Quality into the 21st Century

Perspectives on Quality and Competitiveness for Sustained Performance

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Perspectives on Quality and Competitiveness for Sustained Performance

International Academy for Quality

Tito Conti, Yoshio Kondo,
and Gregory H. Watson, Editors

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Foreword

This first decade of the 21st century is becoming a period of increasingly strong global emphasis on economic and human change and improvement, and upon the methods and practices that successfully accomplish this. In particular, there is a new focus on quality with a more powerfully productive role for its principles, methods, and disciplines in terms that fit today's new human, business, and technology demands. This emphasis recognizes the new character of quality in human terms throughout today's worldwide markets. Fewer and fewer men and women throughout the world are content to remain second or third class economic citizens indefinitely in their lives as their fathers or mothers may have been; content with the quality of the products and services they buy, use, and maintain; accommodating of inadequate quality practices and processes through which they work that waste their time and effort; satisfied with the quality of the environment and health conditions under which they live; or pleased with the quality of the professional and governmental services they receive.

In technology terms, there has been an increasingly powerful impact on society—in particular, from information technology and the Internet. In this environment, the quality of an organization's products and services becomes transparent to customers almost immediately rather than in the months or even years of the past. Newly developed products and services once likely to provide years of assured income for businesses are increasingly likely to be replaced—or become a commodity in months or even weeks—unless their excellence in performance is apparent. And in terms of global trade and the principles of corporate governance that surrounds it, this recognizes that

products and services no longer travel under any single national passport and that much more systematic and visible forms of international cooperation and responsibility are becoming increasingly essential.

Taken together, these demands call for a far more expansive use of quality practices throughout business than in their original applications in product manufacturing, which themselves continue to grow in scope and importance—not only in manufacturing but also throughout many other industries as well as business services. And these demands, very importantly, now also include more and more definitive emphasis upon the use of quality principles and methods throughout healthcare, education, technology, medicine, and increasingly in government, public administration, and in professional occupations.

One of the most basic and pacesetting changes throughout today's quality practice is in business itself. In the companies that are achieving the most significant results in meeting these new demands, the focus upon quality is as a fundamental organizational and marketwide strategy for company competitiveness. It moves from the past 20th century focus on the management of quality to the 21st century focus upon the quality of management and of the continuous senior management leadership which implements it. This is quite different from the previous emphasis, where quality had primarily been understood in terms of technical operational emphasis and strong standards and practices with periodic upward reporting to senior management. While strongly continuing this technical emphasis, this new quality focus systematically provides continuous strategic alignment of the quality of the company's products and services with today's ever-increasing user expectations. This, in turn, has direct consequences for the expectations of direct senior management leadership and attention. It requires a new 21st century emphasis upon quality methods and tools to guide and assure the continuous change and constant improvement that is so essential in providing the constantly upward expectations of today's global customer. And it focuses on reducing and eliminating a backward creep in quality that, in some areas, has been one of the human, as well as business and technology, issues with some products and services.

We know the inherent power of quality from our General Systems Company experience, which implemented these disciplines and methodologies in a wide variety of areas, from financial and banking services for consumers; to transportation efficiency for trucking, railroads, and air transport; to hospitals' operating room effectiveness for healthcare patients; to software reliability for information technology; to lean production for automotive and diesel engine manufacturing. There are strong examples throughout Europe, Asia, the Americas, and across the world of the human, business, and technological value of this powerfully productive 21st century

quality discipline and methodology. One of the examples in the United States has been in the strong new sales of some consumer products that surprised economists, far exceeding their projections and continuing to do so. These projections had been based upon data from past periods, which had not recognized the new systematic quality discipline and methodology in these companies, which was bringing about full alignment of their quality with changing and increasing customer expectations and which was generating strong new sales growth.

Nonetheless, we all know quite well that these examples of performance excellence through quality discipline and methodology are by no means yet fully widespread, and that the principles and methods of 21st century quality are still limited in their broad use. One of the major tasks before many organizations and individuals is to further clarify and focus these practices and to have a clear basis for effectively applying and using them.

This volume, with its clarity of quality information and the insight about its best practices from some of the most highly qualified and experienced quality experts, provides an important resource and guide for the men and women who are committed to this major improvement in quality and to the application of the principles and methods that will help bring this about.

Dr. Armand V. (Val) Feigenbaum
General Systems Company
Pittsfield, Massachusetts

Introduction—The Quality Perspective on Business Competitiveness

HISTORICAL TRANSFORMATION

The 20th century was one of change—from a generation that embraced the radio as the primary means of communication and the horse as a primary means of transportation to one that uses cellular telephones and commutes via airplanes. Enabling technologies that permitted this social transformation have made this past century one of remarkable progress in all dimensions as society has coped with the implications of these changes in its infrastructure and adapted to the new lifestyles that are possible with the advent of such breakthroughs. Behind these technology shifts has been a "tacit enabler" of success for mankind; the inherent quality of products that have been produced and man's ability to deliver consistent service have also made quantum improvements. At the beginning of the 20th century, a transition was occurring in the business quality model. The shift was from a model based on a craftsman pouring personal energy into works for individual customers—each item produced was an outcome of the personal knowledge of the needs and desires of that customer—to a business model for mass production in which all of the customers were considered to have exactly the same needs and desires (or as Henry Ford so aptly summarized this position, customers could have any color Model T Ford that they wanted "as long as it is black"). The end of the century is marked by a phrase that was first coined by Tom Peters: *mass customization.* In this business model, the individual needs of all customers are considered in the high-volume production of goods and services, and the particular wants of these customers are provided for through an

adaptive process that is able to transform the mass goods and services into a personalized form that is acceptable to each customer.

BUSINESS COMPETITIVENESS

What is competitiveness? The American Council on Competitiveness, originally founded in 1983 by then–Hewlett-Packard CEO John A. Young, defined competitiveness from both the micro- (the economic level of organizations) and macroeconomic (the economic level of the market) viewpoints as "the degree to which [either a business or nation] can, under free and fair market conditions, produce goods and services that meet fair tests in international markets while simultaneously maintaining or expanding the real income of its [employees or citizens]." When describing the competitiveness of a firm, it is the long-term capability of the firm to compete that provides for enduring success. There have been many one-product or one-concept firms that have not lasted beyond their original idea. True competitiveness is based on establishing continuing relationships with customers so that the firm captures their customer's experiences and is able to use this knowledge to stimulate innovation and develop products and services that are even more useful for these customers. This process is inherently a learning or discovery process.

LEARNING PROCESS

Throughout the course of this past century's transformation, a learning process occurred that focused on quality. At least four cycles of learning can be observed that align with the transformation of the business model. In the first learning process, the basic business model for mass production was transformed by the shift in operating philosophy from the craftsman model to the production model. In the craftsman model, each and every piece produced was inspected for compliance to the customer's need or requirement, while in the production model quality was accepted in batches of products that were produced at the same time and statistical sampling was used to select only a relative few products for a more detailed inspection. The learning that enabled this creation of quality control was based on the foundation principles of Taylor's scientific management, as aided by discoveries in the application of statistics for sampling.

The second learning cycle in the last century was able to transform production in a different way. The end-of-the-production-line test was

inefficient in two ways: (1) when products failed the inspection, rework of products was required to bring them back to conformance for the failure that was observed, and (2) valuable production time was lost as workers were diverted for these corrective actions. The principle of prevention and the use of process thinking led to the discovery that in-process measurement could be used to establish quality management at the point where defects were produced. Process management, coupled with Dr. Walter A. Shewhart's discovery of the statistical process control chart, enabled quality to be more efficiently and effectively managed at the point of defect detection, thereby boosting production capability. This was the foundation for quality engineering.

The third learning cycle occurred when manufacturers observed that the definition of defect that was being used in their processes did not assure market success. The real business need was not to assure compliance with the engineering description of the product, but to assure its success from the quality perspective of the customers who used it. This was a discovery that was stimulated largely by the Japanese focus on customers and their insistence on getting the product right from the customer viewpoint. Quality assurance linked the product requirement to customers and then encouraged engineering to figure out how to make the product to that requirement.

The fourth learning cycle was stimulated by the observation that quality was not an act that could be delegated to the workers—it required the active involvement of the entire organization. According to this concept, employee involvement reached all the way from the frontline worker to the executive level and provided both team training and basic analysis tools for problem solving to the entire company. The idea of total quality was the concept of Dr. Armand V. Feigenbaum, but the Japanese took this idea to a higher level of performance, leading to their strong economic growth following World War II. The maturing of total quality during the second half of the century involved four major ingredients: (1) inclusion of the lean production methods associated with just-in-time management, (2) adoption of ISO 9000 as a minimum standard recipe to define and document a quality management system, (3) acceptance of business excellence models as a guideline for challenging organizations to improve their business processes through rigorous self-assessment against objective criteria that were observed in best practices, and (4) the addition of advanced statistical tools for business process analysis combined with widespread use of statistical analysis packages due to growth in the Six Sigma set of tools and methods. The current state of quality involves building a systems approach with all of these ingredients to add value for all the organization's stakeholders.

EVOLUTION OF KNOWLEDGE

The philosophies, methods, and tools of the quality movement did not appear on the work scene as a revelation that was complete in all dimensions. Rather, they evolved and became part of a body of knowledge that lacked systematic integration until the closing years of the 20th century. As the new millennium begins, it is essential that we capture the knowledge and discoveries of the past to assure a strong foundation for the future. This is the basic purpose of this book.

STRATEGIC IMPERATIVE

Strategy is the persistence of a vision, and quality requires the alignment of the entire organization to that vision as well as the consistent execution and performance of those activities that deliver the vision. For a business to sustain success it must be capable of overcoming the natural forces of entropy that stimulate the loss function—degradation in production capability through equipment wearout and technological obsolescence—and continuously improve performance so that the resulting customer experience is one that is consistently exceptional when compared with competing market alternatives and choices in value that customers can make. In the final analysis, true success sustains performance by delivering expectations for all the organization's stakeholders simultaneously—both short-term profits and long-term value for shareholders as well as delivered product and service quality and reliable long-term performance for products and services.

Thus, the editors from the International Academy for Quality (IAQ) have chosen as the title of this book *Quality into the 21st Century: Perspectives on Quality and Competitiveness for Sustained Performance*. It describes the viewpoints of individual members of the academy on both the state and the evolving direction of the body of knowledge for quality management. The editors of this book are particularly indebted to Dr. Armand V. (Val) Feigenbaum for his foreword to this book that sets the initial perspective on the future direction of quality.

This book contains a number of chapters that define the business perspective for quality. It begins by pointing out the importance of a broad view of success from the perspectives of customers, owners, managers, and employees who have a desire for holistic quality that satisfies the needs of all these dimensions. The book then shifts emphasis to emerging themes in quality—such as social values, privacy, security, and software quality—that are driven by today's technological environments. The final chapters summarize two developing areas of quality management: (1) the integration of

quality into the strategic planning process of business through policy deployment, and (2) the broad scale application of the business development and problem-solving approaches called Six Sigma.

ABOUT THE IAQ

What is the International Academy for Quality, who are its members, and why should the perspective of this organization be important? The IAQ is an international, not-for-profit organization that was created to focus 66 academicians from 28 countries to work on projects that advance the global knowledge and understanding of the philosophy, theory, and practice of quality. The members are chosen from among the most respected, active, and experienced protagonists for quality in the world; members represent both academics as well as leading practitioners and executives. Academicians come from all regions of the globe—about one third each from the Americas, Europe-Africa, and Asia-Pacific. Membership in the academy is by invitation only and requires global support and peer recognition from all geographic regions in order to attain the level of academician. As part of their volunteer work, academicians provide papers for global quality conferences, assist developing nations in establishing quality management systems and infrastructure, and work on special projects that further expand the body of quality knowledge in all of its dimensions. The primary authors of this collection of articles are all academicians—in a few cases academic assistants have worked with an academician in research or preparation of a chapter. Brief biographies of the authors are included at the end of the book.

CONCLUDING COMMENTS

This book's 11 articles describe the perspectives of academicians about emerging changes in the field of quality and offer their insights into the directions that are improving the quality field, leading to a more integrated approach that brings the methods and techniques into the mainstream of business management, rather than leaving them as an artifact of the factory floor or part of new employee orientation. Quality has indeed "grown up" over the years—it is no longer a set of tools and tests or practices and procedures. Quality has become a way of assuring the continued competitiveness of business and doing quality is no longer an option, it is the only way that management can assure the sustainability of its profit. Today, quality is mandatory in business—it is no longer an elective subject that only the best

companies will pursue. Without quality, businesses will find that their customers will not tolerate their commercial presence and the force of a free market will operate to eliminate the company from among the viable competitors for their business. The reward of exceptional quality is a sustainable business.

This project represents the undertaking of more than two years of work. We wish to thank the many IAQ academicians who worked with us on this project—those whose papers appear in this book as well as the many whose papers will appear in future works. Your efforts will indeed make a difference in the understanding that future generations have of the current state of quality as well as help to shape coming directions in the application of quality methods and tools. We hope that our readers will find this book as interesting and instructive as the editors did in compiling it.

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A Strategic View of Organizational Stakeholders

Tito Conti

INTRODUCTION

Recognition that employees and business partners—if properly involved—can play an essential role in organizational improvement dates back to the early days of TQM. The Malcolm Baldrige National Quality Award incorporated that view in its 1987 model, although assessment of company results was limited to quality, operational results, and customer satisfaction. The European Quality Award made a further step, by putting employee satisfaction and responsibility to the public and the community among the expected results, in addition to customer satisfaction and economic/financial results. In doing so, it paved the way to a more organic and integrated view of the organization's goals and opened the discussion on the identity and role of *stakeholders* in organizations. The introduction of the category "Impact on Society" in the European Quality Award (European Foundation for Quality Management [EFQM] model) was particularly important: while showing the attention to the social and physical environments typical of the European tradition, it introduced the concept that companies' and even customers' interests can find a limit when public interest is at stake.

The concept and roles of stakeholders in relation to quality and excellence took better shape with the subsequent evolution of TQM models. The present Malcolm Baldrige Criteria for Performance Excellence say: "Results should be used to create and manage value for your key stakeholders: customers, employees, stockholders, suppliers and partners, and the public and the community. By creating value for your key stakeholders,

your organization builds loyalty and contributes to growing the economy." To place stockholders and employees side by side in the stakeholder category is a big step with respect to the past. That really implies a new vision of organizations, where share of power and benefits is no longer the result of conflicts between parts nor of ideological views that may weaken companies' and economic systems' performance, but is instead a free choice that companies can make to foster their long-term performance in an ever tougher and more global competitive environment.

To complete the picture, let us also notice that the new ISO 9000 series of standards are widely focused on the concept of stakeholders, specifically in their ISO 9004 Guideline for Performance Improvement. But the question arises: is the ISO's and TQM/excellence model's view of stakeholders really perceived in all its implications by the business community? If perceived, are common executive behaviors consistent with that view? In the following, such issues will be discussed starting from a critical review of both the concept of stakeholder and the relationship between stakeholders and the enterprise. An important aspect of the discussion on stakeholders is its relevance in relation to the issue of ethics in business, a central topic today.

MODELS FOR ORGANIZATIONAL IMPROVEMENT

Before entering the theme of this chapter, it is worth spending some time on quality-related models and terminology to avoid possible misunderstandings.[1] Many such models are quite popular today, under the names of TQM models, quality improvement models, (business) excellence models, or quality system standards. We prefer the definition *models for organizational improvement*, a short expression for *models for organizational quality improvement*. (A longer but even more precise definition could be: models for improving organizational quality with the aim of improving output quality.) In the following, the more synthetic expression "TQM models" will be used.

Models have long been used to support theories in many scientific areas. They normally are simplified representations of complex realities. They aim at understanding the causes determining complex phenomena or complex systems' behavior. The problem with models is the ability to define and circumscribe the system under study and to single out the critical variables in relation to the observed outcome. The more specific the outcome that is desired, then the easier it is to find an appropriate model. Widening the scope inevitably means more complexity, but also more subjectivity and more difficulty in validating models.

If creating models is a typical subject for argument in physical sciences, it is more so in economics and social sciences where the human variable is involved. And even more so in quality, especially when the roots of quality are explored, where intangible factors often hide. So, discussions on the legitimacy of quality models on one side and discussion on which model is the best on the other side (what is beyond excellence models?) are meaningless. Models have always been useful when correctly interpreted (as working hypotheses, not as dogmas) and will be useful in quality, too.

The European Quality Award's model (Figure 1.1) is important in the history of quality models because it represents a first step in integrating such models into business models. Accordingly, this model cannot claim to be a generic business model, but rather a very specific model: a model for the organization *in relation to quality improvement.* To that purpose, it adds to the traditional models a new part that is external to the organization: its results, which are significant from a quality perspective (customer related, people related, business and society related). Results are represented on the right-hand side of Figure 1.1. The left part of the figure is a representation of those organizational factors—the "enablers"—that, in the model architects' view, are critical in relation to the quality (and quality improvement) of the right-hand side results. Obviously both the right- and left-hand parts of the model are subjective, and in fact other very respected models spell results and enablers differently. But, substantially, the three major award models—the Deming Application Prize, the Malcolm Baldrige Award, and the European Quality Award—are today similar and consistent.

The Malcolm Baldrige model was certainly innovative, however it still mixed results and enablers together. It was the European Quality Award that first separated enablers from results, which was a fundamental step toward

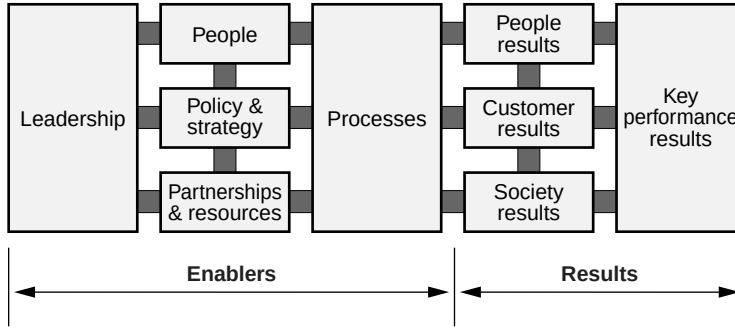

Figure 1.1 The European Quality Award model (EFQM excellence model).

the integration of quality improvement concepts into organizational models (the Malcolm Baldrige followed). In fact, the left-hand part of the model of Figure 1.1 could be changed to accommodate for existing or new organizational models—or for the adaptation of such models to the specific aim of organizational improvement. We will see shortly (Figure 1.4) a schematic representation of organizational improvement models as seen by the author, where the left-hand part is not prescriptive (except for processes): it can be defined according to an organizational theorist's preferences. What is recommended is some form of *conceptual* standardization of the right-hand part, the added part, which addresses quality improvement models.

We can now summarize the rationale of organizational improvement models as follows:

- They are aimed at performance improvement.
- They are divided into two parts: (1) performances that are to be improved and (2) the main critical qualities (or critical quality factors) on which one should act to get such performance improvements (enablers).
- The organization has to identify classes of performance that have to be improved (for example, business/customer/people/partner/shareholder related) and, for each of these qualities that have to be improved (for example, for customers: product-/service-/relation-related qualities).
- In order to improve the above-mentioned performances, the organization has to define and act upon those quality characteristics that have to be improved.

It should be clear from the above that, even if we synthetically talk about performance improvement, organizational improvement, and process improvement, we always take the word *quality* as implicit. In fact, improvement must be related to some "qualities" or characteristics of products, services, processes, or organizations. Since we are talking of quality and quality models, we make reference to those characteristics that are important either for the customers, or the stakeholder, or the company itself. Those are the quality characteristics that are put in evidence by TQM, excellence, or organizational improvement models.

We conclude this section on quality-related models by saying that the effort to integrate quality concepts into business or organizational models initiated by the award organizations is continued by individual researchers and practitioners worldwide.[2] After this clarification about models, we can come back to our central theme of stakeholders.

THE ENTERPRISE AS AN AUTONOMOUS SUBJECT

Stakeholder is a collective concept used to identify the interested parties in any organization. It relates to (more or less) homogeneous classes of subjects whose interests are, to different extents, bound to the organization's results. Stakeholders are supposed to contribute to the aims of the organization and are entitled to benefits in return.

In the early days of capitalism, when personal or family ownership of the enterprise was the rule, identification of the enterprise with the owners was total and the property was considered as the sole legitimate beneficiary of the enterprise's results. All those parties who cooperated to reach such results were expected to claim nothing more than the monetary compensation agreed upon in advance. The situation is different today for large public corporations, where property is traded in the marketplace and usually subdivided among a high number of shareholders. Most of them are small and have no power or influence on the corporate strategy. They cannot be considered part of the "property" in a full sense. They are, in fact, different in nature with respect to the large investors, who have better inside knowledge and major influence on the company business. They are often very vulnerable to hidden risks—as some aspects of the economic and financial downturn of the beginning of the 21st century has made evident—and need to be protected even from possible majority shareholders' or top executives' negative behaviors. The corporate system has to take into account the needs of the new *Investor Class* that forcefully emerged from the economic and financial boom of the 1990s.[3–5] The investor class is a class of ownership that shares the risk of shareholders but does not share the power and knowledge of the inner cycle of investors, who to some extent can still be assimilated to property.

In the above situation, identification of ownership's interests with those of an enterprise is risky. Better to keep the two separate, especially if the company aims at excellence. Better to consider shareholders as stakeholders. The growing importance of other stakeholders—typically management and employees—is another argument in favor of such concept. In fact, the company is "the subject" that all the stakeholders are bound to care for and should clearly stand as such in every model that organizations refer to when they aim for sustainable success. Excellence requires fair contribution and cooperation from all the stakeholders and, at worst, protection from bad behaviors from *any* of them that could negatively impact the company's sustainable development, profitability, and/or global value.

In an attempt to rationalize the role of stakeholders in TQM models, we will keep shareholder satisfaction separated from *company satisfaction*,

allowing for a possible divergence between the interest of the company and the interest of its controlling shareholders. Such distinction is conceptually important today, in a time of "financialization" of the economy that risks to underplay enterprise excellence in favor of short-term financial benefits.

A stakeholder management policy is needed and has the hard task of defining the share of benefits among stakeholders in ways that are fair to them and fit the strategic goals of the organization. When talking of share of benefits, traditionalists become suspicious, thinking in terms of economic benefits only. These are important, but stakeholder expectations can be satisfied in different ways. For example, employees are very sensitive to quality of the physical and social environment, self-fulfillment opportunities, job enrichment, and the long-term success of the enterprise; suppliers look for long-term relationships, information, and cooperation.

Conceptual separation between enterprise and ownership in models that are supposed to guide the former to excellence can hardly be accepted by small and medium enterprises (SMEs), where property is closely interlinked with the enterprise. However, if correctly intended, it can favor the development of a sound business culture, making the possible transition to a public company easier, if and when the time comes. It is certainly painful for entrepreneurs to accept the idea that their creations can become independent subjects, a situation similar to that of parents in relation to their growing children. But it is common experience that when companies grow, the founder disappears, and rights for property are traded in the marketplace, then relations between companies and shareholders tend to become financial only and often volatile. If TQM models aim at the organization's health and at long-term prosperity of the enterprise, they should separate the enterprise's goals from shareholder's goals, giving the former central stage.

STAKEHOLDERS AS A DISTINCT CATEGORY, SEPARATED FROM CUSTOMERS

The trend today is to incorporate customers in the stakeholder category; we see this trend in award models as well as in ISO 9000. In the author's opinion, the concept of stakeholder gains in clarity if it is limited to those categories that cooperate to achieve company goals—and expect a fair recognition in return. Customers certainly become partners when they enter the stakeholder category. But customers in general and consumers in particular feel no obligations to their suppliers. Their link to a specific supplier is intrinsically unstable. They change suppliers when they find it

convenient. The normal supplier–customer relationship is asymmetrical, where the former is like the person in love who seeks correspondence from the loved person, but has no right to exact it.

Supplier–customer partnership is typical of business-to-business (B2B) relations and is normally formalized by a contract. In the case of business-to-consumers (B2C) relationships, a kind of "stakeholder attitude" may arise when they are so delighted by a vendor's products and behavior that an emotional, loyalty feeling arises (similar to love) that dictates their choices. But such attitude, being emotional, may easily change if the supplier betrays customer trust. Consumers are volatile by definition. They tend to pursue their own interests. They tend to make their purchase decisions on the basis of the "value for money" concept alone.

Figures 1.2 and 1.3 highlight differences between the enterprise–customer relation and the enterprise–stakeholder relation. In the first case, customer satisfaction is pursued to retain good customers; in the second case, mutual satisfaction should be pursued in a win–win kind of relation.

