Winter 2003 | Vol.45, No.2 | REPRINT SERIES

California Management Review

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The decision to bring a new, innovative technology into a complex organization is only the first step in an implementation journey. Many new technologies disrupt existing organizational routines and relationships, requiring potential users to re-learn how to work together—a challenge that usually proves more difficult than anticipated. As a result, a technology implementation process can unfold in many ways, determined less by features of the technology itself than by a complex interaction between the technology and the adopting organization. Those participating in an implementation effort may have considerable leeway in how to interpret the technology's benefits and challenges, and so the same technology can be seen differently and can elicit different responses, even in organizations that may appear quite similar.[1]

These responses matter. Research on technology implementation shows that some organizations ultimately reject the same innovations that other organizations successfully implement.[2] Factors found to promote implementation success include top management support, slack resources, and prior experience with innovation.[3] Other research has emphasized the ways relationships and work routines are disrupted by a new technology.[4] What is clear from prior research is that technology implementation is difficult—and especially difficult when an innovation challenges existing patterns of interdependence among individuals or groups. In these cases, implementation becomes an organizational learning challenge, in which shared perceptions about organizational risks and benefits may be as important as technical advantages to implementation success.

During a technology implementation project, people interpret ambiguous cues and draw conclusions about the meaning of what is happening around them. Research on human cognition has shown that such conclusions, which are typically tacit or taken for granted, are rarely spontaneously re-evaluated or checked for accuracy.[5] Simply by working closely together, people tend to develop shared assumptions and beliefs—a process sometimes referred to as “sensemaking” or “social construction of reality.”[6] The result of this process is that people look at a given situation through an implicit, often shared, frame of which they are unaware. Organizational learning researchers have found not only that tacit frames held by individuals can impede learning, but also that people can be coached in altering these frames to improve both interpersonal and organizational effectiveness.[7] This article combines these disparate research perspectives to explore the effects of shared frames in the technology implementation journey and to suggest ways that leaders can frame or, if necessary, reframe an implementation project to increase the chances of successful outcomes.

Frames around Reality

A frame is a set of assumptions and beliefs about a particular object or situation.[8] The process of framing is a process of creating meaning—either passively and unconsciously or actively and consciously—that is not a necessary or factual aspect of that situation. Frames are shaped by past experiences in similar situations (or situations that seem similar in some way to those perceiving them) and affect both how we feel and how we think. Framing is neither bad nor good; it is simply inevitable. We interpret what is going on around us through a lens shaped by our personal history and our current social context. The catch is, we tend to assume that our framing captures the truth, rather than presenting a subjective “map” of territory that could instead be mapped differently.[9]

In a well-known example of the power of framing, Viktor Frankl, a Nazi concentration camp survivor, endured Auschwitz by imagining himself sharing the stories of courage he saw around him to those on the outside. Frankl, a psychiatrist, later described the moment of transformation that allowed him to persevere in these worst of conditions, in which he recognized the opportunity to reframe his experience from one of minute-to-minute suffering and fear to one of future-oriented vision and hope.[10] Although an extreme example of reframing, this case is illustrative of the power of cognitive frames and of the potential consequences of seeing the same situation one way rather than another potentially very different way.

Although the notion of a cognitive frame has much in common with other terms such as mental models[11] and taken-for-granted assumptions,[12] the framing terminology applies well to the technology implementation context and is particularly evocative for conveying the meaning intended in this article. First, it captures the notion of looking through something at something else; that is, a frame directs attention to features of the object of interest in a subtle way. Although our interest is in the painting itself, its frame can enhance of diminish our appreciation of its colors and shapes

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without our conscious attention. Second, psychological research has demonstrated powerful effects of tacit frames on human behavior.

Psychologists describe the effects of framing when approaching new tasks or people. For instance, research has shown that when children frame a task as a performance situation they are more risk averse and less willing to persist than children who frame the same task as a learning situation.[13] Those in the latter group persist longer in unfamiliar, challenging tasks and hence ultimately learn more and do better than the other children. Those with a performance frame engage in less experimentation and innovation and are less likely to formulate new strategies in difficult situations and more likely to fall back on (ineffective) strategies they have used previously.

As individuals, we tend to have habitual ways of framing a new situation. Some research has identified a distinction between a "promotion" and a "prevention" orientation. A promotion orientation is characterized by having ideals, goals, and an eagerness to attain them, which leads to a tendency to frame new situations in terms of possible gain, or lack of gain. In contrast, a prevention orientation is characterized by a sense of obligation and vigilance against potential loss, in which new situations are framed as opportunities to lose ground.[14] At the same time, behavioral therapists have devoted considerable effort to studying the process of reframing, to understand how to help people change their tacit frames to obtain better results in their lives. One tradition, rational behavioral therapy, teaches people to practice trying out more productive, healthful, and learning-oriented ways of framing themselves in the situations in which they find themselves in their lives.[15]

Managerial research also has investigated the power of reframing. Chris Argyris, one of the founding researchers of the field of organizational learning, advocates identifying and questioning certain tacit assumptions that profoundly affect how people interact with others in difficult conversations, such as conversations characterized by competing views or conflict. The tacit assumptions targeted for reframing pertain primarily to participants' own (assumed reasonable) and others' (assumed unreasonable) intentions. By becoming aware of and altering these skewed frames, organizational participants can learn more and achieve better results.[16] Donald Schön, a long-time colleague of Argyris' showed that how practitioners (ranging from physicians to architects) framed their role and shaped their behavior corresponded to the results they achieved.[17] The catch is, as these researchers point out, our spontaneous frames in difficult interactions are designed for self-protection. This protection comes at a cost; self-protective frames all but preclude the opportunity to learn and improve. Fortunately, people can learn to *re*frame—shifting from spontaneous and initially tacit self-protective frames to reflective or learning-oriented frames, that are no longer tacit but rather explicitly imposed on a particular situation to try to improve the process and the results obtained.[18]

Most models of framing in psychological research consist of two contrasting alternatives—such as: learning versus performing, goal-achieving versus self-protecting, or health-enhancing versus health-limiting. Similarly, technology implementation can be framed as an organizational learning opportunity or as mere execution (in which those whose jobs happen to be affected are responsible for a set of new tasks).

