Enabling Technologies for World-Class Business Operations

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Rapid changes in the business environment, occasioned by strong and varied forces acting on a global scale, make it imperative for an enterprise to aggressively embrace change. The traditional view of a business as a collection of related functions, such as research and development, sales and manufacturing, is being replaced by a new paradigm, wherein the business is composed of a linked network of customer-focused processes. This shift in thinking has changed the role of executives—from one of managing hierarchically structured, functional organizations to one of leading core-business processes that meet the evolving needs of the business' stakeholders. This paper provides a framework for leveraging an array of enabling management technologies to help business leaders transform their businesses, and identifies key lessons learned in applying these technologies.

Introduction

It is the rare business leader who does not need to plan to keep pace with changing customer preferences, rapidly evolving technology, increasingly demanding stakeholders, and aggressive global competition. One misstep and the whole business could founder.

Current management theory and best practices have suggested that the very model of the operating business must be reinvented to enable it to succeed during the 1990s—and into the next millennium. This transformed view of business entails moving away from the traditional functional view of an organization—encompassing such areas as finance, marketing, research, and development—and towards a linked network of customer-focused processes, such as product and order realization. This paradigm shift requires not only new ways of organizing work, but also new management roles and approaches. For example, reengineering[1] is a widely adopted approach, organized around a process-oriented model of the enterprise.

Today's business leaders have at their disposal a bewildering array of methodologies and tools emerging from business management literature and experience: Continuous process improvement, total quality management, reengineering, strategic management, core competencies and capabilities, strategic intent, time compression, rehosting, downsizing, and strategic technology management, to name a few. Stakeholders are demanding that they apply quality principles and criteria, such as the International Standards Organization's ISO 9000 certification and participation in the Malcolm Baldrige National Quality Award program.

Which tools will help businesses navigate the paradigm shift to the process-driven organization, and which are but tempting fads? The choices are not made any easier by the less than encouraging results that have been reported. For example:

- An estimated 50 to 70 percent of reengineering projects have been failures.[2]
- After more than a decade of massive investment in information technology, some have claimed that few productivity improvements have materialized.[3]
- A fixation on time-based competition, where, for example, a company strives to dramatically reduce the time to market of its products, can lead to improvements, but not necessarily in other key parameters, such as profitability.[4]
- The *Wall Street Journal*[5] has stated that, in practice, trendy theories often lead to

results that fall far short of their claims. Businesses, then, "find they must sharply modify, abandon or find antidotes to programs that bring sweeping changes to organizational and human-resource management."
- Former industry-leading companies, having fallen on hard times, are being counseled to learn to thrive on chaos[6-8] or to have their business-improvement focus radically altered.[9]

The Quality, Engineering, Software and Technologies (QUEST) partnership organization of AT&T Bell Laboratories works with clients facing the challenges of handling the paradigm shift to the process-driven organization. Experience has shown us that there is no single aide that fits all situations. Instead, the current array of methods and tools—which we view as *enabling* both for the business and to each other—must be synergistically applied to allow a business to meet its challenges most effectively.

In the following sections, we discuss at a high level how a business, and the forces acting upon it, can best be captured by a new conceptual business model. (Readers wishing additional details on the concepts discussed are provided a full list of references.) Based upon an understanding of the dynamics of this model, a strategy and implementation approach can be developed. Such an approach will help to integrate efforts to bring about the required business transformation. Indeed, this model has allowed us to define an actionable framework for business transformation. We then discuss key lessons learned.

Evolution of Enabling Technologies

To understand the business and improve it, increasing focus has been placed in the last few years on business *processes*. The view of a business as a linked network of customer-focused processes has created an important shift in thinking over the past years. In January 1994, AT&T marked the 10th anniversary of its divestiture of the Regional Bell Operating Companies, and the accompanying transformation of the "rules of the game" in the domestic telecommunications industry. The past decade of evolution to AT&T's current structure has included a number of substantial achievements: Malcolm Baldrige National Quality Awards, substantial appreciation in share price, record revenues and profits, and, at one point, being number one in market value among U.S. firms.[10]

Panel 1. Acronyms Used in This Paper

APEX - Achieving process excellence
CEO - Chief executive officer
DMOQ - Direct measure of quality
MIS - Management information systems
ISO - International Organization for Standardization
QUEST - Quality, Engineering, Software, and Technologies
TQM - Total quality management

Yet these results were not achieved overnight. Rather, they followed often painful dislocations and adjustments to AT&T's structure, personnel, culture, values, operations, processes, and information systems, and involved many difficult business decisions. But important, too, was the tapping of a source of strength—AT&T's strong roots in the origins of the quality movement.

