Technology and the Future of Healthcare

Guidelines for Making Unaffordable Investments You Can't Afford Not to Make

The Paradox

The subtitle's inconsistency—making unaffordable investments you can't afford not to make—is carefully worded. It is not a sign of sloppy writing or inattentive editing. It accurately reflects one of the most daunting challenges facing healthcare leaders in the early 21st century.

- On the one hand, useful technologies are appearing at an unprecedented rate. New medical devices and computer systems are available to solve many of healthcare's most vexing problems. Even more promising technologies are clearly visible on the horizon. Talk of a technology revolution is not exaggerated.
- On the other hand, operating surpluses and investment capital have never been harder to find. Few health systems have spare cash, and reimbursement for medical services is falling farther behind the actual costs of providing them. Investing in technology next year is hard to justify for health systems struggling to meet payroll this month.

The predictable outcome is not pleasant. Retrospective, cost-based reimbursement is finished; it's "so 20th century." Governments and employers are using their power of the purse to spend less on healthcare. They do not seem interested in whether providers can survive on lower revenues.

A downward spiral could be reinforced by failure to consider technology solutions simply because they are perceived to be too expensive. Providers and payers have not adequately invested in technology compared to other industries that have reinvented themselves over the past decade. Spending money to make (or save) money could be the key to healthcare's renaissance, as long as leaders approach the task with an open and visionary mind.

Critical Success Factors for Technology Investments

Prior analysis of operations, problems, and desired outcomes

User involvement throughout adoption and implementation process

Clear specifications for technology selection

Detailed implementation plan with contingencies

Realistic and adequate budget

Specified responsibility and authority

Systems integration

Open systems architecture

Internet- and Web-enabled networking

Common Causes of Technology Implementation Failure

Inadequate planning for implementation

Insufficient release time for users involved in planning

Insufficient education and support for implementation

Inadequate contracts with vendors

Inadequate vendors (check references!)

Redundancy (maintaining legacy system and replacement technology)

Definition and Context

> "Board members and chief executives don't necessarily need to know how a technology works, but they should not approve it until they understand what problem it solves."

Technology is the realm of **processes and tools developed for achieving practical purposes.** The good news is that technology solves problems and saves money when selected, implemented, and managed appropriately. The bad news is that technology can be counterproductive if any step in the process is mishandled.

The difference between good and bad outcomes is often explained by how carefully an organization defines the practical purpose that needs to be achieved. Technology should never be acquired purely for technology's sake. Rather, it should be adopted because it is the best solution to a problem that needs to be solved.

> Technology is the only tool left to solve many of the most vexing problems facing providers today.

Consequently, healthcare leaders should demand that technology requests are based on a clear problem statement. Board members and chief executives don't necessarily need to know how a technology works, but they should not approve it until they understand what problem it solves. The most dazzling technology is not worth acquiring unless it does something important and does it better than the alternatives.

ROI vs. SIB

Return on investment (ROI) analysis has historically been the "gold standard" for evaluating technology acquisition. Unfortunately, ROI is subject to some

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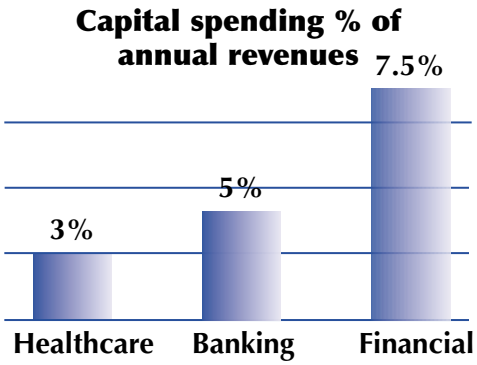
Questions Healthcare Leaders Should Ask