The Role of Leaders in Framing

The role of leaders in framing is important for several reasons. First, a project leader is the organization's lead user—the most visible spokesperson and translator of the potential implications of a new technology for the organization. Second, research has shown that people pay particular attention to what leaders say and do, compared to what peers and others say and do.[19] Hence, leaders' actions relevant to a new technology are likely to have an impact on how people frame the technology implementation project. Thus, leaders can use framing—on purpose—to get better results in technology implementation projects. This article builds on a framework that identifies the key dimensions of individuals' tacit, situation-specific frames as assumptions about: one's goal in the situation; one's own role; and the role of others in the situation.[20] In a study of 16 technology implementation projects, I found differences across projects in all three dimensions. These differences could be attributed to leadership.

Research Base

This article summarizes findings of a study of technology implementation in cardiac surgery departments in 16 hospitals. Four of the 16 cases are highlighted to illustrate differences in framing and leadership identified across these highly similar organizations. Cardiac surgery departments tend to be very similar to each other, especially as manifested in roles and relationships in the operating room (OR) team. Performing a coronary artery bypass graft or valve replacement surgery includes many small adjustments and minor differences across procedures due to patient variation and surgeons' preferences, but overall these procedures are highly similar across organizations.[21] This homogeneity was conducive to studying differences in framing or managerial approach (whether deliberate and active, or unconscious and passive) as a way of explaining differences in implementation success across sites.

The cardiac surgery task unites four professions and an array of specialized equipment in a carefully choreographed routine. Surgeons carry out the actual cutting and stitching to repair diseased components, supported by "scrub" and "circulating" nurses, an anesthesiologist, and a technician called a perfusionist who runs the heart-lung bypass machine. An OR team in a typical cardiac surgery department does hundreds of open-heart operations a year, and the team's sequence of individual tasks constitutes a well-defined routine supported in precise ways by particular technology. This routine, more than any other in the many hospitals studied, proved extremely resistant to change.

Although open-heart surgery has saved and extended countless lives, the operation's invasiveness—the surgeon must cut open the patient's chest and split the breastbone—leads to a painful and lengthy recovery. A new technology, introduced in the late 1990s, enabled surgical teams to perform the surgical procedure less invasively, with the promise of shorter and less painful recovery for patients and potential competitive advantage for the hospitals that adopted it. However, using the technology required a radical new approach to working together as an OR team.

The standard cardiac operation has three major phases: opening the chest, placing the patient on a heart-lung bypass machine, then stopping the heart; repairing or replacing damaged coronary arteries or valves; and weaning the patient from the bypass machine and closing the chest wound. The new technology, now adopted by more than 100 hospitals, provided an alternative way to gain access to the heart. Instead of cutting through the breastbone,[22] the surgeon uses special equipment to access the heart through an incision between the ribs. The small incision changes the procedure surgery in several ways. First, the surgeon has to operate in a severely restricted space, eliminating much of the information about the heart that was formerly available by sight and touch. Second, the tubes that connect the patient to the bypass machine must be threaded through an artery and vein in the groin instead of being inserted directly into the heart through the incision. And a tiny catheter with a deflated balloon must be threaded into the aorta, the body's main artery, and the balloon inflated to act as an internal clamp. In conventional cardiac surgery, the aorta is blocked off with external clamps inserted into the open chest.

The placement of the internal clamp is an example of the greater coordination among team members required by the new technology. Using ultrasound, the anesthesiologist must work carefully with the surgeon to monitor the path of the balloon as it is inserted, because the surgeon can't see or feel the catheter. Correct placement is crucial, and the tolerances on balloon location are extremely low. Once the balloon clamp is in place, team members, including the nurse and the perfusionist, must monitor it to be sure it stays in place.

As explained by one nurse interviewed, "The pressures have to be monitored on the balloon constantly…The communication with perfusion is critical. When I read the training manual, I couldn't believe it. It was *so* different from standard cases." Perhaps not surprisingly, learning and implementing the new technology was more challenging than initially expected by most surgeons adopting it. Although the company that developed the technology estimated that it would take surgical teams about eight operations before they were able to perform the new procedure in the same time as conventional surgery, most teams took 30-40 operations to achieve this goal.[23]

Recognizing the combined organizational and technical challenges of learning to use Minimally Invasive Cardiac Surgery (MICS), the company that developed the technology (which we refer to here as "Minimally Invasive Surgery Associates (MISA)," a pseudonym) provided a three-day off-site training program. Each hospital purchasing the new technology was required to send an OR team of surgeons, anesthesiologists, perfusionists, and scrub nurses to the training, where the team attended lectures and participated in hands-on laboratory sessions. The design of the training recognized the "bundled" nature of the product—unfamiliar equipment paired with a novel procedure for its use—and emphasized both technical features of MICS and the need for new interpersonal dynamics for an OR team to successfully incorporate the new technology into its ongoing operational services.

Consistent with prior research on technology implementation, the study deliberately varied factors previously associated with successful outcomes, including innovation history, resources, management support, and project leader status.[24] Two of the four teams discussed below were successful implementers; two were not.[25] Two had senior surgeons in charge, and two had newer, junior surgeons. Two were academic medical centers; two were community hospitals. Two had more management support; two had less. None of these factors explained the differences in implementation success that emerged, as shown in Table 1. Instead, how the surgeon leaders framed the technology and the implementation process, and how that affected the rest of the team, appears to have mattered greatly.

The Cases

A Top-Down Approach: Chelsea Hospital

"Chelsea Hospital" (a pseudonym—as used for all individuals and organizations mentioned in this article) was a leading academic medical center, with a corresponding history of innovation implied by that status. The adopting surgeon at Chelsea, "Dr. C," was nationally renowned and recently recruited to run and help revitalize the cardiac surgery department. Dr. C had significant prior experience with MICS, having performed 60 procedures at another hospital (not in this study) and worked on the early design of the technology as a scientific advisor to MISA. Chelsea senior management was very supportive of the surgeon's request to invest in MICS and agreed to send a team to the training program prior to the start of his appointment.

