

Delivering on the Promise: An Adaptive Approach to Information Technology in Healthcare

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Executive Summary

Information technology (IT) holds great promise for healthcare, but despite great effort and investment, much of this promise remains unfilled. This pattern has been seen repeatedly in other industries and suggests the promise may lie in emerging markets and methods. If so, that is a great opportunity. Because we in healthcare are expert in current methods, this paper will focus on emerging markets, and an approach called Adaptive Designsm that may allow the healthcare industry to take advantage of opportunities presented by technology that are outside of the present “paradigm.”

The paper starts by examining the thinking around IT adoption that prevails today in the healthcare industry. It then looks at the phenomenon of emerging technologies.

The next section offers an in-depth look at two important approaches to achieving business success: Best Design and Adaptive Design. A brief case study—the story of Sony and the creation of the Walkman—illustrates the power of Adaptive Design. This is followed by a discussion about the importance of understanding the “job to be done,” and a look at what that job is in healthcare.

We then look at why attempts at achieving Adaptive Design often fail, with an emphasis on the difficulty that established organizations have in making the transition to emerging strategies.

The concluding section offers four scenarios for achieving the promise of IT in healthcare. Three of the four scenarios presented here are outside the “present paradigm.” Keep in mind that the objective of this paper is not to proselytize a method, but to create dialogue and discussion around new ideas.

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Introduction

The U.S. healthcare system faces many well-recognized challenges: high costs, inefficiency, inadequate safety, insufficient access, and poor financial performance. For years, many have been calling for a fundamental change in the way healthcare is delivered. And while there is no clear picture as yet of what this change will look like, many believe that a “paradigm shift” in healthcare is coming, and that information technology (IT) will be an important catalyst.

A review of research into the impact that IT has had on healthcare to date shows that:¹

- Most current research focuses on quality and safety.
- There is evidence that clinical information tools can improve prescription drug administration and patient safety² through improved drug dosing, reduction in adverse drug interactions,^{3,4} and more appropriate utilization.
- Studies looking at adverse drug interactions and improved formulary usage have demonstrated cost savings.⁵ However, few studies document improvements in productivity, efficiency, service, or major costs savings in other areas.
- Despite anecdotal claims of other benefit related to specific aspects of clinical information systems,^{6,7} clear, objective evidence is lacking.

For the promise of IT to be fulfilled, success must move from narrow, limited examples out into widespread practice.^{8,9} However, cost,^{10,11} clinician resistance,¹² poor functionality, and an unproven business case are obstructions.^{13,14}

Prevailing Strategies for IT Adoption

Both the literature and discussions with users suggest that most healthcare organizations base their current IT strategy on some combination of the following assumptions:

- Well-funded hospitals and health systems should continue to invest in IT implementations and fund the costs through operating and non-operating revenue.
- Systems with the financial resources should work to reduce user and functionality barriers to IT adoption by investing heavily in customization, user engagement, training, and building IT support staffs.
- Less financially stable organizations should invest in “plug and play” IT solutions that offer less flexibility, or they should delay making additional investments in IT.
- Barriers such as cost, user resistance, and poor functionality should be treated as technical problems to be overcome or minimized by better understanding of data needs, technical improvements, access to better products and standardization.^a

^a “I think there is going to be a lot of movement in health care IT this year. [We are] building awareness and laying the foundation for an interoperable system. We’re looking at driving standards for interoperability of information across the health system.” Janet Marchibroda, CEO of the eHealth Initiative is quoted in *Modern Physician*, February 2003. The eHealth Initiative has four goals: identify the data necessary to deliver better healthcare; reach consensus on standards that should be applied to that data; determine the clinical information needs of stakeholders; and demonstrate interconnectivity between large health systems.

- Because it is the industry’s biggest sponsor—and because quality care is a public good—the government should encourage IT adoption in healthcare through subsidies or mandates. In other words, one way to overcome the lack of a clear business case for IT adoption is to create one by offering financial incentives to hospitals that integrate new IT systems¹⁵, or enacting new laws that require it.¹⁶

Unfortunately, these solutions define (and confine) the debate. We believe that the debate must be extended to reexamine *how* that revolution will occur. It is our hope that a fresh look at this problem will point the way toward a safer, more accessible, and more profitable future.

Delivering the Promise: Understanding Emerging Technologies

A 1970 *New England Journal of Medicine* (NEJM) article predicted that by the year 2000, computers would act almost as an extension of the brain of the physician in making clinical diagnoses and decisions.¹⁷ The history of technology tells us that something like this may well happen at some point in the future, but also teaches us three important lessons:

1. Predictions about the future are often right in the sense that a new technology will likely reach its potential—eventually.
2. The timeline for realizing the potential of new technologies is usually not what we suppose.
3. New technologies almost never enter the marketplace along a pre-designed pathway.

An example of all three of these points is the videophone. AT&T presented the first videophone at the 1964 World’s Fair in New York to great acclaim. Despite the fact that AT&T saw potential in the videophone, the first videoconferencing equipment to reach the marketplace was introduced by PictureTel, and not until 1988. The timeline clearly was not what futurists in the 1960s would have supposed.

But videoconferencing *is* slowly becoming an important part of the way we communicate. Today, inexpensive cameras and microphones enable videoconferencing via the Internet. The potential to combine video and audio technologies in one place is becoming more commonplace. However, the way it is happening is not direct. Applications for combined audio and video communications have come as evolutionary advancements in telephone and other technologies. Videophones are becoming part of our everyday experience through a number of other applications (e.g., cell and wireless technology), and the results are proving to be vastly more successful than any direct attempts to manufacture and sell videophones.

IT clearly holds great promise for the future of healthcare delivery, and the predictions that IT will become an important part of clinical life are almost certainly correct. But if we cannot know in advance either the time frame or the route, how can we prepare?

Adaptive Design Versus Best Design

In a classic work, Henry Mintzberg, one of the most prolific and powerful researchers of corporate strategy, points out that the processes that sustain a successful business also hinder its ability to discover new growth.¹⁸ He believes that a successful, established business flourishes based on its ability to execute its strategy as designed, an approach Kenagy & Associates calls "Best Design." New-growth business succeeds based on its ability to discover its way forward, a process we call "Adaptive Design." If done right, new-growth, Adaptive Design businesses ultimately transition to a Best Design model. The rub here is that although products and services created through Adaptive Design generally transition well to Best Design, the converse is rare. Established businesses seldom successfully transform Best Design methods into true emerging market opportunities.

Best Design

In Best Design, information is given to management that leads it to espouse value for a project or initiative (Figure 1). Management then gathers data to better understand the opportunity. If the project aligns with the organization's current activities, resources, and needs, it passes to the "analyze, plan, and predict" stage. Successful planning leads to implementation, often as a small-scale pilot. Success comes with refinement and scaling to return value to the company—most commonly measured for senior management in terms of aggregate dollars or return on investment (ROI). Best Design generally focuses on high-leverage problems or opportunities and, therefore, generates big, long-term projects that require significant investment. With all the time, effort, and energy invested in Best Design, the pressure to see a return on investment becomes intense.