Clear definitions and correct perceptions of customer and stakeholder roles help in overcoming never-ending discussions in some intriguing cases, for example, in education. Should students be considered customers or stakeholders? In principle they are both. However, the child in primary school is essentially a customer, as he/she is entitled mainly to receive; parents have more the stakeholder characteristics. Moving to higher-level schools, students should become more and more stakeholders. They should increasingly participate in the learning process. Similarly, in relation to public services, citizens are stakeholders because they pay taxes and become customers when they benefit from service. However, these discussions risk

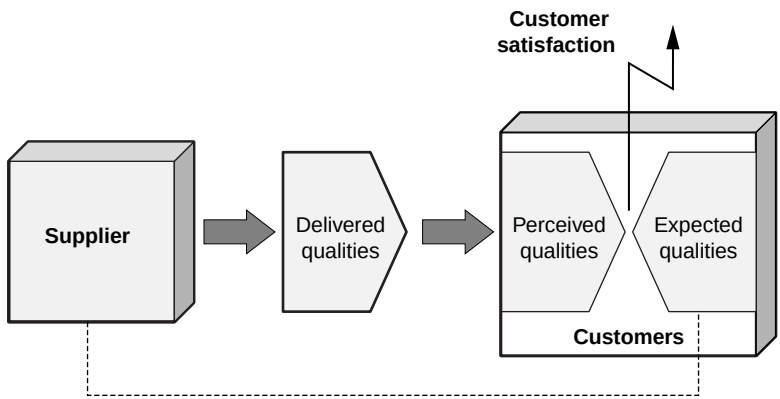

Figure 1.2 Customer satisfaction in customer/supplier relation.

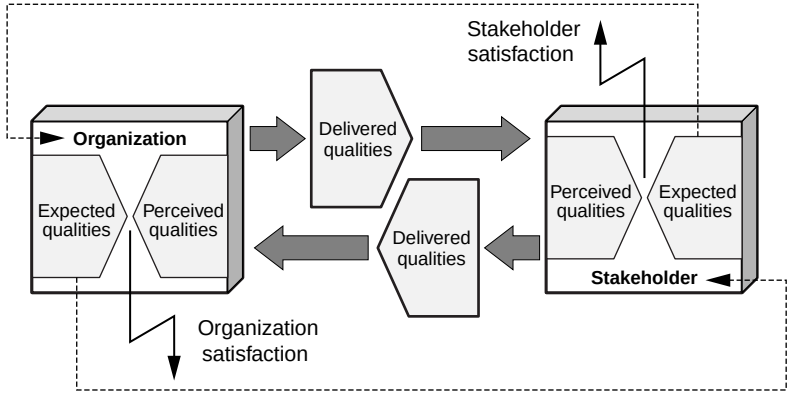

Figure 1.3 Mutual satisfaction in organization/stakeholder relations.

becoming academic, since quite often the two roles are superimposed. It is more useful to analyze the relationship taking Figure 1.3 as a reference.

It is interesting to note that the concept of stakeholder suggests how to complete relationships that otherwise look shaky. Some relations look one-dimensional, linear, but in reality they should be considered as triangular. The hidden third party is normally "the society." Take, for example, the problems of saving energy or water, or the problems of waste reduction and environmental pollution. The customer–stakeholder transaction, with its exchange of value for money, does not exhaust the subject, unless today's and tomorrow's societal needs are taken into account. The society as stakeholder should complete the picture.

TQM MODELS GIVE EVIDENCE TO THE AIMS OF THE ENTERPRISE

TQM models give evidence to the aims of the enterprise, made explicit in its *mission* and put in a temporal perspective by its *vision*. In the EFQM model—and now also in the graphic representation of the Malcolm Baldrige model—the purpose of the organization is represented on the right-hand side, while the left-hand side represents the critical systemic factors, or enablers, that have to be properly nurtured and enhanced in order to achieve excellent results. Figure 1.4 provides a very schematic representation of TQM models in the author's view.

In this view, the enterprise and its long-term success enjoys center stage, while customer preference and stakeholder contribution/satisfaction

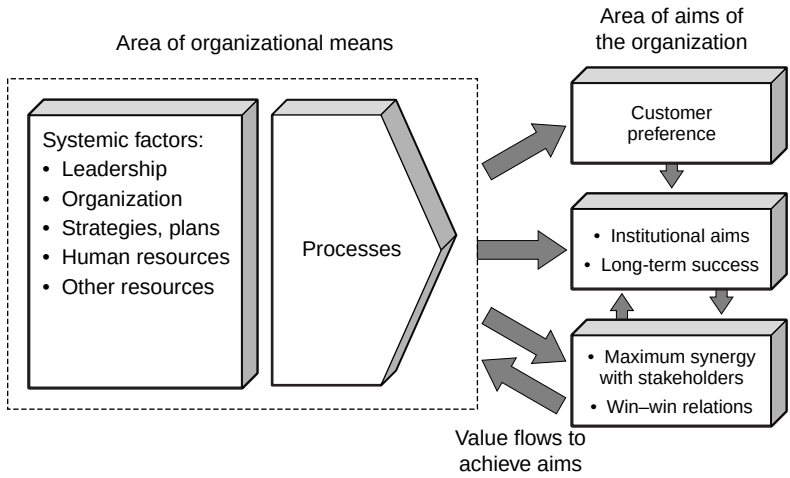

Figure 1.4 A schematic interpretation/representation of excellence models.

are located to the side. In fact, since only an excellent and healthy company can consistently satisfy customer and stakeholder expectations, the main concerns when aiming at excellence should be the company itself and its ability to meet its mission, create value, and constantly improve its fitness for purpose in the ever-changing competitive environments. Within that mission, the ability to generate competitive value for customers (present and prospective) is fundamental to guarantee the cash flow that is needed to satisfy the expectations of the company itself and its stakeholders The arrows in the upper part of the right-hand side of Figure 1.4 represent the flow of value in company–customer relations. In the case of the company–stakeholder relationship (lower part, right-hand side), the flow of value is bidirectional, both at the operational level (cooperation in generating results) and the goal/result level (sharing the benefits).

Stakeholders represented in the lower block at the right-hand side of Figure 1.4 are shareholders, upper management, employees, business partners, and society.

THE ENTERPRISE AS THE FOCAL POINT OF THE STAKEHOLDER SYSTEM

Organizations prosper if there is commonality of intents, shared vision, and cooperation among stakeholders. Stakeholders, all together, hold power.

Such power should be rightly balanced. Abuse of it by a single stakeholder or a group of them causes organizational diseases, poor performance, and dissatisfaction of customers and other stakeholders. A graphic representation of the relationship between the organization and its stakeholders is given in Figure 1.5, where the company is placed at the center of a "stakeholder system" made of two concentric circles, on which the "internal stakeholders" and the "external stakeholders" are located. Internal stakeholders (shareholders, executive managers, and employees) bear the bulk of responsibility and hold most of the power. External stakeholders can be closely involved in the company's business but bear less responsibility and (normally) are not expected to participate in direction setting and strategy definition. Typical of this category are the business partners and the society (local community, public authorities, educational institutions, research centers, trade associations, and consumer associations). Such an external ring can offer the organization big opportunities, typically by nurturing and exploiting strong networks of external partners; or they can present threats when some of the external stakeholders try to jump into the internal ring, changing hats. Obviously management (intended here as the executive management) is

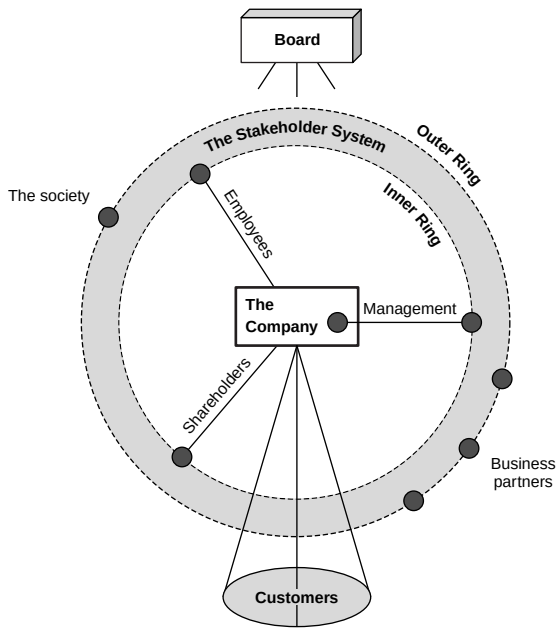

Figure 1.5 A model of the company/stakeholder system, the customers, and the board.

both a fundamental part of the organization (indeed the most important) and a stakeholder of the inner circle. If not well balanced, such double roles can create problems. From the company excellence point of view, self-identification of management with the company is of paramount importance, while amplification of the stakeholder role can be dangerous.

Another entity is represented in Figure 1.5: the board of directors. It may or may not be present; if present it may have different missions. However, the author is firmly convinced that it could evolve into a very fundamental role if a stakeholder-based organization takes root. Besides protecting minority shareholders' interests, it should have the role of guaranteeing a correct balance of power and a fair distribution of benefits among stakeholders. When necessary, the Board should be able to counteract pressures for short-term profits—or other types of pressures—that may impair long-term prosperity of the enterprise.

In past papers I used a "gravitational" representation of the relationship between the company, its stakeholders, and its customers. The core of the "gravitational system" is the company that rotates in an orbit around its customers (to express the concept of customer-centered organization). Elliptical orbits on which the different stakeholders rotate (internal stakeholders in inner orbits, external stakeholders in outer orbits) surround the company–customer gravitational core system. The meaning is that the "stakeholder system" should pursue the company's goals (they rotate around the company), while maintaining their autonomy (their orbits) and expecting benefits in exchange (the energy they receive). Problems arise not only when conflicts among stakeholders of the inner orbit overcome physiological levels, or one of them holds excessive power, damaging the others; but also when a stakeholder from an external orbit wants to move to the internal orbit or occupy the gravitational center of the system. When such pathologies arise, companies risk losing customer focus and compromise their value generation capability.

ORGANIZATIONAL PATHOLOGIES DERIVING FROM STAKEHOLDER UNBALANCES

Examining organizational pathologies is useful to prevent diseases that limit company performance and sometimes lead to premature death. As with the human body, the study of pathologies helps in understanding physiology and staying in good health. Organizational vaccines and antibodies must be developed to prevent and cure the most serious diseases.

According to a study made by A. de Geus, the average life span of corporations is much smaller today than their potential life span. He found that average corporate life expectancy is well below 20 years (50 years after infant mortality), while many examples of long-lived companies suggest that the natural life span of a corporation could be two or three centuries or more.[6] He compares the present status of enterprises to the status of the Neanderthal man, where life expectancy was about 30 years. Life is shortened by disease. Many corporate diseases arise in the stakeholder system. Most of them develop from imbalances among stakeholders and lack of an effective control system. Let us examine a few of them.

1. The neurotic request for short-term profits coming from the stock market can seriously harm companies. Shareholder pressure on the CEO can lead to a number of negative consequences. First and most obvious: seconding short-term requests without taking proper care of long-term needs can sometimes start an unstoppable decline in a business. Second, the CEO becomes at the same time more powerful and vulnerable, which makes his/her requests for benefits greater and greater.[7] Third, this situation makes CEOs quite often despotic toward their employees (while they last), disrupting the magic balance among stakeholders that is key to high performance. In summary, the weight of the prominent investors and/or upper management can increase abnormally, to the detriment of other stakeholders (unbalances between the three poles in Figure 1.5), the customers, and the company itself. The Enron debacle and other episodes that plagued the financial market during the downturn initiated in 2000 are clear proof that market pressure combined with despotism, lack of ethics, and of transparency toward stakeholders can make an explosive mixture.[8,9]

2. The historic conflict between employers and employees was the natural consequence of the increase in dimension of the enterprises during the industrial revolution and lack of governance rules fit to the new situation (experience from the army and agricultural sectors were initially extrapolated to the new context). Strong unbalance in favor of the property owners created reactions from the workers that often became very harsh (especially in Europe). Conflict between the two parties became the rule in the second part of the 19th century and a good part of the 20th century, often expanding into social, political, and armed conflicts. Apart from those tragic outcomes, even from the enterprise performance point of view, conflicts between employers and employees had devastating effects. Now, hopefully, the time for a more mature view of the problem has come and the concept of employees as stakeholders may generate benefits for both parties and for humanity at large. Such evolution should be favored by the dramatic increase in education levels. In many business areas human capital is

already valued more than financial capital. Wisdom from the CEO and the board in creating the "magic balance" among stakeholders that leads to maximum synergy is the key to excellence.

3. The effects of state-controlled economies in former Communist countries are well known. But even in some western economies (Europe), excessive state interventions caused serious pathologies in the recent past. Since enterprises generate employment, political parties started to nurture state-controlled companies as vote breeders (not to mention favors in purchasing policies and other forms of corruption). Where that happened, the result was that political parties became the reference stakeholders and management (often incompetent) was totally subdued. Not only that, but in order to gain union consensus, benefits to employees were often granted that made state-controlled companies' wages grow well above those of the private sector and were totally disconnected from productivity. Taking the gravitational model mentioned previously, political parties, management, and, quite often, unions occupied the center of the system; the company was moved to the most peripheral orbit and customers went out of sight. Not only did many large companies totally lose market orientation, but also a whole generation of managers were disoriented.

Other examples of pathologies can be made. The three above are typical of two extremist ideologies: wild capitalism (social Darwinism, H. Spencer's style) on one side, and statism (state control of economy) on the other side. Time has come to abandon ideological schemes. Now market economy is accepted all over the world, and pragmatic approaches can replace the ideological ones when the issues at stake are performance in hyper-competitive environments and quite often quality of life. TQM models aim at suggesting pragmatic solutions based on real experience. Sharing responsibility (more than power) and benefits among stakeholders (obviously under executive and board direction and control) seems to be a recipe for success. Very little experience has been accumulated in that area up to now. Why not get a little bit more courageous in applying what TQM models say but has not yet become real business practice?

In order to put what TQM models suggest into practice, one must first recognize existing cultural biases that may place obstacles along the road. The United States is probably where TQM has produced the most significant results in the recent past (in terms of improvement, taking into account the situation in the 1970s), however with a mostly exclusive focus on shareholder value. In Europe, given the cultural bias in favor of people and society, the appearance of stakeholders on the quality scene did not create big problems—even if the rationale for it is now different from the past (it is now accepted that benefits to stakeholders should be in proportion to

their contribution). In Europe, TQM models ought to be, probably, better used to enhance productivity and competitiveness. To put it in few words: Europe needs a more specific focus on creating *shareholder value*, the USA needs a more general focus on *stakeholder value*. Given the primary role of the USA in economy and finance, the way American corporations interpret and implement TQM models is extremely important. A global economy where industrial enterprises were totally subdued to finance could make this stakeholder issue obsolete before birth: the stock market could become the sole stakeholder.

Regarding Japan, the author is not familiar enough with the country to express thought-out judgments. At the enterprise level, it seems that considering employees as stakeholders has been part of the national culture for a long time (see for example the concept of life employment). That view may be at risk now because of the persistent crisis. Similarly, the concept of suppliers as stakeholders took root in many Japanese companies long before gaining popularity in the West. However, there is little evidence of explicit corporate policies aimed at fairly balancing benefits among all stakeholders. Bad practices and lack of transparency seem to have plagued Japanese business as they did in the West, to the detriment of small investors.

Let us briefly discuss now the advantages of a strategy that aims at making stakeholders a strategic asset.

MAKING STAKEHOLDERS A STRATEGIC ASSET

The problem is converting the stakeholder issue from a source of problems and conflicts (remember employee–employer conflicts and supplier–customer arm's-length relations of the past) into a strategic asset. Excellent organizations do enjoy a multiplier effect in their performance thanks to close cooperation with their key stakeholders. That is a difficult and rare achievement, requiring leadership. Were it easy, excellence would be more common among organizations. Clearly there is no easy recipe, since leadership cannot be preassembled or cloned, so let us briefly examine some of the competitive advantages of a stakeholder-based strategy.

• Transforming the enterprise and its parts into teams of deeply involved and highly motivated people has been universally recognized as a critical factor for excellence. That remains a dream for many executives; it becomes reality when leadership is able to create deep and widely shared values to win the minds and hearts of people so that they voluntarily accept alignment toward the mission, which is made visible by a convincing and attractive vision. That rare situation is based on trust; people must feel that

beyond the words there is a clear corporate policy and total leadership commitment, not just tactics and clever tricks. Morality and ethics should reveal themselves not so much through corporate edicts but from daily executive behaviors.

Economic downturns definitely strain employer–employee relations when they happen. However, if trust has been created, overcoming the problems will be less difficult. What destroyed trust in many cases during the latest economic cycles was seeing CEOs taking a big part of the pie—both in times of plenty and in lean years—while employees did not share the benefits to the same extent as they shared the pain.[10] This is particularly true after hearing for years many of these same executives preaching about employee involvement, partnership, and satisfaction.

• Enterprises are more and more parts of networks. Some enterprises—like IKEA, for example—thrive on their ability to manage and direct complex networks.[11] Even in nonprofit organizations, like schools and universities, the way to excellence passes through the ability to create synergy through networks. Networks allow organizations to focus on their core business; but more than that, in the age of knowledge, networks are a way to keep learning and stay at the leading edge, whatever the kind of business. Abysmal differences and tremendous competitive advantage can derive from the ability to exploit networking.[12]

• Smaller companies can accelerate their learning process and growth if they identify among their customers larger companies that are at the same time demanding and supportive. Proximity and customer intimacy can be the way to both create customer loyalty and grow in competitive terms. But again, trust is at the basis of partnership. Opportunistic behaviors destroy partnership. Deep-rooted ethics behaviors are at the heart of the stakeholder concept.

• Corporate citizenship is an important issue in this globalization era. Good enterprises usually feel the need to be good citizens of their local communities and their nations. Now, globalization asks for being good citizens of the world, too. Protection of the environment, personal health and safety, respect of human rights (in particular juvenile rights), and respect for cultural heritage have become fundamental issues. Observance of the law is the minimum that can be expected. Even to reach that minimum, standards and rules are insufficient. Companies have long since recognized that they need a "code of ethics." But even that is inadequate if the stakeholder culture has not developed in the organization and the society—from the local community to the planet—has not been recognized as a stakeholder.

Mr. Pasquale Pistorio, President and CEO of ST Microelectronics, one of the most successful semiconductor companies in the world and winner of

the European Quality Award in 1997, was the first to have all of his plants certified according to the ISO 14000 environmental standards. He argues that protecting the environment is just part of good business and that the so-called "European model" (model of development, in relation to social and environmental issues) should be rationalized, made more effective and efficient, but not abandoned. In an interview after the 2002 World Economic Forum in Davos, he said: "To me, the most surprising fact of the forum was the discovery of a new interest for the social aspects of the enterprise. In the past, we used to talk exclusively of economics, business, technology, and capitalism. Now we talk of the social context of the enterprise—not only about the environment and the digital divide, but also about the specific contribution that companies can give to the solution of the problem of inequalities in our world."[13] Mr. Pistorio is not a leftist social scientist. He is a brilliant and successful manager and leader who took over an Italian semiconductor company that was just surviving, thanks to state subsidies, and brought new life to it. Now a joint Italian–French venture, ST Microelectronics is an incredibly successful enterprise, ranks high on the short list of the most prestigious semiconductor companies worldwide, is a leader in continuous improvement, and increases shareholder value.

In a stakeholder-based strategy, stakeholder contribution must be carefully coordinated and benefits should be carefully balanced. To do so, an effective board must support the CEO. It is therefore important that companies give a positive solution to the *corporate governance* problem.[14] The stakeholder view of the corporation certainly helps to solve that problem. In fact, it suggests a new role for the corporate board: that of supervising the balance of power, responsibilities, and benefits among *all the stakeholders*—shareholders and CEO included. Quite often today, boards are seen as the expression of the larger shareholders; they hardly protect the interest of smaller shareholders. Protecting the interests of the company first, then *of the totality of stakeholders*, would be a big step forward. Obviously a first task of the board should be to define the balance of obligations and related benefits among stakeholders; that would be an important part of the definition of the global corporate policy.

STAKEHOLDERS IN THE PUBLIC SECTOR AND IN SOCIAL AND POLITICAL ORGANIZATIONS

Since the ultimate goal of any sound quality strategy should be producing value for all the involved parties, we cannot ignore those public institutions

that are expected to create value for citizens—considered as both customers of public services and stakeholders of the commonwealth—and then to have a strong impact on quality of personal and social life. We have already mentioned such public institutions as schools, healthcare, and so on, where a clear identification of all customers and stakeholders is a prerequisite for high performance. We have also noticed that ending isolation and creating interdisciplinary networks can tremendously increase effectiveness of such organizations. It may be interesting to spend just a few words to suggest that TQM models can also fit the improvement requirements of the social and political organizations in which we live, that are typical of liberal democracies and are bound to administer power, at different levels, for the good of people.

Figure 1.6 suggests a representation of organizations at all levels as a stakeholder pyramid: from associations of citizens and consumers to local and state governments, up to the national, regional, and world level. Enterprises also enter the picture, but we have already discussed them, as well as their interactions with their environment, in the stakeholder perspective. Individuals and organizations at lower levels should normally be considered as stakeholders of the organizations to which they belong (represented at the upper levels). But organizations at equal—or

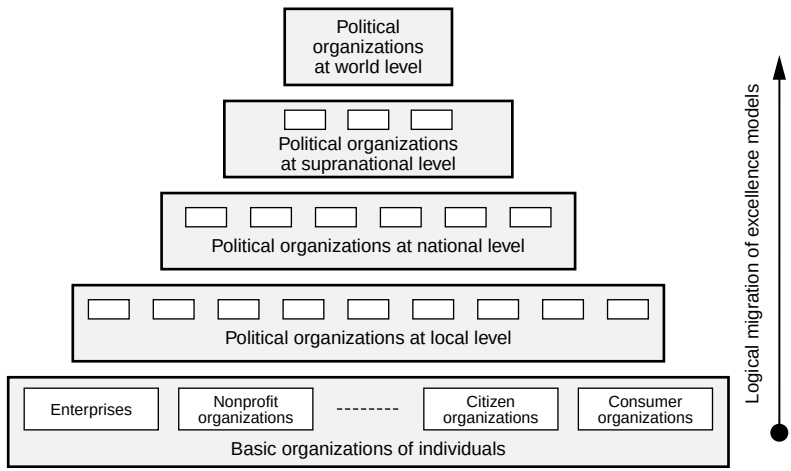

Figure 1.6 Organizations may have different characteristics and exist at different aggregation levels. From the excellence models' perspective, organizations at higher levels should consider lower level organizations and individuals as partners and stakeholders (not subjects, as in hierarchical, authoritarian organizations).

higher—levels can be stakeholders, too. What is always important is to identify all the stakeholders of the examined organization and define their rights and obligations.

In liberal democracies, the individual is the source of sovereignty; she/he delegates part of it to the *polis* (the political organization) in exchange for benefits. Today, political organizations tend to become more and more complex, with a plurality of sovereignty levels. For example, in the United States, beyond the local levels we find the state and federal levels. The European Union is aiming at the same direction and we see how difficult it is for old states to give up part of their sovereignty (for example, in relation to macroeconomics, foreign policy, and defense). However, these complex systems can only work if lower-level entities give up part of their sovereignty; in exchange they become stakeholders (with defined obligations, rights, and benefits). Globalization certainly requires planetary, nonbureaucratic, surveillance systems that, without unduly interfering with lower-level sovereignty, assign some limits, in exchange for peace, free trade, and reduction of disparities. Obviously, the stratification of levels creates centers of power at the top of the organization, with risks of bureaucracy. That is why a fundamental principle for large organizations, corporations as well as federations, should be the so-called *subsidiary principle*, which says that power belongs to the lowest possible level in the organization. A higher body should not take unto itself responsibilities that properly belong to a lower-level body. Interestingly, large corporations facing the problem of how to manage complexity and balance power are more and more thinking in federative terms.[15]

However utopian these considerations may be, a systemic view that tries to balance power, responsibilities, and obligations among the system's stakeholders can provide useful hints for large organizations. Globalization asks for a better ability to manage complexity, in order to avoid manmade chaos.

TQM models provide useful suggestions on how to improve any type of organization, and the concept of stakeholders and their balance can help overcome chronic problems, like managing relations only in terms of power-based confrontations, which previously had conflicts as the most likely outcome. Taguchi would probably say that struggle for power in organizations results in a loss for the totality of its stakeholders and quite often for the society: in the long run, everybody loses and nobody wins.

CONCLUDING COMMENTS

Stakeholders are formally recognized as important constituents of TQM models, but their nature and role in the enterprise system has not been

sufficiently investigated. Despite good intentions, investigation of the stakeholder role, real involvement, and balance of power in both the Malcolm Baldrige and EFQM assessments has normally been superficial; certainly it is less profound than in the more traditional business areas.