The surgeon thus played no role in configuring the team, which was put together according to seniority and consisted of the heads of anesthesiology, perfusion, and cardiac surgery nursing. Although the rest of the team did a "dry run" after training and prior to the first case, the surgeon did not participate, explaining in an interview that he did not see the new technology as particularly challenging and that "the technical aspects are not much," so "it was not a matter of training myself, it was a matter of training the team." Dr. C reported not changing his approach to communicating with others in the OR team, whom he felt he could rely on as professionals who should know their jobs. Eschewing the optional use of special aids such as a head camera to help the team see what he was seeing during the operations, the surgeon did little to guide others through the transition. An OR nurse, "Martha," noted that "[Dr. C] can visualize [the operation] without [the head camera]," but she could not, and so "the most difficult thing about MICS is that you can't see. If there is a bleeding artery or something unusual, I can't see it. In an open chest I can see." In short, the

TABLE 1. Background Summary and Implicit Frames in Four Technology Implementation Projects

	Chelsea Hospital	**Decorum Hospital**
History of Innovation	Extensive	Limited
Management Support	Extensive	Extensive
Project Resources	Adequate	Adequate
Status of Adopting Surgeon	Chief of Department	Chief of Department
View of Project Purpose	To demonstrate leading-edge capability	To stay competitive with other hospitals *("keep up with the Joneses")*
View of Leader's Role in Project	Skilled senior surgeon who has considerable past experience with the technology and will make it work here single-handedly	Skilled senior surgeon who minimized the degree of challenge and change posed by the new technology, and played down the importance of other team members. *"He's very much the commander of the ship."—Anesthesiologist*
View of Team's Role in Project	Executors of the surgeon's new technology project, doers	Non-surgeon team members seen as playing relatively unimportant role *"If you are [assisting rather than primary perfusionist] I don't want to hear from you."—Perfusionist's report of the surgeons' actions*
• Team practice session	Nurses did dry run alone	No practice session, independent reading of product manual
• Members' perceptions of their ability to speak up in action	*"if you observe something that might be a problem you are obligated to speak up, but you choose your time."—Nurse*	*[If I sensed a potential problem] "I'd tell the adjunct, or I might whisper to the anesthesiologist … [people] are afraid to speak out."—Nurse*
• Members' role in project debriefing	None	None
Project Outcome	Implementation eventually abandoned	Implementation abandoned early

surgeon did no active coaching with the team as MICS was being introduced. As one team member noted, the surgeon simply expected that "we know what is going on."

Following training, it seemed to the team that the technology would significantly alter routines in the OR. Indeed, initial procedures had greater communication between anesthesiology and surgery than usual, and also between perfusion and surgery. Yet, "after the first four to six cases, we were back to the usual pattern of communication," according to "Jim," a perfusionist. Team

TABLE 1. Background Summary and Implicit Frames in Four Technology Implementation Projects *(continued)*

	Janus Medical Center	**Mountain Medical Center**
History of Innovation	Extensive	Limited
Management Support	Management Opposed MICS	Management Neutral
Project Resources	Somewhat Constrained	Adequate
Status of Adopting Surgeon	Chief of Department	Junior Surgeon
View of Project Purpose	To help patients	To empower the team and thereby accomplish ambitious goals for the department.
View of Leader's Role in Project	Skilled senior surgeon who carefully communicated rationale for and confidence in the technology and a need for help from his highly-skilled team.	Junior surgeon who communicated excitement about the challenge and emphasized the critical role of other team members and of teamwork. *"The surgeon said, 'Hey, you guys have got to make this thing work'. That's a great motivator."—Perfusionist*
View of Team's Role in Project	Hand-selected professionals and highly-valued subordinates whose skills were vital to success. *"The surgeon values our skills … that's why I was picked."—Nurse*	Critical members of the team, without which the project would fail. *"The surgeon empowered the team. That's why I'm so excited about MICS. . . . it is about what a group of people can do."—Perfusionist*
• Team practice session	Dry run with all team members except surgeons	Full team dry run, with thorough discussion of how to communicate differently as a team for MICS
• Members' perceptions of their ability to speak up in action	*"I am very comfortable speaking up… you have to talk …there is no chance for recovery."—Nurse*	*There's a free and open environment with input from everybody."—Nurse*
• Members' role in project debriefing	Everyone participates in unstructured debriefing in the OR and in impromptu meetings to assess MICS results	Full-team sessions after first 15 cases; surgeon debrief sessions for next 20 cases.
Project Outcome	Successful implementation	Successful implementation

members grew increasingly frustrated. Martha ultimately commented that when she saw an MICS procedure on the schedule, she said to herself, "just give me a fresh blade so I can just slit my wrists right now." The surgeon commented, after almost 20 operations with the new technology , "It doesn't seem we are getting that much better. We are a little slicker, but not as slick as I would like to be. It is not that easy to keep the balloon in place." By the end of this study, the future of MICS at Chelsea was highly uncertain, and ultimately it was abandoned.

Leading as Teaching: Janus Medical Center

Like Chelsea, "Janus" was an urban academic medical center with a long history of adopting surgical innovations. Disappointed in the performance of an earlier innovation, Janus's chief of cardiac surgery, "Dr. J," was eager to test MICS. In contrast to what happened at Chelsea, his first step was to put together a special OR team. After selecting a second surgeon, who would be particularly suited to "manage data collection," he deferred to leaders in each of the other three disciplines to select the remaining team members. Each disciplinary group selected carefully. For example, "Betty," the head of cardiac surgical nursing, selected herself and another highly experienced nurse to participate, because of the challenge of the new procedure. The second nurse, "Sophia," reported being selected because "the surgeons recognize how important our knowledge is." Similarly, the head anesthesiologist explained, "the key to success [in MICS] is finding people who are good at what they do and limiting the technique to those people . . . the technique is so challenging that I felt it was best to keep in the hands of a couple of people."

Interestingly, the composition of this team resembled Chelsea's in that both were characterized by seniority in each profession; however, perceptions of the selection process were strikingly different. Unlike team members at Janus, no one at Chelsea reported being selected for particular skills.