QUEST has been a consulting resource in the ongoing effort to transform AT&T and its Business Units. QUEST's experience with these changes led to the publication of two books[11,12] that have been widely disseminated in AT&T as part of the AT&T Quality Library, which is supported by the AT&T Corporate Quality Office. These books highlight the importance of the process perspective, as well as the importance of the complementary functions of *process management* and *process improvement*. Because of the critical business issues facing AT&T, and facilitated by these books, strong process management and improvement efforts began with the formation of numerous quality improvement and process management teams throughout AT&T.

The process approach to change, however, was soon forced to adapt to a diverse set of realities.
- First, the need to reconcile process improvement with organizational issues—structural modifications and promulgation of policies and directives.
- Second, the need to orient all of the processes toward clear, bottom-line goals, such as cycle-time compression, cost reduction, and overall product and service quality improvements.
- Third, increasing pressure to make ever more radical changes—and to make them fast.

To deal with the first set of realities, the policy deployment[13] approach took on importance. Integrated with the above process-based methodology, it was able
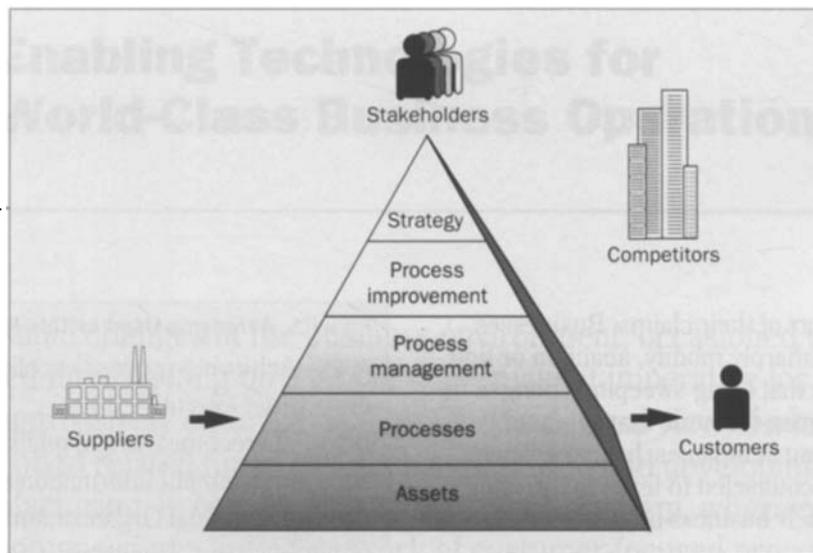
Figure 1. This model illustrates the business and its environment as discussed in this paper. The model builds upon the well-known customer-supplier mode, within the context of total quality management (TQM) and AT&T's total quality approach. The business can be considered to have five interdependent layers: *assets*, that the business possesses, such as information, employee skills, etc.; *processes*, by which supplier inputs are transformed to outputs for customers; *process management*, which ensures that the processes are meeting customer needs and internal performance objectives; *process improvement*, provides institutionalized change to meet ever changing internal and external conditions; and the *leadership and strategy*, which provides direction for asset use, processes, process management, and process improvement. External to the business entity are: customers; competitors; suppliers; stakeholders, such as share owners, government and community; and the industry environment, including economic and socio-political drivers.

to link a fundamental refocusing of strategy and policy with process management and improvement. This integrated approach was an important element in enabling the AT&T Transmission Systems Business Unit to win the Malcolm Baldrige National Quality Award in 1992.[14]