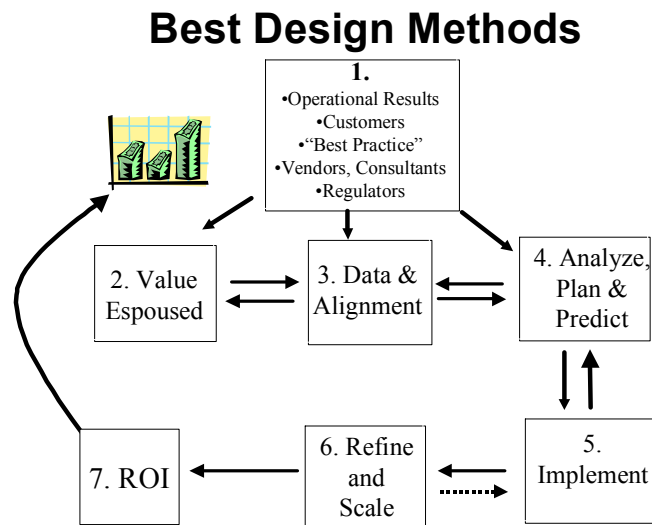


Figure 1

Best Design is a powerful tool for extending products and services that align with an organization’s existing methods, capabilities, and values. But the world is changing rapidly, particularly in healthcare. A host of problems are merging—increasing complexity of services, globalization of health care problems, aging of baby boomers, increasing utilization, and the dramatic increase in the demographic complexity of our patient populations—we are facing a “perfect storm” of challenges.^b Best Design fails in complex, dynamic, rapidly changing environments. Why? Not because of technology, people, or resources, but because it is a method that cannot adapt quickly enough to a rapidly changing environment. What is needed in such environments is Adaptive Design.

Adaptive Design

Our research and experience in the success and failure of emergent, new-growth businesses reveals that Adaptive Design offers five essential links that create a positive feedback loop [Figure 2] that results in increasing returns:

1. A *new value proposition* is identified close to the work.
2. The new value usually involves known technology and creates *relevance* immediately.
3. The organization *redirects resources* to do what is needed to realize that value proposition.
4. The company employs *problem-solving* methods whose goals are to try, do, fail, and improve.
5. The organization is *impatient for value returned* in order to close the loop.

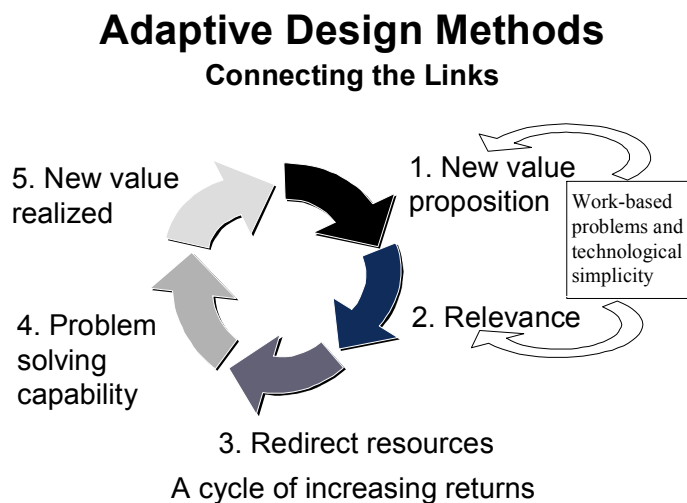


Figure 2

It is worth looking at the five attributes of Adaptive Design in greater detail.

^b David Lawrence, former CEO of Kaiser Permanente, has looked specifically at these four drivers of complexity – services, aging, demographics and globalization and is very articulate on the predictable effect they will have on health care.

The New Value Proposition

Value in emergent, growth businesses stems directly from the value-adding work. The essential questions to ask are:

1. Why do we exist?
2. What products or services are fundamental to our business?
3. Where and how do we add value?

New value propositions flow most effectively from finding the answers to those questions in the work place, *not in the conference room*. Once you are clear on where and how to add value, then you must connect to the workplace with tools for Adaptive Design, including learning lines, direct observation, documentation, and trust building to allow the new value propositions to become evident.¹⁹ What is the most difficult part? Creating separation from traditional organization methods so that new value propositions can begin to flow from the point where value is added, not from a Best Design team or technology vendor.

Relevance

Because emergent innovations almost always begin as technologically simple changes that satisfy the new value proposition, relevance is almost automatic. It does not need to be “aligned,” or more accurately, it is self-aligning by adding value in the workplace. Projects launched by committees, task forces, and the executive suite often are not self-aligning. Management must be careful to maintain this distinction.

Redirecting Resources

This is perhaps the most difficult problem for established organizations. Every successful Adaptive Design effort carefully shepherds scarce resources from traditionally valuable, but lower performing businesses. In our experience, established companies find this step to be extremely difficult. It requires challenging, testing, and refining beliefs, values, processes, and habits of behavior in the crucible of the workplace. The key is to carefully redirect existing resources into a relatively separate environment for problem solving, and learning while holding everyone’s feet to the fire for early return of value. Even though separateness is essential, this stage will intermittently require problem solving on the part of the CEO or COO.²⁰

Problem Solving Capability

Every successful adaptive organization is great at problem solving and learning. According to Wharton professor George S. Day, “Successful adaptation to the vagaries of emerging technologies requires a willingness to experiment and an openness to learn from the inevitable failures and set-backs.”²¹ Adaptive Design needs to go one step farther—it must treat every failure as an *opportunity* to learn. But you cannot wait for a committee to discover a sentinel event to indicate a problem and initiate a project—healthcare is too complex, dynamic, and unpredictable to wait for a committee to deliver the answer. Our observations and recent

research²² suggest that organizations must learn to immediately identify system failures as close to the work as possible, engage in problem solving in the course of work, and change the work to systemically resolve the misalignment between current methods and customer needs. Problem solving then becomes the engine for improvement and change, creating great new opportunities for IT.²³

New Value Realized

The final link in the chain is to quickly yield new value. It is the reverse of the approach to innovation followed by venture capital organizations and the dotcom companies of the late 1990s. A new value proposition relevant to the work and developed with a mature problem solving capability will quickly generate value. Not much value, because these are by definition emerging opportunities, but value nonetheless. The Best Design mentality that fueled the dotcom bubble was to take a great idea and grow it quickly, assuming that profitability would come through scale. The Adaptive Design approach is to be patient for growth, but impatient for value and profitability. Wal-Mart started out profitably but took ten years to grow to a point where it was taken seriously by the marketplace. The ability to generate value quickly reinforces the cycle and closes the loop to create another New Value Proposition. Closing the loop and repeating the cycle is the essence of Adaptive Design—creating a positive feedback loop that leads to cycles of increasing returns.

An Adaptive Design Case Study: The Walkman Story

In 1979 Sony launched the last of its big, new-growth businesses.[°] Masuru Ibuka, co-founder and honorary chairman of Sony, traveled a great deal. Flying from place to place, he enjoyed listening to audiocassettes—which at the time were still relatively novel—on Sony’s recently developed hi-fi cassette recorder/player. Ibuka did this despite the fact that the unit weighed about four pounds. Before a long-haul trip in 1978, Ibuka *could see value* in creating a smaller, lighter tape player and approached Sony executive deputy President Norio Ohga with the problem. Ohga asked the engineers if such a thing was possible, and shortly thereafter a prototype was created. The engineers *problem-solved his concerns by experimenting* and turning one of their monaural tape recorders into a stereo tape player. Ibuka was surprised and elated at the quality of the sound, but also found that there were still many small problems that needed to be solved.

