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Embracing New Technology Adoption

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Abstract

This paper presents a pragmatic approach to understanding the successful adoption of new technology. In order to maintain a competitive global position in an increasingly borderless virtual society, non-profit and for-profit organizations alike face critical problem-solving and decision-making dilemmas whether to convert current enterprise systems to new innovative technologies, to modify, upgrade, or enhance existing technologies, or to maintain the status quo while awaiting the next paradigm shift to a product diffusion even more agile, powerful, all-encompassing, and cutting-edge. Through the lens of a Chief Information Officer, this essay leads the reader through a series of phases, processes, and roles while examining the potential successes and pitfalls of organizational technology selection and implementation. Unique to this paper is the influence of organizational culture upon every element of technology adoption within a 21st century digital social-cultural environment.

Keywords: agility, change management, organizational culture, technology adoption, implementation processes

1. INTRODUCTION

Technological innovation drives the world within our social-cultural environments as we know and experience them. But how do we decide which technologies we need and when, and why do we need some of them but not all of them? Many theorists have tried to make sense of the insatiable human need for innovation and progress. In the "Third Wave," Toffler (1981) inherently linked and labeled this logical and natural progression of mankind in terms of *waves*, the first stage beginning with the transition of hunter-gatherers into farmers, the Agriculture or Agrarian Age (precipitated by the tool-making Iron Age); through the second

stage known as the Industrial Revolution (manufacturing environment); and finally to the current stage, the third wave known as the Information Age (service-driven knowledge-based society). By comparing the Information Age technology to the previous eras, Toffler provided a logical and meaningful sequence to man's events. Debons (2008, p. 14) cleverly paraphrased Toffler's three waves, indelibly memorialized by the phrase, "farms, factories, and floppies," confirmed that no matter what moniker man applies, technological innovation has always been with us.

Beniger's (1986) detailed history of the rise of technologies, argued that exceptional times and situational events force controversy resulting in innovation. He asserted that controversy should be embraced, not feared, because situational events, typically random and unstoppable, occur for a variety of reasons, such as political, economic, military, scientific, cultural, and even religious. Standage (1998) cited precipitous events for their historical importance as man's great inventions of the industrial revolution, the emergence of the steam engine, the railroad, and mass production factories, along with the great advancements of weaponry propagated through world wars, and the subsequent 'cold war'' that induced digital innovations. Kuhn (1996) taught us that these important scientific philosophical changes were known as paradigm shifts. Drucker (1959) predicted the demise of the manufacturing culture by coining the term, *knowledge worker.* Carr (2003) argued that technology no longer has the advantage; it is the strategic process that matters. Carr's argument is valid if the definition of IT focuses only on technology, servers, switches, and other systems that make up the traditional IT infrastructure. But the IT infrastructure of the digital 21st century organization does matter as it represents the life blood of the IS system (Borkovich & Noah, 2014). Christensen's (1997) theory of disruptive technology argued that implementation and adoption success is grounded in conflict resolution and change management. Most called these events 'progress,' while others applied the label, 'technology.'

In the second half of the 20th century, the introduction of the digital era and the spawning of bits (Shannon, 1948), mainframe computers and more, the business world began it's metamorphose from a blue-collar labor-driven manufacturing society to a white-collar service-oriented society. By the dawning of the nascent 21st century, the transformation was all but complete, with the exception of a few Luddites and outliers that continued to make in a new world of doers. Professionals were demanded to assume technology leadership roles, universities developed degrees and certification programs, and corporations transferred engineers and scientists, among others, into positions of information systems and technology professionals, management theorists, and corporate anthropologists.

Today, we make individual day-to-day technology decisions at home, school, and work that significantly impact our success in the world. But who makes these technological decisions for others, specifically in the workplace, and how are these decisions made? These are lofty goals to explore and the information and resources are too vast to be fully considered within the confines of this essay. Therefore, *albeit not limited to*, Table 1 depicts the key phases, tasks, and roles that influence the successful or failed outcomes of an innovative technology implementation. Furthermore, we argue that organizational culture has a definitive influence in the outcome of every element related to technology adoption.