For the second set of realities, the process methodologies needed to be enhanced by a strong quantitative thrust, geared to ensuring that specific improvement goals were reached. This began with comprehensive development and application of the science of measuring the effectiveness and efficiency of business processes. Metrics were applied to measure customer satisfaction, process performance, and supplier effectiveness. One such set of metrics, direct measures of quality (DMOQ), which are metrics expressed directly in terms of customer satisfiers, have been increasingly deployed in AT&T's product and service businesses. Metrics deployment was buttressed by widespread application of statistical techniques[15] and by additional analytical techniques, such as quality function deployment,[16] activity-based

costing, cost-of-quality analysis,[17] data quality,[18] etc.

For the third set of realities—faster, more radical change—AT&T's business units have increasingly applied reengineering methods. A sound way was required, however, to balance business drivers against feasibility and risk to determine when *evolutionary* change would suffice, versus when *revolutionary* change was imperative. The *"Reengineering Handbook"*[1] provides a decision-making mechanism that puts the degree of change and the attendant risk in the proper perspective.

The New Paradigm of Business

An ongoing effort at QUEST has been the development of enabling technologies in an integrated way, to address these and other realities. To understand and act upon this integrated development, it is useful to consider a model of business under the new paradigm. Thus, a business leader needs ways to:

- Clarify strategic intent, competitive strategy, and time-phased objectives.
- Understand the fundamental challenges, risks, and performance gaps facing the business in light of these strategic drivers.
- Understand the relevant methodologies, approaches, and tools that can help to bring about meaningful changes, whether in the form of "point solutions," "evolutionary changes," or "strategic initiatives."
- Integrate these into a coherent program of change, which will meet the needs of the business at affordable risk. Of particular importance is the need to address the non-technical human and organizational issues associated with change.
- Follow through to implementation.
- Focus management attention on implementation management and metrics for sustained results, rather than on spawning new projects before the current ones have taken hold.

To deal with these issues, and to provide a model for understanding and improving a business, we find it

Table 1. Continuum of methodologies that can be applied for process improvement.

Paradigm	Operations Improvement	Process Improvement	Breakthrough Improvement (Reengineering)	Customer/ Supplier Partnering	Total Quality Management	Corporate Strategy and Development
Scope	Operation	Process	Process	Inter-company	Enterprise-wide	Multi-company
Customer	Downstream Operation	Process or end-customer	Process or end-customer	Partners	Stakeholders	Shareowner
Change	Localized	Moderate	Radical	Coupled	Pervasive	Structural
Metrics	Operational	Process and end-customer	Process and end-customer	Shared value	Internal and external	Shareowner value
Focus	Individual/ workgroup	Customer and objectives	Breakthrough/ technology	Relationship	Enterprise and environment	Exploiting synergies
Owner	All	Process-owner	CEO/MIS/ champion	Process-owner	CEO/ BU leader	CEO/Board of directors
Risk	Low	Moderate	High	Moderate	Moderate	High

useful to resort to a model of the business and its environment, as shown in Figure 1. It builds upon the well-known customer-supplier model[11,12]within the context of total quality management (TQM),[19] which is the foundation of AT&T's Total Quality Approach.[20]

External to the business entity are: customers; competitors; suppliers; stakeholders, such as share owners, government and community; and the industry environment, including economic and socio-political drivers. It is imperative for the leaders of a business to understand the constraints and opportunities presented by these external forces, and to leverage this understanding to help formulate a mission, vision, and strategy based on this interpretation.

Layers of the New Business

The business itself can be considered to have five interdependent layers:

Assets. At the foundation of the business are its assets. First and foremost are the employees and the skills and competencies that they bring to bear. Other assets include information, capital, equipment, facilities, intellectual property, and other resources.

Processes. These assets are dynamically engaged by business processes. The backbone business process in any company is its primary value chain, by which supplier inputs are transformed into outputs for customers. A process includes the sequence or network of work activities; the organization, workgroup and individuals

executing the process; and the information systems and equipment that enable the process. It ends with a product or service output for an internal or external customer. Typical business processes include business management, product realization, order realization, billing, support processes, etc. Examples of process improvements in product realization and order realization are highlighted in this issue of the AT&T *Technical Journal.*

Process Management. To ensure that processes are meeting customer needs and internal performance objectives, a process management layer is required to monitor process performance against objectives or standards for particular metrics. Typical metrics include customer satisfaction, employee satisfaction, customer service, product quality, and performance metrics internal to the process, such as cost, time, and quality.