Still, Ibuka asked fellow co-founder and then-president Akio Morita to try the new item. Morita, too, was surprised at Ibuka’s little tape player. His response to the experience of using it was prophetic because he could see in this product a *new value proposition*: “This is the product that will satisfy those young people who want to listen to music all day. They’ll take it everywhere with them, and they won’t care about record functions. If we put a playback-only headphone stereo like this on the market, it’ll be a hit.”²⁴

Redirecting resources—primarily human and technical—from *existing profitable businesses*, Morita and Ibuka led the engineers and sales force in creating this new opportunity. The Walkman was born and *became profitable* soon thereafter.

[°] Emergent opportunities are, by definition, almost never identified by market research. From 1953 to 1979 Sony launched 12 blockbuster new-growth businesses that grew it from a small shop run out of a bombed-out retail store into the powerful force we know today. Two things happened to Sony after this period that have altered their ability to generate new value. First, the co-founder Akio Morita went into semi-retirement. Second, in 1982 Sony hired its first MBA into its marketing function.

New Value at the Point of Use or Work²⁵

Morita's genius was in seeing new value that no one else could see. Typically, businesses rely on market research and analysis to make such product decisions. But the attempt to specify *ex situ* the requirements and attributes of a product may cause problems. Customers do not so much buy products as they hire them to do specific jobs. While we might speak in terms of desired attributes, we typically look around us to find items that help us get a particular job done.

What is one thing that the following items have in common?

- Exercise
- Coffee
- Mattress

The common thread is that they are all things consumers “hire” to help them get through the mid-afternoon slump. They are from *different product categories*, but compete to do *the same job*. Categorizing products in terms of their intrinsic attributes, rather than their “job to be done” has often led smart people to design products and services that are better than those offered by competitors, but that fail to succeed with customers.

Understanding desirable attributes in a product or service—rather than the product's job—can have negative consequences. For instance, what “job” does a physician do? We have observed that physicians who utilize computerized medical records often enter an examination room and spend the first few minutes focused on the computer screen in the room and not the patient. The patient's response? “The doctor is cold.” Furthermore, clinicians report that the experience is unnerving because they feel unprepared—they don't know if they are to give bad news or just interpret normal lab results until they are already in the room with the patient.

In this instance, physicians have a job to do, which is to utilize the information they have just accessed to meet patient needs. Observation reveals that clinicians and their staffs remedy the problem of entering the room cold by printing hot lists of essential information. Ironically, the computerized “paperless” system relies on even more paper. Not understanding the job to be done in this instance created a situation in which physicians must design a workaround to perform successfully as caregivers.

Other functions that seem obviously suited to the strengths of IT have not worked out as expected either. And while computers have been used to improve analog systems, there can be negative consequences as well. In an interview, an IT project manager reported:

Everyone is trying to measure the improvements in health care enabled by IT. But there are tradeoffs. I'm not sure we're unwilling to make those tradeoffs. I just think that when we gain something by implementing IT there is also something lost. No one is studying what is lost. Sometimes the losses are greater than the gains.

Our observations confirm the validity of this statement. In one facility, the deployment of a computerized scheduling system met all the milestones established by the vendor and management and yet, when we actually looked at “the job to be done,” increased the average time^d it takes to schedule a new surgical procedure from a few minutes to more than half a day. Compounding the loss of time is the fact that an additional person is required to update the system’s catalog of procedures. Easy access^e to a central schedule and the ability to allocate operating room time automatically based on average procedure times are touted by managers and vendors as gains, but they are often unaware of the actual cost of the change.

A major contribution to the hidden costs is the gap between work as reported and work as it actually happens. We frequently do an exercise with staff and managers in which we ask them to help us to map out the material and information flows for a particular process. After diagramming the process in as much detail as possible, we observe the process as it actually happens. *Without fail, the described process does not match observations. The variation is never subtle and is often surprising.* Is it any wonder that efforts to gather input from clinicians may result in systems that do not really meet people’s needs?

Successful emerging technologies and methods deliver value while minimizing tradeoffs. To create new value in healthcare, we must link our efforts very closely to the work as it actually happens. The starting point for new and improved information systems must begin with a deep understanding of the jobs to be done in healthcare. Present healthcare IT development focuses on implementation through the methods of Best Design. We believe that Adaptive Design offers a much better model.

Delivering the Promise: What to do When Best Methods Fail

Intelligent, highly trained people are working diligently to deliver on the promise of IT for healthcare. As outlined earlier in this paper, governmental subsidy and mandates are currently being advocated as the best way to ensure that healthcare organizations reach that goal. There are other options. Clayton Christensen’s groundbreaking work on disruptive innovation^f and our research show that Best Design methods are inappropriate. But how can one identify when “the tried and true” is not the best thing to do? And even more importantly, if “what we know how to do” is inappropriate, what do we do instead?

^d This is the amount scheduling time required to book a case beyond the time it takes to schedule a case the facility has previously done.

^e These features, often spoken of enthusiastically by hospital personnel, are not what they seem. First, due to a series of problems, write-access is restricted to one person and even read-access has been restricted to a rather small subgroup of those people who might need the information. Every day, for instance, the charge person for anesthesia has to come to the scheduler to obtain a paper copy of the schedule. Second, our observations have revealed that the automatic time allocation is also problematic for three reasons: first, the mean times for procedures generally have very broad standard deviations; second, the data for calculation must be gathered and inputted; finally, we have observed that the data inputted into the system are almost never accurate.

^f This paper has its genesis in the work of our mentor and teacher Clayton Christensen. Essential to any review of emergent phenomena are his pioneering concepts of disruptive innovation including *The Innovator’s Dilemma* (Harvard Business School Press, Boston, MA) 1997. In addition we have found Day GS, Schoemaker PJH. “Avoiding the pitfalls of emerging technologies.” *California Management Review*; 42:2; pp 8-33, 2000, a reference for these concepts viewed in a more traditional business framework.

Looking at healthcare IT through the Adaptive Design lens shows that the spectrum of opportunity that this approach offers exceeds that of Best Design. Best Design is ideal for improving products and services in known markets (See Figure 3, Region A). Best Design also attempts to fit new technology into existing markets, with varying success. (See Figure 3, Region B)

The Spectrum of Opportunity Adaptive Design Methods

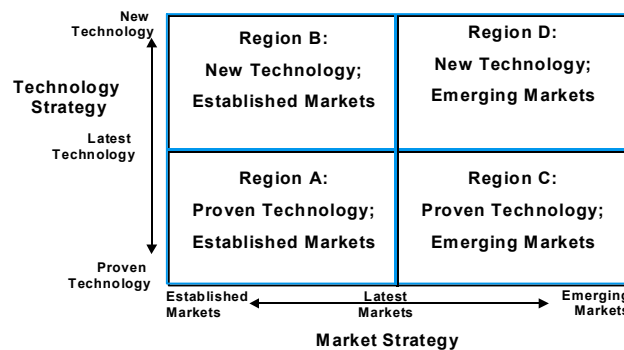


Figure 3

Best Design methods, however, are ill suited to regions C and D. Viewed through this lens, our present inability to deliver on the promise of IT in healthcare is not only understandable, it is completely predictable. The promise and opportunity of IT in healthcare will only be achieved through emergent products and services and Adaptive Design-like methods.

