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Wonders of the Invisible Workplace: IT and Process Reinvention

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Abstract: This introduction briefly summarizes the six articles that makeup this special issue on IT and process reengineering, and places them against a backdrop of the role of IT within the 21st century organization. Maintaining high-quality information technology (IT) is essential as organizations move toward a "system of systems" and a "team of team." Added to this milieu of managed change are emerging new requirements for leadership and challenging new roles for knowledge workers in the next decade. This article examines three goals for IT in organizations: increased productivity, mediated change, and empowered workforce. Four enablers are identified as the means through which IT can accomplish modernization: (1) using next-generation IT as cognitive tools, (2) understanding the dynamics of organizational culture in order to purposefully change culture, (3) nurturing human performance as a source of yet unrealized gains, (4) leading people as well as managing resources.

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Categories: C.5, H.4, J.4, K.3, K.6

1 IT and New Paradigms for Work and Education

Crossing momentous thresholds seems to evoke a fondness for pronouncements and predictions. Certainly, the coming of the second millennium has elicited no end of commentary on new computer technologies and their impact on society. We are endlessly reminded that the 21st Century will be the Knowledge Age, where information fuels production just as energy did for the Industrial Revolution. Organizations are cautioned that the relatively easy pickings of the 1980s and early 1990s have passed and that survivors in the next decade will need to be able to

- Re-engineer processes to reflect core competencies of the organization
- Ensure that information and ideas flow smoothly throughout the entire organization
- Renew commitment to fundamentals such as human resources, corporate culture, and distributed management.

I became interested in the techno-social aspects of information technology (IT) as a natural progression in my teaching of technical communication at a college of engineering and science. My concern was how the practice of technical communication would change based on new technologies in the workplace. In investigating this aspect of IT, I was struck both by the profoundness and the pervasiveness of IT's potential to shape so many entities so central to our lives.

The topic of IT and change calls to mind such things as office automation, fiber optic networking, and computer-aided manufacturing. And certainly enterprise computing and e-commerce are claiming much attention these days. However, in soliciting articles for this special issue, I was especially interested in authors who could speak to the transformation both of education and of the corporate environment, and the new synergy the merger of academia and the workplace might engender. Now that employee knowledge is viewed as a tangible, manageable resource, such concepts as situated learning and cognition facilitation should be as meaningful in the workplace as they are in the classroom.

My call for participation brought in six contributions, each developing a separate dimension of the theme of transformation through technology.

- Ioannis Antonious, Mike Reeves, and Vic Stenning's „The Information Society as a Complex System" supports the contention that we are in the mists of a fundamental change in human history. The idea of an "Information Age" was bandied about for several decades -- to the point that it became a cliché. Now that recent developments in IT demonstrate noticeable differences, we are more cognizant of the reality of the term. Indeed the social context of the "information society" is no longer either controllable or predictable thorough traditional methodology. In essence, this paper makes a case for complexity theory as the science of the information society by expanding on a set of parallels:

CHARACTERISTS OF AN INFORMATION SOCIETY	**ASPECTS OF COMPLEXITY THEORY**
New value added services	New relevant variables
The agile enterprise	Non-linearity and rapid structural change
Power to the individual	New stable branches
Virtual communities	Self-organizations
The excluded middle	Changing attractors
The new economics	Autocatalysis

- William D. Schindel and Gloria M. Rogers' „Tools and Methodologies Supporting and Assessing Organizational Change“ considers how IT can instantiate the principles of continuous quality improvement (CQI), both in business/industry and in academia. While CQI is a data-driven approach to managing change, collecting and codifying data within a large, multidimensional organization is costly and time consuming. Schindel and Rogers focus on a software approach to gathering and reducing observations through an automated collection and evaluation of significant organizational artifacts. First presenting a generalized system, the paper then discusses specific issues of application and implementation.

- Stefanie Thies' „Cof(f)ein: Construction and Presentation of Design Knowledge" describes an IT application to facilitate the design of a complex, multi-staged system. The specific domain considered is human-computer interface through graphical screen design. Design is an open-ended problem-solving exercise that requires iterations of instantiation, evaluation, and reflection. Cof(f)ein contains a robust database of context-sensitive help for critiquing artifacts, along with the ability to enhance the knowledge-base by adding conventions as each application processes. Additionally, being more than a tool for providing commentary, guiding reflection, and prodding improvement, Cof(f)ein also mediates among the varieties of roles and talents required to design and develop a sophisticated human-machine interaction.