Both internal stakeholders (those who are formally part of the enterprise system, such as shareholders, upper management, and employees) and external stakeholders (business partners) can become important corporate assets through an adequate stakeholder policy. Involvement of stakeholders in the enterprise, which in most cases is tactical and opportunistic, should become strategic. Clear definition of roles, obligations, and benefits for the different stakeholders and their balance should become a fundamental part of the corporate policy. The corporate board should become the guarantor of the system.

Search for a correct balance is particularly important in the case of internal stakeholders if a strong and unitary team is to be created—a condition needed for success in the marketplace (or, to take also into account nonprofit organizations, in one's own activity area). In regards to external stakeholders, new opportunities are emerging due to networking developments in most business areas. Incredible multiplier effects can be reached by creating stakeholder networks and managing them with the guiance of a sagacious stakeholder policy. This is part of the expanded leadership role today that goes beyond the enterprise's borders to seize the opportunities that an increasing global market is offering.

ENDNOTES

1. See T. Conti, "From Quality Models to Models Aimed at Organizational Improvement," in *The Best on Quality*, vol. 12 (Milwaukee: ASQ Quality Press, 2001) for a more detailed discussion.
2. T. Conti, *Organizational Self-Assessment*, 2nd ed. (Boca Raton, FL: Chapman & Hall, 1997).
3. B. W./1, "Accounting in Crisis," *Business Week* (28 January 2002).
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7. B. W., "Too Much Corporate Power?" *Business Week* (11 September 2000).
8. See note 3.
9. See note 4.
10. See note 7.
11. R. Norman, and R. Ramirez, "From Value Chain to Value Constellation: Designing Interactive Strategy," *Harvard Business Review* (July–August 1993).

12. K. P. Coyne and R. Dye, "The Competitive Dynamics of Network-Based Businesses," *Harvard Business Review* (January–February 1998).
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15. C. Handy, "Balancing Corporate Power: A New Federalist Paper," *Harvard Business Review* (November–December 1992).

2

Customers, Competitors, and Consistent Quality

Gregory H. Watson

INTRODUCTION

Over the past two decades, the Theory of Attractive Quality, developed by Dr. Noriaki Kano of Tokyo Science University,[1] has gained increasing exposure and acceptance. This paper describes the Kano Theory of Attractive Quality, interprets the theory regarding business issues concerning customer satisfaction, proposes extensions of this theory to related business issues, and describes basic consumer perceptions about quality using the framework of this theory. The Kano Theory can be applied for strategic thinking, business planning, and product development to demonstrate lessons learned in innovation, competitiveness, and product compliance.[2]

COMPETITION DRIVES BUSINESS

The objective of business performance is sustainable competitive advantage. This means that a company is delivering profit in the short term (thereby satisfying investors) and strength in the long run (thereby providing a secure working environment for employees) while simultaneously delivering excellence in its products and services (thereby satisfying customers).

One of the truisms in today's technologically volatile markets is that no existing market share is safe and no product life is indefinite. This is as true in the high-technology sector as it is for all consumer products. Competition destabilizes both protected market niches and technological advantages that

have endured for established businesses. The basic force that drives market destabilization is innovation. Highly successful companies can be relegated to a mere shadow of their "glory days" and the potential for vanishing if they do not find ways to re-create their market success through a steady stream of innovative products and customer-oriented solutions. These types of conditions represent "strategic inflection points"—a disturbance in the market forces or a discontinuity in the way customers perceive their needs.[3]

The business challenge for any company is to obtain and retain its customers, while at the same time growing into new market niches. *Competitive excellence* is achieved when a company has the ability to grow sales revenue through both increasing transactions with current customers (growing "product share" within their customer base) and by extending its offerings to additional customers (growing its "share of the market" by attracting potential customers). Profitability of a firm is assured by a concurrent focus on decreasing the cost to deliver products and services and simultaneously growing the number of customer sales transactions.

Since share of competitive markets is captured at the expense of an adversary, the winner must be able to provide a perceivably superior product or service and subsequently be able to sustain that performance perception as its customers continue to experience the product or service throughout its lifecycle. In other words, the ability to sustain "performance" over time is more valuable to a company than its ability to "inform" or advertise at a point in time. As practiced by companies such as the Dell Computer Corporation, this type of innovation requires the constant delivery of excellence in each customer's experience.

One thought leader on innovation is the German economist Joseph Schumpeter, who introduced the idea that innovation requires the planned abandonment of established, familiar, and customary or comfortable ways of working . . . whether in products or in services, competencies or human relationships, or the whole organization itself.[4] This concept of innovation is called *creative destruction.* By planning to rapidly replace your own products or services in the market, organizations preempt the opportunity for competitors to gain advantage. Some of the high-technology companies have driven this market tactic to the level of a science. For instance, Intel executives have been known to talk about this practice using cannibal-like descriptions such as: "You've got to learn to eat your young." This practice of constant innovation places some very special requirements on an organization's ability to study, interpret, and meet the needs of consumers. In such a rapidly moving environment, the consumer does not always know what they need or what benefits could be brought to them with a new generation of technology. As the late Dr. W. Edwards Deming once quipped: "The customer never asked Mr. Edison for a light bulb." The burden for

development of applications for such breakthrough technologies is on the producer, not on the consumer.

ALIGNING WORK TO CUSTOMER PRIORITIES

One of the key problems in business is the lack of alignment between the way people work to design and produce products and the concerns and interests of customers of those products. This lack of alignment is caused by a fundamental discontinuity in the language of consumers and producers. Producers tend to focus on organizational performance while customers are most concerned about product performance. Their priorities are greatly different. The customer is most concerned about issues like ease of use, timeliness, certainty of performance, cost to own, and variety or choice in the product's features. Most producers tend to be more inwardly focused on such concerns as productivity, schedule, standards, cost to produce, and volume of output. It is no wonder that customers are not well satisfied by the market offerings—the American Customer Satisfaction Index shows a chronic 20 percent dissatisfaction rating across all industries. How can a company improve its performance? What is the underlying relationship between product innovation, market dynamics, and customer satisfaction? Dr. Kano's Theory of Attractive Quality provides an explanation.

DEFINING THE THEORY OF ATTRACTIVE QUALITY

A graphical presentation of the Kano Theory of Attractive Quality is constructed with two axes that define three relationships in the ability of customers to identify their requirements for a product's features (see Figure 2.1 for a graphical depiction of these axes and relationships).

One axis describes the range of customer satisfaction/dissatisfaction and the other describes the physical fulfillment/nonfulfillment of the requirement (or, as I interpret it, the excellence level in execution of the design features as measured from complete fulfillment to nonfulfillment). A useful definition of customer satisfaction is the degree that customers appreciate the product or service offering, are willing to recommend it to others, and follow-up with a purchase at the next point where they require a similar product. A definition of physical fulfillment (execution excellence) is the degree to which the design of the product or service is able to perform its function relative to the capabilities of the competing products

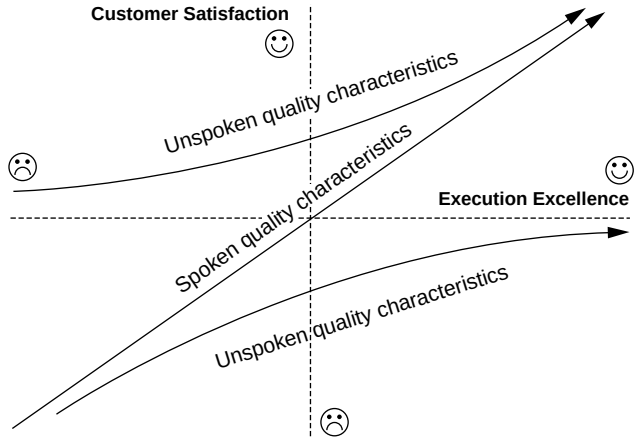


Figure 2.1 The Kano Theory of Attactive Quality.

or industry standards. The better the design, the more enhanced the relative position of the product or service as a choice option for customers. Execution excellence provides a head-to-head comparison of product differentiation as compared to competing market choices of customers.

The experience of customers in defining the features and product capabilities that they require may be characterized using three different curves. The first curve represents an openly stated or explicit purchase requirement (this is what Dr. Kano calls the "spoken" requirement for product features or quality characteristics, such as may be found in a request for quotation or proposal). In addition to this explicit description of the needs by customers, Dr. Kano identified two other curves that represent different categories of "unspoken" customer quality requirements. The first relationship defines quality characteristics as "unspoken" because these requirements are so well known that they are assumed to be obvious by a knowledgeable consumer. In this case a product may be so well known and understood that people do not think explicitly about specific characteristics when defining the product. In the second relationship, quality requirements remain unspoken because consumers have not discovered them and they have no idea how this type of application can be delivered to increase the value of their work or personal productivity. It is unspoken because they may not even be aware of the potential for the existence of this feature or capability. The Kano Theory of Attractive Quality integrates these ideas into a definition

of quality that is able to explain fundamental relationships between consumer behaviors and product design. In the next sections, each of these three relationships is described in more detail.

SPOKEN QUALITY AND COMPETITIVE PERFORMANCE

The better a product is designed, the more likely it is to achieve higher satisfaction of its intended customers. In addition, the more poorly executed product (or service) designs are most likely to dissatisfy customers. This relationship holds true for each of the features included in the criteria used for decision making by customers.

The basic competitive principle is that leading results wins the consumer's choice. Winning in this case means that the relative score on the customer's stated preferences is the highest for the set of procurement criteria. Products that are represented by the middle curve have one common characteristic: the customer is able to define their purchase criteria for evaluating the differences that exist among the competitive offerings. A "spoken need" typically is a set of procurement decision criteria which, when most fully delivered (for example, the "best" degree of execution excellence for a particular design feature) results in highest customer satisfaction, and therefore also wins a sale for the company that has created this product formulation. This middle curve represents the traditional definition of a competitive market as described by Michael Porter.[5,6] In Porter's view, a company must differentiate itself either through cost leadership or product differentiation. When focused on a particular marketplace, the relative merits of competing products may be judged—much as *Consumer Reports* evaluates alternatives among competing commodities to recommend their buyer's choice or "best of breed" in the Darwinian sense of survival, where only the "fittest" survive the tests of time.

An example of spoken quality characteristics that everyone should be able to relate to is the choice of an automobile. When shopping for a vehicle everyone has their own particular "wants" or "musts" that need to be satisfied. We may make a list of the things that are required in the car for our family or personal use. When we examine this list we may observe such characteristics as fuel economy, number of passengers seated, color, music system, and type of transmission.

However, this curve does not provide a complete description of competitive conditions. There are two other curves that need to be considered in order to understand the complete relationship between customer satisfaction and product design.

UNSPOKEN QUALITY: SURPASSING STANDARDS

Those features that are so closely related to the basic product concept that they are not perceived to be in any way distinct from the operation of the product as a whole are core product features. These features define a product but do not differentiate its performance against competitors.

Products that are on the second curve have *assumed quality characteristics.* In other words, customers do not speak about their most basic requirements for product performance and "assume" that each of these product design fundamentals are understood by all of the most serious bidders for their business. Kano calls this behavior *unspoken quality* because the customers do not state these requirements explicitly, nor are they considered in the set of purchase criteria used to evaluate alternative offerings. The customer actually only considers these factors in their absence.The most interesting observation about this "standard" level of product performance is that no matter how well these product features are designed, they will never provide a "competitive" level of satisfaction for customers. These features deliver only a threshold of satisfaction. The performance on these factors must be above a certain minimal level, but incremental performance beyond that level does not enhance customer perception. Since these sets of product features are not satisfaction drivers, this implies that products whose features are dominated by this category of feature are able only to compete on "price." In this market condition, the company with the lowest cost of operations can win the dominant market position.

To illustrate the concept of this lower level of unspoken quality, let us reconsider the purchase of a car. In making the list of characteristics that are desirable, we failed to consider the following: the car starts, goes, turns, and stops. But, you say, every car does this. Precisely! We have so defined a car that we no longer speak of these fundamental characteristics explicitly—they are tacitly understood, that is, unspoken characteristics. They don't contribute to our satisfaction with the product precisely because we don't think about them. But, consider what happens when they do not perform with excellence. We become absolutely livid with dissatisfaction! Products that have a significant standard feature that can "go wrong" are in jeopardy from neglect in their design. It is essential to safeguard standard features from poor performance, lest their poor performance overwhelm the competitive advantage gained by those design characteristics that lead to an initial purchase decision. Since these standard product characteristics are not usually included in an initial purchasing decision, the only result they can have is to alienate consumers when they fail.

In the 1970s and 1980s, a study conducted by the Strategic Planning Institute called the Profit Impact of Market Strategy (PIMS) identified that customer-perceived quality is much more a significant factor in profitability than originally thought.[7] In dealing with this lower level of unspoken quality, it is important to emphasize that customer perception is reality. If your customers believe there is a problem or flaw in your product or service offering, then that is the reality, whether or not the product conforms to an internal specification. The root cause of this problem may be that the specification does not reflect the reality of the customer's desires. Remember the golden rule: those who have the gold make the rules—and in business the customer's gold weighs very heavily!

UNSPOKEN QUALITY: ATTRACTIVE QUALITY

In the relationship of unspoken quality, performance excellence results from delivering innovation in product design that unexpectedly delights consumers.

The job of a design engineer (or "imagineer" as they are called by Disney) is to find "unknown future requirements" of their customers and imaginatively apply advanced technology to create a satisfaction advantage that distinguishes the product (or service) as truly unique in its competitive market. This product development strategy can establish a new product as "prime mover" or "first-in-class," with all of the advantages that being first in time-to-market entails.

Distinctive products capture the imagination of customers. If a product's features are so unique that it virtually has no competition, then it has created a dominating competitive niche. Note that this will occur whenever the unique features are highly desirable for customer-valued product (or service) applications. When customers both "perceive" and "believe" in the value of a feature, then a distinction is created that drives buying behavior in the market.

It is important to note that features in this category do not have competition. They represent the "thought leaders" who have established a new frontier in the product arena. This means that there is a desire to possess the uniqueness for many early adopters of technology who will cope with any design problems in order to have the opportunity to find a new way to gain new knowledge using this unique feature.

There is a downside to this type of unspoken quality. Due to its appealing nature, it attracts the creative imitation of competitors. Perhaps an

example will help to illustrate this downside. In purchasing a car, many buyers consider the product and its features to be a commodity at worst and at best requiring only a cursory competitive product analysis to determine what purchase to make. When these types of market conditions prevail, then products have lost any distinction in characteristics. Customers then tend to rely more on brand perception than product analysis to make their purchase decision. Brand perception is driven by the history of the customer with a particular make of product rather than creating perceptions about a specific product model. If a competitor does not have a strong brand image and products are not particularly differentiated, then the company must build an extended product (bundling service features with the product) to create a differentiated market offering. This is why companies are offering zero percent financing charges for new car loans. The customer expects to pay interest on their loan. Eliminating interest fees produces an "unexpected customer delight" by meeting an unspoken request not to "waste money" on interest paid to banks.

THE NATURAL FORCE OF ENTROPY INTRODUCES A DYNAMIC SHIFT

There is a natural progression in the distribution of innovative product features. While a feature is innovative it will lead to product "leadership" in the market; however, it will fall to the "competitive" performance level as competitors see its value and imitate its capability. Over the long term, such a feature may eventually become a "basic" feature of the product as customers expect that all viable products have this capability.

This natural transition of innovative product features leads customers to anticipate certain trends in the path of "feature migration," which each competitor must learn to observe as a marketplace expectation. It is also true that customers expect that each new product will be equal to or surpass the prior generation's capability. This is particularly true for product quality.

Perhaps a little perspective on automotive history will help to illustrate how entropy influences the viability of a product design. In the mid-1950s—an era of cheap gasoline, rising customer expectations, and expanding automotive engineering know-how—the first inkling of the concept of a "muscle car" was born and Americans fell head-over-heels in love with this raw form of "controllable" power. The muscle car provided a high-horsepower, high-torque V-8 engine that showed great distain for such mundane economic considerations as the price of its gasoline or the interval between required service appointments to keep the engine purring. The key feature became the ability of the car to "excite" the customer on acceleration. Unexciting acceleration

was for the older generation. Engineers pushed the limits of physics to deliver the thrill of raw power to consumers—until they ran out of engineering options and this sense of raw power became an expected feature in all vehicles, including the economy class, which accelerates much faster than the family cars of the 1950s. The ability to go fast was transitioned into an expectation of society by the innovation of engineering.

INNOVATION EVENTUALLY DECAYS INTO MEDIOCRITY

When products are unable to be truly differentiated based on innovation and competitive feature design, then those features that were once innovative or competitive become assumed as part of the standard feature set of product. This relegates these once "differentiating qualities" to the realm of the commodity. The time that it takes for features to make this transition (from the "leadership" level to "basic" performance) is a function of the product's viable market life and the endurance of the innovative "technology," which changes with the commercial attractiveness of the technology.

It is important to note that these three relationships are not independent, but over time "exciting" features will migrate into "competitive" features as competitors and the purchasers understand their value. Likewise, "competitive" features will become "standard" as the market accepts their routine benefit and associates these features with the basic product concept (for example, the ability to steer a car is not a competitive benefit, but it's absence is much more notable). The law of entropy applies and all features degrade in "competitive significance" over time.

The net effect of gravity is to lose competitive product positioning (and any market advantage), therefore it is important for a company to continuously refresh its products in order to keep them from becoming commodities and to assure that they are perceived as "innovative." This product recreating cycle is the driver for introduction of a product line's continuous flow of new product concepts, each in its own way extending the customer capability in a way that directly improves perceived performance in the customer's application environment. The customer must perceive "value" in order to maintain an edge.

In a practical application of this theory of attractive quality, design engineers may assign the set of product features under consideration a descriptive characteristic using the Kano model to help identify what to focus upon for integration into the product concept. Individual product features can be characterized using this set of curves (for example, each feature is ranked "exciting" or "standard" or "competitive") and thereby assist the

design team to set design parameters for the feature in order to align the customer's requirement with their design objectives.

What product development strategy should a company take in order to overcome this application of the law of entropy? In the late 1980s, Hewlett-Packard made the choice to pursue IU^2N (John Doyle, then a Hewlett-Packard corporate senior vice president, defined IU^2N as "an imaginative understanding of user needs"). Following this strategy, engineers should apply their talents to the creative application of technology in the interpretation and realization of the unstated needs of their targeted customers. How does this work? A case study of the Ford Taurus will illustrate how product design engineering can apply Kano's theory.

INTERPRETING THE THEORY OF ATTRACTIVE QUALITY: FORD TAURUS

Much has been written about the customer value proposition that was embedded into the Ford Taurus during its design process.[8] Ford benchmarked the entire spectrum of its competitors and identified "best practices" in design features in order to establish competitive targets for the design of its new product. The result: *Motor Trend Magazine* voted the Ford Taurus as "Car of the Year" for 1986—and their headlines noted the attention paid to its details: "It even has a coffee cup holder!"

Taking the example of the coffee cup holder as an innovative feature with attractive quality, let's consider how the Kano theory has worked out in the real world. The design of the coffee cup holder for the 1986 Taurus was accomplished in the Dearborn engineering facilities of Ford. As a working model of a coffee cup, the engineers used a "standard" 8-ounce Styrofoam cup that is used by many commercial food institutions. The problem with the design is that people do not drink out of these cups at home and half of most daily automobile trips begin at home where the driver is most likely to want a cup of coffee on the way to work. Given this usage model, the first coffee cup design can be seen as faulted, even though it was innovative and worthy of honorable mention as an automotive feature. Upon seeing this design weakness, competitors quickly sought to create more "humanized" designs: increasing the size of the cup, adapting the holder for juice boxes in addition to cups, designing the cup holder for mugs as well as glasses, and so on.

This "war of the coffee cup holder" was eventually won by Lexus in their "relentless pursuit of excellence" in the design of the coffee cup holder: walnut paneling, hydraulic activation, and positive mechanical locking, combined with a soft rubber holder that would adapt to any cup that was

placed in it! All this design excellence was delivered at a manufacturing cost over $100, compared to the initial Ford Taurus $20 cost and the cost of an aftermarket coffee cup holder around $2! This illustrates the competitive battle for differentiation that is found in the price–performance trade-off of the spoken quality curve—now that the automobile manufacturers have come to understand that one of the key purposes of an automobile is to safely transport coffee! However, the battle also raised consumer expectations.

A friend of mine once told me that he had not realized how dependent he was on the coffee cup holder until his first child was born. He decided to get a new car and have his wife drive his safe Volvo. Upon looking at new cars his only requirement was economy—until he discovered that an economic car did not necessarily include a coffee cup holder. This discovery increased his purchase price by almost $2,000—this is the cost of an emotional decision! His choice was made based upon an emotional response to the failure to receive an expected product feature and is typical of consumer behavioral response when a "standard" feature is not adequately delivered.

Consumers tend to react to products in a predictable manner that may be related to the Kano quality model. Most of us react whenever our "spoken and unspoken" quality requirements are not fully met by a product or service! We move from the creative mind-set that is engaged by the "attractive" quality curve to the rational mind-set of the "competitive" quality curve to the emotional mind-set that takes over our behavior when confronted with dissatisfiers on the "standard" quality curve.

CONCEPT OF TECHNOLOGY HALF-LIFE

Intellectual property is inherently perishable. This is the implicit nature of product design. Just as a radioactive isotope has a half-life function—the period of time over which half of its level of radioactivity decays—so technological innovation also has a decay function that results in the loss of competitiveness for specific design features. It is essential for companies to anticipate the transition of technology and its impact on both product and production technologies. Technology half-life is a measure of the time it takes for the turnover in an organization's fundamental area of technology application. (For example, it indicates the half-life of change for turnover in technology—for instance, in the electronics industry Moore's Law indicates the rate of turnover of technology for computer memory devices. Half the duration of the current cycle for the transition in one cycle of Moore's Law as applied to the semiconductor industry would equate to the technology half-life for these innovations.)

This technology half-life determines the minimum frequency for strategic business scanning of an organization's technology environment to look for changes in the critical technology assumptions of their business model. This frequency assures that an organization will not miss detection of a strategic change in technology direction, but it also allows product development reaction time to counter the moves of competitors. This observation provides a fundamental reason for using the idea of a stretch goal for an organization. Why set a stretch goal for an organization? It is not because anyone believes that the goal is "correct" or even "achievable." One reason for a stretch goal is to establish the frequency with which an organization evaluates its design performance to determine what technology focus areas require management attention for strategic change. This analysis will also help to establish priorities for investment in research compared with alternative investments in marketing or capital equipment.

TECHNOLOGY TRANSITION AND THE SPEED OF COMPETITION

The key question for any company is: What is the speed of transition for innovative concepts to become competitive concepts and then to move on down to the basic product concept level? It is the time that it takes an industry to accept a technology and for that technology to become "ubiquitous" within that industry. This is an observable and measurable time. Once this factor, or capacity to change, is known, then an innovative company must adjust its planning horizon to assure that its strategic thinking stays ahead of industry trends. The industry's planning horizon—the period used to encourage the "creative destruction" of it's product line—should be set so that the "half-life" of its technology base (half of the industry's transition time from one generation of technology to the next) approximates the strategic planning horizon. This implies that in some industries, strategic product planning should become a continuous event!

Since innovation represents the "creative destruction" of the familiar or "current" in order to make way for distinctive product advances or differences in applications, understanding the rate of technological change for the fundamental technologies that drive an industry's product and production capabilities is a most significant component in designing the proper strategy for continuing competitiveness and sustained profitability. What is the relationship between the degree of product innovation and customer perception of quality performance in a product? Do the more highly innovative products get away with higher failure rates?

INNOVATION DILUTES QUALITY CONCERNS

Customers really do care about innovation, but while they purchase "features" they also buy the quality of the total market offering (a bundled product and its related services). However, in the final analysis it is the quality of the products and services that determines the level of customer loyalty and commitment to a particular brand or company. In essence, customers buy quality.

Customers do not desire failure. While a customer never excuses catastrophic product failure, products at the "bleeding edge" of technology will typically enjoy a high degree of customer forgiveness for relatively minor quality issues or bugs. This occurs because "early technology adopters" have become conditioned to accept that they must "pay a price" for being the first to apply a new technology. Generally they believe that they will obtain a competitive advantage by learning how to use a newly emerging technology and that this advantage will far outweigh any disadvantage that is suffered from lack of product maturity. However, there are two related concerns that these customers share. First, they do not want to feel that they are being systematically taken advantage of by serving as a Beta test site for all new product releases. Second, they expect that problems reported with the product will be rapidly corrected and their operations or application of the product will not be interrupted as a result of any product-related problems. In this competitive environment there are two basic quality rules for new product introduction:

1. Companies must be exceptionally responsive to all reported customer issues reported in the early months after initial product release. Companies must investigate each voiced concern and, recognizing that many customers remain silent, must have a proactive way to reach out and discover any latent consumer issues that are not reported.