Phases of Successful Technology Implementation
• Understanding the Organizational Culture
• Defining the Leader's Role (CIO/CTO)
• Communicating the Message
• Selecting the Project Manager, Team & Plan
• Choosing the Right Technology
• Designing the System
• Implementing the Process (Checks & Balances)
• Adhering to the Schedule (The Timeline)
• Introducing the Technology (The Roll-Out)

Table 1. Phases (and Role-Players) for Successful Technology Implementation

This essay is framed as a secondary review of technology adoption literature. However, its uniqueness demonstrates the synthesis of social-cultural influences upon the success or failure of organizational technology adoption by analyzing and applying the theories of corporate anthropologists, sociologists, and business management subject matter experts. The intent of this paper is not to solve the overarching technology adoption crises of today as that philosophical agenda will be left to the theorists. Our paper explores why, when, and how a new

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technology should be introduced, implemented, and adopted, by limiting the focus to a smaller and more controlled environment, the organizational workplace.

2. THE CULTURE

The mission of technological innovation has always been to collect the data assets of the organization and structure them in a way that is most useful to problem-solvers and decision-makers. However, management research has long suggested that to facilitate decision support, the organizational culture needs to align with the goals and objectives of the enterprise and business intelligence strategy, for without this "cultural glue that welds managers [and employees] together for the implementation of organizational strategies, the absence of this glue would bring about disastrous effects" (Štok, Markič, Bertoncelj, & Meško, 2010, p. 305). Researchers argue that organizational culture is inured and employees tend to embrace information systems that are in concert with their culture and resist those that conflict (Cooper, 1994). However, executive management drives continuous new introductions, modifications, upgrades, enhancements or changes to its business enterprise architecture that are paramount to its digital and cultural evolution ensuring economic growth, return on investment (ROI), increased competitive edge, and market share.

The influence of corporate culture's impact upon the successful adoption of a technology cannot be diminished. Many anthropologists, sociologists, and technologists concur that the construct of culture applies to organizational management and technology implementation. Breslin (2004, p. 19) reports that "having the right set of soft skills is just as important, if not more important, than technical skills and knowledge." Zheng, Yang, and McLean (2010, p. 765) add that "Organizational culture does not directly lend its influence on organizational effectiveness; rather it exerts its influence through shaping the behavior of organizational members."
"Decisions are not made in a vacuum. They are made in the context of a particular business strategy, skills and experience, a particular organizational culture, and a particular set of technology and data capabilities. Most companies focus on just two elements -- technology and data -- or none at all," observes Davenport, Harris, DeLong, and Jacobson (2001, pp. 121-122). Figure 1 illustrates Davenport's depiction of a knowledge-based project's strategy; however, for the purposes of this paper, the model clearly shows that the attributes of 'organization and culture' have equal standing with 'technology and data' within the cone's base, providing a solid foundation for a successful project.

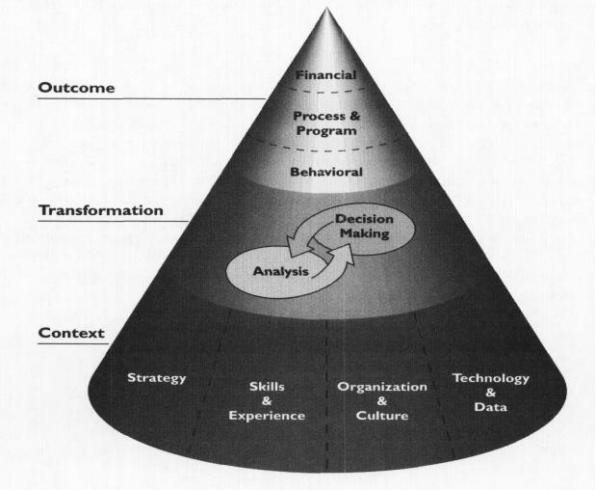

Figure 1. A Model for Building an Analytic Capability (c. Davenport et al., 2001, p. 121)

Davenport, DeLong, and Beers (1998, p. 50) further recognize that a successful technology project is linked to a favorable corporate culture through eight key factors:

- Economic performance or industry value
- Technical, organizational infrastructure
- Standard, flexible knowledge structure
- Knowledge-friendly culture
- Clear purpose and language
- Change in motivational practices
- Multiple channels for knowledge transfer
- Senior management support

At times it is necessary for management to modify the organizational culture by establishing rewards or incentives to motivate and encourage employees' buy-in to the new or changed system. Establishing appropriate rewards for employees who lead the way by utilizing the system can become an important organizational ritual or tradition. Recognitions, such as gift cards, raises, awards, bonuses, contests, and favorable performance reviews encourage effective long-term behavior, and should tie-in with the evaluation and compensation structure (Davenport et al., 1998; Hurley & Green, 2004).