- Rita K. Hessley, Daniel L. Morris, and Michael R. Mueller's „Integrated Applications of Electronic Structure Computation in the Undergraduate Chemistry Curriculum" discusses the authors' experiences integrating advanced educational software into the teaching of organic, physical, and analytical chemistry. The use of a computerized structure computation package -- such as *PC-Spartan Plus®* -- may create gains of several different types. The simulations develop higher-order reasoning skills through synoptic overviews that allow the problem solver to
  - define the task and make analogies to other similar problems,
  - prune away extraneous elements or eliminate "noise" from the problem space,
  - mediate state transformations, such as clustering specifics and making super-ordinate categories, and
  - link new knowledge with prior knowledge.

- Dieter W. Fellner and Marco Zens' „Electronic Submission, Managing and Approval of Grant Proposals at the German Research Foundation based on Standard Internet and Office Tools" describes a workflow management system (WFMS) to aid in the submission, distribution, and evaluation of grant applications made to a major German funding agency responsible for the allocation of in excess of 1 billion $US per year. WFMS is emerging as a powerful enterprise tool for improving productivity in organizations. Essentially, advanced database applications, WFMSs are characterized by process-centric models that ensure rapid, accurate, and sequential routing of tasks. Moreover, such tools promote coordination through an emphasis on the transactional component of work. "Golden Gate" -- the project discussed in this paper -- is a robust system built from commercial-off-the-shelf (COTS) components.

- Jessie Lennertz, „Perceptions about Internet Use by Teaching Faculty at Small, Christian College and Universities“ reports the results from a well-defined, contained study investigating the impact of the Internet on selected aspects of behavior in the teaching profession. Basically, Lennertz study collects self-reported effects of Internet use for changes in (1) communication style, (2) teaching style, (3) personal productivity, (4) meeting the organization's mission, (5) social networking, (6) research, and (7) professional development. The findings help to put into perspective some of the more aggrandizing claims for the Internet in education. Additionally, the results may prod speculation about other significant issues. Many colleges and universities that have invested heavily in advanced educational technologies are concerned with baseline issues of entry-level expertise, effective utilization, and universal access. However, a growing number of institutions are also -- or soon will be -- facing the question of moving beyond the more easily implemented gains.

To provide a context for these articles, the next sections review some of the major issues for IT and organizational change. The changes taking place are many and complex. In the late 1980s, MIT's Sloan School of Management initiated a set of collaborative studies with major businesses to determine IT's role in corporations for the coming decade [Morton (91)]. To present the findings of these rich studies in a cohesive fashion, the team adopted a simple model to serve as a framework. Figure 1 is an adaptation of that model and will serve to orient my discussion.

The figure shows major entities and their potential influence among one another. Examining the combined interaction gives a "snap shot" of the organization and its dynamics of change or transformation. Critical to any successful institutional transformation is that the organization has a clear vision of its mission and its core competencies. This is necessary whether the change is driven by IT or not. Equally important, the shaded area labeled as culture contains the three forces commonly characterized as "people issues." The centrality of these elements is best stated by Michael Morton: "One root cause for the lack of impact of IT on the improved economic performance of organizations is an organization's unwillingness to invest heavily and early enough in human resources" [Morton (91)].

Within the context of „re-everything,“ IT has been proclaimed as a generalized *factotum* for reaching a number of highly desirable goals. Section 2 summarizes three of the major claims made for information technology as a facilitator for (1) increased productivity, (2) organizational change, and (3) workforce enhancement. Building on this background while also sharpening the focus, Section 3 advises on how four potentially „inhibiting“ factors (IT applications themselves, organizational culture, human resources, and redefinition of management) can be redefined from „hindrances“ to „enablers.“