Process Improvement. Since industry environments shift, customer needs evolve, competitor performance improves, and stakeholder expectations increase, a layer of process improvement provides for institutionalized change in the business, through such techniques as continuous improvement, reengineering, etc. Process management and improvement are complementary activities, and are critical to process environments ranging from software quality assurance[21]to manufacturing.[14] As illustrated in Table I, there is a continuum of methodologies that can be applied, depending upon the individual business's requirements, including risk tolerance, scope of change, etc.

Figure 2. The five inter-dependent layers of a business are linked vertically through the values, communication, and policy deployment of a business. These form the basis for both top-down and bottom-up linkages of high-level strategy and policy to daily processes and operations, and for engaging and energizing individuals in a common vision, mission, and purpose.
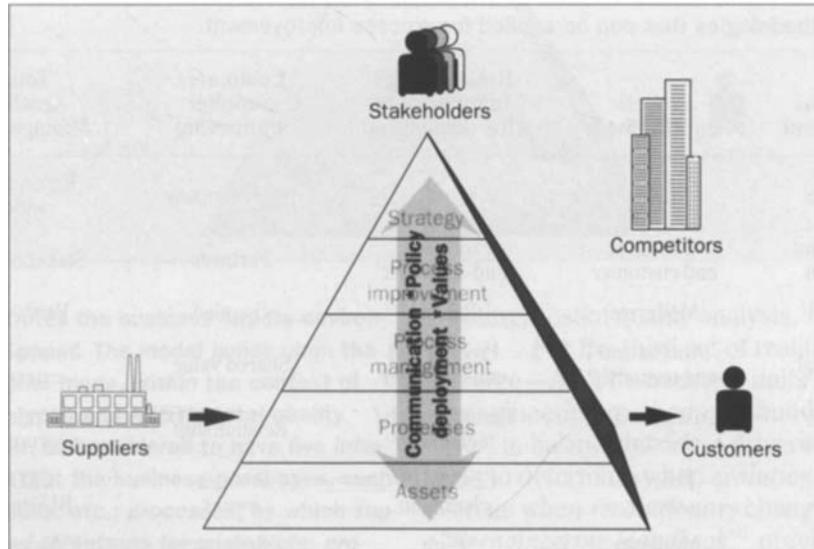
Leadership and Strategy. Finally, guiding the business is its leadership and strategy, which provides direction for asset utilization, processes, process management, and process improvement. This strategy may be at three levels:

- Strategic intent, which provides a constant direction and driving force for the business,
- Corporate strategy, which identifies top management's objectives for each unit and allocates resources, or
- Competitive strategy, which sets objectives and focus based on developing a unique, sustainable advantage.[22-24]

These five layers are linked vertically through values, communication, and policy deployment. (See Figure 2.) AT&T's common bond, a shared set of values that form the infrastructure for social and business activity transactions, has been the focus of much effort recently. Values, communication, and policy deployment form the basis for top-down and bottom-up linkages between high-level strategy and policy, and daily processes and operations. At the same time, they also provide a base for engaging and energizing individuals in a common vision, mission, and purpose. Leadership transformation and culture changes are critical to this effort.[19]

With this business model as a context, the full scope and requirements for managing a business and leading change are apparent. To ensure the sustainability and improvement of business results, it is not sufficient to provide "quick fixes" to the business. Instead, one should ensure that:

- All layers of the business are fully implemented and institutionalized, especially process management and process improvement.
- All layers of the business are fully linked in the vertical dimension, through shared values, communication, and policy deployment.
- The people at all levels of the business are aligned, engaged, and empowered to meet the strategy and objectives.
- All elements of the business are fully aligned and congruent. Such elements include strategy and assets, processes and assets, strategy and process improvement, and customers and processes.

