Review Paper ■

Managing Change:
An Overview

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Abstract   As increasingly powerful informatics systems are designed, developed, and implemented, they inevitably affect larger, more heterogeneous groups of people and more organizational areas. In turn, the major challenges to system success are often more behavioral than technical. Successfully introducing such systems into complex health care organizations requires an effective blend of good technical and good organizational skills. People who have low psychological ownership in a system and who vigorously resist its implementation can bring a "technically best" system to its knees. However, effective leadership can sharply reduce the behavioral resistance to change—including to new technologies—to achieve a more rapid and productive introduction of informatics technology. This paper looks at four major areas—why information system failures occur, the core theories supporting change management, the practical applications of change management, and the change management efforts in informatics.

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It's not the progress I mind, it's the change I don't like.
—Mark Twain

Along with the inevitable failures, medical informatics has had many successes—probably more than should have been expected, given the challenges of the hardware, software, and infrastructure that faced us in the past. However, many of the successful systems were implemented as stand-alone systems that involved a modest number of people. Furthermore, the systems were often implemented in specific, limited areas that could see potential direct benefits from

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the systems. Typically, there were local champions, who made major and personal commitments to the success of the systems, and the enthusiasm of these champions was readily transmitted to the people with whom they worked directly. In turn, most of the people working on these systems felt like pioneers, and the literature of medical informatics is filled with their accomplishments.

When we embark today on designing, developing, and implementing more complex systems that have wider impact, a new set of challenges looms even larger. Certainly, technical challenges still exist; they always will. However, as our new systems affect larger, more heterogeneous groups of people and more organizational areas, the major challenges to systems success often become more behavioral than technical.

It has become apparent in recent years that successfully introducing major information systems into complex health care organizations requires an effective blend of good technical and good organizational skills. A "technically best" system can be brought to its knees by people who have low psychological own-

ership in the system and who vigorously resist its implementation. The leader who knows how to manage the organizational impact of information systems can sharply reduce the behavioral resistance to change, including to new technology, to achieve a more rapid and productive introduction of information technology.

Knowledge of the significance of people and organizational issues is not new. One of our informatics pioneers, Octo Barnett, identified political and organizational factors as being important 30 years ago.[1] However, given the realities of that era, they were "well down the list." By 1998, Reed Gardner, another definite pioneer, stated in his Davies Lecture[2]:

> In my opinion, the success of a project is perhaps 80 percent dependent on the development of the social and political interaction skills of the developer and 20 percent or less on the implementation of the hardware and software technology!

We are seeing a shift in the balance of the people and organizational issues as opposed to the technical issues. An effective medical informatics change strategy can help convert what health care organizations are experiencing today—technology-centered tension—into welcomed opportunities that will lead to improvement in all phases of the health care process.

The content that supports both the intellectual content and strategy for this cornerstone comes from multiple disciplines, e.g. psychology, sociology, management, and anthropology. This paper discusses four major topics—why information system failures occur, the core theories supporting change management, the practical applications of change management, and the change management efforts in informatics.

Why Do Information System Failures Occur?

If only it weren't for the people, those awful people, always getting tangled up with the systems. If it weren't for them, the health care area would be an informatician's paradise.*

Complex problems rarely have simple solutions. During the many stages of the solution process, there are numerous opportunities to go wrong, whether the solution tends to be a technical one or not. As we delve

into increasingly complex medical informatics problems, we will increasingly face this challenge. In reviewing information system failures cited in the literature as well as drawing on our personal observations and experiences, we have seen the rising importance of the human issues that are often referred to as people and organizational issues.

Table 1 presents a categorized overview of the reasons for contemporary failures in implementing major information systems. There is typically no one single cause in a given case. In fact, a snowball effect is often seen, with a shortcoming in one area leading to subsequent shortcomings in other areas. No precise statistics exist for the relative importance of the causes; however, personal observation tells us that the two most important are communications deficiencies and the failure to develop user ownership.