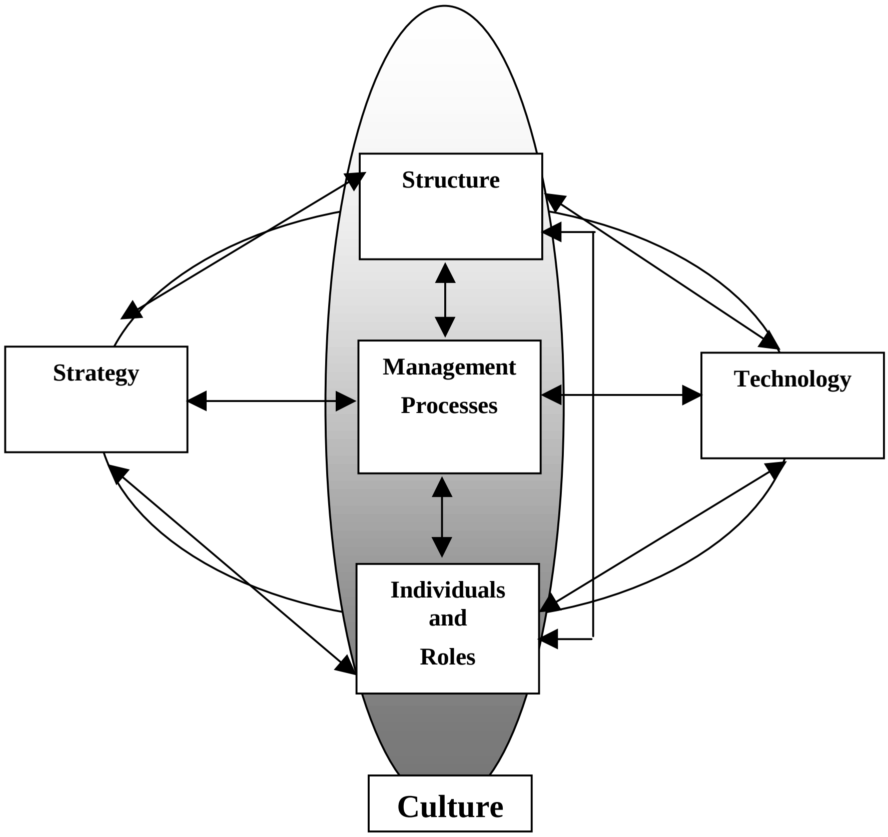

Figure 1: Elements of Organizational Transformation

2 Three Claims for IT and Organizational Change

In general, the more global claims popularized during the last two decades did not measured up to expectation. „Re-engineering" through IT hasn't totally fulfilled its promise. Even Michael Hammer and James Champy, whose *Reengineering the Corporation* popularized the term, estimate that from 50% to 70% percent of efforts don't live up to their goals [Hammer, Champy (93)]. Long-time information technology expert, Geoffrey James maintains that such failed expectations occur because most IT implementations do not use corporate culture and human resource policy to their advantage [James (96)]. Instead, they rely on a top-down mandate that – more often than not – creates passive resistance in the workforce. Thomas Davenport also examines the short-sightedness of treating IT solely as a technical issue. He points to the irony of using sophisticated project management methods and tools to engineer IT software, but then ignoring the organizational structure, the corporate culture, and the human resource policies within which the application must operate [Davenport (93)].

2.1 IT and Productivity

That business, industry, and government have become enamored with information technology can be inferred from the capital outlay of the previous decade alone. The 1995 U.S. corporate spending for computers was about $500 billion. This exceeded the sum of 1995 corporate profits by $175 billion [US Bureau of the Census (96)]. However, the spending spree may be at an end. After conducting an industry-wide analysis of IT investments, technology economist Paul Strassman (*The Squandered Computer*) asserts that the era of exuberant business spending for computer is coming to an end. Economics will prevail over electronics [Strassman (97)]. From a managerial perspective, Eileen Shapiro's *Fad Surfing in the Boardroom* takes corporate executives to task for seeking "quick fixes" to systemic problems and blames superficial management for IT's lackluster returns and outcomes. Shapiro charges that managers have a naïve faith in technology to solve all problems which allows them to step around responsibility for planning a sound implementation scenario. She warns that "evangelizing" about the computer-enabled modern workplace will not overcome deeply ingrained organizational patterns of behavior. She further cautions that short-term gains will not balance out the long-term problems that poorly integrated IT engenders [Shapiro (97)].