Tiwana (2002, p. 73) observes that, "Employees are not like troops, they are like volunteers. Encouraging use and gaining support requires new reward structures that motivate employees to use the system and contribute to its enthusiastic adoption."

3. THE LEADER

Today most organizations ensure that prudent business decisions are made by seasoned highly educated professionals, led by C-Level corporate executives known as the Chief Information Officer (CIO) or the Chief Technology Officer (CTO). CIOs and CTOs use Information Technology (IT) and Systems (IS) (i.e., hardware, software, processes, methods) to formulate business strategies and intelligence, maintain a competitive edge, and create and enable lasting value for their companies. Their decisions to procure new technologies, upgrade existing products, or merely maintain the status quo critically impact business strategies for years to come, a heavy mantel of responsibility resting upon a single individual or team.

Eckerson (2003) argues that organizations succeed not only because of specific technology, but because of the 'soft' skills of leadership, communication, planning, and interpersonal relationships. Succinctly, Tseng (2010, p. 828) notes that without a champion to nurture the desired path, organizational culture can present a major barrier to any worthy project. Equally convinced, Gonzalez (2011) avers that strong leadership is essential to achieve technology maturity.

A prudent CIO/CTO manages this effort like a formal project for an external customer. When developing strategies, pondering new purchases, or solving problems, clever CIO/CTOs rely upon the experience and recommendations from a team of professionals, represented by multiple disciplines such as IT/IS, engineering, marketing, business development, procurement, contracts, accounting, communications, legal, human resources, as introducing a new technology product, process, or system impacts every department in the company in a primary, secondary, or tertiary capacity. And not to be overlooked, the successful CIO/CTO secures executive level sponsorship and support to ensure a high level of confidence and trust in the authority and decision-making powers of the CIO/CTO. In summary, executive management support and the identification of a corporate sponsor or champion to "define the vision, be an activist, and to communicate a unified message" (Tiwana, 2002, p. 61) will pave the way for a consistent and manageable organizational cultural change in concert with IT/IS objectives.

4. THE MESSAGE

Has there ever been a successful leader who could not communicate and inspire? One of the most important tasks the CIO/CTO does is to personally communicate his/her vision for the new strategy and adoption of the technology. Becker (2004) proffers that interviews and facilitated sessions are the best way to solicit user feedback and to create a face-to-face bond, as surveys are not a reasonable tool to solicit this type of outcome. And Trembly (2001, p. 32) observes that, "Tech products do great things [but] they also make people nervous. One way of encouraging participation is to regularly communicate the status and progress of the IT project to everyone concerned."

As the leader of change, the CIO/CTO begins by communicating the message and the vision. As it is inherently human to resist change, the quality and delivery of the announcement must not minimize the impact or lessen the severity of the reaction, because the trauma will be more severe when it is realized that the truth has been withheld. And presenting a change as temporary, knowing that it will not be, is a manipulative practice that rarely ends well for the communicator. Carton (2008, p. 81), a noted scholar in change management dedicated to mitigating fear and disruption, asserts that "In order to be effective, the announcement of the change must meet three criteria: it must be comprehensive, factual, and specific." The audience must be empowered with the truth and a mission to succeed in order to embrace and implement change effectively.

Rogers (2003) further reminded us that people have different levels of readiness for adopting new technologies by classifying them into five groups: Innovators; Early Adopters; Early Majority; Late Majority; and Laggards. A thoroughly prepared CIO/CTO knows his/her audience (constituency) and will have ascertained where the majority of the corporate population lies with respect to accepting technological change. Awareness of potential obstacles by mandating clear and cogent communication will mitigate barriers of mistrust before they become hurdles and detriments to

technology implementation or modifications to the system. Davenport et al. (2001, p. 125) suggest that, "The most sophisticated analyses in the world are worthless if findings cannot be communicated to decision-makers in ways that will encourage their use."

5. THE PROJECT TEAM

Sometimes the most brilliant, senior, experienced, educated, or technologically savvy individuals do not make the best team members. To use a choral analogy, the best team members are typically those who enjoy being part of a contributing chorus, happy to sing and blend their respective voices of soprano, alto, tenor, and bass; ever content to shine with an occasional solo. The CIO/CTO serves as the Conductor with the Project Manager equally content to share the limelight in the supporting Assistant Conductor role. A team works best when it sings in harmony from the same musical score (sharing the same goals and objectives).