By focusing often on patient benefits and also, but less frequently, on the desire to be a leading cardiac center, Dr. J motivated the team to endure the hardship that learning MICS entailed. He communicated in a thoughtful manner to help all members of the team understand the intricacies of the new procedure. Betty reported that "[Dr. J] talks everyone through [the procedure]. He says things like 'Can you see it?' and so on." He frequently communicated his growing confidence in the technology, and team members shared a belief that patients benefited enormously from the procedure. Sophia enthused, "Every time we are going to do a [MICS] procedure I feel like I've been enlightened. I can see these patients doing so well....It is such a rewarding experience. I am so grateful I was picked." This enthusiasm cannot be attributed to ease or enjoyment in doing the procedure. In fact, Janus team members, as at other sites, complained loudly about the hours of wearing a lead apron required for protection against the fluoroscopic radiation used in MICS. Nonetheless, motivation for continuing was high, and team members saw the minimally invasive approach as part of cardiac surgery's future.

In addition to impromptu debriefs, team members at Janus carried out more formal evaluations of MICS, using accumulated outcomes data on cost of the procedure. After careful reflection, the surgeons started to accept more challenging patient cases after the 40-case mark. Despite MISA's request for purchasing hospitals to allow potential customers to visit and observe the procedure, Janus initially declined to have visitors. At first glance, this seems insular and perhaps not learning-oriented; however, the leader's rationale for the refusal is instructive. He explained, "I did not like the idea because I wanted my team to be comfortable. [But], maybe it would not be a problem now." Ultimately, Janus was a highly successful implementer of the new technology, in contrast to Chelsea. It provides an example of an academic medical center that succeeded in changing team routines in the OR. The next two cases in community hospitals illustrate how the technology was received in organizations that are less used to being on the leading edge of innovation.

Business as Usual: Decorum Hospital

At "Decorum"—a community hospital within driving distance of two large cities—the chief of cardiac surgery "Dr. D" decided to adopt MICS because, as he explained, "We'd like everyone to know we can do it. It is a marketing thing. Patients want to know we can do it." He continued, "We try to be innovative here." Some of the other team members believed that Dr. D's reason for doing MICS was solely for image. A nurse explained, "He wanted to be competitive with other institutions. For example, [large city] is so close, we need to be at the leading edge." Another team member later echoed, "…to keep up with the Joneses." This defensive stance accompanied a practice that was unique in our data set—that of using the new technology while continuing to split open the patient's breastbone, only using a smaller incision than usual. According to one of the perfusionists, this was seen as a more safe practice than the manufacturer's recommended approach, even though "every time I go to a conference, it doesn't seem like we are doing it like MISA says—but having the sternotomy makes the access safer for [patients] so [we don't] take any risks." A nurse presented this slightly differently, "[the surgeon] is a creature of habit. He always does the median sternotomy." Another nurse described his leadership style as follows: "Dr. D is very regimented. Proper decorum in the room is his big thing." We were told in two different interviews that the surgeon was the "captain of the ship" and in one that "he's the chairman and that's how he runs the show." He did little coaching and was difficult to approach; as this nurse elaborated, "[To speak to the surgeons] you have to go through formal channels."

Amidst this formal structure, the surgeon insisted that team members who participated in training remain the only people doing MICS, to enable them to learn the procedure effectively. Although allowing team members to become comfortable with the new routine and with each other, this also had the effect of making the project quite insular. As one nurse reported, "There are no inter-area meetings here." Another elaborated, "We have meetings within surgery, but not with cardiology [or other groups]. Meetings aren't in-depth, they are just the number of patients, the number of complications, etcetera." Implementation of MICS at Decorum ultimately failed; the department's use of the new technology gradually dwindled away to nonexistent.

A Team Innovation Project: Mountain Medical Center

The MICS project leader at "Mountain"—a community hospital serving a small city and the surrounding rural area—was a junior surgeon who recently joined the cardiac surgery group. Although the hospital did not have a history of extensive innovation, the most senior cardiac surgeon—dissatisfied with what he knew of previous minimally invasive technologies—suggested that the new surgeon, Dr. M, take the lead in evaluating and potentially adopting MICS. More than in any other site in our sample, this young surgeon treated implementation of MICS as a project that needed to be structured and led. His leadership took two forms: managing a project and empowering a well-selected team. To this end, Dr. M selected team members based on their prior experience working together. He recognized that MICS represented a paradigm shift for the surgeon and the rest of the OR team, such that,

> "the ability of the surgeon to allow himself to become a partner, not a dictator, is critical. For example, you really do have to change what you're doing based on a suggestion from someone else on the team. This is a complete restructuring of the OR and how it works. You still need someone in charge, but it is so different."

Dr. M explained further that his own behavior had to shift from order giver to team member and that he worked to empower and inspire other team members:

> "The MICS procedure is a paradigm shift in how we do surgery. It is not just techniques, but the entire operating room dynamics. The whole model of surgeons barking orders down from on high is gone. There is a whole new wave of interaction."

"Bob," one of the perfusionists explained, "The surgeon empowered the team. That's why I'm so excited about MICS. It has been a model, not just for this hospital but for cardiac surgery. It is about what a group of people can do." He explained that it works because "the surgeon said, 'Hey, you guys have got to make this thing work.' That's a great motivator." Dr. M often wore a head camera, as a nurse explained, "so others can see what's going on, and ask, 'Why did you do this then?'" As a result of this effort, team members noted that communication was "much more intensive" and that the "hierarchy [has] changed" so that "there's a free and open environment with input from everybody."

This reframing went beyond the operating room. Perfusionists and nurses began to reframe their own roles from simply skilled technicians who used their hands to support surgeons' work, to involved thinkers, who read the medical literature. For example, Bob reported,

> "If an unusual case is coming up, I ask surgeons about it, look at the literature, and talk with the surgeons beforehand. The surgeons [are] open to me bugging them on that level. It used to be viewed skeptically, but they have grown to expect that interaction from me."