2.2 IT and Managed Change

No one would have difficulty accepting the claim that technology changes business practices. Of greater interest, however, are the numerous case studies demonstrating the depth, complexity, and all-too-frequent unpredictability of the change resulting from a technological innovation. Mutual Benefit Life, for example, used modern IT to delegate decision-making in case management to employees who were previously involved in straight-forward form processing and record management. Though well-intentioned, the change culminated in an unhappy outcome. Many workers were not suited for such responsibility, even with additional training, because the company had a long tradition of taking low-skilled candidates from the local workforce as a contribution to community development [Berkley, Eccles (91)]. What initially looked like improved opportunities for employees resulted finally in a number of displaced workers. MBA courses are filled with such tales of disjunctures between expectations and outcomes for IT.

Equally informative are studies that report a perplexing lag between the time of innovation and the point at which the technology affects a meaningful change. Joanne Yates' history of early forms of information technology includes several cases that illustrate a slow acceptance or an inability to understand the innovation's potential for systemic change [Yates (89)]. Examining such inventions as the telephone, the telegraph, and the vertical filing cabinet, Yates finds that while the product had utility for business, a gap of years sometimes existed between early adopters and wide-range change in business practices.

2.3 IT and Workforce Enhancement

While socio-technical perspectives on computers in the workplace are not new, Shoshana Zuboff's groundbreaking book, *In the Age of the Smart Machine*, put the dark side of computers into an idiom difficult for modern-day executives to ignore. She warns against simple automation because it strips away the meaning of work for people. Instead, she cogently argues that IT's ability to "informate" -- that is, collect and interpret data on its own usage -- can provide employees with a means to self-manage, to perceive and value their contribution to the total corporation, and to make informed judgments about their own performance [Zuboff (88)]. Richard Walton, in *Up and Running: Integrating Information Technology and the Organization*, also develops the contention that IT's intrinsic information – when properly used -- enriches the human capital of an organization through self-reflection and self-guided adaptation [Walton (89)].

In his keynote address to the 1997 Association for Computing Machinery (ACM) conference, Fernando Flores was eloquently direct in his pronouncement on why IT fails to meet its promise:

> Working with banks, engineering companies, manufacturing companies, everyone has the same problem: how do we organize, coordinate, and use this technology. My opinion is that the explosion of business re-engineering happened in the hope for an answer. But they got it wrong: they began to re-engineer the flow of paper, and failed to see that the central issue is people [Flores (97)].

Emphasizing the wrong side of the equation through the 70s and much of the 80s produced a narrow definition of IT as "automation." Most of the effort to understand the human context focused on cognitive modeling with the intent to program computers to emulate human intelligence. This marginal vision of IT produced applications intended to reduce cycle time, achieve economies of scale, and eliminate or minimize reliance on humans for routine and repetitive tasks involving computation, data processing, and traditional workflow such as record keeping. However, the most important change for IT came in the early 1990s and involves the transformation from automation associated with displacement and de-skilling to that of a partner or enabler for singularly human abilities [Norman (93)]. This expanded view broadens awareness of the delicate balance between computers and humans within a situated context.

Folding new IT products into old hierarchies is a complex and demanding process. This section looked at three sought-after IT outcomes (increased productivity, managed change, and enhanced human abilities). The conclusion is that much of IT falls short because of impoverished implementation planning coupled with blind faith in technology to solve problems. However, a convergence of factors over the past decade has improved the climate for meaningful, cost-effective IT. The next segment examines four areas of opportunity and reviews how new awareness can change potential inhibitors into enablers.

3 Four Enablers of Integration

Just throwing computers/software at a problem misjudges the importance of the human dimension. All IT implementation scenarios must take into account the stress factor of automation. Computers have a dubious reputation in most organizational contexts – many applications have been difficult, counter-intuitive, and time-consuming. It is natural for people to have developed an aversion to them. Finding ways to merge cultural values with corporate IT goals is not easy. Nevertheless, the utility and ease accruing make the effort worthwhile.