The Project Manager

One of the most critical decisions made by the CIO/CTO is the appointment of a talented and responsible individual to execute the project's vision and strategy. A dedicated Project Manager (PM) can fulfill this role by serving as a facilitator and liaison to the CIO/CTO, keeping the technology leader informed and the team focused and on-task; ensuring that no surprises surface after the ability has ceased to implement corrections or course changes. PM skills involve balancing technology management, people, and processes as vital resources in IT development. "Any failure in an area means failure of the project. Technology is usually the scapegoat, but the technology is proven. It's really about culture change" (Trembly, 2001 p. 41).

The Team

Not to be overlooked is the selection of the team members and the PM's recommendations are critical to ensure the likelihood of esprit de corps, a shared vision, and strong work ethic. If possible, all primary disciplines need to be represented and the employees should be dedicated to the success of the project full-time. End-users should also participate as Team Members and beta-testers as their contributions to the overall product development and effectiveness will be invaluable. Routine conversations between the tech team and the user community about the ability of the IT environment to meet their needs will encourage productive feedback and save re-work time later. Becker (2004, p. 667) recommends that: "The most important aspect is meeting with the user community to solicit feedback. Like organizational therapy we're trying to detect the issues and [find] opportunities."

The Project Plan

The PM, with input from the Team, develops a Project Plan with specific elements identified, such as a work scope, period of performance, milestones, budget and schedule; key personnel; workspace; meetings; reports; and assignments to cover all the tasks. Definitive planning decisions are made, such as the identification of scope or tasks where contractors or consultants are required, whether new products need to be licensed or existing products need to be replaced, enhanced, modified, or upgraded.

Outsourcing

Should the CIO/CTO and Team determine that technology products or services are to be outsourced; the market research and solicitation process begins immediately. Bidders lists are created, Request for Proposals (RFP) developed, and sources sought. As with any formalized project, all costs (direct and indirect) will be segregated, identified in a code of accounts, and tracked within the organization's project management cost accounting system.

The results of a competitive or sole source RFP have a substantial impact on the cost and schedule of the technology acquisition and its implementation. Types of procurements and resultant contracts also play major roles, such as advisory consulting, service contracting, training agreements, product or equipment purchases, make-or-buy and lease-or-purchase decisions, license or development decisions, and open or closed source code considerations. Comparing life-cycle costs to long or short-term initiatives, acquiring or merging with another company, adopting another's IT strategy (*or not*), all have substantial impacts on decisions, costs, and schedules. Capacity of the organization to produce under these constraints and empowering the team to recommend and participate in strategic decisions will teach and encourage employees to lead, resulting in enthusiasm and pro-activity that will encourage others to embrace change, as well (Belasco & Stayer, 1993).

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6. THE RIGHT TECHNOLOGY

The availability of new technology is as vast as the reasons for selecting new products and services. Prior to selecting the right product, process, or service, today's CIO/CTO has to weigh the risks and threats, such as costs, schedule, down-time, resources, safety, and security of the company against the future benefits, rewards, competitive advantage, increased workforce, and potential market share to be gained. An important function of a CIO/CTO is to act as steward of the company's technology purse, continually managing the serviceability and value of the enterprise. A CIO/CTO must evaluate all the technology costs that will culminate in the overall life cycle (i.e., conservative period of three to five years) before replacement. A Cost-Benefit Analysis is also performed to determine if the potential Return on Investment (ROI) will be minimal, adequate, or of maximum benefit. Most CIO/CTOs will not plan for an ROI longer than a 36-month period as the nature of technology advancement cannot be predicted very far into the future (Stenzel, 2007).

Selecting and implementing new technologies are of paramount organizational importance, taking an enormous amount of research, planning, and preparation to accomplish. Since all enterprises are unique, the CIO/CTO has to make the right decision at the right time for his/her company, not necessarily error-free as most errors are generally correctable, but the best fit to align the specific strategic needs of the enterprise to maximize value for both external and internal customers. Although the traditional information systems Technology Acceptance Model (TAM) (Davis, 1989; Bagozzi, 2007) where perceived usefulness and ease of use are of primary benefit to end-users and their sponsors, the 21st century CIO/CTO considers TAM only one factor among a myriad of technical, social, and cultural issues under a holistic system. No longer considered merely a traditional service group embedded in a "departmental silo that uses command and control management policies, the business of the IT organization is technology, and the business of the CIO is the business of the entire enterprise" (Stenzel, 2007, p. x).