Change and Change Management

Technology has indeed taken a place next to war, death, divorce, and taxes as a prime cause of bone-shuddering anxiety.—JOHN SEYMOUR

Change is a constant in both our professional and our private lives. Our children grow up taking for granted such things as powerful personal computers that we could not envision at their ages. The idea that human beings naturally resist change is deeply embedded in our thinking about change. Our language (e.g., "resistance to change"), our assumptions, and our mental models about change all seem to imply that something in our natures leads us to resist change. However, it is easy to find examples of human beings, from childhood on through old age, actively seeking out change of all sorts. Human beings do not necessarily resist change automatically; however, many people do resist being changed, i.e., having changes imposed on them.

Organizational change normally involves some threat, real or perceived, of personal loss for those involved. This threat may vary from job security to simply the disruption of an established routine. Furthermore, there may be tradeoffs between the long and short run. As an individual, I may clearly perceive that a particular proposed change is, in the long run, in my own best interests, and I may be very interested in seeing it happen, yet I may have short-run concerns that lead me to oppose particular aspects of the change or even the entire change project.

The rate of change is escalating in virtually all organizations. The pressure is intense on anybody con-

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*Paraphrased from Kurt Vonnegut, Jr., in *Slaughterhouse-five*: "'If only it weren't for the people, the goddamned people,' said Finnerty, 'always getting tangled up with the machinery. If it weren't for them, earth would be an engineer's paradise.'"[3]

Table 1 ■

Reasons for Contemporary System Failures

Category	Examples
Communication	Ineffective outgoing communication
	Ineffective listening
	Failure to effectively prepare the staff for the new system
Culture	Hostile culture within the information systems organization
	Hostile culture toward the information systems area
	No strategies to nurture or grow a new culture
Underestimation of complexity	Missed deadlines and cost overruns
	Lost credibility
Scope creep	Failure to define and maintain original success criteria
	Failure to renegotiate deadlines and resources if criteria do change
Organizational	No clear vision for the change
	Unintended consequences
	Ineffective reporting structure
	Staff turnover
	Staff competency
	Provision of a technical "fix" to a management problem
	Lack of full support of "boss(es)"
	Roles and responsibilities not clearly defined or understood by everyone
	Several people vying to be "in charge"
	Adequate resources not available from the beginning
	Failure to benchmark existing practices
	Inability to measure success
Technology	System too technology oriented
	Poor procurement
	Lure of the leading (bleeding) edge
	Inadequate testing
Training	Inadequate or poor-quality training
	Poor timing of training—too early or too late
Leadership issues	Leader too emotionally committed
	Leader's time over committed
	Too much delegation without control
	Failure to get ownership in the effort
	Leader's political skills weak
	"Lying" to get initial approval

nected with the health-related world to focus time and attention on understanding the forces driving the changing environment and develop or implement the information systems needed to support the altered environment.

Change Management

The phrase *change management* is very common in management articles as well as newspapers.[4,5] Moreover, managerial interest in the topic has been stimulated by the comments of Peter Drucker[6] as to whether one can manage change at all or merely lead or facilitate its occurrence within an organization. Nevertheless, using the traditional terminology, what is meant by change management, how did it evolve, and why has this concept become so important?

Change management is the process by which an organization gets to its future state, its vision. While traditional planning processes delineate the steps on the journey, change management attempts to facilitate that journey. Therefore, creating change starts with creating a vision for change and then empowering individuals to act as change agents to attain that vision. The empowered change management agents need plans that provide a total systems approach, are realistic, and are future oriented. Change management encompasses the effective strategies and programs to enable those change agents to achieve the new vision.

Today's change management strategies and techniques derive from the theoretic work of a number of early researchers.

Examples of Core Theories from Other Disciplines

In 1974, Watzlawick, Weakland, and Fisch published their now classic book, *Change: Principles of Problem Formation and Problem Resolution.*[7] Theories about change had long existed. However, Watzlawick et al. found that most of the theories of change were philosophical and had been derived from mathematics and physics. Watzlawick et al. selected two theories from the field of mathematical logic on which to base their beliefs about change. They selected the theory of groups and the theory of logical types. Their goal of reviewing the theories of change was to explain the accelerated phenomenon of change that they were witnessing.

Watzlawick et al. concluded that the earlier theories explained first-order and second-order changes:

- *First-order change* is a variation in the way processes and procedures have been done in a given system, leaving the system itself relatively unchanged. Some examples are creating new reports, creating new ways to collect the same data, and refining existing processes and procedures.