The problem is that history suggests that established healthcare organizations will face severe challenges in seizing this opportunity and, paradoxically, the more successful they are, the greater the challenges they will face. The next section outlines those challenges in the context of how the best judgment of great managers in successful organizations may destroy a link in the Adaptive Design chain and break it.

Missing Link #1: New Value Proposition

Like Masuru Ibuka’s desire to listen to music on the airplane, new value propositions arising from emerging innovations are specific “jobs to be done.” *Because by definition, they do not currently add value,* they often do not make good business sense to established organizations. Discovering why gives us Missing Link #1.

Value for established organizations that are expert at Best Design often revolves around three factors:

- Growing profitable businesses
- Solving big problems

- Developing new businesses

Anything that aligns with profitable growth has relevancy to established organizations. In general, the most successful organizations are excellent at identifying, developing, and incorporating new products and services that add value to present business, even if those products and services require breakthrough thinking, huge investment, and radical organizational change. IBM successfully moved its disk drive business from thin film to magneto-resistive head technology despite the barrier of years of R&D and a \$2 billion price tag because the company could see the relevance to its current product line.²⁶

Secondly, companies that see value in terms of solving big problems can accomplish astonishing feats of restructuring. Note the capability of large hospitals to dismantle 50 years of tradition and fund multimillion-dollar capital investments to build freestanding heart hospitals.

Finally, if the opportunity to grow a profitable business, solve a big problem, and develop a new business all align, the greatest firms can perform astonishing feats of corporate legerdemain. Nortel's "right angle turn," led by its CEO John Roth—through the acquisition of Bay Networks—transformed a traditional voice-communications company into a modern provider of Internet, optical, and wireless technologies and services in a very short timeframe.

The problem for established companies is that emergent value propositions are often not big enough to gain the attention of a large successful company. Digital Equipment clearly saw personal computers developing but did not believe that they were a relevant growth opportunity. Early PCs were profitable, but in the 1970s, PCs were seen as toys that lacked a significant business application. By the time their value was proven by the standards of established markets and firms, it was too late for Digital.

Digital Equipment exemplifies perfectly how and why Best Design methods fail. And Digital Equipment is not alone. In almost all of Christensen's more than 300 examples of disruptive innovation, an established firm recognized the emerging opportunity and discounted it because the value proposition did not fit their business model.²⁷

Missing Link #2: Relevance

People and organizations developing successful emerging technologies see the new value proposition because they have a deep and unique understanding of the value-creating work. This proximity creates immediate relevance for an organization in the Adaptive Design cycle.

Most organizations have low tolerance for the new and unproven.²⁸ Therefore, in the best firms, managers and executives become very proficient at espousing value and generating the data to create alignment for the organization through explicit tools such as business plans and implicit methods like consensus building and mental models²⁹ that clarify ambiguity and decrease risk.³⁰

This approach is essential for success, and the most successful established organizations have the most refined methods for information gathering, interpreting, and predicting, as well as creating

clarity, and implementing programs. The key is to make the scenario a perfectly logical extension of what the organization already knows how to do.

Unfortunately, emergent opportunities are, by definition, not “perfectly logical extensions” of past experience. In such circumstances, traditional explicit and implicit tools and methods do not add clarity but are dysfunctional, myopic lenses that can distort the new business opportunity into something it is not.

When IBM considered the emerging technology of the Haloid-Xerox 914 copier in 1958, organizational thinking linked copiers to typewriters: one produced print; the other copied it. This thinking clarified all the technological, managerial, and manufacturing concerns, and the only issue left was whether the existing typewriter sales force could handle the product. It made good business sense to spread the selling cost of the new product line over an established divisional sales force. But copiers were an unknown quantity, confounding the ingrained sales methods that powered the market dominance of the IBM electric typewriter. No one could create clarity around another scenario and the opportunity was rejected.³¹ A huge new growth business went elsewhere.

Bad management was not the problem; prospectively, IBM made the “correct” business decision. In the history of emerging technologies, the problem for industry leaders has come from applying *good management skills and tools* to create alignment through Best Design methods.

Missing Link #3: Redirecting Resources

Companies like Sony from the 1950s until Akio Morita’s retirement in 1979 make it safe to think and act “out of the box.” A third missing link for established organizations is that they may see the emerging technology but lack the flexibility to redirect resources to address the opportunity.

Successful companies prefer proven profitable businesses they understand to potentially profitable businesses they do not. In addition, there is a natural reticence to develop new business that threatens to attack or cannibalize current profits. Because the burden of proof lies with proponents of change and because managers are more sensitive to losses than to comparable gains, the status quo usually prevails.³²

Those who understand and champion new value propositions tend to be close to the work and may have little influence on higher-level strategic decision makers. If the company’s established business—well aligned with strategy, process, and tradition—starts to falter, leadership looks for ways to shore up the core, typically by cutting costs or reallocating assets. If the fledging business is measured by the standards of the core, it is an easy target for elimination. The result is that the resources required to nourish growth and adaptability vanish.

In a successful company, familiar business methods and technology have already developed and matured, creating a close alignment between strategy and tactics, organizational structure and process. The most successful firms are likely to have the strongest attraction between these fundamental elements. This gives the organization a great deal of stability. But stability creates inertia that must be overcome before the new capabilities can grow and prosper.³³

Missing Link #4: Problem Solving Capability

Adaptive Design requires a robust, flexible problem solving capability. Best Design methods are knowledge- and data-centric, focusing on finding, scaling, and capitalizing on a great idea. But it is usually not the “Great Idea” that transforms an industry.

By the 1990s it was easy to disparage IBM and DEC for missing the microprocessor and the PC operating system. Critics failed to understand that these were never “great ideas,” but rather were unique products that were progressively improved in unanticipated ways through problem solving so that they emerged with ever-greater functionality. The strategic thinking, organizational structures, processes, and values that led to DEC’s demise and IBM’s missed opportunity were the product of decisions made in the 1970s and early 1980s when the PC really did not look like such a great idea.

It is not the “Great Idea,” but rather the capability to problem solve—to do, try, fail, and improve, and then repeat that cycle is the hallmark of success for great growth companies as disparate as Toyota, Southwest Airlines, Intel, and Wal-Mart.⁸ The other challenge is to be able to change directions and even back out of a path already taken. This is difficult for most organizations once executives, managers, and employees have “skin” in the game. Typically, an individual or group of executives or managers proposes a specific course of action, product line, or company direction. For what seem like the right reasons at the time, there is agreement to move forward. Then a market change or external event occurs that would have resulted in a different decision had it happened before the decision was made.

The problem is that someone has started moving down a particular path and assumed “ownership” of that direction. Responsibilities and authorities have been assumed; budget and staff have been allocated. After all the work that went into “winning” the approval, it is difficult to go back and say, “Things have changed, so let’s change what we all agreed to just a short time ago.”³⁴

Missing Link #5: New Value Realized

The companies that have excelled at developing emergent ideas start with relevant new value propositions, allocate resources to them, problem solve, and generate profitability or other forms of value quickly. No one can argue with new value, but, for Best Designs firm, it is all a matter of scale.

In general, the value realized by the new venture will be relatively small for an established company. In fact, though such ventures may return profits quickly, they are often killed because they are not big enough. The added revenue—or even profit—of a developing business will not meet the immediate growth needs of a typical large organization. Consequently, many good companies pass over great opportunities.