7. THE SYSTEM DESIGN

When the CIO/CTO, in concert with executive management, determines that the organization is ready for an IT/IS change, it is important that the new or changed system is closely aligned with its original business goals or adjusted to fit the revised corporate strategy. The existing system may not need to be completely abandoned and should be examined first for opportunities for enhancement or upgrade. A successful organization leverages the strengths of useful systems by synergistically incorporating the existing technology into new products and services whenever possible.
This process will also serve as a point of reference (comfort zone) to the organization's employees who may be resistant to change or wary of learning and using new technology products or systems. For example, employees are creative, innovative and impatient, and if they cannot access an information system, or are frustrated at the rate of response, or merely do not know how or what to do, they often implement technical workarounds. Petrides, McClelland, & Nodine (2004, p. 100) describe workarounds as "informal practices and idiosyncratic methods of data collection and management; both inventive solutions to pressing organizational needs, and over time, costly alternatives to a robust and flexible information system." Akin to this view, Becker (2004, p. 18) offers that: "One of the more troubling IT maladies is the business acceptance disorder. In layperson's terms, the business community isn't using the technology." Becker (2004) recommends identifying and diagnosing the symptoms early, soliciting user feedback immediately, embracing and rectifying the issues, providing additional education or training if warranted, and securing users buy-in.

New or enhanced systems should also be used to change the competitive landscape, combining technology and business functions to achieve as many objectives as possible. Building flexibility into the system at milestones or cost points will also serve as interim review points where a mid-course correction or change will be the easiest to implement with the least negative impact to cost, schedule, personnel, or other integral resources. Although creative ideas from team members are welcome, the PM needs to prioritize all primary tasks to maintain the spirit of the original goals and objectives, thereby avoiding complexities (bells and whistles) that may exceed the capabilities of the enterprise

architectural capacity and the allotted funding. Wise CIO/CTOs will also review notes and lessons-learned from existing system implementations or related past projects to ensure that prior errors and missteps are not inadvertently repeated.

8. THE PROCESS – CHECKS & BALANCES

Ever cognizant of the schedule, budget, and management of course corrections, the PM requires business management tools to monitor a tech project's progress. Organizational enterprise systems incorporate specific software products to manage a project, but checks and balances are managed by human processes and systems. Stenzel (2007, p. 219) advocates the concept of the Balanced Scorecard as a team's map of key objectives and themes by explaining: "The greatest benefit from implementing the Balanced Scorecard has been increased employee knowledge of how they are able to personally contribute to the department's strategy." Other methods also provide planning value and guidance, such as Earned Value Management (EVM) whose greatest impact is in its metrics to analyze the functional tasks of planning, budgeting, and discipline. Marshall (2007, p. 21) argues that "the more intensely the principles of EVM are applied to a project the more likely a project will be successful." And the "Strength, Weaknesses, Opportunities, and Threats (SWOT)" analysis (Humphrey, 2005) may provide invaluable guidance as an evaluation of a company's critical elements comparing the risks and rewards of each strategic quadrant. Any of these methods can provide valuable assistance to the CIO/CTO and Team when determining the correct strategic path for a technology project.

9. THE TIMELINE

The decision when to implement new technology is just as critical as the selection of the technology itself. Traditional strategic business planning is generally oriented to three to five year cycles (Stenzel, 2007), but due to the rapid change and high risk model of IT/IS implementation, the CIO/CTO must be flexible enough to respond with planning adjustments as often as quarterly, semi-annually, or annually as needs dictate. To meet the strategic goals and objectives of the organization, the tactics employed by the CIO/CTO must be agile, iterative, and ever-evolving so that unexpected corporate strategy changes may be easily accommodated with affordable and manageable mid-course corrections of staffing, operations, and technology (Stenzel, 2007). Cost considerations, such as scheduling, budget, procurement, contract negotiations, subcontractors, consultants, etc. are all critical to success. The coordination and delivery of material and equipment purchases, build-outs of sites and locations, computer rooms, storage facilities, servers, purchase of ancillary equipment, development of user manuals and standard operating procedures and training all require a facilitator assigned to manage and monitor each process. Equally critical is the human factor, ensuring that key personnel are in place for implementation, transitions, turn-over of responsibilities, and eventual day-to-day operations. All these elements must be successfully accomplished before the roll-out can commence.