- *Second-order change* occurs when the system itself is changed. This type of change usually occurs as the result of a strategic change or a major crisis such as a threat against system survival. Second-order change involves a redefinition or reconceptualization of the business of the organization and the way it is to be conducted. In the medical area, changing from a paper medical record to an electronic medical record represents a second-order change, just as automated teller machines redefined the way that many banking functions are conducted worldwide.

These two orders of change represent extremes. First-order change involves doing better what we already do, while second-order change alters the core ways we conduct business or even the basic business itself.

Golembiewski, Billingsley, and Yeager[8] subsequently added another level of change, defining *middle-order change* as lying somewhere between the extremes of first- and second-order change. Middle-order change "represents a compromise; the magnitude of change is greater than first-order change, yet it neither affects the critical success factors nor is strategic in nature."

Kurt Lewin is credited with combining theories from psychology and sociology into the field theory in social psychology.[9] Lewin focused on motivation and the motivational concepts that underlie an individual's behavior. Lewin believed that there is tension in a person whenever a psychological need or an intention exists, and the tension is released only when the need or intention is fulfilled. The tension may be positive or negative. These positive and negative tension concepts were translated into a more refined understanding of conflict situations and, in turn, what Lewin called "force fields."

Lewin indicated that there are three fundamental types of conflict:

- Individuals stand midway between two positive goals of approximately equal strength. A classic metaphor is the donkey starving between two stacks of hay because of the inability to choose. In information technology, if there are two "good" systems to purchase or options to pursue, then we must be willing to choose.

- Individuals find themselves between two approximately equal negative goals. This certainly has been a conflict in many organizations that wish to purchase or build a health informatics system. A combination of the economics, the available technologies, the organizational issues, among other factors, may well mean that the organization's informatics needs cannot be satisfied with any available products, whether purchased or developed in-house. Thus, the decision makers must make a choice of an information system that they know will not completely meet their needs. Their choice will probably be the lesser of two evils.

- Individuals are exposed to opposing positive and negative forces. This conflict is very common in health care organizations today, especially regarding health informatics. This conflict usually occurs between the system users and the information technology or financial people.

Kurt Lewin's field theory allows the types of conflict situations commonly found in health care to be diagrammed and analyzed.

Small-group theory is another tool that is highly applicable to health informatics because of the way that health care environments and activities are organized. Caring for patients and educating students typically involves many small groups of people. Small-group theory can help us understand why there are such wide ranges of effectiveness among these groups.

These are just a few examples of the social science theories that can help the change management leader understand some of the underlying behavioral issues that need to be faced as health informatics technology is brought into today's complex health systems.

Practical Applications of Change Management

> *There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things.*—NICCOLO MACHIAVELLI

One of the most difficult problems organizations face is dealing with change. In today's rapidly changing, highly competitive environment, the ability to change rapidly, efficiently, and almost continually will distinguish the winners from the losers. Many health-related organizations will disappear because they find themselves unable to adapt. Furthermore, many of the pressures for change in health care organizations are independent of technologic change. This means that informaticians working for change are doing so in organizations that are already highly stressed by other pressures.

Major organizational changes typically involve many different types and levels of personal loss for the people in the organization. For example, change always requires the effort to learn the new, which is a loss in terms of time and energy that could have been used elsewhere. Although some may welcome the learning opportunity, many of us don't want to invest that time and energy unless we are dissatisfied with the current arrangements or see powerful advantages to the proposed change. Upgrading to new software is a common example, in which the future benefits may not be seen as sufficient to outweigh the short-term investment required to learn the new programs.

Second, people want to feel good about themselves. Ideally, people are able to take pride in their work, feel responsible for a job well done, feel they are part of a high-quality enterprise, and feel that their time has some significance. In many work situations, the work itself and the organizational culture make it difficult for people to feel good about themselves. In these poorer situations, people usually invent strategies to help them feel better about themselves, and these strategies involve getting some sense of control, belongingness, and significance out of their work. Sometimes this involves opposition to management, on the assumption that management is always up to no good. More commonly, the worker–management relationships are not completely alienated. Still, the workers' strategies for achieving "good" feelings are unknown to or quite misunderstood by management. Therefore, change initiatives, unknowingly and unintentionally, threaten to cause the workers serious personal loss. Not surprisingly, the workers resist and do all they can to sabotage such change initiatives.