2. As a design rule, product performance should be subject to continuous improvement of its quality—each product generation must not repeat any previously discovered problems and must perform at a higher level of reliability.

The conclusion is clear: while there is a relatively high degree of tolerance for quality problems with "innovative" products, there is no tolerance for quality problems in commodity products. As a corollary to this conclusion, consumer confidence is undermined whenever a company has

a prolonged trend of releasing new products that have problems into the market. They are treating their customers as if they were part of the product development and testing process and waiting for the customer to detect the problem. Customers want value in the products and services that they purchase and consistently delivering a promise that is perceived to be valuable is a critical aspect of competitiveness. How should a company create its customer value proposition?

SURVEYING APPROACHES TO VALUE PROPOSITIONS AND COMPETITIVENESS

A company's value proposition contains two elements. The first is the explicit promise of value that is given to customers. The second element of a value proposition is a combination of actions that are taken internally to deliver a "consistent way of working" that delivers this proposition of value in a way that reflects constancy of purpose in the organization's fulfillment of its promises.

Both of these elements of a value proposition—its goal (the promise) and its delivery process (internal way of working)—have been investigated over the past decade. Looking at these studies, it is clear that a consistent theme emerges as a synthesis supporting these two elements.

In *Built to Last,* companies that were able to sustain performance over time were called *visionary companies* and they were recognized as the "crown jewels" in their industry.[9] Porras and Collins observed that these companies followed a dualistic path to achieve success: they preserved their core values while at the same time acting innovatively to stimulate progress. Core ideology is the focal point—a blending of guiding principles; the belief structure of the firm; and business purpose, the vision or direction that determines why the firm exists. The type of value proposition that is put forward by Porras and Collins is the values around the way of working as a group that create the sustainable corporate engine allowing the company to clearly focus on delivering its customer proposition over the long haul.

A second aspect of the value proposition describes what the firm actually does and extends on the belief system by choosing a specific value proposition as a market discipline and way to deliver enduring customer value. In *The Discipline of Market Leaders,* Treacy and Wiersema describe three aspects of delivering value to customers.[10] The first aspect is a company's value proposition: the promise that it makes to customers to deliver a certain combination of service, convenience, price, quality, selection, and so on. The second aspect of value is the operating model that defines precisely how value is transferred to customers: the set of business processes, cultural norms, operating systems, and functional competence that creates

the ability to deliver on the value proposition. The third aspect is the value discipline of an organization. A *value discipline* describes the way in which companies combine the features of their operating model for the delivery of their value proposition in order to be the best in their chosen market. Treacy and Wiersema identify three different value disciplines that create different types of customer value. They further state that in order to achieve the "lasting excellence" (such as described by Porras and Collins) and achieve business leadership through sustained growth, a company must make an explicit choice to demonstrate consistent excellence in one of the following competence areas: innovative products, marketing leadership, and operational excellence. What are the three market disciplines they describe?

The first is *product leadership*—concentrate on offering innovative products that continually push the known performance boundaries. The value proposition for customers is that these products will be the best product in the market from the aspect of innovative features and capabilities. The second value proposition is *customer intimacy*—focus not on delivering what a generic market wants but what a specifically targeted customer wants. Customer-intimate companies do not pursue every market opportunity or individual business transactions; they cultivate long-term relationships that deliver value through a continuing relationship that becomes more and more seamless between a customer's need and the company's product and service support. The third market discipline that delivers value to customers is *operational excellence*—focus on delivering capable, but "middle-of-the-market" products and services at the best possible market price and with the least possible inconvenience. The value proposition of companies pursuing this market discipline is delivering both low price and hassle-free service.

A company's choice of value discipline resulting in market leadership represents a distinct and strategic choice by its leadership team. According to Treacy and Wiersema, these three choices are exclusive—a company can only excel in one market discipline and this discipline defines what a company does at its core, framing its subsequent strategic plans and operating methods.

In *Lean Thinking,* Womack and Jones focus companies on the methods by which they create value for their customers.[11] When companies focus on existing organizational structure and outdated value propositions, then managers create waste and the economic strength of the firm falters. Lean thinking focuses upon value-creating activities for the product or service—the value stream that flows smoothly based on a pull of customer demand through the company's processes for delivering that demand and providing the highest satisfaction of customer requirements.

How does a company make such a strategic choice as to what discipline it should pursue and how it translates that choice into internal activities that

drive market results? John Kay defines an approach for adding value and identifies four ingredients as value drivers: product innovation, reputation (brand), strategic assets (factors that create a market barrier to entry for other potential competitors), and architecture (relationships with employees, suppliers, and customers).[12] The focus on value comes from a strictly financial perspective. Kay defines value as a comprehensive financial difference between the value of goods and services produced and the cost of their production. This value definition can serve as both a motivator and an appropriate measure of achievement. Creation of value permits a company to determine how to share the value produced among the organization's stakeholders (customers, shareholders, and employees). Kay describes the outcome of success as a product of these four value ingredients. Success comes when managers act on their company's specific capabilities and advantages and make appropriate changes that move it in the direction of becoming a consistent value producer. What is the best way to effect such designed change?

Rosabeth Moss Kanter describes such a value production process as a "crystallization" of new action possibilities (new policies, new behaviors, new patterns, new methodologies, new products, or new market ideas) based on "reconceptualized" patterns in the organization. The architecture of change involves the construction of new patterns, or the reformulation of old ones, to make new, and hopefully more productive, actions possible.[13] Kanter believes that in order to make change happen, it is important to be aware of the foundations of the organization. The innovative building blocks of change must be laid on chosen departures from the foundation of tradition in order for change to reach the point of institutionalization (full integration across the organization into the approach taken for its routine ways of working). Productive change is able to take an organization to a new level of performance in its delivery of value to customers and thereby more fully secure its place in a competitive market. Kanter's approach provides an operational definition for implementing Schumpeter's innovation through "creative destruction."

LINKING VALUE DISCIPLINES TO THE THEORY OF ATTRACTIVE QUALITY

How does this digression into value disciplines of a company relate to the Kano Theory of Attractive Quality? Consider overlaying a Johari window structure used for describing individual competence over the axes of the Kano model. This structure (see Figure 2.2) creates four distinct quadrants which may be envisioned as strategic approaches to value delivery. In each of these four quadrants a different competitive focus is required of an organization. In

Figure 2.2 Value propositions and competitive positioning.

the upper left quadrant, a company focuses on the value discipline of product leadership—consistently giving value to customers through technology exploitation and innovation. In the upper right quadrant, a company delivers the value discipline of customer intimacy—consistently beating competitors by its knowledge of customer desires and its ability to deliver them at a higher quality (measured by a price–performance indicator) than can its competitors (in a Darwinian "only the strong survive" approach to business). In the bottom right quadrant, a company delivers the value discipline of operational excellence by being the cost leader so it can compete on price and reliability of its products. The bottom left quadrant is simply not a competitive place to remain. A business in this quadrant is on its way to bankruptcy!

Many people have treated the Kano model as a static model of the customer dynamic, just as the Treacy-Wiersema value disciplines model has been treated as static. However, in the real world environment of business, both of these models are dynamic and change as a function of the transformation in product lifecycle within a specific product category. The technology half-life of a product allows an organization to calculate an anticipated "duration" for specific product features. This calculation also establishes a market transformation cycle time. In other words, it establishes the "beat" of the market in terms of the willingness of its customers to accept all the new technology—an estimate of the technology diffusion susceptibility of a market. The speed of change becomes a distinguishing characteristic in leading companies. Companies must not only welcome change, they should actively seek change to stimulate progress in all dimensions of performance.

Companies that enjoy sustained success must discover within themselves the ability to reinvent their greatness. The Kano Theory of Attractive

Quality provides an important insight into the set of actions that such a company must consider. If a company makes a mistake in the bottom two curves of the Kano model, then no matter how much innovation is in a product or how extensive the capability to design exciting products and features, it simply does *not* matter. Mistakes on these bottom curves invoke a response that is very similar to the Hierarchy of Needs identified by Abraham Maslow—survival needs, such as security or safety, will always overwhelm the need for personal development or self-actualization.

In today's dynamic markets with rapid innovations in technology, companies are finding that a highly capable product creation strategy must be matched with marketing agility to continuously position it as a superior offering based on an in-depth and intimate knowledge of customer needs issues and concerns. Not only must the positioning be superior to competitors, but it must be clear from the viewpoint of the customer's own value system that superior value is also being delivered. Following the creation of the value proposition and the promotion of this value proposition, selling it to customers, a company must be able to consistently produce reliable results and demonstrate their operational excellence to deliver the value proposition in a flawless manner to customers. How can this example be seen in a competitive world? Let's reconsider what happened to the Ford Taurus.

RETURNING TO THE FORD TAURUS EXAMPLE

What is the rest of the story about the Ford Taurus? While the Ford Taurus was one of the most creative new product concepts in automotive history, it had reliability problems in it's drive train, which causes history to judge this product (which made an initial splash as the "Car of the Year") as a Blue Book "lemon" rather than a market "leader." Reliability is defined as quality performance over a long period of time—or *sustained performance excellence.* Whenever a basic quality level is not delivered, this experience will wipe out the reputation gained from innovative features or better competitive positioning.

PRODUCT LIFECYCLE INTRODUCES A DYNAMIC FUNCTION

Since a company consists of several product lines with many different products, it is difficult to extrapolate from the Kano model to corporate strategy. The reason for this difficulty is that the company actually has an

entire portfolio of products, each of which is at a different moment in its product lifecycle. When products are first released, they may fall into the innovative domain of product leadership. As competition recognizes the value acceptance by customers they will seek to replicate the same capability. As competition increases and the customers begin to rely on this capability, then it will transition into the expected or "must be" quality category that is found in a commodity view of the product's capability.

The speed of this transformation from innovation to commodity feature is characteristic of each particular industry. In the cellular phone or laptop computer businesses, this cycle time is now measured in months (using single digits!). The implication of this observation is that a company must be able to simultaneously produce all three value disciplines if it wants to remain a market leader over the long haul.

Competitive excellence is achieved when a company is able to constantly recreate high levels of "exciting quality" while paying attention to the foundations of both product reliability and the design of product functions or features which correctly anticipate the *true* needs of its customers.

While Treacy and Wiersema believe that a company must choose only one market discipline in which to excel, their proposition must be challenged in the circumstance where the speed of the product lifecycle turnover is so rapid that the business model never rests in equilibrium. High-technology telecommunications firms such as Nokia, which must learn to thrive in a business environment where innovations are introduced quarterly into their business, cannot maintain a single, stagnant value discipline. Under pressure for a constant stream of new products, it is essential that these companies manage their entire product portfolio to balance out innovation with customer intimacy. This leads to a significant understanding of the buying behaviors of the leading adopters of new technology, and at the same time demands fault-free (Six Sigma level) quality because there will be no time to correct deficiencies in a product once it has been introduced. The customer expectation for flawless execution of the value proposition that they "buy into" has its own internal problems. What is the distinction between flawless execution and perfection in the way work is done? Consider the question that we are continually confronted with: Is perfection too much to hope for in human activities?

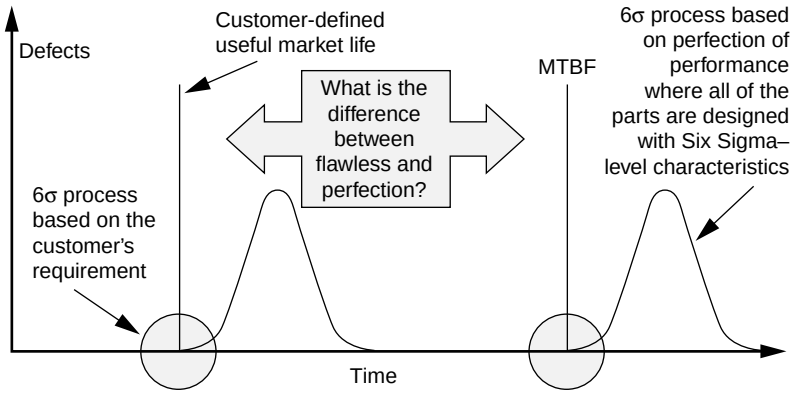
FLAWLESS EXECUTION AND PERFECTION

Perhaps an example is the best way to explain the distinction between these two concepts. Consider the Motorola "Bandit" pocket pager. This product

was designed to deliver Six Sigma as an absolute performance target—essentially no defect in any of the product design features. The outcome of the effort of the Motorola engineers was a product that had a mean time between failures (or MTBF, a statistic that describes the average point of expected failure—half of the failures will occur before this time and half afterward) over 150 years! Motorola cites this performance as a phenomenal indicator of customer satisfaction, when in reality it indicates a lack of knowledge of the customer's perspective. How long does a customer want to use a "disposable" pocket pager? What is the useful product life? Is this level of perfection really the desired goal? Most people would be quite pleased if the performance of their pager provided complete reception and also reliable messages during a two-year useful life.

What was the problem in the Motorola approach to defining this critical performance characteristic? Lack of customer perspective! And this lack cost Motorola dearly, as Nokia beat them to the market on digital cellular technology, causing a fall in Motorola performance—all because Motorola defined flawless design execution as perfection in an engineering sense, rather than a customer-oriented sense. The difference is a loss of time to market. Notice how this distinction impacts competitiveness in Figure 2.3.

Consider the Motorola "Bandit" pocket pager. This product was designed to deliver Six Sigma as an absolute performance target. The outcome is a product with the mean time between failures (MTBF) over 150 years! What is the useful product life? Is perfection really the desired goal?



Which process costs more? Which process delivers more customer value?

Figure 2.3 Flawless executive and perfection.

While Motorola's engineers slaved to minimize the risk for every potential defect that could occur out to a 150 year MTBF, it left itself vulnerable to a swift-moving competitor that delivered exactly to the market expectation for useful life. In this case, too much quality can cost dearly in total business terms.

On the other hand, the approach identified for flawless execution delivers Six Sigma performance relative to the customer's expectation. This means that companies must understand the requirement of their customer for the useful life of their product as well as the features— spoken (essential) and unspoken (differentiating)—that they desire it to have sustained during this performance period. These observations lead to the next discovery in the extension of the Kano model: in this dynamic environment, there is a different concept for delivering quality to customers.

QUALITY IN THE VALUE PROPOSITION

Customers can experience quality gaps that originate from two distinct causes: one is related to the misunderstanding of the design requirement, while the second is a function of the execution of the design requirement as it is delivered to the market. The design gap exists between what the customer requires and what the customer is promised. The conformity gap exists between what the customer is promised and what is delivered. These two gaps are illustrated in Figure 2.4, which depicts a simple process for defining products and delivering products. The first gap comes from design shortfalls and is a gap in "expectations," because the promise that is offered to the customer does not meet the inherent opportunity to satisfy the customer's base requirements. The second gap may be considered a gap in "entitlement," as the customer is not receiving a level of performance that they are entitled to receive based upon their reliance on the market proposition embedded within the product offering (the promise from the advertising or specification).

The *design gap* represents a problem in the value proposition delivered to the market by a company's business model. There are two aspects to the value proposition of an organization—one is the market dimension of delivering value to customers, while the other is the concept of values as a way of working within an organization. The design gap indicates that there is a lack of appreciation for the outcome desired by customers—the delivery of value. The conformity gap identifies a problem in the values-based proposition—the way an organization works to achieve a stated goal for quality of delivery. Value entitlement is the expectation that customers have for performance excellence in both of these dimensions of the quality delivery equation.

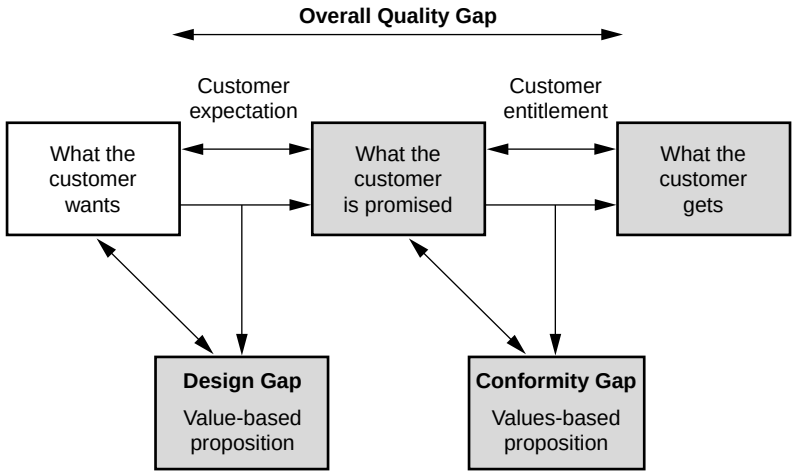


Figure 2.4 How is a quality shortfall created?

In order to determine how much impact closing these gaps can have on an organization, it is essential to measure the performance gap. One measure of this type of performance is the process capability (C_p) index, which measures the width of a customer requirement specification (their tolerance for variation around a nominal performance level) to a measure of process variation using six standard deviations of the process variation. This statistic indicates how well a process has been designed and is a reasonable indicator of the performance that is anticipated in an initial capital investment in a process. Of course, C_p represents the best that a process can achieve in terms of its performance. A process does not operate at this level—variation happens and the process operates at a lower level than is measured using the related performance index C_{pk} to account for variation from the designed performance level.

For the purpose of this discussion, it is sufficient to recognize that C_p indices estimate the optimum return on capital investment for a process. The process is purchased based on a requirement and the requirement establishes the "expected value" of process performance. If the process is operating at its designed target level of performance and under its design conditions for variation, then C_p will be achieved. When the process is operating at less than its C_p level, then the performance metric return on capital employed will demonstrate the loss due to this "off-centered" condition. If C_{pk} is improved to the design C_p, then return on capital employed is maximized.

A significant observation about the process capability index is that it links together the voice of the customer (customer requirement) and the voice of the process (variation inherent in the process design). The difference between the "idealized" or process potential of C_p and the "real world" or process performance of C_{pk} provides an estimate of the gap in performance that must be closed to optimize the value proposition for a product or process. This gap is a measure of improvement to achieve "flawless execution" in a work process given a fixed level of capital investment. What would be the effect of decreasing this gap between C_p and C_{pk} while at the same time increasing the overall level of performance?

INFLUENCE OF QUALITY PERFORMANCE

Flawless execution can be measured using sigma (standard deviation or its probabilistic expression using the normal statistics Z-distribution) as an indicator of performance. There is always some performance shift from the ideal condition for which a process has been designed (C_p) as it is executed over time (note that there is an equivalence between C_p and sigma: when C_p is multiplied by three then the result is the design sigma level of the process). Also, short-term observations of process performance have less opportunity for performance variation to occur than do long-term observations. In the mathematics of Six Sigma, this effect is noted heuristically as a 1.5 sigma shift between the short-term and long-term distributions. The same type of difference can be observed when evaluating components of variation estimated using samples (sometimes noted as Zst for the short-term normal probability calculation used to obtain a sigma value). In the terms of ANOVA (analysis of variance), this is the same component of variation as "within" sample variation—an average of the variation within the samples. However, there is a second component of variation that must be considered: the shift between means that occurs across the samples. This component of variation is the "between" samples variation that represents long-term process drift (and this is calculated using Zlt for the long-term component of variation). The difference between short-term and long-term variation indicates the combined or total effect of variation on a process. While "1.5 sigma" is used as a rule of thumb, the exact gap may be calculated based on these differences of the "within" and "between" components of variation.

The impact of this distinction between short-term and long-term effects of variation is lost as a business improves its performance beyond the current 3–4 sigma levels that represent today's most common performance targets.

As one evaluates the sigma offset as a function of the short-term process performance when short-term process approaches Six Sigma, then the absolute level of the sigma shift has less of an impact on process performance, and the correction between short-term and long-term performance becomes diminished in value. In Figure 2.5, the absolute impact of a process shift can be observed to decrease significantly as its process performance level improves.

This discovery is critical when it comes to understanding the significance of the pursuit of flawless execution by management. It is only processes that are performing at industry "average" (in the three to four sigma range) that are impacted most heavily by process shift and drift. Any of the high-performing processes are much more robust across an entire range of shift and drift as the absolute effect of these conditions decreases with increasing process quality. Thus, higher process quality has an effect that is observed as a "predictable outcome" of a robust process by customers. Such predictable outcomes lead to exceptional customer experiences as a result of robust process performance and sustainable business performance.

Sigma Offset	Sigma Short-Term (Zst) 3	3.5	4	4.5	5	5.5	6
0	1350	233	32	3.4	0.39	0.017	0.001
0.25	3000	665	88	11	1	0.1	0.0063
0.5	6200	1350	233	32	3.4	0.7	0.017
0.75	12,200	3000	665	88	11	1	0.1
1.0	22,800	6200	1350	233	32	3.4	0.39
1.25	40,100	12,200	3000	665	88	11	1
1.5	66,800	22,800	6200	1350	233	32	3.4
1.75	105,600	40,100	12,200	3000	665	88	11
2.0	158,700	66,800	22,800	6200	1350	233	32

Note how the impact of the shift (as measured in parts per million) decreases—as the process improves, the short term sigma (Zst) and long-term sigma (Zlt) converge.

Figure 2.5 Higher quality decreases sigma shift significance.

BRAND VALUE OR CUSTOMER LOYALTY?

The net effect of management's attention to the Kano Theory of Attractive Quality should not be an increase of customer satisfaction, but rather an increase in brand value. *Brand value* is achieved through the sustained delivery of "moments of customer satisfaction." Customer satisfaction focuses on individual events in the relationship with customers while brand value maintains an enduring relationship with customers despite temporary setbacks. A customer is most strongly influenced by the quality of the latest engagement that they have with a company in their relationship with it. Customer satisfaction is the perception of a level of performance by an individual that is then combined to provide a collective view of the market average viewpoint. Brands are different. A brand represents the effect of a company's sustained performance over time. Brand is the image that is imposed by the actions of a company upon its market. Brand has a unique point of origin that may be different from or aligned with the individual product concept perspectives. Brand is the enduring value of customer experience. When senior management pays attention to building strength in its customer dimensions, this strength must deliver two moments of success: the immediate moment of quality at the initial experience and the enduring moment of reliability as the experience is savored over time.

CONCLUDING COMMENTS

For a company to consistently win its daily battle for customers, it must compete in both gaining and keeping its customers. Sustained growth is not just a market- or revenue-centered goal; it is the essential ingredient in a recipe for overcoming entropy and the economic effect of inflation. If a company does not continue to grow it is not standing still, it is actually losing economic ground. Success will always require customers and particular knowledge of them that will deliver focus in everything the organization does. To obtain sustained success in business results, excellence must be expressly embedded in our customer's experience. Such activity must be directed at delivering the best value—flawless execution—to customers. Flawless execution requires organizations that deliver Six Sigma levels of performance.

Organizations don't compete for markets as a whole, they compete one customer at a time based on their ability to consistently fulfill their value proposition for quality performance. As Dr. W. Edwards Deming once said: "You don't have to do this . . . survival is not compulsory."

ENDNOTES

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2. Dr. Noriaki Kano of Tokyo Science University created and developed the Theory of Attractive Quality. In 1997, the Union of Japanese Scientists and Engineers (JUSE) awarded Dr. Kano the Deming Prize in recognition of the significant contribution of this theory to the body of quality knowledge. Special appreciation is given also to Glenn Mazur, translator of Dr. Kano's original Japanese manuscript and to Dr. Tito Conti and Dr. Yoshio Kondo, fellow academicians in the International Academy for Quality, for their thoughtful comments and critiques that have helped to improve this chapter.
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3

Persistent Leadership: A Key to Sustainable Quality

Gregory H. Watson

INTRODUCTION

Leadership is about moving ahead, gaining advantage—forward motion, winning a position. It most often is associated with a hierarchical organization structure where leaders are groomed at all levels: from executives who develop a grand business strategy across markets, technologies, and product lines, to shop floor supervisors who must lead their work group in tactical execution of their work processes to deliver specific tasks in the overall strategy. This analogy is especially true when it is applied to delivery of quality, where leadership at all levels, with appropriate focus on specific objectives, is required to win enduring competitive advantage for any organization. If an organization loses its momentum, stagnates, or becomes the victim of entropy, then it is not likely to sustain success over time. Only through conscientious effort can an organization grow and prosper over the long term. The obligation of leaders is to deliver long-term organizational strength in increments of short-term success.