10. THE ROLL-OUT

Many considerations must be addressed when the technology roll-out is planned and questions abound. Should the CIO/CTO run parallel products or systems for 30, 60, or 90 days, six months, one year, or should a cut-off date be established with a complete switch-over to the new technology on an earlier prescribed date? Should the CIO/CTO plan and operate a short Alpha Test in-house and a prolonged Beta Test with a pilot or control group of employees, or the converse? Does the enterprise plan radically turn-on the new system for the entire company concurrently, or shall it be managed incrementally in departmental or regional (geographic time zone) phases so that customer support is constantly maintained and mid-stage adjustments or corrections can be implemented without impacting everyone? How shall the public be notified and when? And shall the internal customers be notified by email, intranet, company website, newsletters, personal announcements, or invitations to training? Will the training be performed in-house or will consultants be hired?

Other questions involve issues outside the organization, as well. The concerns of the clients must also be considered, such as running parallel systems of soon to be replaced or obsolete technology in order to maintain performance, current revenue streams, and meet external and internal compliance thresholds while mitigating customer fears and ensuring consistent support and satisfaction.

When determining a cut-off date to cross-over to the new technology, the company must anticipate planning for adequate job coverage when employees are attending training. Equally important will be handling slower work performance while employees adjust to a learning curve. Also, the CIO/CTO must decide whether or not (*and for how long*) to maintain a legacy technology as a back-up system and if adequate funding and manpower are available to support this extra effort.

Thornthwaite (2007) argues that continuous education of management, staff, and users is essential to maintain corporate commitment and to convince the stakeholders of the value and purpose of the new technology. "You need to continually gather concrete evidence of success and use that to educate senior management. The positive result is that as senior management understands the business value of the new system, they no longer question your budget" (Thornthwaite, p. 673). Furthermore, "for knowledge creation and decision making, the organization must have a learning culture" (Sun, 2010, p. 517).

No less important, technologists understand the construct of agility and its value during project implementation. Agility copes with and overcomes ever-changing and evolving organizational events through maneuverability, flexibility, and the ability to rapidly adapt to dynamic scope and environmental changes within an organization. The term agile (in this context) is analogous to Larman's (2004) use of agility to describe a software or information systems development methodology meaning rapid and flexible response to change, maneuverability, and iteration. Larman's original intent that agility applies to technology development equally applies to the agility required of people, processes, and technology within a well-defined rapid-response fast-paced organizational setting.

11. CONCLUSION

Based upon this limited selection of philosophies from technical subject matter experts, cultural theorists, and social scientists, we opine that organizational culture has a great deal more influence and impact on technology selection and adoption than traditionally considered. Therefore, placing the social science of corporate culture on an equal footing with people (users), processes (problem-solving and decision-support systems), and technology (IS/IT) may prove to be a prudent business practice to ensure the longevity, stability and continued success of technological adoption (Borkovich, 2011). Further review and study of technology's social science 'softer' side may uncover additional cultural attributes worthy of a second look from the pragmatic CIO/CTO.

A CIO/CTO crafts and communicates a vision and a strategy to constantly innovate, seek better solutions, and inspire change, actions, and results. Carton (2008) captures the essence of this eternal challenge with this assertion:

> Successful changes are nothing but a continuous process. In the field of information systems, it is often promised that new software or computer systems will give a bit of a break. This is never true, and the break is always short-lived. Far better to experience change as a process, forgetting the concept of permanency. Each change follows and precedes a change; as change never occurs in isolation. (p. 80)

The successful leader is called upon to play many roles when identifying a new technology or system and must have the ability to convince others of its value and benefits. The CIO/CTO becomes a philosopher to determine *why*; a researcher to determine *what*; a scientist to determine *how*; an estimator to determine *how much*; a psychologist or sociologist to determine *who*; a cultural anthropologist to determine *how we do things around here*; and a soothsayer to determine *when*. It is a heady experience and upon success the rewards and accolades are great, but the miscalculations that negatively impact so very many can be dire. The effective CIO/CTO stays true to the mission of the organization, its core values and culture, and embraces change for the better. Long ago and still true today, philosophers and theorists understood the insatiable thirst of the human race for constant improvement and change through technological innovation. The siren to improve and enhance systems through technology adoption will forever beckon and inspire the bold, prepared, and confident leadership of the CIO/CTO.

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v31 n3046

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