3.1 Emerging Technology: Cognitive Tools

It was not so long ago – even so close as the beginning of the1980s – that the dynamic and creative things people wanted to do with computers far outstripped the capabilities of computing to implement. It now appears that the situation has reversed. Our current technologies have powerful potential, but we seem to be slow at codifying the insight it takes to develop software that will harvest these gains in the many domains that require a synergy between machine and human.

Nevertheless, as software developers grow increasingly aware of the market potential, rapid advances in cognitive tools are likely. For example, Lotus Notes announced in late June of 1998 a series of new products co-developed with IBM, all of which make use of scaffolding to enhance human-machine partnerships. For example, one application is a CSCW product (*Teamroom*®) that actively mediates real-time collaboration [Walker (98)]. Such applications use a rich visual interface, object manipulation coupled with semantic feedback, along with a powerful exchange protocol to explicitly (but unobtrusively) model expert behavior within a situational context. Five candidate categories of advanced IT now demonstrate nascent characteristics of cognitive tools and should become more robust within the near future. Each is discussed in turn below.

3.1.1 Automated Process Management

Using a networked base, early examples of these systems routed documents (just as switching devices route telephone calls), using imaging to replace paper as work is moved along a path of transitions, allowing for rapid preparation, processing, in-route tracking, and data auditing. For other systems, the „work“ may not be electronic versions of paper documents but rather physical entities (such as customer service or product deliveries) that are being tracked. Such systems were among the first „enterprise“ applications and have good performance records for improving accountability and lowering cycle time. The current focus is on end-to-end systems for regularizing corporate business practices that have entropied into a tangled mess of ill-fitting or convoluted procedures. Advanced systems include graphical synoptic capabilities, such as conceptual overviews, metaphoric representations of the "work world," and navigational devices to help the users traverse the information space.

3.1.2 Computer-Supported Collaborative Work

While early CSCW products emulated a meeting, today’s more sophisticated applications make claims that they surpass a mere analog of face-to-face group discussion by actually establishing a new medium featuring a more effective *idea* exchange protocol. These products incorporate group decision-support systems, liveboards, shared editors, and synchronous/asynchronous communication technologies. More highly specialized CSCW applications encourage problem solving by emulating the heuristics of an expert in the domain and provide visualizations (in the form of templates) which promote guided-inductive exploration of the problem space [Conklin, Begeman (88)]. As variations of "smartware," these agents act as software mediators for human interaction.

3.1.3 Knowledge Management

Only a few decades ago, „corporate capital“ meant the physical assets of a company. Today, the definition has been broadened to include the intellectual abilities of the workforce. However, rather than a static and a-contextual inventory of personnel, knowledge management (KM) tools help to track experience and deploy expertise. This ability to „know what an employee knows“ is critical in a time of matrix management, flexible organizational structure, and rapid team building. Baseline implementations of KM include searchable knowledge databases with links to job histories, resumes, skills, certifications, and degrees, and special talents. When a problem arises, efficient knowledge management helps to leverage the abilities of the entire organization and not just a few people who are physically (and perhaps arbitrarily) located in the same working unit.

3.1.4 Data Mining and Knowledge Discovery

With the ability to automate actions comes the potential to store large quantities of data related to these transactions. Extracting information from large databases is a function of simple statistical methods; however, extracting patterns and trends that have a predictive value almost always requires more sophisticated techniques. Frequently requiring custom algorithms and embedded „intelligence,“ data mining tools have enormous potential for improving the quality and effectiveness of business and scientific decision making. These tools truly partner with the user by allowing for „what if“ inquiry and by supporting iterative probing in which the user and the software use intermediate results to shape and refine a query.

3.1.5 Netware Applications

In one sense, an Intranet is not an application so much as it an advanced distribution mechanism or a new medium. A major claim for this fastest-growing computer technology within the past two years is that Intranets leverage a company's intelligence by allowing users easily to create, access, and distribute company knowledge. Once seen as repositories of information (essentially, electronic page-turners for benefits manuals, company newsletters, and the cafeteria menu) and used to foster a cosmetic sense of the participatory management, applications now are targeted toward improving operations and contributing to the bottom line. Eventually, the „wired“ enterprise will provide one single, simplified interface for access to competitive/strategic information, collaborative workgroup support, self-service functions for records administration, and powerful tools such as resources for decision support, embedded training, and ongoing learning.