COMPETITIVENESS AS THE DRIVER OF BUSINESS

All organizations compete: competition may be direct, indirect, latent, or virtual. With direct competition, there is a clear "head-to-head" marketplace confrontation between organizations. With indirect competition, the degree

of competitiveness is transparent to the market (for example, where an OEM supplier also sells directly to the market under their own unique brand, usually with a great deal less value [price] than the sales of the OEM). Latent competition occurs when there is another organization that has the requisite competence, technology, capability, and capital to move into your business, but has not chosen to do so (yet). Virtual competition is a type of competition that applies to not-for-profit and public sector organizations—while they have no specific group that competes directly, it is possible to evaluate one's organization against "close substitutes" or organizations that do similar things with a for-profit motive. Building relationships is always a matter of choice for customers, no matter what business or economic sector is considered. It is the nature of customers to choose among alternatives. Customers will choose the alternative market proposition that gives them the most value (maximizing the benefit received for the cost paid: Was the product or service worth what you paid for it? Was it worth more than other alternatives that could have been chosen?).

Competitiveness is "the degree to which a nation can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining or expanding the real income of its citizens." This definition was established in the late 1980s by the President's Council on Competitiveness, chaired by John A. Young, then the CEO of Hewlett-Packard. When taken from the macroeconomic environment of nations to the microeconomic environment of the firm, this definition says one clear thing: Markets rule and the customer is king when it comes to competitiveness.

What does it take for an organization to be a winning competitor? The first step is that leaders of the organization must have the vision and foresight to know what advantage must be gained; what vulnerabilities must be eliminated; what opportunities must be seized; and also what alliances or partnerships must be garnered in order to have the proper combination of competence, capability, and capacity that will give it a sustained edge over competitors. One operating definition of a company that is a world-class competitor is that it:

- "Knows its processes better than its competitors know their processes
- "Knows the industry competitors better than its competitors know them
- "Knows its customers better than its competitors know their customers
- "Responds more rapidly to customer behavior than do competitors

- "Uses employees more effectively than do competitors
- "Competes for market share on a customer-by-customer basis"[1]

Business leadership (sustained success) is achieved when an organization coordinates all of its activities to deliver quality above its competitors, costs below its competitors, and technology ahead of its competitors. Each of these must be appropriate for the business enterprise model that describes how the organization competes and delivers its goods or services to its customers.

Volunteerism As the Basis for Association

Building such an environment is the job of leadership. One of the most essential ingredients in this job is initially recognizing that organizations consist of volunteers: each can withdraw their support and choose a different relationship to pursue. But, if such defections happen, then the entire organization is placed at risk because a key ingredient in its recipe for success is weakened. Consider how "volunteerism" works in a free market environment:

- Employees are volunteers—they can take their competence, skills, and knowledge and move to another organization that provides them with a better value proposition.
- Customers are volunteers—they can take their business to another organization that provides them with better value for their investment.
- Shareholders are volunteers—they can invest in other opportunities that provide them with higher returns.
- Members of the management team are also volunteers—they can move to the helm of other organizations that appreciate their talents more.

In order for such a volunteer structure with fragmented "natural interests" to succeed, common ground must be established and a sense of loyalty created across all of these different "political" dimensions of an organization. There are some who do not have the opportunity to "volunteer" to associate with an organization due to inadequate skills or insufficient choices available. For these disenfranchised souls of the free market, choice is not an option and leaders have the unique test of their skills to convince these individuals that their choice, while not truly voluntary due to lack of options, is one that they can learn to not only appreciate but enjoy.

In any organizational or business setting, winning, or gaining an enduring competitive advantage, is about building sustained loyalty by

recognizing contributions of each of these organizational constituencies to the organization's shared success. Enduring organizational success is created by leaders who are dedicated to building consistently strong relationships in all these dimensions of participation.

WHAT IS LEADERSHIP?

What Is a Leader?

Leaders take their organization into the future and inspire their people to aspire to great goals. It is the essence of leaders that they live in the domain of the future, thinking ahead of the daily grasp of their people. Leaders must frame an organization's vision of its future place and then find a way to articulate their desired state so it becomes a shared purpose that forms a common bond among all organizational constituents so they not only embrace the vision but also commit themselves to drive it into reality and sustain it in the face of adversity. Leaders must concern themselves first and foremost with the fundamental purpose of their organization and discover new ways to clarify the actions required on a routine basis to continue the journey toward the desired direction. The validity of a leader's strategy is measured by the persistence of the organization's shared vision. Great leaders not only articulate a vision, but they also evoke a sense of excitement about their organization's significance to society that encourages people to commit their personal life energy to the organization, sharing in its vision and promoting its well-being because they sense that this will help to satisfy their own personal ambitions in life.

Leadership As Value Creation

What is the job of a leader? Well, unlike many positions, it does not come with a pre-issued job description. Leaders follow a general behavioral pattern that encourages others to follow their lead. But, how do you do that? The fundamental thing a business leader does is to manage business resources (finances, assets, and people) in a way that creates shareholder value (growth in stock price plus dividends) while, at the same time, creating lasting brand value (sustained value from the perspective of enduring customer relationships).

Shareholder value is created by a variety of business practices:

- Growing revenue through new product sales, business acquisitions, building market share, or increasing the scope of the product line

- Improving profit margins through improved pricing power due to market dominance, increasing the product differentiation advantage over the direct competitors, and operational excellence defined by defect elimination, cycle time improvement, and cost reduction
- Reducing the cost of capital by reducing capital intensity (fixed asset-to-sales ratio, days of inventory, and days of receivables), reducing the percentage cost of capital, and also by decreasing the debt/equity ratio

Brand value is really an expression of customer value that is sustained over time. Brand value is created by giving customers what they need to be successful in their business and by responding quickly to changing market conditions that are caused by new product opportunities or problems observed with the current product line.

While these are the business emphases of "leaders at the top" of an organization, this is not an exhaustive definition of what a leader must do. To deliver leadership over the long run, it is essential to encourage an organization to see things differently and to act upon that vision. Let's consider first how these leaders are developed in order to understand what makes a good leader.

Development of Leaders

Leadership is an experiential journey—a pathway for development, not an end in itself. No one really sets out to be a leader. People set out to live their lives, and when they express themselves in ways that produce value to others, they transform into leaders. It is by living that one becomes a leader, not by seeking leadership! All great leaders come forth out of experience—there is no unique self-promotional pathway that exclusively results in leadership or identifies an individual as a leader, nor is there a series of jobs that uniquely guarantees that a person will have what it takes to lead. What does it take to lead an organization and how do leaders learn what it takes?

Attributes of Great Leaders

Great leaders have the ability to inspire others to achieve more than they thought possible by building a bond around a common goal that is perceived as a worthwhile value by the whole team and a shared mission—a reason for existence—that gives energizing meaning to an organization. Some of the key things that successful leaders do include:

- Create a bold new vision of what the future can and should be.

- Design a strategy to realize this vision based on astute knowledge of:
  - Organizational factors
  - Environmental factors
  - Long-term interests of the stakeholders
- Energize the network of people who must deliver the vision:
  - Encourage committed people—inspire a personal endorsement and belief in the chosen strategic direction that is so strong that people "feel good" about committing their "life force" to fulfilling this shared vision.
  - Communicate the vision in symbols and words that are powerful enough to implement the strategy through the force of committed people.
- Maintain context sensitivity to emerging technology or business vulnerability that may require midstream steerage to achieve the vision.

This is the recipe for strategic leadership: identifying and choosing an organizational direction. But not everyone can build a collaborative environment for their business. Not every leader is a success. Not everyone who serves at the top of an organization can act as a leader. What is it that distinguishes between the great leader that people would follow anywhere and those leaders who we cannot remember? What are the attributes of really great leaders? The starting point is to recognize that the key distinguishing factor between the "two tails of this distribution" is the leader's ability to generate commitment in others. You cannot command commitment: you can only inspire it. We want leaders to articulate exciting possibilities.

When considering what has made some people into great leaders, there are a number of attributes that encourage achievement of success. These may be categorized into moral characteristics, communication skills, thinking skills, and personality traits:

- Moral characteristics:
  - Honest, trustworthy, and of high personal integrity
  - Ability to convey hope, will, purpose, and fidelity through action
  - Genuine care for others—authenticity and willingness to develop others

  - Competence and wisdom
- Communication skills:
  - Risk-taking—willingness to push oneself out of comfort zones
  - Humble self-reflection—assesses successes and failures (especially the latter)
  - Solicits opinions—aggressive collection of information and ideas from others
  - Careful listening—propensity to listen to others
  - Openness to new ideas—willingness to view life with an open mind
- Thinking skills:
  - Knowledge of a massive amount of relevant information
  - Moderately strong analytical ability
  - Ability to think strategically and multidimensionally
  - Good business judgment, competent in their work
- Personality traits:
  - Credible
  - Forward-looking
  - Achievement-motivated
  - Self-confident
  - Emotionally mature
- High energy level
- Inspiring

What Is Leadership?

Leadership happens when leaders lead. The domain of leaders is the future. The leader's unique legacy is the creation of a valued institution that will survive over time. Peter Drucker has commented: "The chief object of leadership is the creation of a human community held together by the work bond for a common purpose."[2]

Jack Welch is quoted as saying: "Good business leaders create a vision, articulate the vision, passionately own the vision, and relentlessly drive it to

completion."[3] Some of the activities of leaders include their work to: translate intention into reality and sustain it over time (applying the principle of constancy of purpose); concern themselves with the organization's basic purpose and to refine that purpose as the environment changes over time; induce clarity to their organization's vision so that the entire organization is able to understand the vision and identify with it; and arouse a sense of excitement about the significance of the organization's contribution to society.

Leaders learn to force choice into their organization. Leaders do not wait until things happen to them; they make things happen. What are some of the most important choices and activities of a leader?

- Values force the choice of "Why?"
- Vision forces the choice of "Where?"
- Competitive position forces the choice of "How?"
- Recruiting and selection force the choice of "Who?"

Learning to lead is really about learning to manage change. A leader facilitates a new vision or operating philosophy into reality for the organization and thereby creates its culture. The entire organization acts to execute their mission, and the culture takes on a life of its own, becoming more cause than effect. Unless a leader continues to evolve, adapt, and adjust to external change, the organization will sooner or later stall. One of a leader's principal gifts is his/her ability to learn from experiences and grow while serving in the role as leader.

Being a Leader versus Exhibiting Leadership

But, there is a difference between being a leader and exhibiting leadership. What does this mean? Consider the following common qualities that exist in many effective companies:

- Clarity in direction and purpose
- Consensus about the path forward and action plans
- Intensity about their core organizational values

These qualities do not just happen—they must be coaxed into existence by a leader. For instance, leaders must learn to take charge without taking control—they must treat their team as volunteers who are able to leave of their own volition to pursue another cause. This means that the dominant communication mode must be encouragement, not command and control. A distinction has been made between transformational and transactional

leadership.[4] A *transformational leader* is one who commits people to action, converts followers into leaders, and convert leaders into agents of change. Organizations find their greatest expression in the consciousness of a common social responsibility that translates a shared vision into a living reality. This is what is really meant by transformational leadership. On the other hand, *transactional leadership* focuses on the specific tasks or transactions that must be done in order to execute a strategy. The paradox is that this type of "leadership" requires strong and effective management to assure sustained success.[5]

WHAT IS MANAGEMENT?

What Is a Manager?

A manager has responsibility for accomplishing work processes, executing projects, and applying resources to achieve a mission. A manager manages the execution of transactions. They deal with problem solving (gap closure between what is and what should be). They focus on special cause variation (which is identifiable as to cause), not on common cause variation (which is built into the management system). The highest form of problem solving is in resolving a new future—this is the domain of those managers who also lead. Managers take an approach to problem solving by evaluating the current state and historical performance trends to define gaps to close. Leaders face the uncertainty of the future and resolve the unknown issues that it holds in order to clarify the direction to take. The job of the manager is to plan, coordinate, and execute in the near term by organizing the assets at hand to accomplish specific objectives.

The Role of Management in Organizations

Management executes work to accomplish the desired direction of an organization. Each of the objectives achieved moves an organization closer toward its desired state, closer toward its vision of the future. The role of manager is to serve in the facilitating role that assures coordinated acts will deliver the future—one step at a time. Managers train and develop subordinates to assure that they have the requisite skills and knowledge to build competence on the job. Managers are task focused and delegate actions to subordinates by empowering them to make decisions within bounded conditions that contribute toward forward progress. They hold people accountable for the responsibility that is assigned and wield their authority to coax people and control the results obtained by the work of their team.

What Is Management?

Good management controls complexity; effective leadership produces useful change. Leadership complements management; it does not replace it. Management controls people by pushing them in the right direction; leadership motivates them by satisfying basic human needs. The manager has their eye on managing the bottom line—productivity and cost—and works with people to ensure that they are able to contribute their best efforts to the common objectives of the day. The good manager is proud of their ability to organize chaos into accomplishment.

Attributes of Good Managers

Based on a behavioral analysis of successful and unsuccessful managers (as reported at the 53rd Annual Quality Congress), there are some common traits that distinguish the most successful managers from those that are not perceived as successful.[6] Sixteen traits were identified as leading to success. Interestingly, only one trait was observed to detract from managerial performance. The positive behavioral traits observed in this study included:

• *Customer-oriented*—Expresses sincere gratitude (for complaining) and regret (for the problem) to customers who report difficulties, while neither disclaiming or confirming responsibility for the problem, but letting them know they are heard and understood; takes action to research complaints and establish the limit of company responsibility; presents examples of other companies who have been successful because they listen and rapidly respond to the issues and concerns of their customers; and follows through in replacing faulty equipment or making other appropriate correction of problems.

• *Customer advocate*—Explicitly adopts the viewpoint of the customer; acts as if the customer complaints or requests are legitimate (even when they are not); goes out of their way to meet directly with customers; uses own customer visit experiences to increase the company's interest in customer inputs; insists that others take customer concerns into account; and takes ownership of the customer's problem.

• *Organizationally astute*—Understands the organizational, functional, or group dynamics associated with a particular situation; acts based on knowledge of the role and significance of different internal and/or external groups or units; recognizes the strengths and limitations of existing procedures with respect to how individuals respond; and identifies differences among cultures and groups in appropriate response to policies and procedures.

• *Influencing*—Uses data to persuade others; makes an effort to change the behavior of others; uses well-chosen symbolic events or examples to persuade, motivate, or influence others; appeals to shared interests; specifically aligns self with key influential others; and offers resources in exchange for commitment or support.

• *Interpersonally diagnostic*—Identifies the specific strengths and limitations of others and of one's positional relationship to others; puts self in a specific other's position in order to identify their concerns and interests; adjusts behavior according to the reactions or concerns of specific others; assesses individual motivations; and takes a flexible approach to situations in order to build consensus for actions.

• *Goal oriented*—Identifies specific goals for self and others; allocates resources and efforts to achieve the maximum results or impact; emphasizes adherence to, and acceptance of, appropriate performance measurement systems for self and others; demonstrates a sense of urgency in resolving a problem or issue; and describes business implications of quality plan.

• *Persistent*—Executes plans and projects over an extended period of time; follows up on issues to ensure that commitments or expectations are being met; makes repeated efforts to overcome obstacles, achieve results, or get a message across; and takes special efforts to maintain long-term relationships with business colleagues.

• *Planning and organization*—Prioritizes own activities; develops a plan of action before proceeding; delegates activities to appropriate others; and orchestrates the activities of others.

• *Mentors subordinates*—Provides individuals with specific guidance on how to improve their performance; ensures subordinates own responsibility for their activities; provides subordinates with resources needed to achieve success; delegates responsibilities for activities and also decisions to subordinates in order to develop their competence; and encourages subordinates to assume additional challenges or assignments.

• *Collaborative*—Adjusts own position in order to accommodate interests or concerns of others; enlists the support of influential others before taking action; actively solicits the involvement of relevant others to identify problems and develop or implement solutions; and pulls together teams or task forces quickly.

• *Initiating*—Takes steps to address an issue before it becomes a crisis; champions new approaches to improve productivity and quality of work; and owns responsibility for, or volunteers for, additional assignments beyond normal responsibilities.

• *Professional*—Aware of own strengths, limitations, and growth areas and behaves accordingly; open to criticism and maintains calm when personally confronted; and assumes responsibility for the mistakes or decisions of associates.

• *Conceptual*—Identifies key issues in complex situations; uses underlying themes, cross-cutting issues, or patterns to help explain a situation; recognizes major threats and opportunities for the business; and uses potent metaphors and symbols to articulate a vision or describe a situation.

• *Innovative*—Willing to take risks; identifies "new" solutions to problems; responds positively to explicit challenges; sets goals that go significantly beyond established standards; and expends an exceptional level of effort to achieve a desired goal.

• *Communicative*—Describes a positive impact as a result of having made a presentation or other communication; tailors communications to the needs of the specific audience; puts considerable effort into formulating a communication to ensure that the "right" message comes across; and consciously reflects on the form, content, and impact of discussions with others.

• *Self-confident*—Assumes leadership role in difficult or poorly structured situations; takes a strong stand on controversial issues; presents and defends a position despite unfavorable reactions from senior managers or others; treats senior managers as peers; and presents a forceful, unambiguous description of own role.

The one negative trait that leads to loss of influence and ineffective personal interactions was:

• *Makes fast decisions*—Takes the initiative to formulate group decisions; pushes the group to making conclusions; emphasizes the outcome over group process; forces subordinates to follow his lead; and is overconfident and directs others through controlling behavioral actions and forceful argument.

Distinctions between Management and Leadership

There is a subtle, but very significant, distinction between a manager and a leader. A person is promoted to become a manager; but one must evolve into a leader. While a manager may be a leader and a leader may be a manager; a manager does not have to be a leader and a leader does not have to be a manager. Leadership takes a role in an organization and management

takes a different, and hopefully, complementary role. What is the distinction between these roles?

Warren Bennis comments that "the difference between leaders and managers is that leaders master the context while managers surrender to it. Leaders educate to achieve understanding while managers train to assure consistency. Leaders thrive in a world of chaos while managers strive to achieve stability."[7]

While leadership deals with direction, management deals with speed. To increase one's speed in the wrong direction is the definition of foolishness. Leadership deals with vision—keeping the mission in sight—and with effectiveness and results. Management deals with establishing structure and systems to drive those results. Management focuses on efficiency, cost–benefit analyses, logistics, methods, procedures, and policies. Leadership focuses on the top line in order to deliver the bottom line. Management focuses on the tasks required to deliver the bottom line. Leadership derives its power from values and correct principles. Management organizes resources to serve selected objectives to produce the bottom line. Of course, management and leadership are not mutually exclusive; in fact, it might be said that leadership is the highest component of management. And leadership itself can be broken into two parts: one having to do with vision and direction, values and purposes, and the other with team building—or inspiring and motivating people to work together with a common vision and purpose.

As Steven Covey says, "the basic role of the leader is to foster mutual respect and build a complementary team where each strength is made productive and each weakness is made irrelevant. The basic role of a manager is to use leverage to multiply the work and role of the producer. A producer rolls up his sleeves and does what's necessary to solve problems and get results."[8] Leadership requires vision and judgment, while management requires discipline and execution. Managers master those processes that deliver efficient performance. Leaders innovate to achieve the effective application of organizational assets. As shown in Table 3.1, distinction between management and leadership can be described using different juxtapositions to define important differences.

The leader works on the emotional and spiritual resources of the organization, on its values, commitment, and aspirations (all associated with the right—or emotional—side of the brain). The manager, in contrast, operates on the physical resources of an organization, on its capital, human skills, raw materials, and technology (all associated with the left—or logical—side of a brain.

While fostering development of leadership at every level, leaders must choose for managerial roles those who possess the attributes of successful managers. Some positions are a better fit for leaders while others require

Table 3.1 Differences between managers and leaders.

Manager	Leader
Exercises “know-how”	Exercises “know-why”
Administers a process	Innovates a solution
Accomplishes transactions that define tasks	Influences transformation of an organization
Maintains performance	Develops competence and capability
Focuses on system and structure	Focuses on people
Relies on command and control	Communicates direction and inspires trust
Asks what and when	Asks why and how
Takes a short-range view	Takes a long-range view
Delivers the bottom line	Achieves a vision of the future
Imitates prior successful managers	Originates new definitions of success
Accepts status quo	Challenges the status quo
Acts like a good soldier	Acts as their own person
Does things right	Does the right thing

managerial expertise. Organizations require a balance between managerial and leadership skills and competence in its executive team.

Top Management Commitment

There is an old story that discusses the fundamental distinction existing between top management commitment and involvement—it features a pig and breakfast. Now that I have your attention, you will probably remember the story. When it comes to breakfast, the chicken is involved, but the pig is committed. Commitment is good, and management is a requirement of position—but what should a leader be committed to? Leaders must assure that each stakeholder’s interest is delivered over the long term by the organization’s:

- Customers
- Employees
- Owners
- Suppliers

All of these interests are served by a common management direction: sustained growth of the organization is the foundation that defines success from the perspectives of all constituents. If the leadership lets an organization become overwhelmed by entropy—the decay that occurs when business

stagnates—then no constituency has its needs served over the long term. All leaders must deliver both short-term profits and long-term competitive strength. This requires leaders to focus on continuous improvement toward ever-increasing targets in order to obtain the favor of all constituents: creating ever-improving desirability of the investments, which include product as well as the workplace. Interestingly, this activity is shorthand for the new operational definition of quality (see chapter 2 for a value-based definition of quality as an entitlement of customers).

Understanding the Customer Value Proposition

Ultimately, quality is whatever the consumer determines it to be as judged by the enduring or sustained commercial success of a product or service in a competitive market. A critical starting point for thinking about quality is *value*. The ultimate customer is the ultimate determinant of value. It is true that customers want those things that they value. The only problem for customers is to determine what is the true value proposition among alternative choices. Competitive excellence demands that the processes that support the creation, production, and distribution of goods and services be centered on the customer-perceived value of products. This is very different from building a customer-centered company that only asks its current customers what they want and does not seek to generate creative quality attributes that attract new customers. This distinction may be observed using the following model for quality that was developed by Dr. Noriaki Kano of Tokyo Science University.[9]

"Three important truths characterize the new world of competition:

1. "Different customers buy different kinds of value. You can't hope to be the best in all dimensions, so you choose your customers and narrow your value focus.
2. "As value standards rise, so do customer expectations, so you can stay ahead only by moving ahead.
3. "Producing an unmatched level of a particular value requires a superior operating model—a "machine"—dedicated to just that kind of value."[10]

Michael Treacy and Frederick Wiersema call a company with this type of focus a *customer intimate company.* It is characterized by:

- "An obsession with the core processes of solution development (such as helping the customer understand exactly what's needed), results management (or ensuring the solution gets implemented properly), and relationship management.

- "A business structure that delegates decision making to employees who are close to the customer.
- "Management systems that are geared toward creating results for carefully selected and nurtured clients.
- "A culture that embraces specific rather than general solutions and thrives on deep and lasting client relationships."[11]

Companies that are driven to create this degree of intimacy have a cult-like fascination with the customer that is continuously expressed in people's attitudes and behaviors. In companies with this focus there are two strong motivating beliefs:

1. Customer value is the ultimate measure of work performance.
2. Accelerating value development for customers is the driver of business success.

Building this strong customer focus into the culture and values of an organization is the job of both the leader and the manager. Leaders demonstrate commitment to this value proposition by communicating its implications for the company's business model in a crisp, easily comprehended manner. Leaders must get employees not just to understand this commitment but to personally embrace it in their daily work routines. To achieve emotional acceptance by all members of the team, leaders must identify the right operational levers that permit managers to take definitive actions that deliver customer value. Managers must recognize these opportunities to deliver value and seek conscientiously to accelerate actions that build and sustain the value proposition. This means removing obstacles that inhibit effective action by the frontline workers and giving people the tools and resources needed to work effectively and efficiently. In order to assure that success is sustainable, the value propositions of all stakeholders must be satisfied. What are the core elements for each of these other value propositions?

Shareholder Entitlement to Quality

The basic purpose of business is to generate a profit for investors by serving the customers of the business. Sustained performance requires continuous growth in sales, or else entropy (this is the economic affect of inflation) will cause degradation and the business will decline over time. How is business success measured? The ultimate yardstick for business is financial performance. The key indicators of financial success include:

- Gross revenue increases faster than the cost of operations.
- Growth is stimulated by innovation rather than acquisition.

- Transaction volumes increase as transaction costs decrease.
- New products have better quality than the ones they replace.
- Capital payback periods are consistently reduced.
- Product warranty claims, product returns, customer complaints, labor variance, scrap, and rework all decrease simultaneously.

The output measures of a business that deliver sustainable competitive advantage are twofold: shareholder value-added and brand value.