Third, change initiatives often require large losses for middle managers. Generally, people perceive that information systems increase the ability of top executives to know more about what is going on and to exert more direct control. This means a serious loss of personal and organizational significance for the middle manager. Sometimes middle managers fight this loss. Any significant organizational change involves changing habits, that is, changing the way we actually do our work. This usually involves changes in the way we interact, both with people and our tools. New systems require us to learn a new set of behaviors.

Types of Change

Changes in an organization can often be identified as one of four types, with the definite possibility of overlap among them:

- *Operational changes* affect the way the ongoing operations of the business are conducted, such as the automation of a particular area.

- *Strategic changes* occur in the strategic business direction, e.g., moving from an inpatient to an outpatient focus.

- *Cultural changes* affect the basic organizational philosophies by which the business is conducted, e.g., implementing a continuous quality improvement (CQI) system.

- *Political changes* in staffing occur primarily for political reasons of various types, such as those that occur at top patronage job levels in government agencies.

These four different types of change typically have their greatest impacts at different levels of the organization. For example, operational changes tend to have their greatest impacts at the lower levels of the organization, right on the firing line. People working at the upper levels may never notice changes that cause significant stress and turmoil to those attempting to implement the changes. On the other hand, the impact of political changes is typically felt most at the higher organizational levels. As the name implies, these changes are typically made not for results-oriented reasons but for reasons such as partisan politics

or internal power struggles. When these changes occur in a relatively bureaucratic organization, as they often do, those working at the bottom often hardly notice the changes at the top. Patients are seen and the floors are cleaned exactly as they were before. The key point is that performance was not the basis of the change; therefore, the performers are not much affected.

Microchanges and Megachanges

When communicating about change, the models of Watzlawick and Golembiewski tend to be too abstract or difficult to explain. A more practical model that we frequently use divides changes into *microchanges* and *megachanges*, with no great attempt at elaborate definitions. As a first approximation, the following scheme can be used to differentiate between the two:

- *Microchanges*—differences in degree

- *Megachanges*—differences in kind

Using an information system as an example, modifications, enhancements, improvements, and upgrades would typically be microchanges, while a new system or a very major revision of an existing one would be a megachange. This scheme works surprisingly well for communication within organizations as long as we remember that one person's microchange is often another person's megachange. So while the system designers think they are making a minor change to enhance the total system, an individual end user may see the change as a megachange and resist it vehemently. When designing the total "people" strategy for any system, it is important to involve a variety of people from the very beginning, to clearly understand how groups function in the organization and how the work is really done.

The Cast of Characters

For any given change, people can occupy a wide range of roles that will strongly influence their perceptions of the change and their reactions to it. These are roles such as champion, end user, developer/builder, watchful observer, obstructionist, and such. As on the stage, some people may occasionally play more than one role. In other cases, the roles are unique. Unless we clearly identify both the players and their roles in any change situation, we risk making decisions and taking action based on generalizations that are not true for some of the key players.

An overview term often applied to the various roles is stakeholders. The stakeholders have some interest or stake in the quality of both the change and the change implementation process. The roles of the stakeholders are subject to change, especially during a change process that extends over some time.

For those implementing change, the following steps are critical:

- To identify what roles they themselves are occupying in the process

- To identify what roles the others involved in the process are playing, being careful to recognize multiple roles

- To identify carefully which role is speaking when one is communicating with those playing multiple roles

- To monitor throughout the process whether any roles are changing

Resistance to Change

It is easy to change the things that nobody cares about. It becomes difficult when you start to change the things that people do care about—or when they start to care about the things that you are changing.—LORENZI AND RILEY

Resistance to change is an ongoing problem. At both the individual and the organizational levels, resistance to change impairs concerted efforts to improve performance. Many corporate change efforts have been initiated at tremendous cost only to be halted by resistance among the organization's employees. Organizations as a whole also manifest behavior similar to that of individuals when faced with the need to change.

The relationship between individual and organizational resistance to change is important. An organization is a complex system of relationships between people, leaders, technologies, and work processes. From this interaction emerges organizational behavior, culture, and performance.