3.2 Culture and Empowerment

Defined as a compelling influence that permeates the entire organization, „culture“ -- on its simplest level -- consists of a set of values that helps employees understand which actions are considered acceptable and which are considered unacceptable. Sometimes confused with organizational „climate“ (which has more to do with immediate, situational forces impinging on an organization), culture is rooted in history and stems from deep-seated values and beliefs. Primary research contributing to an understanding of organizational culture originates in sociology, anthropology, social psychology, and economics. The following sections point out three ways in which culture can be used to leverage meaningful integration of advanced information technology, as represented in a corporate Intranet.

3.2.1 Operating from a Reliable Assessment of the Culture

Recent studies have shown a correlation between a strong organizational culture and organizational effectiveness [Gordon (92)] [Keston (92)] [Kettl, Ingraham, Sanders, Horner (96)]. In fact, some studies question the relative benefit of leadership to organizational effectiveness versus a strong organizational culture [Cooke, Rousseau (88)]. Nevertheless, it seems reasonable that management could improve or maintain an organization's productivity when armed with an understanding of its culture. Given destabilizing organizational dynamics (turnover, reorganizations, downsizing), it is vital for management to assess the strength of their organization’s culture. Determining *both* the competencies and the culture of the workforce helps managers to more effectively exert leadership.

3.2.2 Linking Strategic Values with Cultural Values

Getting past the slogans of organizational culture provides a deeper awareness of the sources of friction in an organization. From a theoretical perspective, cultures are not inherently dysfunctional. Difficulties arise when a change in business practice conflicts with the inherent workplace values. Case studies are numerous in which a well-intentioned innovation fails because it runs counter to the deeply-embedded values instantiated over time within the company.

3.2.3 Change Culture Using the Dynamics of Culture

Change is difficult enough, but when it takes place within the climate of downsizing, soliciting user buy-in becomes even more problematic. IT innovations are – at best – frequently regarded as imposing a new learning curve on an otherwise already full work day. In the worse case, change initiated by IT is looked upon as a threat to job security. Thus, an implementation scenario should include incentives (the push) such as rewarding performance over activity as well as morale enhancers (the pull) such as instilling pride of achievement and fostering ownership.

Research suggests that organizational culture is preserved and communicated through the use of stories and other forms of symbolic artifacts [Kanter (83)]. Just as cultural activities such as dialogue, telling narratives, and ritualized behavior are used to sustain a cohesive social identity, new media can be used to mediate culture change – without necessarily resorting to tactics such as propaganda. For example, a judicious use of the new „corporate grapevine“ can propagate appropriate legends, signals, and symbols.

3.3 Human Resources -- a Source of Strength

Most companies today face the problem of becoming more effective while cutting costs. Typical organizational responses have been downsizing, reinventing or restructuring, total quality, and greater emphasis on strategic management of resources. At this point, most of the easy gains in cost management have been accomplished. Taking „reinvention“ to its next phase requires greater insight and more stringent oversight of the components of the organization.

For example, the „empowerment“ movement depicts human resources as a deep well of potential. Many advocates make the case for increased IT investment by projecting gains in employee effectiveness as the direct result of technology-sustained enhancement of talent pools. However, few of these claims have been substantiated and much of the rhetoric takes on the tone of a locker-room pep talk. Images of a networked community of laborers whose stifled abilities have been liberated by oceans of open-access information systems may be a pleasing picture, but actually realizing gains requires extracting a set of tactics from socio-technical contributions to IT implementation. Three such areas for exploration are suggested in the following sections.

3.3.1 Awareness of Predictable Human Response Patterns

IT does not exist in a vacuum; nor does the efficacy of an application depend totally on the design quality or workmanship of the software. Two considerations are primary -- the disruptive potential of IT and the need to consider attitudinal/political context when cost-cutting. Change, even demonstrably positive change, involves disrupting the equilibrium. People are most comfortable when operating within a structure that includes clear and reasonable expectations, proven routines/methods for accomplishing tasks, and reasonable and predictable rewards. It is not so much that people are reluctant to change as that they resist disruption. Organizational behaviorists vary on the number of predictable emotional stages personnel go through in response to change. Four are recurrent in most models: (1) denial, (2) resistance, (3) exploration, and (4) commitment [Jackson (89)]. Anticipating these stages and understanding their dynamics can help both management and the workforce adjust more quickly by sorting out what is unacceptable from what is unpopular, by marshalling resources to support activities that will smooth the transition, and by distinguishing political opposition from genuine, pragmatic concerns.