A Process for Restructuring

A disciplined, top-down process of enterprise restructuring that enables these conditions to be met has the following steps:

Strategy. Clarify or rethink strategy, based on an external scan of suppliers, customers, stakeholder needs, competitors, the industry environment, and an internal scan of assets, as well as capabilities and competencies.[25,26] Benchmarking is a fundamental tool for the external scan. First, the strategic intent, objectives, and mission of the business must be crystallized. The overall corporate-level strategy can then be defined. This, in turn, helps set individual unit-level objectives (based on

resource considerations), and the competitive strategy of the unit, especially in the dimension of measurable objectives, for example, improvements to "customer-requested ship date" performance.

Processes. Identify key, or core, processes, which are based on strategic, competitive, and customer drivers. Then assess their current levels of performance by applying quantitative metrics, linked to customer needs and stakeholder drivers, to assess the success of the process—and of the business. Partitioning the business into its key processes provides a foundation for managing the business from a process-driven perspective. It also provides a fabric for policy deployment to engage, so that the highest level of objectives—such as customer satisfaction, financial return, employee satisfaction, and quality—can be translated into specific lower-level objectives at a meaningful key-process and sub-process level. To accomplish meaningful process changes, the appropriate metrics must be applied to provide guidance in regard to the nature and scope of the change to be undertaken.

Process Owners. Appoint qualified process owners to enable process management. Process management is different from the traditional functional, or departmental, management. A process is an end-to-end entity that cuts across many departmental and organizational boundaries. Consequently, the appointment of qualified process owners must be particularly selective. This is especially important in an organization undergoing a shift from a functional orientation to a process-driven orientation. Organizational inertia, traditional values, and the fear of change will create powerful barriers. It will require consistent, credible leadership to overcome these barriers, and foster an environment of teamwork, cooperation, and information-sharing across former operational boundaries. This is where leadership learning is particularly important, and where consultation can play an important supporting role. With proper planning, both the team and the coach can be part of a results-driven unit in which well-chosen metrics provide the yardstick against which business results can be measured.

Metrics. Manage each process against metrics that are linked to strategic, competitive, and customer imperatives. Process management is a closed-loop activity. It involves collecting data relevant to the metric, and then processing the data statistically to acquire meaningful information that can be used to assess performance

against either control limits or specific performance objectives. Control action must then be taken, as required, to adjust the process to maintain its performance. Process management can only be truly effective in a standardized process. Process standardization is a major focus of ISO 9000, addressed elsewhere in this issue.[14]

Improvement. Improve those processes that are not meeting the strategic needs of the business, or otherwise fall short when evaluated against key quantitative standards. A number of paradigms of business change and improvement exist that are fundamentally related to processes (see Table I). They range from improvements to a specific operation, to rethinking the mission and structure of the entire enterprise. They differ in many dimensions: scope, customer, degree of change, metrics, focus of change, owner, and degree of risk. This is further discussed in the section, "Improvement Paradigms." The scope of change to be pursued should be based on a number of factors, such as the size of the gap between current and required performance, the resources available, the organizational tolerance for risk, the time available to complete the change, etc. The arena of change needs to include: the actual sequence of work activities or operations; the individual's skills, responsibilities, values, rewards, and motivators; the organizational structure and role; the information systems and/or process equipment; and sometimes, the physical facility layout or work environment.

Feedback. Finally, and perhaps most importantly, feedback from all of these steps must be continually incorporated into the first step, strategy—to ensure the strategy is feasible and meaningful. At the same time, it is contingent upon the process owners to continuously adjust and improve their processes, based on changes at the strategy level. The desired state for the above cycle of actions is that, at any time, they mutually act to drive the business to some state of homeostatic equilibrium, wherein the strategy and the processes are aligned and the processes are smoothly running in an effective and efficient way. This requires a strong capability in self-monitoring and feedback control. The process owner and the process teams should participate in a strategy or mission shift, for example, and should be capable enough and sufficiently empowered to make suitable adjustment, or to recommend such adjustments if they require large resource allocation.