Finally, as at Decorum, Dr. M mandated stability of the OR team and the surgical procedure for early cases. The team that went to training performed the first 15 cases without adding or substituting any members. At that point. the group systematically added new members, following an explicit approach to training them. He also deliberately scheduled early MICS cases closely together enabling the team to perform six in its first week, compared to one or two for most hospitals. Similarly, he selected consistent patient conditions for the first 30 cases to allow maximal stability of the surgical procedure. After this period, the team began to innovate and even developed suggestions for modifications in the equipment, which they communicated back to MISA. The perfusionists worked with another manufacturer to design a custom perfusion pack for MICS. Mountain Medical Center went on to become one of the most successful implementers of MICS, not only in this study, but also among all customers of the new technology.

Summary

Two of the four hospitals succeeded in their efforts to adopt MICS; two ultimately abandoned the effort. This difference was not determined by management support, resources, project leader status or expertise, or even by the hospitals' academic status and history of innovation. As elaborated below, differences in how the project was framed by each project leader gave rise to different attitudes about the technology and to striking differences in teamwork. Three dimensions or themes emerged as characterizing differences in how MICS implementation was framed: project purpose, the leaders' role, and the team's role. Each dimension consisted of a learning-oriented approach versus a coping approach. The former encompassed aspirational aims and coaching-oriented leadership, the latter had protective or defensive aims and technically oriented leadership (summarized in Table 1).

Project Purpose: Aspirational or Defensive

Although each of the four cases represents a unique journey, they fall into two groups in terms of team beliefs about the reason for implementing MICS. Members of the successful teams, Janus and Mountain, shared a sense of purpose that can be characterized as aspirational—related to accomplishing compelling goals for patients or for themselves. The Janus team emphasized patient benefits; Mountain was motivated by achieving new frontiers as a team. The other two teams' goals were fundamentally preventative and reactive—both, in different ways, viewing the technology as a necessary burden to be endured. These teams were driven by concerns about competition (at Decorum), and, by a sense of the necessity of coping with the inevitable and sometimes oppressive force of technological change (at Chelsea).

Despite having in common their status as academic hospitals—which are all but required to innovate to remain leading-edge centers—team members at Chelsea and Janus saw the MICS project in fundamentally different ways because of the ways the two surgeons communicated about the new technology. Chelsea's highly experienced leader, seeing the change imposed by the new technology's components as relatively insignificant, did not go out of his way to make sure that others in the OR team were on board and motivated to learn the new procedure. Others were left to infer a rationale for implementing MICS, and in the vacuum no one seemed to have identified a compelling purpose for the change. Instead, they saw it as an unreasonable burden, something to dread. The absence of an explicit purpose for change left the team assuming that it benefited the surgeon to be on the leading edge of technology while feeling no ownership of this goal themselves. In contrast, team members at Janus shared an explicit aspirational purpose for enduring the hardship that learning MICS entailed for each of them. Each person noted the excitement of doing something new that helped patients recuperate from surgery more quickly than they would otherwise. Nurses reported being grateful they were picked for the project and feeling inspired by the challenge of learning something new while helping people.

The two community hospitals displayed a similar split. Decorum team members communicated an explicit belief that the reason for doing MICS was to "keep up with the Jones's" and to avoid being blindsided by competitive pressures in the future, especially given their geographic proximity to other leading hospitals. Perhaps consistent with this defensive stance, Dr. D had sought to minimize the change by carrying out a modified, limited sternotomy, thereby communicating implicit messages that change was to be resisted and learning to be minimized. In contrast, team members at Mountain expressed their conviction that MICS was an exciting opportunity to push the envelope of what was possible—not only for cardiac patients, but also for an OR team. Table 1 summarizes these framing differences across the four sites.

The Surgeon's Stance: Interdependent Team Leader or Individual Expert

In addition to communicating different explicit or implicit goals, leaders at Janus and Mountain framed their role in the project differently than did those at Chelsea and Decorum. Specifically, they explicitly communicated their interdependence with others, emphasizing their own fallibility and need for others' input for MICS to work. Without conveying any loss of expertise or status, these leaders simply recognized (and communicated) that in doing MICS they were dependent on others. The leader at Janus emphasized that he had hand-picked great people for the project—a model in which an enlightened leader recognizes the important contributions of subordinates. Mountain's leader went a step further, emphasizing that as the lead surgeon he had to allow himself to become "a partner" with the team—adopting an entirely different model for cardiac surgery.

In contrast, Chelsea's leader presented MICS as something driven forward by a more-or-less independent surgeon and emphasized its technical rather than organizational features. Decorum's leader implicitly communicated that others were not capable of playing a significant role in how things went. These differences in how the leaders presented their own roles had direct and obvious implications for how others viewed their own roles and for the meaning of teamwork in the OR for MICS.

The Team's Role: Empowered Team or Skilled Support Staff

Team members at Chelsea and Decorum struggled with the changes that the new technology required of them, particularly in the face of the surgeons' lack of acknowledgement of significant and profound change. They were in a position of seeing themselves as mere enactors of the surgeon's project. In contrast, at Mountain and Janus, team members felt a profound sense of ownership of the project's goals and processes, and they believed their roles to be crucial. As the perfusionist at Mountain summarized vividly, MICS—to the team—was "about what a group of people can do." At Chelsea, the surgeon's position as expert precluded others from seeing a way to make genuine contributions beyond enacting their own narrow tasks, and it put them in a position of not seeing themselves as affecting whether the project succeeded or not.

A dramatic illustration of framing related to the team's role occurred in another hospital called "Regional Heart Center." The surgeon scheduled the first few surgeries using MICS without worrying about whether the team members who went to training would be available at those times. An anesthesiologist explained why this happened, "We don't have any real teams here; it's just who gets assigned where on a given day." A circulating nurse offered, "Nurses are interchangeable. We know our little job. I don't know what other people are doing [but] if you know your job you get respect." MICS was initially framed by members of the Regional Heart Center team as little more than a few new components—nothing that would disrupt the normal modes of interaction in the operating room. The first six cases, however, were unexpectedly difficult, with the surgeon later reporting, "We had to re-invent the wheel every time." After these frustrating experiences, in which patient safety was consistently ensured but with considerable effort, the leader re-framed MICS as a team task and decided to get the original team back together. A stable team composed of those who attended the training performed the following 15 procedures, which went much more smoothly than before. The adopting surgeon later asserted, "Now I won't do it unless 'the team' is here."