3.3.2 Reinvestment in Human Potential

Corporate America had to relearn some fundamental principles in the decades of the 80s and 90s. Primarily, practices born out of the Frederick Taylor legacy had to be overhauled to include:

- The value of individual initiative and insight,
- The need for ethicality, responsibility, and commitment,
- The essential nature of teamwork, both formally and informally structured,
- The breakdown of hierarchical order through innovations such as matrix management.

Such "reinventing" made the need for fundamental change in managerial training/education undeniable. That the workforce is also making a profound transition from employee to knowledge worker is also underscored. Peter Senge's *The Fifth Discipline* describes private sector organizations that have become "learning companies" through a continuous reinvestment in their human resources [Senge (90)]. While Senge and his followers concentrate on "affective" (or psycho-social) growth, other schools of thought underscore the need for cognitive growth. The worker in the 21st century will need to be flexible, tolerant, and adaptive. In all likelihood, tasks will be open-ended and require complex problem solving using "best judgment" to navigate through choices. Much work will require a partnership between computer and human. Additionally, this partnership -- a much enriched version of what we now think of as „interactive software" -- will demand more high-order cognitive skills (such as discerning patterns in bodies of information, decision-making, staged problem solving, complex inferencing and probabilistic reasoning, and deductive/inductive methods of thinking) from the human.

Although training was previously expensive in terms of dollars and inconvenience, new media have made possible alternative forms of training and delivery mechanisms. Three different, computer-mediated approaches have garnered good results and hold great promise for future development: (1) systems simulations, (2) asynchronous or distance education, and (3) embedded or situated learning

3.4 Management as a Source of Leadership

Critics claim that corporate America has been on a decade-long technology spending binge but has little to show for the expenditures. New mandates call for increased managerial accountability and greater control over redundant, overlapping, unintegrated, or obsolete information systems. The trend essentially takes IT out of the realm of a technical issue and moves it to the strategic decision-making level, requiring alignment with core business processes, capital planning and investment control, performance objectives and system evaluation, and sharing of intelligence across the enterprise.

Of the changes brought about by the new awareness of information and organizational processes, perhaps none is more significant than the establishment of the Chief Information Officer (CIO) position. As the following two segments outline, this new „seat at the table“ for information resources management can be used to emphasize the strategic value of IT and to leverage a transition from managing a resource to dynamic leadership for using IT to orchestrate the future.

3.4.1 Use „Alignment“ to Emphasize Value

Growing awareness of the cost of IT has resulted in more demand for accountability. It would be unfortunate if this concern for cost-effectiveness translates into a minimalist focus on the bottom line rather than on a commitment to value. In the push to maximize return and minimize risks, the CIO has unprecedented power to guide purposeful change. An illustrative sample of three opportunities is given below.

3.4.1.1 Map Technology Investment onto Strategic Goals

Investment control takes on added difficulties in organizations where multi-year funding exists only in rare circumstances. Nevertheless, meaningful capital planning should include a strategic roadmap for IT that is driven by mission, organizational components, individual programs, and a reasonable assessment of the current environment and projections for the future. More importantly, this document must be agreed to and adhered to -- to the point that it becomes a touchstone for achieving group consensus. The strategic plan must become a "belief structure," providing guidance for decision-makers at least to the level of middle-management.

3.4.1.2 Implement through Incremental Adjustments

Too often in the past, IT systems were intended as large-scale solutions, but turned out to be overly ambitious, unmanageable, not maintainable, and/or opaque to the end user. The "grand scheme" approach (as typified by the IRS's disappointing attempts to harness the power of IT for tax collection) can no longer be supported. What is needed is an adaptation of case analysis or feedback engineering where consistent assumptions and methods are routinely applied as assessment tools. Results are then fed back into the design/development process, so that IT systems truly become the infrastructure of the organization.