These emergent properties and behaviors are tightly linked in two directions to the lower-level interactions. Organizational resistance to change is an emergent property, and individual resistance to change can give rise to organizational resistance. A self-reinforcing loop of increasing resistance can develop as individuals create a environment in which resistance to change is the norm. That environment in turn encourages increased resistance to change among individual employees. The self-reinforcing nature of this loop can be tremendously powerful, defeating repeated attempts to break out of it.

Studies of system dynamics frequently reveal that major problems that everyone thought were external are actually the unintended consequences of internal policies. The basic dynamic behind this phenomenon is that the organization is made up of a network of circular causal processes: A influences B, which then influences C, which in turn influences A, i.e., the snake bites its own tail. Understanding these internal organizational dynamics is a prerequisite for leading effective change processes.

Rituals of Transition

All change involves loss. In many cases, change requires at the minimum that individuals give up familiar routines. In some cases, the loss is substantial, affecting position, power, networks of friends and colleagues, and such. In all these situations, rituals of transition can be crucial in assisting people to grieve and let go of the old and move on to the new.

The strategies for overcoming the barriers to change are quite diverse and touch on every aspect of the organization. No organization can begin using all the strategies at the same time or even in a short period of time. A better approach is to focus on one or two until they become part of the normal way of operating, i.e., until they become engrained in people's habits. Only then is it time to introduce another strategy. In this way, over time, the organization gradually improves its abilities to learn rapidly, to adapt to new conditions, and to embrace change.

Change Management Efforts in Medical Informatics

If you design something that works with an already existing model and doesn't require people to change their religion, the idea has a better chance of working.—TED SELKER, IBM

The current formal focus on change management in the medical informatics area is relatively new. Two early pioneers in analyzing the impact of information systems were Diana Forsythe and Henry Lundsgaarde. Diana Forsythe worked at the boundaries of cultural anthropology, medicine, and computer science. She was among the first anthropologists or sociologists to collaborate with computer scientists to study the work practices of computing. Her ethnographic work on software development in medical informatics revealed that cultural and disciplinary assumptions are routinely (but often unintentionally) designed into such software, potentially reducing the system's benefits to clinicians or patients. Her field

research in various medical disciplines suggested ways in which software and other technology might better meet those needs.[11–13] Henry Lundsgaarde[14,15] evaluated the PROMIS system. This study produced insights into people and organizational issues and is an excellent example of how to combine qualitative and ethnographic methods with quantitative ones.

A concerted effort to introduce the people and organizational aspects more formally and broadly into medical informatics began in 1993 with a working conference in Cincinnati, Ohio, held under the auspices of the International Medical Informatics Association (IMIA). The years since have shown that this working conference was a seminal event, in that it brought together for the first time isolated individuals interested in the topical area. A number of today's leaders in the area were present at that conference, representing different academic backgrounds, different types of organizations, and different countries.

Following that working conference, IMIA approved a working group to study further the organizational impact of computers in medicine. Other related working groups were approved by AMIA, the European Federation for Medical Informatics, and the Health Informatics Society of Australia. These working groups accepted as their charge some variation of the following theme—applying knowledge of human behaviors to the implementation of informatics in a health care environment.

The IMIA and AMIA working groups, under the initial leadership of Nancy Lorenzi, accepted a four-phase driving-wedge diffusion strategy to spread their messages across the profession. The first phase of this strategy was designed to build awareness of the importance of the topic of people and organizational issues in the area of health informatics. One diffusion product was the book *Organizational Aspects of Health Informatics: Managing Technological Change*, published in 1994.[10] This was followed by a case studies book, *Transforming Health Care through Information: Case Studies*, published in 1995.[16]

The second phase of the diffusion process was designed to educate people about the research from other disciplines, e.g. psychology, sociology, anthropology, and cognitive sciences, that is directly relevant to medical informatics. Products that support this diffusion strategy include the working group newsletter, *Organized Aspects of Medical Informatics*, edited by Bonnie Kaplan, PhD, and co-edited by Marilynne Herbert, PhD. Presentations at national and multinational conferences and publications in recognized informatics journals are other examples of this phase of the diffusion strategy.[17–20]

The third phase of the diffusion process is to apply established methods and models from other disciplines (e.g., psychology and sociology) to the medical informatics area. The working groups actively encourage current practitioners and students to model their medical informatics research efforts using documented and accepted concepts from other disciplines.