Table 2 summarizes differences in how the role of the team was framed, and shows three specific aspects of team process that differed between successful and unsuccessful implementers. Janus and Mountain teams had a palpable sense of teamwork and collegiality that was missing at Chelsea and Decorum. This teamwork was aided by early practice sessions in which each team conducted a dry run using the new technology. Additionally, in Janus and Mountain, but not in Chelsea or Decorum, non-surgeon team members felt completely comfortable speaking with their observations and concerns in action in the operating room, and they also were included in meaningful reflection sessions to discuss how MICS was going. In sum, team members' were seen as playing an essential role in project success in the former two sites but not in the latter.

TABLE 2. Distinguishing Learning Frames from Performance Frames in a Technology Implementation Project

Project Dimension	Learning Frame	Performance Frame
Overall view of the situation created by the project *(and corresponding tacit goal during project)*	Challenging, full of unknowns to diagnose, an opportunity to try things out *(to learn as much as possible so as to know what to do next)*	Same as, or "not that different" from, normal situation *(to get the job done)*
View of self in carrying out the project	Important for and interdependent in overcoming the challenges ahead	Knows what to do, self-sufficient
View of others in carrying out the project	Partners, valued resources, essential resources for overcoming challenges ahead	Co-actors or subordinates

Learning Frames versus Performance Frames

Taken together, the sites that had an aspirational purpose, interdependent team leaders, and empowered teams represent a "learning frame" in this technology implementation journey. Those projects in which the goals were defensive, and in which leaders were seen as technical experts and the rest of the teams as supporting doers, can be characterized instead as having a "performance frame." Table 2 directly contrasts the three dimensions of a learning frame with those of a performance frame, to suggest a more general framework for technology implementation projects.

The claim that a learning frame centrally involves new views of the roles of team members and team leaders may be driven more by features of this particular new technology—especially as it compared with the existing technology—than by demands of technology implementation more generally. MICS imposed a new degree of interdependence in the operating room that required the team to learn a new way of working together. This meant that roles (and perceptions of roles) had to change for implementation to be successful. Nonetheless, despite the unique features of MICS, the frames used by successful implementers suggest general lessons. New technologies often change work processes in organizations and correspondingly, require new roles to enact them. Voicemail and personal computers transformed the role of administrative support personnel, freeing-up time spent taking messages and typing letters for other potentially more creative endeavors. Yet, to realize creative new possibilities, the administrative support role must be reframed. More currently, enterprise resource planning technologies in manufacturing, or electronic medical records in hospitals, profoundly increase interdependence across organizational departments; promised benefits in quality or efficiency may be difficult to realize unless users learn to how to work differently as interdependent members of a complex system.

TABLE 3. Cognitive Frames and Implementation Activities in Different Steps of Successful Technology Implementation Projects

Steps	Activities	Frames (implicit cognitions)	Effects
Enrollment	Communicate deliberateness in project team selection. Communicate purpose of project.	The project will create significant change in this organization or in people's jobs. Others play an important role in whether it succeeds or not.	Participants feel part of a team, have a shared sense of purpose, and are motivated to expend effort on a novel and uncertain endeavor.
Preparation	Offline sessions to safely explore implications of new technology. Practice with new behaviors.	We need to learn how to work together and to anticipate problems, if the project is going to succeed.	Participants develop increasing willingness to take interpersonal risks in project team.
Trial	Try things out and pay close attention to what happens.	Actions at this stage of implementation are experiments. It's not about "getting it right" the first time. I feel a sense of curiosity about what will happen.	Every event, every action is an opportunity to learn; people pay attention and are alert for possible changes that could be made.
Reflection	Discuss results of trial.	I want to learn from the past trials. I wonder what others may have seen that I missed.	Participants discuss what they did and what happened, analyze what it means, and brainstorm alternatives, if necessary.

In sum, those participating in the implementation of an innovative technology must not only learn how the technology works, but they also must begin to envision and enact how the technology may transform the way work is done in the organization. This is fundamentally a process of experimenting with new frames—about goals and roles. Successful implementation is likely to involve collaboration in this experimental, trial-and-error process.

Technology Implementation as a Team Learning Process

In those teams with learning frames, the collective learning process consisted of four basic, tightly coupled, recurring steps. The first step was enrollment of carefully selected team members by the leader, followed by pre-trial team preparation, and then by multiple iterations of trial and reflection. Table 3 summarizes these steps and shows specific activities that the successful implementers in this study had in common. It also suggests implicit frames or underlying cognitions consistent with and supportive of these activities.

A critical feature of the enrollment step was leaders communicating to others that they were being selected for the project for a reason, thus building intellectual and emotional commitment to the implementation process. This represented an implicit awareness that the new technology imposed change, that change is hard, and that others affect whether or not the change succeeds. Enrollment also set the tone of the journey that followed.

Preparation involved attendance at the off-site training followed by a team practice session at home to discuss how existing routines would need to be altered. Janus fell somewhat short in this step in that the team was incomplete (lacking surgeons, as noted in Table 1), but Mountain conducted an extremely thorough team practice session. This practice experience allowed team members to refine their own skills as well as to integrate their actions with those of others. Other activities that took place during the preparation phase included the establishment of team norms, thorough discussion of how the team would work together, how to encourage speaking up with concerns and observations, and how power relations might affect the group and help facilitate working together in a new way.

The next step in the team learning process was a first, real trial of the new technology. This describes the phenomenon of doing actual work while framing it as experimental. Paired with the fourth step, reflection, trials constituted opportunities to learn from what worked and what did not and to make improvements after reflecting on knowledge gained in each round. These two steps together were the basis of a learning cycle that fueled successful implementation.

In sum, when work is not framed as an opportunity to "get it right" on the first try, workers may be more able to learn in the process and ultimately to get it right than when work is framed as an opportunity to perform, to shine, or to execute perfectly. The process of trial and reflection is most successful when participants are open to change, eager to find the best fit, and recognize that other people may have different frames—that is, they may have observed or interpreted something in a different way or may have different information at the outset. To even consider this possibility, however, requires either an innate or trained habit of being curious. This is the essence of a learning frame.