⁸ A study of 500 successful entrepreneurs is instructive. The original idea was very significantly changed by a third of the group, moderately changed by another third and, in the rest, the original idea was almost never left intact. Ahar Bhide, *The Origins and Evolution of New Businesses*. (Oxford University Press: New York), 2000.

The tendency for most established companies is to make huge investments and be impatient for growth but patient for profit—exactly the opposite of the tactics that most successful emerging innovators utilize. One study found that 8 of 24 established firms that entered markets for *an emerging technology that was succeeding* subsequently withdrew, and most did not resume their efforts until outsiders demonstrated the viability of the new product—and by then it was often too late.³⁵ Established companies that wish to enter new markets must be patient for growth, but can be impatient for ROI.

In summary, history and current experience suggests:

- Best Design methods are familiar and powerful tools for extending the capabilities of established organizations in successful business lines.
- Adaptive Design was the catalyst for emerging technologies and markets that have been the foundation for some of the great growth businesses of the 20th century.
- Adaptive Design methods are specific and interlinked. Failure of one link threatens the whole chain.
- Most importantly, the failure of established organizations to take advantage of emergent opportunities is not commonly caused by a lack of resources. Rather, organizations adept at Best Design are almost perfectly designed to fail in developing one or more of the links in Adaptive Design chain.

Developing Emergent Capabilities in Established Organizations

This paper has documented why incumbents fail in emergent opportunities. Kenagy & Associates, LLC is committed to helping Best Design organizations generate the uncommon success of working adaptively. Our research and work focuses on how established, successful organizations can develop emergent opportunities. Healthcare and technology companies have attributes that make them essential partners in the development of a great, new growth opportunity: fulfilling the promise of IT in healthcare. Using an Adaptive Design framework, how might that happen?

Leadership is essential. Without clear, consistent leadership support from the top of the organization, it is extremely difficult to implement an Adaptive Design approach. But what form must that support take?³⁶ People like Akio Morita are extremely rare—steadfastly supporting unproven, emergent opportunities is not a natural activity for most senior managers. The Adaptive Design template is of benefit in defining “the job to be done.”

It starts with a senior leader who is dissatisfied with current Best Design results—someone who does not want to form another taskforce, or upgrade another computer system that has never met expectations. How to start? Begin with these questions. Can the CEO articulate the attributes of each link in the chain? Will senior management create and maintain the learning environment that allows the organization to discover the jobs to be done? Will they redirect resources to work outside the Best Design methods? Can they use the examples of the very few established companies (Toyota³⁷, for one) to create immediate problem solving capability?³⁸ Can they hold the process accountable for early return of value and be patient for growth? Most importantly,

can they eliminate the organizational barriers and defuse the political landmines that stand in the way of generating of new value?

Where Will We Go From Here?

There is tremendous promise for IT in healthcare. And while we do not know exactly *what* the future will look like, our research and experience provides useful information as to *how* organizations will be able to take advantage of the promise that IT offers. Below we offer four scenarios for the future based on Regions A-D in Figure 4. We assume that all companies start in Region A.

The Spectrum of Opportunity Adaptive Design Methods

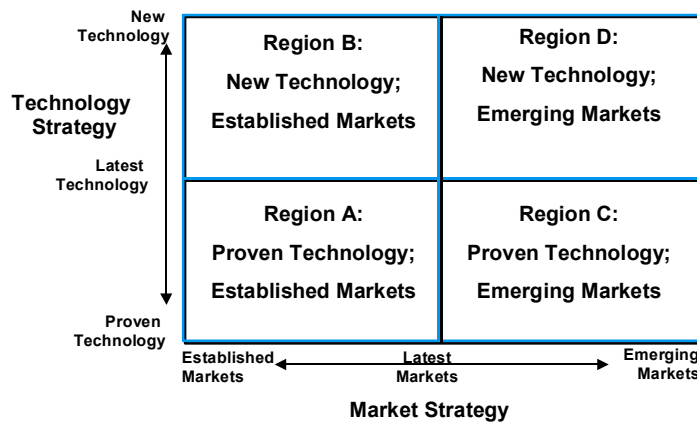


Figure 4

Scenario #1: Remaining in Region A

This is tantamount to AT&T and other companies continually delivering new devices that leapfrog past existing phone technology with the hope of someday meeting futurists' expectations of the videophone. Remaining in Region A will be the course for the vast majority of healthcare organizations and technology companies. Almost everyone will use Best Design methods as they continue to use known and more sophisticated technology in the established IT markets of data acquisition, data transfer, codification of best practice, standardization, security, and safety. Examples of the essentials necessary for delivery on the promise in Scenario #1 include:

- Discovering all the necessary data elements;
- Reaching consensus on the standards that should be applied to the data;
- Determining the data needs of all stakeholders (providers, payers, researchers, public health officials, accreditors, employers, and customers);

- Demonstrating the ability to create connectivity between large health care systems.^h

The most successful companies will invest heavily in achieving these essentials using the latest technology. But the dynamic, unpredictable nature of healthcare will continue to make it difficult to achieve tangible business benefits. Therefore the business case for IT will be delayed and calls for a subsidy will continue. These requests will be accompanied by great political fanfare but be quietly denied by the government because there is no money. Healthcare organizations in Region A will subsidize IT by competing intensely for profitable services, eliminating unprofitable services, raising prices, selling assets, increasing charitable donations, and creating monopolies. This will accelerate healthcare inflation and decrease access, especially in the “safety net” demographic. Mission-based, not-for-profit institutions will be at the greatest disadvantage.

These trends will also increase the competitive advantage of lower-cost, more effective, “disruptive” solutions (office-based treatments and diagnostics, “focused factory” specialty hospitals, for-profit “carve outs,” etc.) forcing further disintegration of traditional networks and relationships. In our view, it is not a pretty picture.

Scenario #2: Migration to Region B

Starting in Region A, a few organizations will use Adaptive Design methods and emergent technology in the current markets of data acquisition, data transfer, codification of best practice, standardization, security, and safety. To achieve a business case for healthcare IT (increased quality, decreased cost, and improved flexibility) they must use the new technology to rapidly deliver on the bullet points noted in Scenario #1.

Scenario #3: Migration to Region C

A small number of healthcare organizations and their technology partners will use Adaptive Design and known technology to achieve success in emerging opportunities. Given the dynamic nature of healthcare, these emerging markets will center on increasing an organization’s capability to effectively improve the workplace at the point of care. This capability will ensure the business case for IT by first providing safer, higher quality, lower cost health care, and increased flexibility for responding to changes in both the clinical domain and the marketplace. New opportunities will emerge in the form of “jobs to be done.” Through close observation, focused simplification, and clarification of the work, technology will be pulled very flexibly into place through an Adaptive Design approach. To avoid organizational barriers and internal political land mines, the most successful healthcare and technology companies will create some degree of separation from their parent organizations for the developmental aspects of this work. Refined Adaptive Design technology will scale through the Best Design mode. The most committed organizations in this group will be extremely successful.

^h See the eHealth Initiative web site.

Scenario #4: Migration to Region D

A very small number of provider and technology organizations will work collaboratively to develop an Adaptive Design approach that leads them into Region D—most likely as an extension of their work in Region C. These organizations must have a degree of separation, but still remain connected to executives at the very top of their parent companies. The solutions they develop will be closely tied to meeting specific needs. Initial efforts will be small, but will add value very quickly. The parent companies should be patient for growth but impatient for value. As they emerge, the effect on healthcare will be logarithmic improvement and lead to an unprecedented transformation. The measures for success will be much more value for much less cost and significantly greater flexibility; there will be no tradeoffs.