At the same time, the business leaders should

have significant knowledge of their processes to readily detect any lack of congruency between the strategy and the processes, and act accordingly. Sustainable results will not be possible unless there is a closed loop that starts the cycle again, with a commitment to examine anew all of the assumptions made during the last cycle.

Of course, the steps above are only guidelines, and must be followed appropriately. Each strategic shift, for example, does not require the re-appointment of process owners and a redefinition of key processes.

Improvement Paradigms

Table I displays a spectrum of improvement paradigms that were briefly discussed previously. In this section, we compare and contrast these different paradigms in detail.

Operations Improvement. This focuses on changing a specific operation, such as a task. Examples are improving a wave-soldering operation to reduce defects, or simplifying a manual-assembly operation to reduce cost or cycle time. Typically, in operations improvement, the *customer* is defined to be the next operation in the process. A drilling operation, for example, might have a bolting operation as its customer. A focus on better understanding and meeting the needs of the downstream bolting operation, such as more cleanly deburred holes, improves the upstream operation. Operations improvement was the original focus of total-quality management. With continuous improvement, the underlying idea is that if every operation is improved continuously, even slightly, noticeable results can eventually be achieved. Key components of operations improvement are the culture, values, and rewards, which change from a concept of "throughput at any cost" to one of quality focus and participation. Sometimes, goals may be non-specific, such as "improve yield," rather than "achieve 94%."

Process Improvement. Much broader in scope than operations improvement, process improvement involves more than improving a single operation. Instead, it involves a restructuring, to meet particular objectives, of the architecture of all the operations that make up a given process. The objectives dictate the nature of the restructuring. For example, a cost-reduction objective often will require a focus on reducing tasks that don't add value. A time-compression objective may create a focus on restructuring existing tasks to increase parallel-

ism, an examination of bottlenecks and queuing behavior to improve product or transaction flow, and a clear understanding of critical path issues—without which no cycle-time reduction will occur. A customer-satisfaction focus may entail segmenting the process to better serve the needs of individual customer segments. A defect-reduction focus may require, in addition to removing root causes of defects, rethinking the balance and placement of prevention, inspection, and value-adding tasks, as well as a robust design of the operating parameters for individual operations.[27]

Of course, there is an interrelationship between the performance of individual operations and the process that links these operations. Reducing variance of the service time of several operations, even without lowering their means, can, for example, significantly reduce the cycle time of the end-to-end process. Improving the performance of defect-prevention activities at the front-end of a process can have substantial payback, in cost and interval reduction, based on savings later in the process.

Breakthrough Improvement. Also called reengineering, this is very similar to process improvement. The orientation is one of process, rather than individual operations. The customer is the end-customer of the entire process, not merely a downstream operation. However, several characteristics help differentiate the two approaches:
- First, the focus is on major gains in key metrics, perhaps 80% to 90% or more.
- Second, the aim is to radically rethink the process. This is done, not by restructuring the existing process, but by visioning[28] or by backward chaining[1] from the desired outputs of the process. The result is to design the process anew from a clean slate.
- A third key characteristic is that of leveraging the possibilities inherent in advanced information technology, such as global networking, expert systems, multimedia, imaging systems, etc., to revolutionize assumptions inherent in the structure of the baseline process.

A consequence of these three characteristics is that direct leadership of the change activity is required from the senior levels of the business. Also, because of the magnitude of the changes, and occasionally the technology, risk and organizational resistance are much higher than with process improvement.

Customer-Supplier Partnering. This paradigm broadens the scope beyond the enterprise to its customers and

suppliers. In an operations-improvement paradigm, customer-supplier partnering might entail modifying a supplier operation output, such as packed components, to better match the downstream customer operation, such as receiving storeroom stocking. However, much greater gains are typically possible by using a process or breakthrough improvement paradigm, and extending the process analysis and transformation beyond the boundaries of the enterprise to permit global optimization of the multi-company process.

Examples include removing activities that are duplicated between vendor and supplier, such as inspection and counting, developing shared expectations, and transforming information flows. One familiar example that leverages automation, segments the process, and shifts activities from the enterprise to its customers, while still creating customer value, is the use of self-service, automatic teller machines in financial institutions and shopping malls.