Shareholder value-added (SVA) reflects the quality of the financial performance results and takes into account cash, return, and growth. A business must generate enough cash to fund its operation requirements and must steward the way that cash is used to satisfy its expenses. A business must also develop a sufficient return: profit (return on assets, capital, or investment) in terms of both the profit margin (absolute level of profit) and velocity (turnover rate for delivery of products or services to customers) in order to satisfy investors and convince them to maintain an investment in the company. The basic rule for investors is that the return must be greater than their cost of capital (equal return to cost of loaned finances or the value that investors could receive from an alternate, usually safer, investment). A business must also have profitable growth. If growth is purchased at a discount, or is not profitable, then the ability to sustain the way the business operates is limited and competitors will ultimately eat away at the company's market share, one customer at a time. When a company continuously "fires on all cylinders" and produces exceptional shareholder value, then shareholders will provide the capital investment needed for exploitation of markets by delivering those customer needs that drive profitability (measured by return on capital employed) from a focused customer value proposition.

Fundamental to the "capitalist credo" is that shareholders are entitled to at least the return they would enjoy from a risk-free investment (for example, bank account or government treasury bill), and if they do not receive this return (sometimes called the cost of capital), then it would make sense for them to withdraw their investment (requiring a liquidation of corporate assets, unless there are other investors willing to make his investment at the level of risk). Cost of capital represents shareholder entitlement from their investment.

Managers have some options to drive enhanced performance:

- Increase margins through higher revenues (strengthened brand, products that delight customers and build market share, higher customer satisfaction that builds enduring brand loyalty) and lower cost through better operating processes and eliminating waste, scrap, rework, and variability in process performance.

- Increase asset turns through more enhanced output from existing assets, thereby minimizing requirements for new investment.
- Increase profitable growth through offering new products and services that extend market penetration in the most desirable (profitable) customer segments.

The bottom line on financial performance for managers is to improve revenue by delivering customer value, decrease the routine costs of operating the business, and avoid investing any more than is required to effectively and efficiently operate the business. This means that managers should increase sales by focusing on high-margin products. Managers therefore have three basic emphases for quality improvement efforts that will drive shareholder value:

1. Improve the effectiveness of current business capacity.
2. Increase productivity (efficiency) from process operations.
3. Improve the design and delivery of products and services.

One of the key measurement linkages between quality management and business management is the cost of poor quality—the sum of failure costs, appraisal costs, and prevention costs. However, cost of poor quality is only one dimension in the value equation for quality. In a study by Bradley Gale,[12] another value dimension was identified related to the profit of good quality (the market advantage gained if a company's quality is perceivably better than the competitor's quality or industry-leading quality) that demands a higher price and will also achieve a greater market share. The third dimension of value is the contribution to brand value or the sustained value to a company's product or service line that is an outcome of the consistent delivery of its long-term performance relating to its quality policy. Both shareholder value (sometimes called economic value-added [EVA] when return is compared to the cost of capital for alternative investment) and customer value (sometimes called market value-added [MVA] to identify the incremental increase in value that is added by a firm in production of its goods and services) are only two aspects of the total value equation.

Employee Entitlement to Quality

Most quality management systems recognize the significance of the contribution of employees to the delivery of quality results. If employees are selected for the right work attitude, intellectual capability, and enthusiasm; are developed with the skills and knowledge required to perform; and provided with the right resources and decision rights to support their

work requirements, then it is possible for them to deliver high performance outcomes. This set of conditions requires that managers delegate authority for action to frontline employees. This is one indicator that the management has empowered its workforce. Other factors include the mutual understanding of management and workers that both must achieve a shared goal in order for both management and workers to "win" their objectives: profitable operations and secure, safe, and rewarding working conditions. When this foundation is met, then employees are able to supervise themselves and are also able to be accountable for their actions. Kurt Lewin, one of the great social scientists who contributed enormously to our understanding of change management with his force field analysis theory, observed: "When people become involved in the problem, they become significantly and sincerely committed to coming up with solutions to the problem."[13] People feel the benefits of being involved in enhanced motivation and satisfaction of their work whenever they have a strong sense of collaboration in setting the goals of work, defining and managing their own working conditions, and evaluating their performance against their goals. Involvement and participation in planning, execution, and review builds a much more collaborative and effective workforce.

Management Entitlement to Quality

Management makes an investment in people: both salary and the continuing investment in skills and competence. What is the return that they expect from this investment? Performance! The expectation of management is that the processes by which work is accomplished will be both designed and executed flawlessly. In the language of process management, managers are entitled to process performance excellence. This process entitlement to quality is a function of the capital investment made by management. Every work process has a degree of capability to deliver the degree of customer value that is a function of the investments made in that process and its people. This capability can be expressed as a ratio of customer requirement to the process variation using the C_p ratio. The objective of management is to optimize return on capital employed in the business by assuring high productivity (asset utilization) based on this level of capability that has been purchased. Management is entitled to receive the performance that has been designed into their investments. This means that work processes should realize their design C_p when operating in a routine environment. Any shortfall in this performance level represents an "entitlement loss" and indicates a performance gap that must be closed by either improving the process or better preparing the people to execute the process.

Supplier Contribution to Quality

When a company cannot recruit or develop the competence required to deliver their goods or services to the market, they build a collaborative relationship with other organizations. Depending on the type of relationship and its structure, this may be anything from a somewhat transitory type of relationship, such as a supplier relationship or strategic partnership, to the more permanent type of relationship that exists when a merger or acquisition occurs. In more transitory relationships, the "volunteer" aspect of the relationship drives the need to build a mutually beneficial relationship that may be characterized as "win–win," where both sides receive satisfaction from their shared activities. To achieve maximum contribution to the overall business operations, management will apply a wide variety of methods to assure that supplier contributions to business effectiveness are maximized. Dr. Kaoru Ishikawa provided an operational definition of supplier partnerships that has been modernized in the following description[14]:

- Both the purchaser and supplier are mutually responsible for the establishment of a common understanding and cooperation between their quality control systems.
- Both the purchaser and supplier should operate as fully independent businesses and respect the independence of the other's operation.
- The purchaser is responsible for stating clear requirements to the supplier so that the supplier understands fully the expectations of production.
- Both the purchaser and supplier should agree to the business terms for quality, cost, delivery terms, quantity, and method of payment.
- The supplier is responsible for the assurance of quality that will give satisfaction to the purchaser that the final customer requirement is met, and the supplier is responsible for providing the necessary data that demonstrates its performance on critical quality items.
- Both the purchaser and supplier should agree upon the methods for test and analysis of parts at receiving inspection (purchaser) and final inspection (supplier).
- Both the purchaser and supplier should take into consideration the other party's business processes and should provide information that will permit the optimal operation of the other party's entire business system.

- Both the purchaser and supplier should manage and control those business activities that affect their relationship: ordering, production and inventory planning, and associated systems.
- Both the purchaser and supplier should establish the process by which they can reach a settlement should a dispute or problem occur.

In order to achieve this type of relationship, companies must develop and maintain a proactive supplier management system. Such a system contains several core elements, especially a core set of procedures for screening, qualifying, certifying, and evaluating supplier performance. In order to develop and maintain good supplier relationships, objective criteria must be developed and used for managing this process. Suppliers feel that they are entitled to maintain a continuing business relationship as long as their prices are competitive and their performance is flawless. This is beneficial to both parties and assures long-term competitive advantage, as the capability of suppliers is added to core business capability to deliver the best possible value to customers.

Quality: A Competitive Business Advantage

How is high performance guaranteed in the long term? To produce long-term success, companies must learn to thrive on change and uncertainty, not merely to cope with them. Senior managers must reinvent the company repeatedly to focus better on delivering core competence for meeting the changing needs of its most critical customers. Routinely, the company must be repositioned in its competitive market, adjusting its organizational structure, product or service lines, business processes, managerial practices, personnel and technology policies, and marketing strategies to deliver consistently in the face of changing customer opportunities, concerns, and requirements.

To achieve this degree of long-term performance excellence that delivers sustained competitive business advantage, managers must embrace a proactive quality policy. Such a policy must focus the resources of the entire organization on delivering the value propositions required by the key stakeholders—by customers and investors as well as employees and suppliers. By optimizing this portfolio of value propositions, leaders and managers can deliver sustained performance that is able to dominate their market.

Quality: A Market Dominance Strategy

General Electric's strategic planning office conducted a study of the various market factors that influenced profitability of the firm. This study was

extended by the Wharton School of Business and became known as the Profit Impact of Market Strategy (PIMS) Study. This study established a definitive relationship between perceived quality, market share, and profitability. The driving force for profitability was the customer's perception of quality. When relative perceived quality and relative market share are both high, then a company's profitability is virtually assured.[15] The PIMS study also observed that customers make their judgments about value, or the relationship between price and quality, not just about quality alone.

This perceived relative value of the total offering (both product and services) influences the purchasing behavior of customers. Relative perceived quality is not the same as product quality or conformance to a design specification—it is quality from the customer's perspective, relative to alternative choices in a competitive market and the price of the offering. Customer desires drive market performance and establish the minimum standard for value—performance level that is delivered for a given price. The PIMS study discovered that the customer's value proposition is the most significant factor in the competitive business equation. Delivering this value is the most important consideration for a business and requires the total attention of the management team as well as the coordinated efforts of all employees. It requires a total commitment to the delivery of quality. In this case, quality is the focus on achieving desired or targeted results through excellence in process performance that is directed at objectives aligned with customer expectations. Management by fact is the approach to focus each organizational element to work together as a team—integrating organizational competence, technical capabilities, and human skills to achieve the shared plan for obtaining sustained success in quality.

CONCLUDING COMMENTS

The conclusion provides a clear focus for all executives: lead people and manage processes. We must look to leaders to set the foundations for quality performance. Leadership must deliver quality and act as the principal driver of the business process model. In this capacity, leaders represent the voice of the owner in the process:

- "The principal requirements of management are to establish a shared vision and common plan, ensure resources are allocated in a way that assures success in the plan, and review and reward progress toward achieving that plan.
- "To influence the entire organization, quality must be driven by senior management.

- "Management must create clear quality values and reinforce them regularly through unambiguous communication of expectations and clearly visible role model behavior.
- "Commitment to quality improvement must be encouraged in all areas of the organization—top management should grant no exemptions to any area.
- "The goal of all quality initiatives should be the improvement of business results and the attainment of recognized business excellence.
- "All employees must be suitably trained in process improvement methods and the appropriate practices of total quality management—no exemptions should be given, although different organizations may be trained differently according to their assessed needs.
- "Organizations need to develop both long-range strategic plans and stretch goals for their planned achievement of 'role model status' in quality leadership and business performance results.
- "The planning process should be 'evergreen'—both flexible and rapidly adaptable to unforeseen contingencies, rather than restricted to a fixed, unchangeable direction for an unalterable period.
- "Plans should be actionable, measurable, and regularly reviewed—they should not be purely philosophical or inspiring visions.
- "Benchmarking is an effective approach for transferring process knowledge, setting appropriate improvement goals, and defining specific improvement plans.
- "Business change initiatives should be balanced between continuous improvement and breakthrough activities, with the decision for selection based on both resource requirements and business performance needs.
- "The organization's infrastructure must support data acquisition and analysis of information at the 'atomic level' of the work process."[16]

These actions define the role that is expected of an organization's leadership to promote high quality performance as defined by customer perceptions—the winning ingredient in a strongly competitive market. In

order to take these actions, leaders must learn lessons from other leaders that may be summarized as a template for leadership action:

- Create a compelling vision that provides a common direction.
- Emphasize the uniqueness of your organization—competence and product.
- Anticipate potential future directions and understand critical assumptions.
- Build a collegial organization, emphasizing the power of consensus.
- Empower and inspire people to use teamwork as a means to get work done.
- Share information internally and externally—forbid "secrets" in most cases.
- Coach the organization to learn from its experience and observe others.
- Evolve the organizational culture to harness diversity and focus on customers.
- Balance risk and capitalize upon discontinuities in the marketplace.
- Develop the next generation of leaders—lead the leaders.

How do they do this? Good leaders:

- Set aggressive performance targets and action plans with quantitative objectives.
- Measure performance achievements against targets.
- Use teams to assure participation of all parties.
- Make decisions at appropriate levels based on objective information.
- Take timely action on priority activities.
- Review performance and provide feedback to assure success.
- Reward performance excellence in teams and individuals.

There is no easy formula to be followed to achieve leadership. The leader's emphasis on quality will give any organization a sustainable

competitive advantage. If this attitude is ingrained in the character of the individual as well as in the culture of the organization, it can't be duplicated by anyone and the uniqueness of the organization becomes its edge in the market.

ENDNOTES

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8. S. R. Covey, *Principle-Centered Leadership* (New York: Simon & Schuster, 1990): 246.
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4

The Human Dimension: Critical to Sustainable Quality

Su Mi Park Dahlgaard and Jens J. Dahlgaard

INTRODUCTION

Konosuke Matsushita, the founder of the world's largest consumer electronics company, has expressed his understanding and approach to "the people dimension" as follows[1]:

> Yet, I cannot resist the temptation to say that I was well aware of the crucial importance of human relations in a corporate setting even in the early days of my business career. Granted, my approach is intuitive, and my knowledge is experiential. But my instinct, and perhaps my conscience, dictated to me that I should trust my employees if I expected them to trust me. I must have full confidence in their ability to learn and their potential for personal growth. Only then would the employees have full faith in my managerial competence and personal integrity.

It is difficult to find a statement that better illustrates the importance of the human dimension in organizational and managerial contexts.

It has been documented by several authors that one of the main reasons for company failures with TQM is superficial knowledge and insufficient understanding about the human dimension.[2–9] More specifically, these authors argue that insufficient people involvement; lack of management commitment; lack of constancy of purpose; and lack of motivation, training and education are some of the most critical factors when implementing TQM. Although the human dimension is recognized as one of the most critical

areas for achieving successful implementation of TQM, not much research has been carried out with a focus on the role and the importance of the human dimension as an essential integrated part of TQM.

The purpose of this chapter is to highlight the importance of the human dimension, with a special focus on the motivation and commitment aspects. More specifically, this chapter focuses on the following issues:

1. Clarification of the meaning of a humanistic approach in quality management
2. Discussion of the limitation of the existing premise of human beings from the theoretical perspective of human motivation
3. Suggestion of an alternative model of motivation based on a more holistic perspective, and presentation of some empirical findings, which indicate support for the suggested model
4. Suggestion for how the research findings can be used to build organizational excellence

THE HUMANISTIC APPROACH AND QUALITY MANAGEMENT

The human dimension of business is normally considered part of human resource management (HRM). Although there is no accepted definition and scope for HRM, Goss suggests seeing "HRM approaches as a position on a continuum from instrumental at one end to humanistic at the other."[10]

As an instrument, "human" is given less importance than "resource" or "management." When people are recruited, they are considered a resource like any other tangible, interchangeable instrument, which managers can control and maintain (like a machine). The scientific and rational management approaches initiated by Taylor have this view of HRM. Brainpower and heart power are ignored in such extremely rational approaches and only muscle power is recognized as a useful resource. One of the critical consequences of ignoring brain and heart power in an organizational context has been the failure to mobilize people's knowledge and creativity as well as killing people's intrinsic motivation. This was the key point in the opening Matsushita quotation.

The humanistic approaches, at the other end of the HRM continuum, focus on the human and social aspects of the human dimension, such as interpersonal relations, morale, a sense of belonging, shared experience, value, meanings, motivation, and commitment of employees.[11,12] Here, humans are considered to be unique (not interchangeable), the most important

organizational asset, which cannot be copied by competitors, and the only asset that can create synergies. People are considered more holistically—having both brains and hearts as well as muscles, and, thus, managing people is considered to require a profound, holistic understanding of the complex structure of human nature.[13]

Several organizational theorists point out that modern organizations are moving from a narrow, rationalistic, and instrumental managerial approach toward a broader and people-oriented direction, with an increased focus on psychological and sociological aspects.[14–17] Several research results indicate that the total quality movement has contributed to the acceleration of this organizational and managerial shift by focusing on horizontal relations, flexibility, and responsiveness, individual and group empowerment.[18–21] However, there seems to be a discrepancy between the basic premises on which the new human dimension practices are based and the existing framework of human motivation. We will examine these premises in the next section.

EXISTING PREMISES OF HUMAN MOTIVATION

Recent research by the authors of this article indicates that one of the most critical factors for attaining employees' motivation and commitment is the ethical/value aspect. According to the research results, it seems that various value related issues are critical motivating factors. However, the existing theories of human motivation do not provide a useful theoretical framework to capture this rather spiritual/ethical dimension of human motivation. Literature reviews of the existing theories of human motivation indicate that most of the existing motivation theories are based on the following two basic assumptions about human beings[22,23]:

1. The human being is a biological creature in line with other animals. A large proportion of human activities are carried on in order to cover various biological needs. Biological needs include, among others, nutrition, avoidance of hunger and pain, fear of death, security, and the feeling of belonging.

2. The human being is also a mental or psychological being. A large number of human activities are carried on in order to satisfy various mental or psychological needs. The need to be recognized by others, to have self-identity, self-respect, to mobilize one's creativity, desire to improve, to expand areas of competence, and so on, are some examples of human mental needs.

Most theoreticians in motivation, as well as in other relevant areas of the human dimension such as commitment and job satisfaction, categorize the spiritual/ethical dimension as an external or environmental element. For instance, Maslow categorized core values in terms of justice, fairness, honesty, orderliness, and freedom as immediate preconditions for the satisfaction of basic needs, known as the hierarchy of human needs.[24] In the recent research literature on organizational commitment and motivation, the core value dimension is often categorized as organizational climate[25,26] or as interpersonal work climate,[27] and the area is treated as one of several commitment-/motivation-related variables.

Many psychologists have tried to uncover the motivators and the processes of motivation behind various human activities. Since Maslow introduced his model of human motivation, a huge number of theorists made contributions to the field of motivation in one form or another during the last several decades. For instance, Ford could identify 32 categories of existing theories of motivation, including his own model of motivational systems theory, in which human motivation is conceptualized in terms of the organized patterning of personal goals, emotional arousal processes, and personal beliefs.[28]

As Ford points out, the history of motivation theories can be summarized in terms of an ongoing conception of the basic nature of human functioning and development.[29] Each theory has contributed more or less to our understanding of the complex phenomenon of human motivation.

However, it seems that the dominant theoretical frameworks, especially seen from a practical perspective, are models belonging to the category of content theories presented by Maslow, Herzberg, McGregor, Alderfer, and McClelland. One of the possible reasons for this may be the models' relatively simple character compared to other models. It should also be pointed out in this context that the focus has continuously shifted from the low level of human needs (lower level of Table 4.1) to the higher levels of human needs (upper part of Table 4.1), parallel with increasing welfare, higher educational levels of employees, and the growing awareness of intrinsic motivational factors.

As indicated in Table 4.1, organizational applications have shifted from an economic or instrumental view to the self-actualizing view of human beings. Under the dominance of scientific management principles, employees were basically considered as biological beings, and the only recognized motivator for these biological beings was monetary/material reward—an extrinsic motivator. However, through the famous Hawthorne experiments in the 1930s and the following emergence of influential motivation theories, organizational applications have been gradually expanding to social and self-actualizing views of human beings. This tendency can be

Table 4.1 Overview of the contents theories and organizational applications.

Maslow (1954)	Herzberg (1959)	McClelland (1975)	Alderfer (1972)	Organizational Applications
Self-actualization needs	Achievement Responsibility Work itself Growth	Need for achievement	Growth	Human as self-actualizing being
Self-esteem/ ego needs	Recognition Advancement	Need for power		
Social needs	Interpersonal relations	Need for affiliation	Relatedness	Social being
Security needs	Job security Company policy Physical working environment			
Physiological needs	Pay		Existence	Economic view

characterized as a paradigm shift from an instrumental/rational approach toward a humanistic approach of human resource management.

Generally, these well-known and well-practiced theoretical frameworks were worked out during the high industrial period (from the 1940s to the 1970s), when the main business focus was on productivity, profit maximization, and material growth, rather than on the contribution of the human dimension to performance excellence of the organization.[30]

SPIRITUAL NEEDS—THE EXCLUDED DIMENSION OF HUMAN NEEDS?

One of the recent remarkable new trends, which emerged during the last part of the 80s and through the 90s, is that an increasing number of academicians from various managerial areas such as human resource management, knowledge management, leadership, intellectual capital, social capital, and business ethics, have emphasized and recognized the importance of ethical aspects or *core values*.[31–39] Trust, respect, integrity, loyalty, justice, and honesty are some identified elements which can be categorized by the term of core values.

Many research results show, for instance, that trust is a prerequisite for communication and dialogue, building people relationships, growing competencies, and creating a cooperative culture. Fukuyama,[40] Gambetta,[41]

Putnam,[42] Ring and Van de Ven,[43] and Tyler and Kramer[44] argue that relationships between people are deep, and that people are more committed and willing to engage in social exchange in general when there is a feeling of trust. According to Mishira, trust is multidimensional and indicates a willingness to be vulnerable to another party, where willingness arises from confidence.[45] Sparrow points out that there is a clear and compelling linkage between trust and organizational design.[46] The higher the levels of trust, the fewer controls are needed, and, therefore, the lower the transaction costs which the organization incurs.

Various managerial efforts seem to have relatively minor effects if such core values are lacking either between employees or between management and employees. As Leventhal,[47] Cohen,[48] and Lind and Tyler[49] indicate, procedural fairness and procedural justice in the decision-making processes are associated with increased motivation and commitment toward the decisions made among employees. Furthermore, other research results show that even reward systems are highly affected by trust and other values. For instance, if there is no trust between management and employees, a reward system will have no significant motivational effect.[50–54] According to Deci et al., a reward system will decrease employees' intrinsic motivation when the managerial climate is controlling rather than supporting and acknowledging people.[55] Goleman argues that articulating the shared sense of goodness in terms of organizational vision and mission statements "allows us to feel what we do together is worthwhile," and this feeling will strengthen emotional attachment to the organization.[56]

Kelley and Thibaut recognized the existence of "altruistic motives" in their research of interdependence phenomena within the research field of social psychology.[57] They argue that human behavior is frequently shaped and guided by a desire to enhance a partner's well-being or by a desire to achieve a fair distribution of outcomes. Rusbult and Arriaga argue that people possibly choose altruistic motives because they know that superior long-term outcomes can be attained through altruistic motives rather than selfish motives.[58]

In spite of the increasing awareness of its crucial role in almost all human activities in organizational and social life, these altruistic and spiritual factors have not been "formally" recognized as a part of human motivation factors. Most theoreticians in motivation as well as in other relevant areas of the human dimension, such as commitment and job satisfaction, categorize the spiritual dimension as an external or environmental factor instead of treating it as a basic motivating factor. They treat this area (core values) as if the sources of core values are somewhere separated from the human being. However, most of the literature recognizes the impact of core values on motivation or commitment, and therefore the core value dimension is often treated

as a commitment-/motivation-related variable. From this point of view, the authors feel a need to challenge the existing theoretical models of human needs and to reconceptualize the theory, even though we are fully aware of the "danger" related to this kind of task. We feel that there is a need for a new holistic contents model, which explicitly includes the third dimension of human needs—spiritual needs—along with the other two human dimensions: the biological and the mental/psychological needs dimensions. It is our hope that by suggesting an alternative content model, a new debate around the issue will be raised, and through the increased awareness of the issue, a more refined and accurate model/models will be developed.

THE TRINITY MODEL

The suggested framework in Table 4.2, the Trinity model, indicates several assumptions. We assume that all three types of human needs are critical motivational factors, and it is also assumed that they should be considered simultaneously in each given situation. This argument does not preclude the contingency aspects of individual differences and situational differences. The way individuals prioritize certain motives more than others varies depending on the situation and the interacting people. However, we assume that different patterns of mixing individual motivational items can be grasped within the suggested framework—that is, the Trinity model.[59,60]

Seen from an organizational perspective, it is suggested that managers should consider all three aspects of human needs—biological, psychological, and spiritual.[61] They have to understand how the satisfaction of these different kinds of needs are interrelated, and they need to work on the satisfaction of the various dimensions of needs, not only for achieving employee

Table 4.2 The Trinity model of human needs.

Physical or Biological Needs (Living)	Mental/Psychological Needs (Learning)	Spiritual Needs or Core Values (Loving)
Food	Sense of belonging	Searching and creating meaning
Water	Friends (mental love)	Trust
Air	Recognition	Justness
Shelter	Individual identity	Honesty/openness
Clothing	Achievement	Loyalty
Safety	Learning	Integrity
Sex (biological)	Creativity	Love (spiritual love)
	Development	Sharing
	Self-fulfillment	Fairness
		Respect

satisfaction and commitment but also to improve *the quality of employees' working life*. However, the last two dimensions are the most complex and difficult dimensions to understand, so we will focus on them now.