Conclusion

In summary, what is required to succeed is not rocket science, but it is different from current thinking and methods. Reviewing the current condition of healthcare IT through this new lens suggests our present difficulties are completely predictable and offers an alternative that can enable healthcare companies to utilize IT to achieve greater success.

- Millions have been invested in Best Design efforts to create healthcare IT. These efforts have not created a consistent business case for IT—higher quality, lower cost, and greater flexibility are as yet unrealized.
- Growth of a product or service that lacks a business case must come through subsidy or mandated compliance. Health care and IT leadership seem to be pursuing this course.
- Failure of Best Design methods raises the question of whether health care faces an emergent opportunity. If it does, history suggests applying Adaptive Design principles to healthcare IT offers great promise. Although it will be very difficult for established healthcare and technology organizations to think outside of their Best Design box, Adaptive Design offers important new opportunities.

Endnotes

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- ¹ The bulleted points come slightly modified from Raymond B, Dold C, "Clinical information systems: achieving the vision." Kaiser Permanente Institute for Health Policy. Feb. 2002
- ² Bates DW, Teich J, Lee J, Seger D, Kuperman G, Ma'luf N, et al. "The impact of computerized physician order entry on medication error prevention." *Journal of the American Medical Informatics Association*. 1999;6:313-321.
- ³ Bates DW, Miller EB, Cullen DJ, et al. "Patient risk factors for adverse drug events in hospitalized patients." *Archives of Internal Medicine*. 1999;159:2553-60.
- ⁴ Bates DW, Leape LL, Cullen DJ, et al. "Effect of computerized physician order entry and a team intervention on prevention of serious medication errors." *Journal of the American Medical Association*. 1998;280(15):1311-6.
- ⁵ See for example: Tierney WM, Miller ME, McDonald CJ. "The effect on tests ordering of informing physicians of the charges for outpatient diagnostic tests." *New England Journal of Medicine*. 1990;322:1499-1504.
- ⁶ Bates et al., "A proposal for electronic medical records in U.S. primary care." *Journal of the American Medical Informatics Association*. 2003;10.
- ⁷ For example of improved response time to adverse events see Kuperman FJ, Teich JM, Tanasijevic MJ, et al. "Improving response to critical laboratory results with automation: results of a randomized controlled trial." *Journal of the American Medical Informatics Association*. 1999;6:512-22.
- ⁸ Ash JS, Gorman P, Hersch W., "Physician order entry in U.S. hospitals." Proceedings of the AMIA annual symposium. 1998:235-239.
- ⁹ Rabinowitz E. "Is there a doctor in the house?" *Managed Care*. 1999;8(9):42-4.
- ¹⁰ 14th Annual HIMSS Leadership Survey sponsored by Superior Consultant Company, 2003.
- ¹¹ Birkmeyer CM, Bates DW, Birkmeyer JD, "Will electronic order entry reduce health care costs?" *Effective Clinical Practice*. March/April 2002. 67-74.
- ¹² Southon FCG, Sauer C, Dampney CNG, "Information technology in complex health services: organizational impediments to successful technology transfer and diffusion." *Journal of the American Medical Informatics Association*. 1997;4(2).
- ¹³ For stories of success after failure see Ash et al., "A cross-site qualitative study of physician order entry." *Journal of the American Medical Informatics Association*. 2003;10:1888-200.
- ¹⁴ See for example Renner K., "Cost-justifying electronic medical records." *Healthcare Financial Management* 1996;50:63-64.
- ¹⁵ See for example, Doolan DF, Bates DW, "Computerized physician order entry systems in hospitals: mandates and incentives." *Health Affairs*. July/August, 2002:180-8
- ¹⁶ For a great overview of the current debate (and its limitations) see, Overhage et al., "The 2001 ACMI Debate." Published in *Journal of the American Medical Informatics Association*. 2002;9:100-208.
- ¹⁷ Schwartz, WB. "Medicine and the computer: the promise and problem of change," *New England Journal of Medicine*, 283:1257-64.
- ¹⁸ Henry Mintzberg, "The Design School: Reconsidering the Basic Premises of Strategic Management," *Strategic Management Journal*, Vol. 11:3 (Mar-Apr, 1990), p. 192.
- ¹⁹ Kenagy & Associates, LLC unpublished research and observations
- ²⁰ Kenagy & Associates, LLC *ibid*.
- ²¹ Day, *op cit*.
- ²² Tucker A, Edmondson A. "Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change." Harvard Business School Working Paper, 2003.
- ²³ Kenagy & Associates, *op cit*.
- ²⁴ <http://www.sony.net/Fun/SH/1-17/h3.html>
- ²⁵ This section uses ideas from Christensen C, Sundahl DL, "Getting the Innovation Job Done: Matching the Right New Product with the Right Market," Harvard Business School Working Paper, 2001.
- ²⁶ Christensen C, Verlinden M, Westerman G. "Product Modularity, Vertical Integration and the Diffusion of Competence." Harvard Business School Working Paper.
- ²⁷ Clayton Christensen, personal communication
- ²⁸ Hogarth RM, Kunreuther H. "Risk, Ambiguity and Insurance." *Journal of Risk and Uncertainty*; 2 (1989): 5-35.
- ²⁹ See Peter Senge, *The Fifth Dimension*, () for an extended discussion of the leadership attributes of mental models
- ³⁰ Schoemaker, P. "When and How to Use Scenario Planning: A Heuristic Approach with Illustration," *Journal of Forecasting*, 10 (1991): 549-564.

³¹ See Vincent Barabba, *Meeting of the Minds: Creating the Market-Based Enterprise* (Boston, MA: Harvard Business School Press, 1966), pp 5-21.

³² Kahneman D, Kentsch J, Thaler R. "Experimental tests of the Endowment effect and the Coase Theorem." *Journal of Political Economy*. 98/61 (December 1990):1325-1348.

³³ Tushman M, O'Reilly C. *Winning through Innovation: A practical Guide to Leading Organizational Change and Renewal*. (Boston, MA: Harvard Business School Press, 1997).

³⁴ Martin C. *Managing for the Short Term* (New York, NY: Doubleday, 2002), pp 72-73.

³⁵ Smith C, Cooper A. "Entry into Threatening New Industries: Challenges and Pitfalls," in Thomas H, O'Neal D, White R, and Hurst D. eds., *Building the Strategically Responsive Organization* (New York; John Wiley and Sons, 1994).

³⁶ Kenagy & Associates, LLC *op cit*.

³⁷ Spear S, Bowen K. Decoding the DNA of the Toyota Production System. *Harvard Business Review*, September-October, pp 96-106.

³⁸ Kenagy J, Spear S, *Deaconess Glover Hospital A*. (Boston MA. Harvard Business School Publishing) 9-601-002, 2000.

ADDENDUM

A Word from Microsoft on “Adaptive Design” and Realizing Potential in Healthcare

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Microsoft’s vision is, along with its partners, to help the healthcare industry realize its potential for improving productivity, safety and quality through proven innovations in integration, greater value and reduced complexity.