Conclusion: Four Tactics for Reframing

To achieve better results on an implementation project, or when facing any new and challenging situation, experiment with the following four tactics for reframing:

- Tell yourself that the project (or situation) is different from anything you've done before and presents a challenging and exciting opportunity to try out new approaches and learn from them.

- See yourself as vitally important to a successful outcome and, at the same time, as unable to achieve this alone—without the willing participation of others.
- Tell yourself that others are vitally important to a successful outcome and may bring key pieces of the puzzle that you don't anticipate in advance.
- Communicate with others exactly as you would if the above three statements were in fact true.

Framing provides leverage. How we think shapes our behavior, which in turn influences whether and how effectively we obtain desired results. This basic causal chain has been identified in different research traditions from cognitive psychology, to behavioral therapy, to organizational learning. Furthermore, there is broad agreement that it is difficult to change behavior or to obtain different results without changing the underlying cognitions that give rise to and support the desired behaviors. Thus, when hoping to change results, framing is the place to start. Learning to use new frames takes practice, however. The framing tactics listed above are extremely powerful and practical, but they must be brought to bear on new situations again and again before they can become second nature. One factor that facilitates deeper acceptance of this learning frame is making its use public rather than practicing it privately. Whether leading or participating in implementation projects, individuals seeking to follow the tactics for reframing can be open with others about what they are trying to do—allowing others to understand, provide feedback about, and even experiment with the learning frame themselves.

Just as cognitive psychologists have identified habitual differences across individuals in framing, and just as behavioral therapists have described ways to help individuals re-frame to improve their emotional and psychological health, this article emphasizes the power of project leaders to influence how others see the project, especially its purpose and their own role in achieving that purpose. When managers decide to adopt an innovative new technology, explicit framing can go a long way to promoting implementation success. In addition, effort spent on framing or reframing can happen at any point in a project—as the case at Regional Heart Center illustrated—and still have an effect. This study found that project leaders who employed and communicated a learning frame helped launch an implementation journey that engaged others in a rewarding collaborative effort to promote innovation.

Notes

1. Work by sociologists such as Steve Barley and Wanda Orlikowski emphasizes the way technological change is constrained by organizational structures and, at the same time, shows that technologies can induce gradual structural change. For example, Barley's study of two radiology departments implementing CT scanners showed that two organizations could have widely different results implementing the same technology at the same time. At one hospital, physicians' and technicians' interactions in the diagnostic process led to re-negotiation of task structures, creating greater interdependence than before the new technology was introduced; while at the other site, implementation of CT scanners reinforced the hierarchical order between physicians and technicians. Similarly, Orlikowski's research on implementa-

tion of groupware found that how people viewed the technology affected how they used it. See S. Barley, "Technology as an Occasion for Structuring: Evidence from Observations of CT scanners and the Social Order of a Radiology Department," *Administrative Science Quarterly*, 31/1 (March 1986): 78-108; W. Orlikowski, "Learning from Notes: Organizational Issues in Groupware Implementation," *The Information Society Journal*, 9/3 (July-September 1993): 237-250.

2. The "Not Invented Here" syndrome can lead an organization to reject an innovation based on an implicit assumption that the innovation does not fully recognize or accommodate their own needs and idiosyncrasies. Katz and Allen show that "NIH" is a likely result of a decline in communication with external sources, and that this is more likely when mean team tenure surpasses 2.5 years. Other inhibitors of change include maladaptive specialization (competences that are proven outdated and inefficient), "competency traps," and the difficulty of reconfiguring work processes to accommodate new technology, as occurs in some enterprise systems. See R. Katz and T.J. Allen, "Investigating the Not Invented Here (NIH) Syndrome: A Look at the Performance, Tenure, and Communication Patterns of 50 R&D Project Groups," in M.L. Tushman and W. L. Moore, eds., *Readings in the Management of Innovation*, 2nd edition (New York, NY: Ballinger/Harper & Row, 1988), pp. 293-309; B. Levitt and J.G. March, "Organizational Learning," *Annual Review of Sociology*, 14 (1988): 319-340.
3. Managerial support, organizational history of innovation, and resource availability have been shown to be associated with innovation and technology implementation success. See W.M. Cohen and D. A. Levinthal, "Innovation and Learning: The Two Faces of R&D," *Economic Journal*, 99/397 (1989): 569-596; M. Iansiti and K.B. Clark, "Integration and Dynamic Capability: Evidence from Product Development in Automobiles and Mainframe Computers," *Industrial and Corporate Change*, 3 (1994): 557-605; J.R. Kimberly and M.J. Evanisko, "Organizational Innovation: The Influence of Individual, Organizational, and Contextual Factors on Hospital Adoption of Technological and Administrative Innovations," *Academy of Management Journal*, 24/4 (1981): 689-713; D. Leonard-Barton and I. Deschamps, "Managerial Influence in the Implementation of New Technology," *Management Science*, 34/10 (1988): 1252-1265; R.K. Yin, "Production Efficiency versus Bureaucratic Self-Interest: Two Innovative Processes?" *Policy Sciences*, 8 (1977): 381-399.
4. Ethnographic research by Orlikowski [op. cit.] and Barley [op. cit.] demonstrates that "people act towards technology on the basis of their understanding of it;" unless team members adopt new cognitive frames they will not be able to realize the full potential of a new technology.
5. See Goleman's *Vital Lies, Simple Truths* for an elegant discussion of self-deception and adherence to interpretations of reality that are not only erroneous but sometimes even psychologically harmful. Argyris has shown that people tacitly assume that they know others' motives and (erroneously) act accordingly. And, Orlikowski's research on new technology implementation suggests that technological frames, or how people interpret a new technology, remain stable over time. D. Goleman, *Vital Lies, Simple Truths: The Psychology of Self-Deception* (New York, NY: Simon and Shuster, 1985); C. Argyris, *Knowledge for Action: A Guide to Overcoming Barriers to Organizational Change* (San Francisco, CA: Jossey-Bass, 1993); Orlikowski, op. cit.
6. P.L. Berger and T. Luckman, *The Social Construction of Reality* (New York, NY: Doubleday, 1966); K. Weick, "The Collapse of Sensemaking in Organizations: the Mann Gulch Disaster," *Administrative Science Quarterly*, 38/4 (December 1993): 628-652.
7. C. Argyris, R. Putnam, and D.M. Smith, *Action Science: Concepts, Methods, and Skills for Research and Intervention* (San Francisco, CA: Jossey Bass, 1985).
8. Several psychologically oriented researchers have investigated the effects of framing. Diana McLain Smith describes the importance of how physicians frame patients in the clinical experience. Donald Schön explains the process of framing by individual practitioners, and the power that a learning-oriented frame has on the practitioners' skill and development. Maxie Maultsby, a pioneer in the field of rational behavior therapy, emphasizes the need for reframing to improve individual psychological health and results. Larry Wilson has developed these ideas further in the realm of organizational change. D.M. Smith, "Different Portraits of Medical Practice," in R. Sawa, ed., *Family Health Care* (Newbury Park, CA: Sage, 1992), pp. 105-130; D. Schön, *The Reflective Practitioner* (New York, NY: Basic Books, 1983); M. Maultsby, *Rational Behavior Therapy* (Englewood Cliffs, NJ: Prentice-Hall, 1984); L. Wilson and H. Wilson, *Play to Win: Choosing Growth Over Fear in Work and Life* (Austin, TX: Bard Press,