3.4.1.3 Define Success and Develop its Metrics

IT's reputation as a time/money sink may be partially attributed to specific projects having vaguely defined goals, poorly applied assessment mechanisms, and unrealistic expectations. To ensure that IT not be made a whipping post for other perturbations (the turmoil of re-organization or the anxiety of a reduction in force), methods for validating success must be clearly defined. Additionally, these measurements must be sensitive not only to economic values but also values such as process improvement, management awareness, and workforce empowerment.

Under this scenario, the CIO's responsibilities increase dramatically. Primarily, the change is qualitative rather than quantitative. This position requires persons who combine both technical skills and leadership abilities -- something of a rare commodity in today's professional world. Indeed, such hybrid leaders are unlikely to exist in bureaucratic environments, where promotions are made largely on technical knowledge and organizational structures foster insularity rather than broad-based awareness.

3.4.2 Transition from Logistical Management to Strategic Leadership

The modern workplace requires a radical redefinition of performance expectations from managers. For example, several panels and commissions looking at the idea of management in the US government have noted that for years the civil service system has rewarded persons who can deliver good results within a well-defined, well-structured workplace. However, changing realities mandate a different style of management. Put simply, modern expectations require that a manager be able to lead people as much as manage resources. The following three examples are but a sample of the impact of this change.

3.4.2.1 Establish Enlightened Partnerships

A CIO must advocate to executive management that IT be understood, developed, implemented, and assessed as a prime agent for organizational transformation. After accomplishing this re-education (which may be a non-trivial task within itself), the CIO must propagate this "vision" of IT as a strategic driver to other units -- including such diverse entities as operations, R&D, and staffing. Working as a partner with these components of the organization, the CIO can transition powerful "best practices" as well as gain acceptance for benchmarking to be used as an assessment tool.

3.4.2.2 Acknowledge Political Agendas and Cultural Differences and Mediate among Them –

The more we learn of the complexity of open organizations, the more we see that loyalty to the basic work unit and promotion of local interests are a natural outcome. Bringing such natural allegiances to the negotiating table keeps them above board and legitimate and fosters consensus building. On the other hand, characterizing such liaisons as divisive or self-serving drives them underground and promotes the dark side of their expression: turf-protecting, foot-dragging, false competition, and insularity.

3.4.2.3 Eliminate Unhealthy Factionalism and Corporate „Stovepipes“

While some sub-culture alliances are wholesome, others produce strife. Distinguishing between wholesome and counter-productive "groups" is difficult; however, the CIO must have both the perceptiveness and the authority to deal appropriately with dedicated teams versus subversive cliques. Furthermore, the CIO must be able to use software and hardware infrastructure to eliminate "islands" and "stovepipes" within the organization. Coordinating the development of cross-functional systems and establishing enterprise-wide standards begins the process of healthy corporate integration.

The emerging role of the CIO in a corporate structure is still somewhat murky. However, for this new position in corporate structure to be effective, both the organization and the individual need to operate out of a true commitment to the investiture of authority and to the enactment of power. Interestingly enough, it is the CIO who often erodes the strategic power of the office by getting bogged down in the "engineering" or actual development of the systems. While the CIO may own both the policy and the practice for IT, it should always remain clear which is the cart and which is the horse.

4 Conclusions

Several factors have merged in the late 1990s to create a workplace burdened both with difficulties and with opportunities. Several of the supposed corporate panaceas (TQM, self-managed teams, business process re-engineering) have not met their promise. After many peaks and valleys of hype followed by moderate payback, many business environments face the sobering realities of implementation accountability and workforce reduction. Additionally, a tightening of the purse strings and more stringent performance reviews add pressure to an already volatile situation.

This document used current literature as a basis to suggest what factors in today's climate might best be exploited in order to harvest the potential of IT in a cost-effective way. Three claims for IT were examined: increased productivity, facilitation for change, and improvement in workforce abilities. Next, four enablers are identified as mediators for effective IT development and deployment. These enablers are (1) new generation IT, (2) existing organizational culture, (3) motivation and human resources, and (4) dynamic leadership.

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