- **How will technology upgrades be handled?**
  - ➢ Hardware and software upgrades
  - ➢ Service and response times
  - ➢ Pricing
- **Who are the qualified vendors?**
  - ➢ Financial and organizational stability
  - ➢ Purchasers' experiences in comparable installations
  - ➢ Reference checks
- **What are the implications for facility design?**
  - ➢ Storage space
  - ➢ Electrical requirements (power, shielding, ventilation)
  - ➢ Reassessing location of clinical functions
- **What other hospital operations are affected by this technology?**
  - ➢ Human resources (recruitment and retention, education and training)
  - ➢ Information services
  - ➢ Physical plant
  - ➢ Medical staff
  - ➢ Patient safety and error reduction
  - ➢ Finance (bond rating, cost accounting, ROI vs. SIB)
- **What are the feasible alternatives to purchasing a technology?**
  - ➢ Outsourcing
  - ➢ Service provider (time or volume use payments)
  - ➢ At-risk contracts with vendors
  - ➢ Lease with technology upgrade protection
  - ➢ Pooled buying and cooperatives

Capital Constraint

Drivers

- Demand for capital is increasing
  -Facility modernization/expansion
  -Equipment
  -IT
- Access increasingly limited
- Investment income down



Definition and Context

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serious limitations that raise questions about its usefulness as a sole decision criterion:

- ROI models evaluate returns to an investment over a period of several years. However, given the accelerating pace of technological development, the useful life of most processes or tools introduced now will be considerably shorter than the multi-year time frame traditionally used in ROI analysis.
- ROI calculations require assumptions about the cost of capital, which is problematic because of uncertainty and volatility in capital markets. The analysis normally assumes purchase of a technology, which is no longer the only way to acquire it. Leasing, per-use or time-based charges, creative arrangements with service providers, and other alternatives to purchase create the need for an alternative to ROI.
- ROI requires making assumptions about cost and revenue streams that are increasingly unpredictable. Revenues associated with investment in any given technology are "guesstimates" at best in today's topsy-turvy environment for reimbursement, and experts will tend to disagree on which costs to attribute to the technology. Quantifying costs and revenues for an investment in technology is art, not science.
- Comparing ROIs on alternative investments can be misleading because different technologies performing similar tasks often produce results that are not directly comparable in economic or clinical terms. For example, CT or MRI can be used to image any particular body part, but clinical imperatives—not costs or revenues—will often dictate which test to use for a particular diagnosis.

> Our healthcare system desperately needs a program to build the technology infrastructure for less-expensive, higher-quality, more accessible care. Stronger political action, not alternative investment analysis, is the only way to achieve the necessary long-run change.

Problems with ROI do not mean that technology investments should be decided by gut-level hunches or rolling dice. Other approaches to investment analysis merit careful consideration:

- Cost effectiveness studies begin by focusing attention on the problem to be solved, which is the reason for acquiring technology in the first place. This technique clearly specifies a goal (i.e., the solution to the problem) as the first step in the analysis and then compares the costs of different ways to achieve it. For example, an 80% reduction in adverse drug events might be achieved in several different ways, from hiring more pharmacists and nurses to installing a bar code system and/or computerizing practitioner order entry. The least-expensive method for achieving this important goal is the cost-effective investment, regardless of ROI.

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Trend Update: Technologies to Watch

Photo Courtesy of SG-2, LLC and Keith Isaacson, M.D., Massachusetts General Hospitals, 2002.

Technology development is moving so fast that even professionals must devote an incredible amount of time and effort just to stay confused. However, several evolving technologies merit the attention of leaders of a progressive health system.

Clinical Technology

Diagnostic Imaging. Technology has arguably changed radiology more than any other clinical area over the past few decades. According to *Radiology* (January 2000), three-quarters of the imaging procedures performed in 1995 used devices that did not exist in 1970. Even more imaging applications continue to move from R & D into common use each year. At present, three-dimensional MRI and CT images are being developed for pre-operative planning and simulation training. Positron emission tomography (PET) and MRI are starting to gain acceptance for typing and staging tumors and studying real-time biological function (e.g., evaluating which drug has the desired therapeutic effect in the brain of a patient with chronic depression). Image-guided interventions are proliferating for taking tissue samples, clearing clogged arteries (angioplasty), inserting stents, destroying cancerous tissue, and performing microsurgery. MRI and CT are also starting to rival endoscopy for locating pathology in the gastrointestinal tract—eliminating the discomfort and risk of a tube inserted into the body.