INDIVIDUAL CORE COMPETENCIES

We define a human's mental needs as the needs for belonging, people relationships, recognition, status, self-identity, achievement, creativity, learning, development, and self-realization. These items correspond to social, self-esteem, and self-actualizing categories.

In order to be more operative in our approach concerning satisfaction of mental needs, we will adopt *individual core competencies* as a corresponding term describing the general personal competencies needed to satisfy mental/psychological needs. In this context, the term *core competencies* is understood as a kind of personal meta skills or a person's internal means to fulfill his/her mental/psychological needs.

Our definition of core competencies differs from the major part of the competence-concerned literature. A review of competence-related literature[62–66] shows that the majority of the literature focuses on competencies from organizational perspectives in line with Prahalad and Hamel.[67,68] Prahalad and Hamel used the term *core competencies* as an organization's collective capabilities to quickly adapt changing opportunities, or as "a bundle of the skills and technologies that enable a firm to deliver a fundamental customer benefit."[69] Dosi et al. defined core competencies as a set of differentiated skills and complementary assets, including the organizational routines and capacities that provide a firm's competitive advantages.[70] In short, their view is that an organization's competitive advantage lies also in the organization's collective core competencies. In this respect, both Dosi et al. and Prahalad and Hamel[71,72] seem to have defined organizational core competencies from a human resource perspective.

Definitions of competencies from a more individual perspective can be found, among others, in Spencer and Boulter et al.[73] Spencer's version is as follows:

> A competency is an underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation.

Boulter et al. state that:

> A competency is an underlying characteristic of a person which enables them to deliver superior performance in a given job, role, or situation.[74]

As can be seen through these definitions, there are interrelationships between organizational and individual competencies. The natural interrelationship between the two competencies is that individual competencies are the prerequisite for the organizational competencies. As pointed out in much learning-related literature, organizational learning can take place when individuals learn both individually and collectively (socially). The same principle may be applied with competencies too.

The core competencies, defined here as competencies, which are needed to satisfy human's mental/psychological needs, can be subdivided into the following two main areas:

1. Emotional competencies (EC)
2. Intellectual competencies (IC)[75]

In order to satisfy human mental needs, it is supposed that both intellectual competencies and emotional competencies are required.

Emotional Competencies

Emotional competencies are an array of noncognitive skills/capabilities and include human capabilities which traditionally have been treated under the term sensibility.[76] *Sensibility* refers to specific human capabilities of mobilizing human organs in various activities of feeling, seeing, listening, paying attention (to be aware), sensing, tasting, and so on, as emotional competencies emerge from the working of the human heart and not from intellectual working.[77,78]

Goleman has categorized the emotional competencies into the following five areas[79,80]:

1. Self-awareness (the ability to know and recognize one's own inner feelings, preferences, motivators, and intuition as well as one's strengths and weaknesses)
2. Self-regulation (the ability to control one's own feelings, impulses, stresses, and changing environment, including the propensity to suspend judgment and to think before acting)
3. Self-motivation (the ability to motivate oneself and be able to establish personal goals and achieve them)
4. Empathy (the ability to know others' feelings, needs, and anxieties, and the skills in treating people according to their emotional reactions)
5. Social competencies (the ability to build relationships with others and influence others)

According to the literature review, most ideas introduced in the emotional competencies–related literature can be covered by the above-mentioned conceptualization of Goleman (see Table 4.3).[81–86]

The literature review shows that several theoreticians include the core value dimension in their framework of the emotional competencies.[87–90] This tendency appears quite clearly in Goleman,[91,92] Cooper and Sawaf,[93] and Dulcewicz and Higgs[94] in their conceptualization of the interpersonal relationship. For instance, Goleman mentions trust building as an important emotional competence in building interpersonal relationships.

Trust, honesty, and integrity are also emphasized in Cooper and Sawaf as important elements in building relationships.[95] As indicated in the previous sections and through the suggested Trinity model, core values are assumed to be rooted in the spiritual dimension, and thereby treated as a separate entity in the model.

Some types of interpersonal skills, such as tools and principles for successful communication, for example, techniques for emphatic listening, dialogue, discussion, and so on, can be understood within a framework of emotional competencies. People who do not possess emotional competencies will have serious problems in understanding other people. Thus, emotional competencies are particularly critical for building interpersonal relationships.

Intellectual Competencies

Intellectual competencies are related to human capabilities, which involve reasoning, in contrast to the emotional competencies, which involve sensing and feeling. From Webster's definition of intellect, intellect is *the capacity for knowledge, for rational or highly developed use of intelligence*. These competencies appeal mainly to the logical and rational capabilities of understanding, analyzing, and making judgments, among others. Planning and organizing activities can also be considered as intellectual competencies. Traditional IQ tests and school grades are generally designed based on an understanding of intellectual competencies. Mathematics and technology are typical areas that require these logical and rational competencies. Written instructions for various machines or equipment are also based on logical and rational thinking processes. In a managerial context exemplified by TQM, for example, intellectual skills include tools and techniques such as the seven old quality tools and the PDSA cycle. Those tools have been developed to support the actualization of people's intellectual capital (IC) to enhance innovation and improvements. Knowledge about technology is also a part of intellectual competencies.

Table 4.3 The elements of emotional intelligence.

	Dulewicz and Higgs (2000)	**Goleman (1995; 1996; 1998)**	**Cooper and Sawaf (1997)**	**Steiner (1997)**
Self-awareness	Know own feelings, in touch with feelings, use feelings to make decisions with confidence	Self-confidence, realistic self-assessment, self-deprecating, know own feelings and emotions, express feelings	Know one's own strengths and weaknesses, emotional honesty	Understand one's own emotions
Self-regulation	Trust-building, handling emotional upsets, focus on task (what needs to be done), articulate unstated feeling, stress management	Trustworthiness and integrity, comfort with ambiguity, openness to change, stress management	Trustworthiness and integrity	Ability to control own feelings and emotions
Self-motivation	Maintain optimism, use anxiety to help perform well, enjoy focused concentration and peak performance, do not give up in face of setbacks	Strong drive to achieve, optimism even in the face of failure, strong commitment	Take initiative, focus on drivers, effectiveness under pressure	
Empathy	Sense what others are feeling, feel rapport with others, open communication, listening, can sense pulse of relationships in groups	Sense what others are feeling, good interaction ability with others, social effectiveness		Know others' feelings and emotions, understand emotional interaction, good listening skills
Social skills	Express feelings, handling conflict, helping others to learn, social effectiveness, promoting social harmony, effective teamworking, consensus building, collaboration, networking	Promoting social harmony, persuasiveness, open communications, expertise in building and leading teams	Motivate others, ability to turn diversity into constructive energy	Express own emotions productively, rebuild damaged relationship

Recently, the distinction between those two human competencies became a central research area caused by several research surveys, which particularly indicated the importance of emotional competencies. For instance, Goleman argues that the strongest determinant for human success is emotional competencies.[96,97] According to Cooper and Sawaf, the intellectual competencies can only explain four percent of a company's success, while the emotional competencies can explain 90 percent of a company's success.[98] Research carried out by Martinez[99] and Dulcewicz and Higgs[100] show similar findings. These findings are interesting, because people's emotional competencies have generally been underestimated, if not ignored, and more or less excluded from an organizational perspective.

Another group of theoreticians argues that the combination of intellectual and emotional competencies as variables for successful outcomes provides a more evident explanation and, for this reason, they argue that both aspects should be considered in relation to the measurement of outcomes.[101,102] The authors agree with their point of view, that in order to attain a more holistic understanding, both dimensions should be considered.

CORE VALUES

Core values comprise those spiritual capabilities which are needed to satisfy human's spiritual needs. The core value dimension in this context is understood in line with "virtue ethics"[103,104] or "character ethics."[105] According to Clouse, character is defined as "a person's pattern of behavior related to the moral qualities of self-discipline and social responsibility." In contrast to personality, which is rather superficial and easy to manipulate, character is assumed to be associated with more fundamental and permanent attitudinal characteristics. Some identified ingredients of a good character range from desire to know the good, desiring the good, and doing the good, to habits of the mind, habits of the heart, and habits of action.[106,107]

Virtue ethics include people's meaning-searching and meaning-creation activities. Virtue ethics correspond to the classical notion of morals and character, which have been widely recognized as desirable character traits both by the ancient East Asian school of thought presented by Confucius, Mencius, and Hsuntzu,[108] to the Greek philosophers presented by Plato and Aristotle, to contemporary researchers from different fields.

In our definition, *core values* are those spiritual/ethical elements which have been guiding principles for human conduct and are proven through history to have been everlasting values regardless of cultural and ethnic

differences. The way to *express* these ethical elements may of course vary between people and cultures just as different people and cultures practice the satisfaction of biological as well as mental needs.

Since we assume that core values are fundamentally and deeply rooted in any culture, we further assume "that they will change seldom, if ever."[109] However, this does not mean that people automatically practice the various core values. People may for several reasons forget the meaning and importance of core values, and hence poor practice of these values may be the result. Selfish ambitions may be another reason why people do not practice core values.

It is assumed that core values are required to be followed in people relationships, otherwise destruction of the relations and demotivation to work together against a common goal will be a consequence. Most people desire that others show respect, fairness, honesty, and so on, and most people have a need for "a feeling to be loved" by others or "feeling that others care about you." Such desires are innate human desires no different from any other human desires, such as having food, clothes, security, and shelter. When people do not behave according to these principles, destruction and self-destruction may be consequences in the long run. The essential point here is that only by following one's natural inclinations will harmony, higher levels of satisfaction, and feelings of self-fulfillment and happiness be attained.[110] The authors' conceptualization on core values can be understood within this framework.

We will end our discussion in this section by referring to a more than 50-year-old example on the importance of feeling to be loved by others[111]:

At a home for orphans, 97 children between three months and three years old were observed by Spitz. The situation was that the home had a bad economy so there were only personnel available for satisfying biological needs such as giving food, washing, and changing diapers. There were no resources for giving the babies/children daily contact, care, and love. Even if the biological needs were satisfied, the babies/children began to show abnormal symptoms after three months. They were crying all the time, and when personnel picked them up they were screaming and crying. During the first year, 27 of the babies/children had died due to lack of care and love, and during the second year, seven more babies/children had died. Finally, only 21 out of the 97 children survived, but most of them suffered with various serious mental diseases.

We regard this example as a good indication of the reasonableness of our assumption above that desires relating to the satisfaction of spiritual needs (core values) are innate human desires no different from any other human needs, such as the need for food, clothes, security, and shelter.

"EXCITED TO DO"—COMMITMENT AS A FULLY MOTIVATED STATE

As described in the previous sections, core competencies (intellectual as well as emotional) and core values together with other elements required to satisfy biological needs are considered as critical drivers (motivators) in creating human motivation. In other words, all three factors—biological, mental/psychological, and spiritual—illustrated in the Trinity model are functioning as drivers (motivators) in creating personal motivation.

We assume that only when all three dimensions of the Trinity model are fully recognized and fully operating in a given situation, the process results in high personal commitment. *High personal commitment* can be defined here as a state where a person is fully motivated to devote oneself to a certain task or to an organization. In this highly committed state, the person is willing to take initiatives and mobilize all his/her current capabilities and potentials. In the organizational commitment literature, this state is generally termed *affective commitment*, referring to the degree of involvement, identification, and the emotional attachment toward one's organization.[112]

Affective commitment is a state where the person possesses an "excited to do" attitude toward a certain work task or toward his/her job. In an organizational context, affective commitment or "excited to do" commitment can be described as "the willingness of social actors to give energy and loyalty to the organization." Another alternative state of mind is the so-called *continuance commitment*[113,114] or passive motivation.[115] This state is corresponding to a "have to do" or "forced to do" attitude of motivation.

In our definition of commitment, the focus is on the individual person's inner state—whether he/she perceives the situation as positive so that he/she is intrinsically motivated to carry out the task, or whether he/she perceives the situation as negative so that he/she is only extrinsically motivated. In a situation where people are *extrinsically motivated*, people focus on the task as a necessary "evil" or necessary instrument in order to attain rewards in terms of salary, material goods, and so on. On the other hand, in *intrinsically motivated* situations, people tend to identify themselves with the task, and the process of carrying out the job itself is perceived as "exciting" and rewarding, rather than the outcomes of the task. In this situation, people are doing something that is worth doing for its own sake, similar to the state of "flow"[116,117] or "mu" in the Zen Buddhist term.[118,119]

It should be noted that, in this context, the "excited to do" commitment is not understood as a "pure" outcome. As defined above, it is "a state where a person is fully motivated to devote oneself. . . ." thus "excited to

do" commitment should rather be understood as the optimal motivated state. That means the state is itself a powerful driving force for creating further outcomes.

In the following section, the processes and results of an empirical research study will be presented. The research has been carried out based on the conceptualizations in this article.

IDENTIFYING DRIVING FACTORS BEHIND PEOPLE COMMITMENT—AN EMPIRICAL EXAMPLE

Danfoss, with about 17,000 employees, is one of Denmark's largest industrial companies. In 1999, it started up a research project with the aim of identifying the factors that are most critical for people's loyalty and commitment. The theory behind the model estimation, as presented in the previous sections, was that people commitment depends on the following three latent variables:

1. People's core values
2. People's core competencies
3. People's personal attitudes

The theory used also said that the first two latent variables are highly influenced by top management, middle management, and colleagues, and people's personal attitudes are influenced by the same two latent variables.

Three hundred and thirty-one (331) middle managers from 10 different divisions were invited to fill out a questionnaire with 82 questions for evaluating and understanding people commitment.[120] The following 17 manifest variables were identified as the most valid in the estimation of a model explaining middle managers' commitment.

Core values:

- The company's atmosphere is open and positive.
- My nearest leader recognizes and appreciates my work.
- My nearest leader shows me trust and respect.
- My nearest leader treats me fairly.
- My nearest leader motivates through his/her own efforts and behavior.

Core competencies:

- Management is engaged in continuous improvements.
- My nearest leader is competent in his specialty.
- In my department, we participate actively in the planning of tasks.

Personal attitudes:

- I communicate well with most people in my department.
- I focus on people's positive sides.
- I trust people until there is a clear reason not to do so.
- I respect my colleagues.

Commitment/loyalty:

- I realize myself through my work.
- I try continuously to mobilize and utilize all my skills and capabilities in my job.
- I make it a point of honor to do my best in my job.
- I work in the company because it will be too troublesome to change jobs.
- I am glad for going to work.

Several structural equation models were estimated to show the relations between the latent variable *commitment* and the other three latent variables. The result of the data analysis (using Amos 4 and Lisrel) is shown in Figure 4.1, which is the model with the highest degree of explanation. From the model in Figure 4.1, we see clearly the importance of the core value factor. There is a strong direct relation with core competencies, and through core competencies and personal attitudes there is strong indirect impact on the

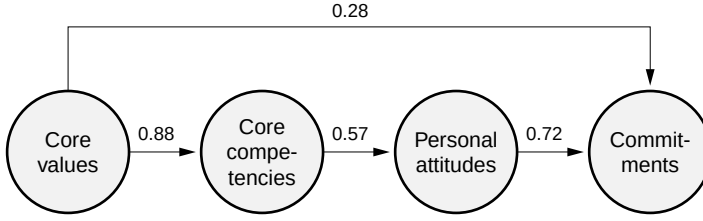


Figure 4.1 The estimated model.

result factor commitment/loyalty. Also, there is a significant direct relation between core values and commitment. So, the model supports clearly the hypothesis that the core value dimension should not be ignored when trying to understand people's commitment. The model's degree of explanation was as high as 0.82.

The data analysis showed that if core values increased by one point, then the expected increase on core competencies was 0.88 (= the impact score), and the impact score from core competencies on personal attitudes was 0.57. The impact score from personal attitudes on commitment was 0.72. The figure also shows that the direct impact score from core values on commitment is 0.28.

All these estimated relations should be analyzed in more depth in order to understand the *indications of possible cause–effect relationships*. People in the company should discuss the above 17 manifest variables (and their measurement results) one by one in each category. It is through such a discussion that people gradually may understand the root causes behind the results of the statistical analyses. During the discussion, there is usually a need for theory to support or reject people's arguments. Deming highlighted this point in his concept of *knowledge about knowledge* as part of *profound knowledge*.[121] Some new theory on the human dimension in TQM has been presented in this article, which is based on Park Dahlgaard.[122]

The findings in the study indicate that the analyzed company should have a high focus on people's core values when they recruit new employees, as well as when educating and training their existing managers and other employees. Another indication is that a focus on core competencies is not enough. Programs for recruitment as well as for education and training should have a balanced focus on both core values and core competencies in order to change people's personal attitudes and commitment. If core values are ignored, there is a high risk that each individual's potential core competencies will not be utilized efficiently and effectively, and the potential effects on personal attitudes (plus behaviors) and commitment will not be experienced.

BUILDING ORGANIZATIONAL EXCELLENCE

Today, many organizations are "searching" for *organizational excellence* but not many organizations have been able to achieve this goal, seemingly because management does not have a profound understanding of what it really means to be excellent. Since 1982, there have been many suggestions for a definition of *excellence/organizational excellence*, and for the success criteria behind excellence. One of the latest suggestions is to describe the

key enabler characteristics, which differentiate organizations with excellent results from organizations with medium or poor results. The British Quality Foundation used this suggestion in a report about business excellence (1998), and the differentiating characteristics (criteria) were shown according to the following list:

1. Management commitment to the business excellence "journey"
2. Effective strategic planning
3. An emphasis on people issues through empowerment and training
4. Unprecedented levels of employee participation through effective communication of and involvement in the organization's goals, mission, and objectives
5. Process understanding, management, measurement, and improvement
6. Deliberately avoiding "jargon" to ensure a seamless integration of business excellence practices
7. Nurturing a culture which focuses implicitly and explicitly on anticipating and serving customers' needs
8. Demonstrating concern for better environmental management
9. Making the internal spread of best practice contagious

Similar lists concerning organizational excellence in terms of long-term competitiveness can be found in several areas of the literature.[123] Such lists may be valuable for organizations which decide to embark on "the journey to excellence," but they may also be misleading. Managers may misunderstand that the shown characteristics are exhaustive, and they may not understand that several of the characteristics are interrelated and have some common prerequisites, which they must understand and work with before they try to "copy" or build those characteristics into the organization. For example, the characteristics 2, 3, 4, and 7 are strongly interrelated, and several of the other characteristics have these four human-oriented characteristics as prerequisites.

As there is an increasing recognition of employees as an organization's greatest asset,[124–126] there seems to be a need to develop a more human-oriented definition of organizational excellence. Such a definition should clearly signal that the first step in building organizational excellence is to build excellence into people, and that "the people first policy"[127,128] and "total development of people" are essentials for achieving organizational excellence.[129]

Dahlgaard and Park Dahlgaard have suggested a new definition of organizational excellence, called the *4P definition,* in which the people dimension is recognized and emphasized as the primary enabler. According to the definition, building excellence into the following four Ps develops organizational excellence:

- People
- Partnership
- Processes of work
- Products/service products

The 4P definition is suggested based on the recent awareness of human resources and their role in the organizational context as the basic unit for any organizational improvement activities. From this viewpoint, it is argued that the first priority of any quality or excellence strategy should be to build quality into people as the essential foundation and catalyst for improving partnerships, processes, and products.[130] But what does that really mean? In order to answer that question, we need to understand human nature, human needs, human psychology, and environmental and contextual factors of human behavior because the project of "building quality into people" can only be carried out when we have a profound knowledge of people and psychology.[131]

It is believed that a precondition for achieving organizational excellence, defined as "the four Ps," is to satisfy people's needs in a balanced way. The core competencies are those capabilities which, together with the core values, are important for satisfying peoples' spiritual and mental needs so that business excellence can be achieved.

It is assumed that the core values, and the emotional competencies in particular, are related to the first two Ps, that is, *people* and *partnership.* Without focusing on the core values and the emotional competencies, it will be very difficult to achieve excellence in the last two Ps, that is, *processes* and *products.* To build quality into the last two Ps, intellectual competencies are needed. The critical or core intellectual competencies are those competencies that are needed to satisfy people's mental/intellectual needs and are, at the same time, necessary to build excellence into the organization's processes and products.

Hence, the first aim of a quality strategy is to build quality into people through the strengthening of both core values and core competencies. The quality strategy should always be implemented both through a top-down strategy and a bottom-up strategy.[132,133] The strategy should follow the policy deployment approach (hoshin planning), which has both the top-down

and the bottom-up strategy included. Such an approach provides a framework for building quality into the following three levels:

1. Individual level
2. Team level
3. Organizational level

When developing the quality strategy, it is vital to have a balanced focus on both core values and core competencies. It is also vital that the quality strategy has a balanced focus on both of the core-competence subsystems, that is, the emotional competencies as well as the intellectual competencies. This is a precondition for improving the quality of work (the partnership and processes).

An efficient quality strategy aiming at improving "the four Ps" can only be developed based on an understanding of the interrelationships between individuals, teams, and the organization, and the critical contextual factors at each level. Figure 4.2 illustrates these interrelationships and the process of building these different levels. The figure indicates that building excellence starts with building leadership, which means recruiting and developing (educating/training) leaders with the right values and competencies. The next step is to recruit and/or develop employees with the right values and competencies. Especially on the value dimension, leaders' behaviors determine if core values (for example, trust, respect, openness, and so on)

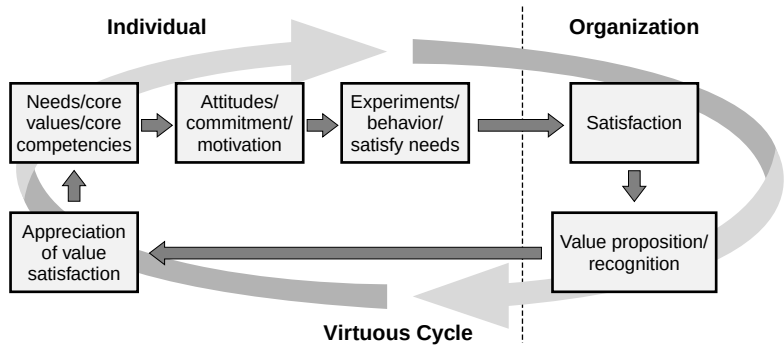
Figure 4.2 A model for building quality into people and organizatinal excellence.

will be diffused and will become a part of the organizational culture. Building teams means that teams are established and developed so that each team is able to practice the right and needed values and competencies. Building organizations means that leaders, individuals, and teams try to practice the needed values and competencies day by day, based on the principle of continuous improvement and a continuous focus on the company's mission, vision, goals, and strategies.

The foundation (building leadership) supports the three other factors represented by the pyramid's three building blocks, and all together the four factors support the last building block of the pyramid, which is called "excellence." You have to work with all four factors if you want to create excellent organizations. This message is valid in any organization.

The aims and assumptions behind Figure 4.2 are clarified in the flow diagrams shown in Figures 4.3 and 4.4. The figures imply an obvious concept that is, however, important to recall.

When talking about needs, values, and motivation, we refer to those individual needs and individual shared values that motivate people to contribute to the goals of the organization. Satisfaction of the organization's expectations is therefore the primary goal. But if we assume our view of stakeholders—as those parties who contribute to the satisfaction of the organization and consequently expect adequate recognition—then positive behaviors of individuals will also lead to their satisfaction, and then



The virtuous cycle is normally initiated by the organization with a "value proposition." To the extent that it corresponds to the needs/expectations/values of the people, it can become a motivator that generates positive behaviors and then creates value for the organization. If the organization is able to recognize people's contribution (create value for the stakeholder "employees"), then motivation increases and the virtuous cycle is activated and values become shared.

Figure 4.3 A virtuous cycle for increasing commitment (inspired by Tito Conti).

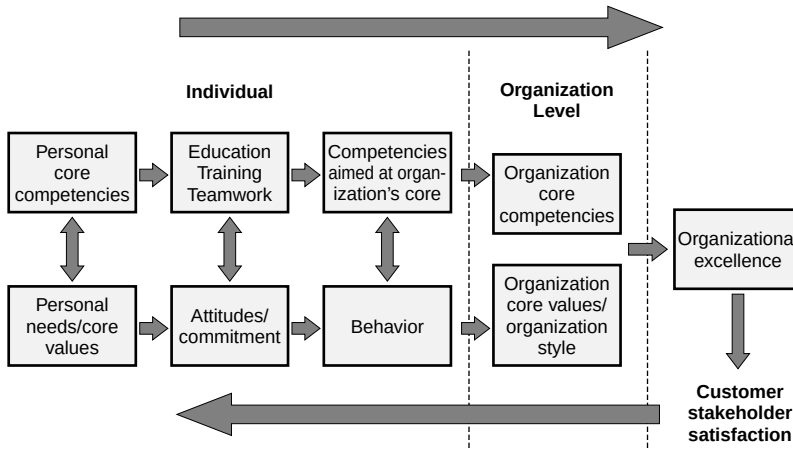


Figure 4.4 From individual to organizational excellence (inspired by Tito Conti).

motivation will be reinforced (see Figure 4.3). If there is not that reinforcement, motivation is going to decrease.