Together with our solutions partners, we offer hospitals, clinics, physicians, insurers, suppliers, employers, and consumers the technology to dramatically improve the quality, efficiency, and effectiveness of the healthcare system while improving healthcare outcomes. We provide the ability to share mission-critical information to improve the efficiency and knowledge of everyone involved in the healthcare relationship, regardless of their location. And by incorporating the best of the Internet, Web-enabled technologies, and mobile devices, we empower organizations to quickly build, expand, and integrate applications that help all healthcare constituents collaborate through the Internet and close the gaps in the continuum of healthcare.

Some compelling examples:

Advanced Pediatrics

[Efficiency Through Technology Enables Pediatric Office to Deliver Comprehensive Care](#)

Most traditional medical practices suffer from a common malady: a paper-based documentation and communication infrastructure that breeds inefficiencies. Despite the best efforts of caregivers, a paper-bound practice can severely limit dedicated patient time. The ability to efficiently retrieve information from this volume of paperwork is a significant challenge as well.

CIGNA Corporation

[Windows Server 2003 Helps CIGNA Reduce TCO and Improve Business Solution Delivery](#)

A business value analysis of a pilot project validated that when migration to Microsoft Windows® Server 2003 as a platform in a shared application environment is complete, CIGNA could consolidate its Microsoft based application servers by as much as 25 percent across all divisions and greatly improve its business solution delivery. Embodying the rapid adoption program approach helped accelerate and enable significant reductions in product certification

timeframes for new production server environments. CIGNA also anticipates lower per-user migration costs.

Evangelical Hospital

[SharePoint Gives Community Hospital More Time to Focus on Its Mission, Saving Hundreds of Labor Hours in the Process](#)

Since 1926, Evangelical Community Hospital has promised and delivered the very best to its patients by providing compassionate and accessible healthcare. But as Evangelical grew, it became clear that the hospital needed a new strategy to keep its 1,200 doctors, nurses, technicians, and employees communicating effectively. Microsoft SharePoint® Portal Server was the answer Evangelical was searching for, offering vast functionality, flexibility, ease of use, and instant integration with other Microsoft applications. With SharePoint, Evangelical's caregiving team can focus on administering care to patients, rather than to reams of paper.

HealthCare Partners

[HealthCare Partners Improves Interface Integration Engine by Using BizTalk Server](#)

HealthCare Partners (HCP) is a leader in delivering high-quality patient care and medical group management to the greater Los Angeles community. The company's existing interface engine strategy was making it increasingly costly to implement better integration solutions. In search of a solution that would offer more flexibility at a more affordable cost, HCP turned to InterKnowlogy and Microsoft. With help from Microsoft and InterKnowlogy, HCP was able to implement the Microsoft BizTalk® Adapter for Microsoft SQL Server™ and the HL7 Accelerator from NeoTool Development and gained an interface engine system that was less costly to develop, worked better and faster, and was more extensible than existing solution.

Ingolstadt Hospital (Klinikum Ingolstadt)

[Regional Hospital Improves Patient Care with Better Information Flow](#)

When Ingolstadt Hospital replaced its paper-based process for emergency ward admission with a solution based on Microsoft Office Professional Edition 2003 and deployed on Tablet PCs, the hospital improved patient care by reducing wait times in the emergency ward because doctors and nurses no longer fill out forms manually. This busy hospital averages 25,000 emergency patient admissions each year, with up to 20 people concurrently receiving care in the emergency ward. Using this solution, Ingolstadt Hospital is saving 15 minutes each time it admits a patient, representing 6,000 hours annually that the staff can devote to providing care instead of handling documentation. With the solution in place, Ingolstadt Hospital expects to improve healthcare outcomes and send people home sooner.

Inland Imaging

[Inland Imaging Boosts Productivity of its Radiologists by 30 Percent](#)

Inland Imaging Centers estimates productivity of its 40 radiologists increased by 30 percent after deploying a Stentor, Inc. iSite Enterprise digital imaging solution that lets clinicians at 14 area hospitals view images, such as CT scans, MRIs, ultrasounds, and X-Rays, online. The solution stores images and allows physicians to access diagnostic images from any PC connected to the regional hospital and clinic network. Instant access to images allows for more timely patient

care, and the system lets multiple physicians view the same image from different locations for real-time distance consultations. Using Microsoft Clustering Service (MSCS) deployed with Microsoft Windows 2000 Advanced Server provides high availability. Inland Imaging has enjoyed 99.999 percent uptime for their data.

Merck & Co., Inc.

[Merck Uses Visual Studio .NET and the .NET Framework to Integrate with Leading-Edge Vendors and Legacy Systems](#)

Once a product is on the market, Merck continues to study its use. The challenge lies in ensuring accuracy and compliance with standards while reducing overall cycle time. The solution had to embrace legacy systems as well as new technologies and reporting tools. Equipped with Microsoft Visual Studio® .NET, the Clinical Research and Development Group produced a flexible architecture that allows Merck to integrate the old, the new, and whatever might come in the future. Now the clinical trial system has been streamlined through automation, and the company can look forward to rapid development of additional solutions as it responds to the needs of a changing industry.

National Cancer Institute

[Cancer.gov Site Redesigned with Microsoft .NET](#)

Josh Stella is currently project manager for cancer.gov, the National Cancer Institute's main web site, and has been working on Web sites since 1994. "The National Cancer Institute (NCI) has published information on the Web for a long time, and the cancer.gov site has existed for several years," he says. "When I was brought to NCI about a year ago, I was asked to look at building a next-generation site. It was clear to me that the first task was to select a Web development environment and Web infrastructure."

New York Presbyterian Hospital

[Classic "Adaptive Design" Approach Helps Hospital Speed Implementation and Lower Cost of Much Needed Solution](#)

New York Presbyterian Hospital (NYPH) replaced its emergency room paper-based forms with Microsoft Office InfoPath™ 2003 running on Tablet PCs. The hospital now has the ability to electronically enter and track patient data from admittance to discharge from the emergency ward, sign required forms, and forward relevant information to other parts of the hospital. This creates a reliable electronic record of patient care that leads to greater efficiency, reduced clerical errors and miscommunications, and improved patient care overall. NYPH worked with its partner, Standard Register, to develop and deploy the InfoPath solution.

Pfizer, Inc.

[Pfizer Streamlines Production Planning at Brooklyn Manufacturing Plant Using Microsoft .NET](#)

Using Microsoft .NET, a team at Pfizer's Brooklyn manufacturing plant developed a solution that provides anywhere, anytime access to all parties involved in the production planning process. Accessible from any location using only Web browser software and a secure network connection, the new solution enables users to better collaborate and share data—a capability that will improve the plant's ability to meet delivery requirements set by Pfizer's supply chain and

marketing groups. Adopting .NET is also improving Pfizer's ability to deliver new applications needed by business users, with its extensive pre-built functionality and toolset leading to a 25 to 50 percent increase in developer productivity.

University of Pittsburgh Medical Center

[University of Pittsburgh Medical Center Anticipates a 43 Percent Reduction in Cost of Handling Diagnostic Images](#)

The University of Pittsburgh Medical Center (UPMC) the leading health care system in western Pennsylvania and one of the largest nonprofit integrated health care systems in the United States, has dramatically increased efficiencies and reduced the cost of managing diagnostic images and patient information with a Stentor, Inc., iSite Enterprise Picture Archive and Communications System (PACS), deployed on the Windows platform. The solution allows clinicians to view instant diagnostic quality images, such as CT scans and X-Rays enterprise-wide, and provides long-term “always online” storage.