> Implementation of computerized practitioner order entry (CPOE) systems would also be advanced by the proliferation of tablet computers. CPOE technology can dramatically reduce many of paper records' most serious problems, particularly adverse drug events resulting from illegible handwriting.

Operating Room of the Future. Surgical technology has progressed at a steady pace for the past several decades, bringing dramatic improvements in areas like minimally invasive surgery and anesthesiology. However, the operating room as a physical space did not change much despite the technological progress. Engineers and architects are now focusing attention on new design concepts that reflect the new technology. This accelerating movement, known as Operating Room of the Future (ORF), is starting to reshape the entire surgical environment by formally integrating the tools of biotechnology and information technology. An ORF suite is visibly different from the traditional operating room. Most equipment is attached to ceiling-mounted booms, not floor stands. Increasingly, the devices can be controlled with voice commands. High-resolution computer screens display comprehensive, up-to-date information to all members of the surgical team. Robots are being deployed to perform many tasks, mechanically enhancing surgeons' motor skills and eliminating the fatigue of long and repetitive operations. Perhaps most significantly, ORF technology is being developed specifically to promote patient safety and reduce errors.

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Trend Update: Technologies to Watch

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Rapid technological change is blurring traditional distinctions in American medicine. For example, the operating room and the radiology department are merging as imaging devices become an integral part of the surgical process. Thanks to miniaturization and portability of equipment, many non-radiologists (e.g., cardiologists, urologists, obstetricians) are starting to use imaging devices in their own practices, and invasive radiologists are performing even more procedures that have been traditionally done only by surgeons. *Health systems' trustees and senior executives must develop policies for mediating the emergent "turf wars." Setting egalitarian standards for using new technology is arguably as important as deciding which technology to acquire.*

Invasive Cardiology. Technological progress is pushing the frontiers of care for heart disease. Robotic surgery has recently been approved for minimal access, beating-heart repair of defects in valves and arteries. Improved cardiac medications and partial heart replacement with left ventricular assist devices are becoming accepted to deal with causes of heart failure that were fatal just a few years ago. Automatic implantable cardioverter defibrillators (AICD) and biventricular pacers can achieve remarkable results for cardiac rhythm problems that were previously treated only with drugs. Ultrasound devices are being used increasingly to assess cardiac function, and other imaging modalities will be in greater demand to deal with the growing use of stents (including the new drug-eluting type) that hinder the redevelopment of plaque removed by angioplasty procedures.

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Predictive Medicine. Genomics was expected to impact therapeutics (i.e., treatment of disease) almost immediately after the human genome sequence was published early in 2001, but its initial applications are appearing almost exclusively in diagnostics. DNA microarrays, SNP data bases, drug effectiveness studies, advanced microscopy and photonics, new laboratory tests (e.g., C-reactive protein as an alternative to cholesterol studies for evaluation of hear disease), and tissue and gene banks are among the new technologies appearing as a result of the genetics revolution. Hospitals can expect to see increasing demand for tests that allow individuals to assess their risk for many major and minor diseases.

Management Technology

Computerized Patient Record (CPR)/Electronic Medical Record (EMR). Some commentators try to make subtle distinctions between CPR and EMR, but the *relevant* point is the accelerating availability of either type of paperless record to overcome the serious deficiencies of paper records:

- Dysfunctional links to charge capture, inventory control, and scheduling
- Uncertain compliance with HIPAA regulations
- Patients moving faster than records
- Difficulty in locating medical records
- Incomplete charts (including delinquencies)
- Use restrictions of single copy
- Complete chart open to people with only limited need to know
- Professional time wasted in clerical functions
- Illegibility of handwritten entries
- Inability to search for common information
- Errors in compiling and assembling charts

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Trend Update: Technologies to Watch

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- Lack of consistent and sufficient space for working with records

Adoption of CPR/EMR technology will be accelerated by the concurrent introduction of user interfaces that overcome nurses' and doctors' resistance to working with electronic records over the past decade. For example, the generation of tablet computers introduced in late 2002 allows clinicians to enter data by keyboard, voice, touch screen, or handwriting from a single device. These tablet computers are also battery-powered and linked to the network by wireless communications.