The fourth phase assumes that our ongoing research will reveal the need for some concepts and methods that are unique to medical informatics. This phase is designed to develop new, discipline-specific research methods and models. The working group encourages students in master's and doctoral programs as well as active researchers to consider innovative research designed specifically for the area of medical informatics.

The Road Ahead

I'm very interested in the future because I plan to spend the rest of my life there.—ROBERT WOOD JOHNSON

As medical informatics becomes involved in ever larger and more complex systems, both the overall organizational leaders and the informatics leaders must adapt to the following realities.

When the impact of technologic change is being managed, people's needs come first: Without people, we don't have an organization. We must implement the new technologies to do what they do best—structured, repetitive work—and let the people do what they do best—think, be creative, and solve problems. People are far better at reviewing boring work than doing it. It is because of these concepts that workflow technology is rapidly changing the role of today's information worker from an information transcriber and mover to a true knowledge worker—an information user.

The knowledge workers are the foundation. According to Peter Drucker in "The New Society of Organizations,"[21] the world economy is in the midst of transformation to the "knowledge society." Increasingly, knowledge is not just one resource among many; it is "the primary resource for individuals and for the economy overall." The essential purpose of management in the knowledge society is to encourage systematic organizational innovation. Drucker makes the important point that in a knowledge economy, the true source of competitive advantage is not so much technology, research and development, or even knowledge itself. It is the people, the knowledge workers whose skills and expertise are the foundation for all innovation.

We need to develop a new way of looking at how we currently function in our organizations. Management and workers will have to come together to build better, more productive work environments by understanding the long-term issues affecting their future and by creating a new way of thinking about how these current enabling technologies can best be used.

Technology Is Not Enough

Because technology investments are largely made up of things (i.e., hardware and software), it is easy to make the mistake of believing that a technology is implemented once it has been bought and installed. In fact, nothing works without people. These human issues become magnified in the process of redesigning work processes. Many work-process redesign projects focus exclusively on technology and fail to address the human and organizational aspects of work. In these instances, organizations fail to explore nontechnical solutions to improving organization processes, such as training or changes in structures, procedures, and management practices. Most often, technology strategy drives organizational change. While the business strategy may be clear, it is often not reflected in a defined organizational change strategy.

Too many technically good applications have failed because of sabotage by users who like the old ways in which things were done. Managing the natural resistance to change and helping convert that resistance into commitment and enthusiasm must be a planned process. New systems should enhance the quality of work life and increase responsibility, empowerment, and motivation.

The Role of Customers

We must rethink our customers' needs, using the concept of customer in the broad sense in the complex health care world. Any time our customers see us doing something better, we win. The message is that we need to identify correctly those parts of our processes that are visible to our customers and consider reengineering them first. The real key is to ensure that we are getting the right process right. For example, Mutual Benefit in the United States transformed their insurance policy issuing and payment process. They were ecstatic with the results of redesigning what had previously been a 24-day process of paying insurance claims, after the redesign payments could be made, in less than a day, generally within three hours. Within 90 days after implementing the new processes, they filed for protection from their creditors. Why? They

did not pay equal attention to re-engineering the processes that brought in the money.

However, the concept of customer needs is also important in the internal sense. In these times of increasing change, it will be even more critical that our people do not perceive that changes are being made just for the sake of change. When the culture is focused on constantly improving the meeting of customer needs, the rationale for rapid and frequent changes becomes much clearer to those in the organization. This point is constantly stressed by Oren Harari in his books[22] and monthly columns in *Management Review*.

The Road to Success

Common wisdom suggests that technology drives change in the organizational environment, but common wisdom is wrong. Instead, information technology is a powerful enabling force that creates new options and opportunities in the environment for what organizations produce—whether goods or services—and how they produce it. The early response by innovative players drives change. Each of the enabling technologies has the potential to transform one or more dimensions of the workplace. Taken together they act as a powerful set of technologies that organizations will have to harness to be successful in the 21st century. There are no quick fixes. Solving these problems requires a response targeted to the needs of our organization, but we need to know how our organization's strategy will play out in the environment as a whole.

The road ahead will not be an easy one. However, the medical informatics area is poised to create outcomes that many of us could only dream of a few years ago. Our challenge will be to implement our concepts and systems as smoothly as possible, not wasting our precious opportunities and resources because we ignored the pitfalls of managing change.

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