Inc., 1998).

9. Rivard, Rudolph, and Nielsen have suggested that our own framing blinds us to others' frames, and what we perceive as a problem may not even be a concern to another person. This recognition is imperative, they suggest, before criticizing a colleague. P. Rivard, J.W. Rudolph, and R.P. Nielsen, "Criticism as a Door to Mutuality: Reframing for Collective Inquiry," manuscript, 2002.
10. D. L. Coutu, "How Resilience Works," *Harvard Business Review*, 80/5 (May 2002): 46-55; V. E. Frankl, *Man's Search for Meaning* (New York, NY: Simon and Shuster, 1963).
11. Mental models are implicit beliefs that shape inferences, predictions, and decisions about what actions to take; shared mental models help people understand and react to the system in which they work in similar ways. See J.A. Cannon-Bowers, E. Salas, and S. Converse, "Shared Mental Models in Expert Team Decision Making," in N.J. Castellan, ed., *Individual and Group Decision Making* (Hillsdale, NJ: LEA, 1993), pp. 241-246; R. Klimoski and S. Mohammed, "Team Mental Model: Construct or Metaphor?" *Journal of Management*, 20/2 (Summer 1994): 403-437; P. Senge, *The Fifth Discipline: The Art and Practice of the Learning Organization* (New York, NY: Doubleday, 1990); M. Cannon and A. Edmondson, "Confronting Failure: Antecedents and Consequences of Shared Beliefs about Failure in Organizational Work Groups," *Journal of Organizational Behavior*, 22 (2001): 161-177.
12. Schein's work on culture describes organizational culture as set of taken for granted assumptions shared by members of an organization about the nature of reality and authority. E.H. Schein, *Organizational Culture and Leadership* (San Francisco, CA: Jossey-Bass, 1985).
13. C.S. Dweck and E.L. Leggett, "A Social-Cognitive Approach to Motivation and Personality," *Psychological Review*, 95/2 (1988): 256-273.
14. Regulatory focus theory identifies certain means accompanying promotion and prevention orientations. E.T. Higgins, "Making a Good Decision: Value from Fit," *American Psychologist*, 55 (2000): 1217-1230.
15. Maultsby, op. cit.
16. Argyris, Putnam, and Smith, op. cit.
17. Ibid., p. 229; Schön, op. cit.
18. Colleagues of Chris Argyris and Don Schon, Diana Smith, Bob Putnam, and Phil McArthur have identified three distinct dimensions of interpersonal frames—how one views oneself, perceives others, and understands the implicit goal in an interaction. See P. McArthur, "Learning in Action: Tools for Collaborative Decision Making," Action Design, Newton, MA, 2002.
19. Team members are likely to attend to each others' actions and responses but are particularly aware of the behavior of the leader. Research on distributive justice demonstrates that *how* a leader directs social processes is equally important to team members as their content; this strongly influences team members' compliance with the leader's decision. T.R. Tyler and E.A. Lind "A Relational Model of Authority in Groups," in M. Zanna, ed., *Advances in Experimental Psychology, Volume 25* (New York, NY: Academic Press, 1992), pp. 115-191. Beyond the team context, leaders have been distinguished from managers (who deal with complexity and pragmatic details) because of their role as meaning-makers. In particular, leaders are critical for establishing a compelling reason to change or to learn something new and challenging. J.P. Kotter, "What Leaders Really Do," *Harvard Business Review*, 68/3 (May/June 1990): 103-111; Maultsby, op. cit.; A. Zaleznik, "Managers and Leaders: Are They Different?" *Harvard Business Review*, 70/1(March/April 1992): 126-135.
20. Smith, op. cit.
21. Field research by physicians noted that cardiac surgery departments are extremely similar in practices, surgical techniques, and operating room set up. G.T. O'Connor, S.K. Plume, et al., The Northern New England Cardiovascular Disease Study Group, "A Regional Intervention to Improve the Hospital Mortality Associated with Coronary Artery Bypass Graft Surgery," *Journal of the American Medical Association*, 275/11 (1996): 841-846.
22. A sternotomy, or median sternotomy, is the first step in traditional cardiac surgery, in which the chest is cut open and the breastbone (sternum) is split apart to allow access to the heart cavity.
23. For more detail, see G.P. Pisano, R.M.J. Bohmer, and A.C. Edmondson, "Organizational Differences in Rates of Learning: Evidence from the Adoption of Minimally Invasive Cardiac Surgery," *Management Science*, 47/6 (June 2001): 752-768.
24. S.C. Wheelwright and K.B. Clark, *Leading Product Development: The Senior Manager's Guide to Creating and Shaping the Enterprise* (New York, NY: Free Press, 1995); K.B. Clark and S.C.

Wheelwright, "Organizing and Leading 'Heavyweight' Development Teams," *California Management Review*, 34/3 (Spring 1992): 9-28.
25. Implementation success was calculated as the rank sum of three variables: absolute volume, penetration levels, and trends in use per site. See Edmondson, Bohmer, and Pisano, op. cit.

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