As the newest type of personal digital assistant (PDA), tablet computers will almost certainly promote physicians' use of wireless devices to access online medical journals and pharmaceutical information and to communicate with patients and other physicians for virtual consultations. Implementation of computerized practitioner order entry (CPOE) systems would also be advanced by the proliferation of tablet computers. CPOE technology can dramatically reduce many of paper records' most serious problems, particularly adverse drug events resulting from illegible handwriting. However, CPOE is not CPR/EMR, and it does not address most of the items on the list above.

Integrated Information Management Systems. Automated information systems have been used in hospitals since the 1980s, but they have generally addressed very specific applications, such as billing or reporting laboratory results. Consequently, hospitals have tended to acquire many specialized information systems, but the systems did not communicate smoothly, if at all, with each other. New information technologies—including open systems architecture, internet protocols (IP), Web services (middleware), portals, data standards, and search engines—are capable of producing much-needed capabilities to share information electronically across the enterprise.

These functional improvements are rapidly being incorporated into hospital information systems.

Decision support software, such as programs that automatically compare prescriptions with diagnoses and identify potentially dangerous interactions between drugs, is another welcome addition to the integrated information systems. The emerging systems are also intelligent, meaning that they "learn" from cumulative interaction with individual users and anticipate their needs. More systems are also incorporating other technologies (e.g., bar coding) to improve safety, enhance revenue, and manage inventory. The promise of these technologies lies in their increased capability to substitute effectively for healthcare's most expensive input—human resources.

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Conclusion

Many hospitals and medical groups are reluctant to adopt new information technologies because the systems are presumed to be unaffordable or because recent failures have been widely publicized. Alternatives to purchase (see ROI vs. SIB) can be used to overcome many real or perceived financial barriers. Careful and unrushed planning (see Critical Success Factors for Technology Investment and Common Causes of Technology Implementation Failure) can dramatically improve the chances for implementations that solve problems. Healthcare leaders who are reluctant to proceed should ponder a statement attributed to Confucius: "Surely we will end up where we are headed if we do not change direction." Information technology isn't perfect, but it will move healthcare in a much better direction than the paper trail.

Definition and Context

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- Reflecting the limitations of ROI, literature on technology investing is focusing more on total costs of ownership (TCO) as a measure of affordability. Prospectively identifying a technology's total costs over time is arguably more accurate than estimating returns flowing from the initial investment. Some health systems are starting to evaluate TCO of technology in the context of estimated cash flow over one or two years as an alternative to ROI over three to five years. If a technology produces the targeted solution to a problem without producing negative cash flow, it is acceptable from the financial perspective.

- Strategic partnerships are also being used to help collaborating health systems acquire necessary technologies that they could not justify on their own. For example, outsourcing effectively represents a pooled purchasing approach with a bright future because it captures economies of scale and transfers risk to a specialized intermediary.

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Alternatives to ROI are not perfect. Indeed, no analytical tool is foolproof when uncertainty prevails. However, the alternatives to ROI are more relevant to the rapid technological change and unpredictable reimbursement that will prevail in healthcare for the foreseeable future. They move beyond ROI to SIB—staying in business. Technology is the only tool left to solve many of the most vexing problems facing providers today. Solutions like hiring more nurses, raising prices, or reducing quality will not work for a variety of reasons, so leaders must find ways to make technology investments even when ROIs are negative.

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Excessive concern with ROI also diverts attention from a major SIB challenge—the compelling need for collective political action to produce fair reimbursement and necessary investments. Medicare and Medicaid will only get worse before they get worse (unless the political situation changes, which seems unlikely in the short-term). By overreacting to legitimate historical problems like fraud and waste, government officials are cutting reimbursement below the health industry's break-even point. Unfunded mandates like the Health Insurance Portability and Accountability Act of 1996 (HIPAA) create an even greater need for labor-saving and cost-cutting technology, but declining reimbursement automatically reduces ROI. Our healthcare system desperately needs a program to build the technology infrastructure for less-expensive, higher-quality, more accessible care. Stronger political action, not alternative investment analysis, is the only way to achieve the necessary long-run change.

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