innovations. American health care could benefit greatly from the establishment by the federal government of a Health Care Extension Service modeled on the AES.

Rule 5: Trust and Enable Reinvention

Yogi Berra said, "If you can't imitate him, don't copy him." That is the heart of Nadler's Uniqueness Principle,²⁵ and the sound reasoning behind reinvention as a universal process. In innovation, new concepts usually must come from outside the current system, but new processes—the things that make the concepts live—must come from inside or they will not work. To work, changes must be not only adopted locally, but also adapted locally. As Van de Ven and his Minnesota Research team wrote, "An initial idea tends to proliferate into several divergent and parallel ideas during the innovation process."²² Many leaders seem to regard reinvention as a form of waste, narcissism, or resistance. It is often none of these. Reinvention is a form of learning, and, in its own way, it is an act of both creativity and courage. Leaders who want to foster innovation should learn to differentiate between reinvention and mere resistance, assuming the former until proven otherwise, and should showcase and celebrate individuals who take ideas from elsewhere and adapt them to make them their own.

Rule 6: Create Slack for Change

Van de Ven places this idea at or near the top of his priority list for diffusion.²² In every stratum of adopter, from innovators to laggards, a recurrent theme is that adoption takes energy. The innovators need the energy for "cosmopolite" search and tinkering; the early adopters, to find innovators and to test promising discoveries; the early majority, to network with the early adopters, to learn some details of the new way, and to assess risks and ben-

efits; the late majority, to monitor the ambient culture; and the laggards must have the emotional energy to remain in custody of the past without feeling devalued or too far out of step. These are investments. In real organizations, they involve real time and real money, in especially limited supply given current health care cost pressures. No system trapped in the continuous throes of production, existing always at the margin of resources, innovates well, unless its survival is also imminently and vividly at stake. Leaders who want innovation to spread must make sure that they have invested people's time and energy in it.

Rule 7: Lead by Example

Leaders who champion the spread of innovation must be prepared for resistance, even ridicule; most important, they must be prepared to begin change with themselves. James Cook had to eat his own sauerkraut, and health care leaders who want to spread change must change themselves first.

CONCLUSION

Exploration and leading innovation has its pleasures and its risks. It has no shortcuts. The spirit of the individuals with whom we work and live is the greatest source of untapped energy in our society, but the processes of innovation and dissemination have their own rules, their own pace, and their own, multilayered forms of search and imagining. The pace of change, writes Dr Joseph Juran, is "majestic."³⁷ To create a future different from its past, health care needs leaders who understand innovation and how it spreads, who respect the diversity in change itself, and who, drawing on the best of social science for guidance, can nurture innovation in all its rich and many costumes.

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Fools must be rejected not by arguments, but by facts.
—Flavius Josephus (37?-105)