Total Quality Management. This paradigm covers both process *management* and process *improvement*, as a process improvement paradigm. As a process improvement, TQM encompasses all of the above techniques. The Malcolm Baldrige National Quality Award framework,[29] when viewed from an improvement focus, provides several important guidelines:
- A focus on customer satisfaction as an ultimate goal.
- The critical importance of leadership in driving change.
- Quality management of processes as a mechanism for managing the business, including benchmarking to set goals.
- The use of information and analysis, or management-by-fact, to drive meaningful process improvement.

TQM under the Baldrige framework is a very different approach than old-style TQM, which leaned much more towards an operations-improvement paradigm.[19]

Corporate Strategy and Development. It is a fallacy to assume that process engineering and TQM are the final answer in enterprise improvement. One paradigm for enterprise transformation, which is grander in scope than any of the above, is *corporate strategy and development*. Strategy, as discussed earlier, has fundamental primacy over process engineering. It sets the context for improvement focus, time frames, and risk tolerance.

Corporate strategy also can drive a fundamental shift in structure, product/market mix, competitive positioning, etc. Corporate development, through merger, acquisition, divestiture, or exiting the market, can operationalize strategy. Put another way, all the process engineering and TQM in the world will not help a company that does not have the competence or assets to successfully compete, or is in a dying industry, until it has redefined its strategy, structure, and competencies. On the other hand, process breakthroughs can be the catalyst for creating or transforming the dynamics of entire industries. Rethinking fundamental processes in a newly restructured divisionalized business, or searching for synergies at the process level after an acquisition, provide substantial challenges, however, in analysis, engineering, and execution.

Some Lessons Learned

As is clear from the discussion above, the business model we have developed has been built on a series of lessons we have learned from working with clients to achieve change. In this section, we will discuss some of these key lessons.

Align Goals and Initiatives. Most organizations have a variety of action-oriented initiatives underway. These initiatives are intended to resolve customer complaints, address management issues, or exploit cost-reduction opportunities. One often sees substantial motion, but not always progress. It is a rare organization that has fully aligned its change activities and focused them to ensure maximum leverage of its resources and an ability to endure change. In AT&T, we have found that policy deployment and process management are critically effective mechanisms for organizing change. A quality information system can be effective in tracking performance against objectives for policy deployment. Mechanisms such as these can also help ensure appropriate constancy of focus for the organization and leadership. This, in turn, provides a consistent direction against which to plan and reach intermediate milestones.

Integrate All Dimensions. QUEST has found that a typical change process includes three major dimensions: project management, change management, and solution engineering.
- *Project Management:* Change should be viewed as a process that can be managed. Scheduling activities, setting concrete objectives, allocating resources, and

tracking progress are essential to ensuring that the change process achieves its goals. Too often, change is managed as a real-time, unfolding activity, with fuzzy goals and no clear timeframe driven by business needs.

- *Change Management*: The non-technical dimension of the change effort is typically the most important factor. Focal points include: building awareness of the need for change; relating the strength of the forces of change to the strength of the forces of resistance, and selecting a change process accordingly;[30] considering the psycho-social and cultural character of the organization; and altering the rituals, symbols, language, stories, role models, and rules of the game.[31]

- *Solution Engineering*: A complete, phased technical approach is required. Typical steps include: development of a vision of the future state of the business; assessment of the current performance of the business; diagnosis of the root causes of the performance gap between current and future views; design of concepts, solutions, or countermeasures; development of new processes, systems, organizational structures, training materials, etc.; deployment of these into the field, including initial pilots; evaluation of the new performance relative to the original goals and vision; and management of the new-paradigm operations to ensure the sustainability of results.

Improve Across Multiple Processes. In the case of large changes, which stretch over several processes, the challenge is to align and synchronize the activities of the various teams that are working on the separate processes. This was specifically identified and planned for in the case of AT&T's Transmission Systems Business Unit, where a set of APEX (Achieving Process EXcellence) teams[14] were coordinated through cross-membership, "Superteam" steering committees, a "Glue Team," and the incorporation of the quality improvement story mechanism to support policy deployment.