Technology Overview

Microsoft .NET is software that connects information, people, systems and devices. Microsoft .NET connects a broad range of personal and business technologies, enabling the user to access and use important information, whenever and wherever it is needed. Built on Web services standards, .NET services enable both new and existing applications to connect with software and services across platforms, applications and programming languages. Working with Microsoft .NET-connected software means using industry-standard protocols that unify existing code, systems and applications, and unlock their value. Microsoft technology helps bridge islands of information to create healthcare without boundaries.

And Microsoft provides trustworthy computing. Microsoft delivers systems that are secure by design, secure by default and secure by deployment, and provides ongoing communications to customers to help them easily and quickly update systems to help protect health information and reduce their risk of security compromise.

Microsoft also provides excellent business value. Microsoft offers the most cost-effective, flexible and integrated enterprise platform with powerful security features for developing and deploying healthcare solutions. Microsoft Windows 2000 and Microsoft Windows Server 2003 support the latest technology advances and standards, and provide a standards-based integration point for legacy systems.

Powered by XML and Web services, Microsoft technology harnesses a constellation of applications, services and devices to create a whole new generation of software that works as an integrated service to help healthcare organizations thrive in the digital age.

Web Services

With the power of Web services, Microsoft helps increase business agility. It empowers organizations to quickly build, expand and integrate applications that help all healthcare

constituents collaborate across the enterprise and close the gaps in the continuum of care.

Web services offer programmable and reusable technologies that leverage the flexibility of the Internet. Now constellations of connected applications can run on multiple platforms delivering information to all the constituencies in the healthcare continuum. Web services are based on a set of common open standards including XML, SOAP, WSDL and UDDI, as defined by the World Wide Web Consortium (W3C) and other standards bodies. Web services applications provide access to information regardless of platform and programming languages boundaries. From the schedule for a doctor's office to the cataloging of medical images to tracking participants in new drug trials, Web services can be used to produce highly personal, intelligent computing experiences.

Tools

Microsoft developer tools provide quick and easy means to develop powerful and feature-rich applications, including Web services. Microsoft Visual Studio .NET is a multilanguage suite of programming tools for building .NET-connected applications. The .NET Framework is a component of Microsoft Windows that provides a programming model and runtime for Web services, Web applications and smart client applications.

The .NET Framework was built for integration. Applications built using the .NET Framework can connect with existing systems and packaged applications across a range of platforms via Web services and other .NET services. This gives the user the ability to leverage existing legacy investments while providing a solid foundation for future expansions throughout the organization and onto the Internet.

Clients

Microsoft delivers a set of operating systems for computers and other smart devices, including Windows XP for desktop and laptop machines and Windows Powered Tablet PCs and Windows Powered Pocket PCs. This smart client software helps PCs and devices work more effectively, online or offline. The result is empowered information workers. The Microsoft Windows family of client operating systems lets users get the information they need when they need it — whether they are working online, offline, in the field or at the point of care.

Servers

Microsoft Windows 2000 and the Microsoft Windows 2003 family of operating systems, combined with Microsoft's enterprise servers, provide the best infrastructure for building, deploying and operating healthcare solutions across the enterprise. Just some of the powerful building blocks of the Microsoft platform include the following:

- Microsoft Application Center to deploy and manage highly available and scalable Web applications.
- Microsoft BizTalk Server to build XML-based business processes across applications and organizations. And Microsoft BizTalk Accelerator for HIPAA and HL7 gives healthcare

organizations the ability to quickly implement and continually maintain the new transaction standards set by HIPAA.

- Microsoft Commerce Server for quickly building scalable e-commerce solutions.
- Microsoft Content Management Server to manage content for dynamic e-business Web sites across an organization.
- Microsoft Exchange Server to enable messaging and collaboration any time, any place.
- Microsoft Host Integration Server for bridging to data and applications on legacy mainframe systems.
- Microsoft Internet Security and Acceleration Server for secure, fast Internet connectivity.
- Microsoft Mobile Information Server to enable application support by mobile devices such as cell phones.
- Microsoft Operations Manager delivers enterprise-class solutions for operations management of Windows 2000 and Windows 2003, the Microsoft Active Directory and other Microsoft .NET Enterprise Server applications.
- Microsoft Project Server to securely develop and successfully deploy best practices for project management across an organization.
- Microsoft SharePoint Portal Server to share information within an organization and with outside key suppliers, partners and clients.
- Microsoft SQL Server to store, retrieve and analyze structured XML data.
- Microsoft Systems Management Server to provide cost-effective, scalable change and configuration management for Microsoft Windows-based desktop and server systems.

Experiences and Applications

The combination of Microsoft tools, clients, Web services and servers create an information environment that empowers information workers. Microsoft technology puts information at users' fingertips, providing them with the most powerful, easy-to-use, productivity software. Microsoft Office XP and the new Microsoft Office System help users quickly perform common business tasks, including word processing, e-mail, presentations, data management and analysis. Microsoft Visio[®] provides a powerful tool for creating flow charts and diagrams to create new procedures and systems. Microsoft Project is an excellent planning tool. Microsoft MapPoint[®] brings precision to navigation. And Microsoft Windows Media[®] and Microsoft Live Meeting[®] facilitate collaboration across the enterprise.

In addition, Microsoft consumer and business services such as MSN[®], Passport, and bCentral[™] can help empower consumers and businesses to exchange medical information and other services in a secure, standardized and user-friendly manner to help improve the quality of care and streamline the healthcare delivery system.

Summary

The Microsoft platform provides the standards-based technology the healthcare industry needs to break down the information barriers that have blocked the exchange of data between the disparate IT environments of the key constituents of healthcare: provider organizations and physicians, pharmaceutical and medical device companies, government and private-sector employers, health insurers, and consumers.

With its consumer-centric strategy and end-to-end platform solutions, Microsoft is uniquely positioned to bridge information islands in an efficient and cost-effective way for healthcare organizations. Microsoft technology and Microsoft partner solutions can be used to integrate these disparate systems, without requiring alterations to existing legacy programs. Across the healthcare industry, this means empowering healthcare workers, giving them the information they need, when they need it.

For providers this can mean bringing data to the point of care where physicians can see the latest lab reports, access electronic medical records, and enter prescriptions electronically on a handheld device such as a Pocket PC or Tablet PC.

For pharmaceutical and biotechnology companies, Microsoft technology can mean optimizing the capacity and asset value of legacy systems, and unifying disparate systems, applications and platforms to improve the overall effectiveness of information management. The rewards for integrated systems can include enhanced drug discovery efforts, shortened clinical trials, accelerated approval, increased enterprise operational efficiency, improved sales and marketing, and the ability to seamlessly link with contract research organizations, regulatory agencies, clinical study sites and other business partners.

For health insurers, Microsoft technology can mean achieving the dataflow they need between employers, providers and consumers, handling administrative and clinical information from many disparate systems distributed across large geographic regions. Insurers can manage and act on data flows to and from multiple sources to feed multiple processes: claims payment, rate setting, pricing, marketing, care management, prescription benefits, eligibility verification, clearinghouse transactions and referral management.

For government and private-sector employers, Microsoft technology can connect what can otherwise be a maze of disparate systems, and provide the data needed to analyze expenditures and find ways to deal with the continual increase in the cost of providing medical care. Progressive healthcare organizations are already using both Microsoft and industry partners solutions to break down the information barriers and realize their full potential.