Recognize and Manage Change. Most change efforts are more complex than are typically realized initially. Symptoms of underestimating complexity include projects that are behind schedule and over budget; organizations with shell-shock from attempting to assimilate too much uncoordinated change; managers who are overworked trying to simultaneously execute, manage, and improve processes; and change agents who have become lost in the complexity of the existing process. A related symptom is organizations and leadership who

become stuck in the planning activity, and have difficulty moving into an implementation phase.

Manage Resistance to Change. All too often change agents focus on the technical dimensions of change, such as process redesign, information system construction, and advanced technologies. Although some efforts fail due to complexities and risk factors in these areas, more often than not, change efforts run into difficulty by not recognizing and overcoming inherent resistance to change. People in the organization can exhibit overt or hidden resistance, often in counter-intuitive ways, based upon their values, beliefs, reward structure, traditions, personality style, power base, and their style of accepting or rejecting change.

Today's environment of downsizing in many major firms certainly has not helped to instill a sense of job security, reinforce loyalty, strengthen relationships, or build morale—even when ameliorated by innovative job retraining or placement programs. Consequently, it is critical that the change leader understand the factors, values, behaviors, styles, timeframes, and individual and team requirements for embracing, or at least accepting change, while isolating or nullifying those who are unwilling to accept the required change.[27]

Rethink the Role of Employees. The real message here is that all the individuals in the new organization will have to undergo a major change in roles. The employee sometimes becomes a beleaguered species in the throes of business process reengineering. Some even argue that downsizing is a necessary part of reengineering. In our rush to move from a function-based organization to one based on processes, the new role for the employee and teams is often given short shrift. The new requirement is dictating that the process-based worker should have a greater span of organizational understanding and control, and will require significant informational support to become a true knowledge worker. At the same time, while the managers must show a high degree of awareness and concern, they must also acquire in-depth understanding of the process they own. Above all, they must lead—leadership is still the key to successful change.

Redesign Processes First. When faced with a need to change, many business have tended to reorganize, or to build a new system. Experience has shown it to be preferable, however, to redesign the business processes first, and then to redesign the organization or information systems. Otherwise, benefits may not materialize,

either fully or at all. There is also a danger of the organization, systems, and processes not being congruous, necessitating another round of reorganization or systems modifications.

Leveraging Information Technology. Advanced information technology, such as the CLASSIC frame-based tool for creating knowledge bases,[32] can form the foundation for creatively reengineering a business to achieve dramatic business results.

Information technology also can play a key role in the process engineering effort itself. QUEST has been working with the AT&T Corporate Information Office and individual Business Units of AT&T to leverage advanced methods, tools, and environments for process capture and analysis, discrete event simulation, and linkage to process execution—in effect reengineering the process of reengineering.

Information technology must be part of an overall context, however, which first addresses process, organizational, and people issues that may be the root cause of the gaps between organizational vision and current performance.

Advance Deployment of Technology. Deployment of technology is often treated as a second thought, and is not given the serious attention it deserves. Potentially fruitful technology can languish in the uncharted area between research and practice, or be entrusted to the wrong hands and become inappropriately developed. AT&T, and QUEST, has begun to position specially staffed groups between research and field operations. The major task of such groups is to work closely with both the researchers and the field practitioners, to ensure full development and deployment of the most promising technologies. One such area is the effort to transform software production from art/craft to engineering by combining state-of-the-art best practices with smoothly functioning software-development processes.[32]

Summary

Although there are many innovative management tools available to address the needs of transforming the business, they need to be applied with an eye to the business as a whole, and with a great degree of common sense. Discussions of the relative merits of "quality" vs. "reengineering" may not be relevant, as they are but different sides of the same coin—process management and improvement. Recent experience, both inside AT&T and within the greater business community, confirms the need to ensure the appropriateness of the solution relative to the needs and conditions of the business. Flexibility, then, is a critical success factor for those beginning the transformation. Nevertheless, the winds of change are forcing us to make the transformation, or risk the strong possibility of being left behind.

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