Figure 4.3 indicates that the leader of the organization with a proper value proposition can start a virtuous cycle. Then, to the extent that such values are shared, organizational quality increases. If the company properly recognizes employee contribution, then motivation increases and a virtuous cycle can take place, where shared values take deeper roots and employees identify themselves more and more with the organization. In this case, values will be created for the organization in terms of satisfaction of stakeholders.

Figure 4.4 illustrates the view that individual core competencies and core values can be developed and released through education and training. In addition, it says that individual competencies, if properly directed, may converge toward organizational core competencies, and the individual core values, if properly directed, may converge toward organizational core values, or collective behaviors, that we also may call organizational style. The mixture of organizational core competencies and values defines the level of organizational excellence and the level of customer and stakeholder satisfaction.

In the next section, we will suggest some practical guidelines for education and training programs, which usually are needed to strengthen people's motivation and commitment and hence for *achieving excellence*. We strongly believe (like Ishikawa about quality) that: *excellence* starts with education, continues with education, and ends with education.

PRACTICAL GUIDELINES FOR EDUCATION AND TRAINING PROGRAMS TO STRENGTHEN MOTIVATION AND COMMITMENT

As previously stated, the first priority when designing a strategy for building excellent organizations must be to build quality into people, which is the essential foundation and necessary catalyst for improving partnerships, processes, and products that will delight the customers. This should be done through a continuous program of education and on-the-job training. In order to improve quality of work and quality of life, this program should be designed to strengthen two essential parts:

1. Core values (CV)
2. Core competencies (CC)

The message of the model in Figure 4.2 is that organizational excellence is created through four factors:

1. Building leadership
2. Building individuals
3. Building teams
4. Building an organization

Practicing leadership is the foundation for creating motivation and empowerment. Perhaps the most prevalent view of empowerment is that it is something that is given to people. However, that aspect is only a part of the picture. Perhaps the most important and difficult aspect of empowerment is the "building" aspect. In other words:

> Empowerment is building power into people,
> building power into people is building leadership into people,
> building leadership into people is building a crew of leaders,
> building a crew of leaders is creating many leaders, who work together on a common aim.

Each of the four factors in Figure 4.2 comprise a number of so-called "tools" (or guiding principles) that all leaders should understand and practice if they want to build an excellent organization, in which everybody is motivated to learn and make improvements through daily work. These tools or guidelines will be shown in the following without comments, because

most of the tools are self-explanatory and are based on the literature review in the previous sections. Some of the ideas for building individuals and teamwork are inspired by a Japanese training program in motivation.[134–137]

The seven tools for building leadership:

1. Have a profound knowledge about systems and people.
2. Focus on people and inspire them instead of being just an administrator.
3. Rely on trust rather than on control.
4. Develop and clarify core values and a shared vision instead of tactics, timetables, and detailed steps.
5. Ask people about what and why instead of when and how.
6. Have a long-term view with focus on real leverage instead of a short-term view with focus on the bottom line.
7. Challenge status quo and seek innovation instead of maintenance and avoiding risk.

The seven tools for building individuals (self-development):

1. Clarify a personal vision.
2. See reality clearly and create the creative tension.
3. Be proactive—take initiatives and responsibilities.
4. Focus on the positive sides and turn disasters into success.
5. Be emphatic when you communicate.
6. Have attention to what is going on right now.
7. Be aware of your defensive routines and learn to learn.

The seven tools for building teamwork:

1. Provide a common purpose for all team members (share the vision).
2. Allocate roles and impart a sense of mission (share the responsibility).
3. Work together with respect for each other's differences (differences are the sources for synergy).
4. Master interpersonal skills: balance dialog and discussion (inquiry and advocacy).

5. Have a win/win paradigm ("benchmark" instead of competing).
6. Master the seven old quality tools.
7. Master the seven new quality tools.

The seven tools for building an organization:

1. Clarify your business goal and plan.
2. Deploy the business plan (policy deployment).
3. Implement cross-functional management.
4. Provide the necessary training and education.
5. Empower and motivate people.
6. Evaluate the current situation by self-assessment.
7. Take necessary action based on the result of the self-assessment.

CONCLUDING COMMENTS

The concepts of core values and core competencies have been defined by relating these concepts to human needs. Core values were related to the satisfaction of human spiritual needs and core competencies were related to the satisfaction of human mental and psychological needs.

It has been argued that the existing theories or frameworks for understanding human motivation and commitment have "ignored" the so-called spiritual dimension of satisfying human needs (the personal core values). However, the empirical findings presented in this paper show a strong indication for the hypothesis that this more or less excluded dimension is the most important for understanding people's loyalty and commitment. The Trinity model is proposed in order to capture this dimension along with the other two already identified dimensions.

The result of the empirical survey indicated that "core values" was the most important latent variable in the model for explaining people's personal attitudes, loyalty, and commitment. So, the result of the empirical survey is a further indication that the spiritual dimension is an important factor for understanding human motivation and for having success with the implementation of TQM.

Thus, we can confirm the original meaning of the concept of value, which originates from the old Latin *valére*, meaning "be worth" or "be strong." When people feel worthy, people are strongly motivated. Value

seems to be the ultimate source in the creation of genuine intrinsic motivation. When people are motivated to do something based on value, the tasks or activities seem to be linked to the person's inner desire. This, in return, creates a genuine commitment of a "want to do" attitude instead of "have to do" or "forced to do" attitude. The French revolution and the Communist revolution are some examples of the power of value. Voluntary workers in many humanitarian organizations, such as Red Cross, Greenpeace, and Doctors without Borders are driven by inner desires based on their personal value sets. The recent focus on the importance of a company's vision can be understood from this perspective. A company's vision that is based on the common value set of all employees is often a strong "guiding star," and such a vision in terms of goals, values, and missions helps employees in maintaining commitment.

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5

Quality Management: Leadership Imperative

Gregory H. Watson

INTRODUCTION

One conclusion that may be drawn from the current state of quality is that effective change will not occur unless it is directed, coordinated, and driven by leadership. Leadership must provide the vision or direction to be pursued. It must coordinate and engage the organization so that all of its stakeholders understand the pertinence of the change on their unique value proposition. Finally, leadership must provide the constancy of purpose to persevere in the face of adversity—adjusting actions, realigning activities, and allocating resources to accomplish the overall objective.

TOTAL QUALITY AND COMPREHENSIVE LEADERSHIP

Leadership's Role in Driving Total Quality Management

Leadership is the critical ingredient in the recipe for sustained quality performance. This truth has been recognized in every system of quality thinking that has been developed since World War II. Indeed, management responsibility for quality is at the core of an ISO 9000 quality system, and executive leadership is the primary driver for success according to the criteria of the Malcolm Baldrige National Quality Award for business excellence. Only

when leaders focus on their unique contribution as a catalyst for continuous improvement does a quality system stand a chance to achieve exceptional performance. But what does it take for an organization to attain leadership excellence, and what activities can a quality professional pursue to encourage responsible behavior by executives that will provide a role model for the entire organization to follow in pursuit of excellence? The basic principle of total quality is that quality is disseminated throughout an organization by the active engagement of all people, at all levels, in all capacities, to focus on delivering value to customers based on shared objectives for organizational performance. Another core value in "total quality" is management by fact, applying analysis methods to diagnose problem areas in a business, and defining directions for management.

The notion of leadership-driven quality has been incorporated into the philosophies of both the ISO 9000 standards and the Malcolm Baldrige National Quality Award criteria. These systems summarize lessons learned about effective leadership and serve as a background for conclusions about the central or core requirement for a company's "common quality language" and as drivers of business excellence.

Comprehensive Leadership

Leaders are not just defined by position within an organizational hierarchy. People can exercise leadership both up and down an organization's hierarchical pyramid. Leadership is the critical success factor in delivering sustained success by establishing quality direction, defining quality objectives, implementing quality programs, and assuring constancy of purpose in the pursuit of business excellence. Not all leaders will be found in positions of management. Embedding a leadership-centered culture is the ultimate act of senior leadership—a selfless act of mentoring others to the point where they have confidence in their own ability to lead and then encouraging them to behave as leaders. Such a comprehensive approach to leadership delivers the ultimate in flexibility and responsiveness to customers, because each person that "faces a customer at the moment of truth" can act as a leader to deliver excellence. Such a system of leadership is based upon solid principles of quality management that are embedded in the operating philosophies that are contained in both ISO 9000 and the Malcolm Baldrige National Quality Award.

Management Responsibility for Quality

ISO 9000 also defines core operating concepts of "management responsibility." In accordance with this definition, management must:

- Establish quality policy and objectives that demonstrate top-level commitment and assure that this policy is understood at all organizational levels.
- Assign an individual as management's representative to establish a quality system, report on its performance, and conduct liaison with external parties.
- Provide adequate resources, including training and personnel.
- Review contracts and customer requirements to assure that products and services will meet their expectations.
- Define and document the descriptions of work for all who manage, perform, or verify work that establishes the quality of organizational performance.
- Delegate authority for initiating action to prevent nonconformities.
- Delegate authority to identify and eliminate problems.
- Encourage employees to make suggestions and recommend improvements.
- Accept responsibility for verifying the implementation of solution proposals.
- Assure that nonconforming products are controlled.
- Review the quality system for effectiveness on a regular basis.

Malcolm Baldrige National Quality Award

Similarly, the Baldrige Award criteria describes generic qualities of leaders and asks that managers:

- Assure that the organization has clear knowledge and understanding of both customer and market requirements.
- Create clear values respecting the capabilities and requirements of employees and other stakeholders.
- Develop a common understanding of purposes and goals and use of complementary measures and information to enable planning, tracking, analysis, and improvement across all levels of the organization.
- Set high performance expectations and challenge people to improve.

- Build loyalties and teamwork upon its values and pursue shared purpose.
- Encourage and support initiative and risk-taking.
- Subordinate organizational politics to customer service.
- Avoid "chain of command" thinking that requires long decision paths.
- Assure consistency of plans, processes, actions, information, and decisions.
- Evaluate organizational performance to assure and improve business results.
- Require self-examination by leaders, receipt of personal feedback, and response by personal improvement.

Management Policy and Quality Policy

Steven Covey states that "a cardinal principle of total quality escapes many managers: you cannot continuously improve interdependent systems and processes until you progressively perfect interdependent, interpersonal relationships."[1] Quality policy and management policy should focus on cross-functional and interpersonal activities because many of the problems that occur in organizations happen at the seams between functional and process boundaries, where accountability and responsibility are not clearly delineated. "Like the genetic code in the natural world, which remains fixed while species vary and evolve, core ideology in a visionary company remains unchanged throughout all its mutations."[2] The management process delivers this policy as an outcome of its coordinated efforts. What is the basic ingredient of an organization's quality policy? There are three basic ingredients: (1) customers as the focus for the definition of excellence in both the purpose and outcome of business; (2) continuous improvement (both incremental and breakthrough) as the approach to the market; and (3) management by fact as the key diagnostic approach to defining and managing the business processes of the organization.

Leaders focus on customers as the integrating principle of their business: a customer-focused business must consider the needs of all of its chosen customer segments and decide where it is going to focus its attention. The ultimate success of a business will depend on many factors: the capital invested by owners, the product or service acceptance by customers, and the excellence of products and services provided by employees. No one factor

can be chosen at the exclusion of others as the sole focus of a business. Successful businesses manage all three of these dimensions to assure a balanced approach to long-term success. How is this philosophy delivered?

Values As an Aspect of Quality

Values-based management (or as Steven Covey describes it, "principle-centered leadership") is core to the implementation of quality. As described earlier in this chapter, values are the "way of working" for an organization. There are four categories of values that are important to consider:

1. Business values: providing values to assure "shared direction"
2. Behavioral values: establishing a desired model for "personal conduct"
3. Moral values: describing the difference between "right and wrong"
4. Personal values: identifying the set of beliefs each person holds

These values are observed through the:

- Process by which an organization makes decisions and shares power
- Manner in which an organization rewards or recognizes behaviors
- Set of symbols and artifacts that represent the organization's self-identity

Values are deployed in an organization using a cascade approach from the top level of management to the frontline worker. The ability to absorb value statements appears to take several years in most organizations. Values cannot be WOW—words-on-the-wall—they must be translated into the heads and hearts of people before they become reality in their hands and mouths. The four steps to deploy values effectively start with leadership's definition of values (see Figure 5.1):

1. Attitudes
2. Behavior
3. Culture
4. Values

In order to assure that quality is deployed throughout an organization, managers must be engaged at all levels to define and cascade the behavioral values, operating philosophies, and improvement objectives that define an

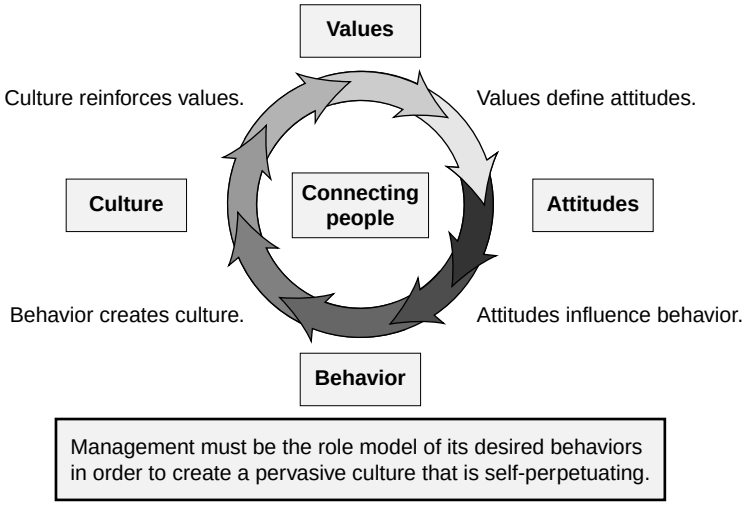

Figure 5.1 Values development cycle.

organization's approach to quality. Management systems that support improvement of quality include the following structural components:

- Policy deployment systems for setting strategic direction for business improvement and assuring linkage of objectives from the level of business strategy to the frontline workers
- Benchmarking and project selection methods that keep the organization focused on the top-priority, high-payoff uses of its improvement system to deliver sustained levels of performance
- Goal setting, planning, and scheduling systems that implement the strategic direction in the form of change projects that fundamentally alter the business performance to meet the shared vision
- Project management approaches that deliver the desired change, one step at a time, and involve the affected parties in the creation of the new methods and procedures that will assure success over the long term
- Problem-solving and data analysis methods that deliver management by fact across all areas and levels of the organization

- Personnel management processes that involve all employees, recognize their efforts for business improvement, and support their personal development
- Quality information systems that collect data, analyze it, and report information about the current status of quality performance in a way that encourages timely response and action for continuous improvement of both internal processes and the customer experience with the product or service in the field

How does an organization interact with the individual employees in each of these categories? When an organization defines its business values, employees must respect them—and at the other extreme, personal values belong to the individuals and organizations must respect them. Between these two extremes lies a delicate balance in which leadership must engage its people through a regular communication process to convince them to align their attitudes and behavior to create a shared culture that influences the organization's way of working together. Shared behavioral values can be a competitive advantage for an organization. The shared moral values of an organization tend to reflect the basic credo of integrity, trust, openness and truthfulness. It is important for organizations not to go beyond this limit and to assure that moral values are one of the criteria used in employee selection as well as their orientation process so that all parties in the organization are aware of the moral and behavioral expectations, as well as the consequences of any actions that cross these boundaries.

LEADING AT ALL LEVELS

It is a tall order to deliver this kind of system. It requires, as Warren Bennis observed, the kind of situation where, "A leader is a follower is a leader."[3] Bennis noted that we face a "chronic crisis of governance—that is, a pervasive organizational incapacity to cope with the expectations of their constituents—(that) is now an overwhelming factor worldwide. If there was ever a moment in history when a comprehensive strategic view of leadership was needed, not just by a few leaders in high office but by large numbers of leaders in every job, from the factory floor to the executive suite, this is certainly it."[4] Good management requires good role models—not just at the top of the organization, but throughout its structure. People then can see that this behavior is not just for "super-leaders" but is part of the expectation for every ordinary worker, even the

supervisor, and they are also capable of exhibiting the shared values. This assures that each person understands that the vision of leadership is not about wishing, hoping, and praying; it is an act of courageous leadership that must be duplicated at all levels of the organization. What does leadership at all levels look like?

Executive Leadership

Senior managers must establish the vision and values for their organization. Executives demonstrate leadership through establishment of a framework for action by creating the management process for cascading values and objectives. A critical aspect of the process of management that remains the active responsibility of the top management team is conducting regular leadership reviews of the business. This is both a due diligence responsibility to the owners of the organization and a fundamental approach to exercising leadership. A leadership review has two emphases: review of the governance structure and "strategic direction of the organization," as well as review of strategic problem areas that lead to business vulnerability through challenging technologies, violation of critical assumptions, or changing "rules of competition" in the market. Leadership reviews offer the top management an opportunity for:

- Demonstrating personal commitment to their "philosophy of management"
- Providing visibility for their "defining moments of quality encouragement"
- Mentoring the organization to achieve desired behavioral changes
- Guiding cross-organizational efforts to achieve desired systemic change
- Encouraging people to "build a desire to win and a will to act"

What else can executives do personally to demonstrate "positive leadership behavior?" A few ideas can be offered:

- *Executive Touch Program.* So top executives can get close to the leading targeted external customers. Requires quarterly visits that are intended solely for relationship building to establish a foundation for future business discussions.
- *Executive Customer Advocate Program.* For the senior management team to facilitate significant problems encountered by major customers in each of the primary lines of business.

- *Complaint Listening Program.* All levels of management can spend a few hours monthly listening to "real" customer complaints directly on call center lines.
- *Executive Escalation Program.* The top level of senior managers rotate through a monthly "duty day" where they represent formal escalation "point of last resort" for resolving all customer complaints.
- *Executive Compensation Program.* Change the compensation so a significant element of the "reward component" is granted for a "statistically valid" increase in customer satisfaction as measured by a valid external method.

Business leaders must exhibit consistency in all that they do. Lack of consistency is considered by employees to countermand the organizational culture and may cause deterioration in a shared system of values. It is particularly important to demonstrate consistent performance when one of the tenets of the organization is *empowerment*—the ability to make individual choices within a set of boundary conditions. An organization's vision provides direction for empowerment, but its values provide the boundaries for making choices.

Management Leadership

All managers may also become leaders. Since this is not a mutually exclusive distinction, each person in a management function should at least aspire to being a local leader. What can be done to demonstrate leadership at the local level? Several actions can be suggested:

- Taking an active role in leading a major quality initiative that has strategic value to the organization as a whole
- Showing a personal interest in developing the next generation of leaders through the personal mentoring of high-potential employees
- "Managing by wandering around" and taking time to talk with employees about any issues or concerns they may have and providing brief words of encouragement
- Reviewing improvement projects that deliver on the annual continuous improvement objectives of their cognizant management function
- Recognizing the improvement efforts of frontline teams and individuals

- Developing the core competence of their organization through team-based on-the-job education and training programs
- Communicating to all employees about business status and briefing them on both the strategic direction and any news that directly concerns them or their livelihood

Frontline Leadership

Leadership is often required at the front line in order to coordinate action and encourage common behaviors that reinforce organizational values. Each person can exhibit leadership as a means to encourage fellow employees and provide an example that reinforces the behaviors of the value system. Some of the actions that can be taken at the personal level include:

- Participate actively in process management activities and continuous improvement team projects.
- Develop your personal problem-solving and statistical analysis skills.
- Mentor new employees in the cultural values and historical accomplishments of the organization.
- Pursue certification in the core skills involved in your profession to demonstrate mastery of the tools and methods of your trade.
- Provide improvement ideas and suggestions to your managers whenever you see any areas for improvement in your work process.
- Participate on teams for conducting self-assessments, audits, and cross-functional process improvement.
- Take responsibility for your personal development and pursue a combination of both internal and external courses that deliver your career objectives.
- Recognize the contributions of your team members by providing encouragement for their achievements and expressing appreciation for their positive involvement in team improvement projects.

Personal Leadership

True leadership is not in words, but in deeds: "The authentic test for mastery of learning is not in what a manager [person] says, but in what a manager [person] does."[5] This requires a consistent practice that is developed from the inside out and exists on both personal and interpersonal

levels, both within the local work experience and across the whole organization. This effort requires two key focus areas: managers must empower the workforce to exhibit the principles of total quality leadership and frontline workers must become aligned with the strategic direction, improvement objectives, and cultural values of the leadership team. Each employee should aspire to represent a role model of the behavior desired of colleagues in the organization.

Role Models for Quality

The competence of a leader requires acknowledging and sharing uncertainty, embracing error, responding to the future, becoming interpersonally competent (for example, listening, nurturing, coping with value conflicts, and so on), and gaining self-knowledge. This type of competence requires a full commitment to personal transformation. All leaders seek to master themselves. They achieve learning through a variety of methods: emulation, role taking, practical accomplishment, personal growth, validation, anticipation, and scientific learning. Leaders have two basic motivations for learning: a need to know and a sense of role (belief that there is a gap between who they are and what they should be). Leaders are formed just as much by their experiences as by their skills. The things that really matter are not taught in a classroom setting.

Nothing is truly yours, truly mastered, until you understand it. Leaders are self-directed and find an internal drive that motivates them to learn and grow so they can cope with unknown situations. Learning develops understanding that allows synthesis of significant ideas into an imaginative new context that becomes the future. In this way, leaders shape life, rather than being shaped by it. Reflection is a pivotal way that we learn. After appropriate reflection, the meaning of the past is known, and the resolution of the experience—the course of action that you must take as a result—becomes clear. This is especially true when the past contains mistakes, as mistakes provide potent lessons for attitudes and behavior to avoid, while lessons from successes are the most potent lessons for reinforcement of desirable attitudes and behavior. Reflections permit us to process our feelings, understand them, resolve our questions, learn what to modify to achieve our desired objectives, and then get on with our work.

The most relevant learning comes from real-world experience. As Warren Bennis observed, "Leaders learn by leading, and they learn best by leading in the face of obstacles."[6] When a potential leader commits to becoming a role model for performance as a leader, they have taken the first major step toward dedicating themselves toward serving others as a leader. This is what the most respected leaders do: serve others out of selfless

humility. When leaders operate out of personal humility, they have an authentic ability to generate good group dynamics and to step in and assist in managing conflicts within their work group. Leaders also help by serving as trainers and facilitators. In order to be effective as a trainer or facilitator, a leader must be a competent role model in the training area. In addition, the leader-trainer-facilitator must understand what the requirements are for learning and be able to satisfy them through:

- Identifying the developmental needs of participants
- Developing educational and training programs that satisfy the needs analysis
- Constructing interesting training that engages and involves participants
- Facilitating involvement, discussion, and active learning by participants
- Determining the effectiveness of the course of learning

EXECUTIVE INVOLVEMENT VERSUS MANAGEMENT COMMITTMENT

Remember the pig (see this story that describes commitment in chapter 3)? It was fully committed to delivering the customer's value proposition! The level of commitment that comes from mere "involvement" is not perceived as commitment. In order for employees to believe that something is a priority for top managers, it must be evident that the top leaders are really committed to supporting and encouraging the action to take place.

What Is Management Participation and Involvement?

Participation means "attendance," and in the world of leadership no points are given for mere attendance. Involvement goes beyond attendance and implies more than "being there"—it means "taking an active role." The question that people ask is whether the manager is "sincere" in the role they play or are they just "role-playing?" Commitment is a third level on this same scale of action. Commitment is the exercise of management will to stimulate success—to be the catalyst that creates the spark that ignites change. True leadership encourages "proactivity" among its people. Leadership's role is to take an organization in directions that it would not go by its own direction. All organized change must be driven by the action

of management—this means that an organization's leadership should encourage a "bias for action!"

What Makes a Committed Executive?

Commitment is not just about making statements or "playing a role"—it represents a profound transformation of attitude that can only be communicated with sincerity "from the heart" of a true leader. Action is aligned with the values of the organization and management is committed to producing the desired business results enabled by deployment of a lean organization with the "savoir faire" or knowledge required to accomplish its objectives. The organization must be lean to accomplish the objectives of shareholder value and the organization must have knowledge to focus on the true needs of customers. The acts of committed leaders are based on demonstrated best practice and internal management of knowledge—to make a difference! True leaders are managers who focus on delivery of efficiency (time), effectiveness (quality), and economy (cost) while exercising their "levers of change" to move the organization in the desired direction:

- Philosophy of management and style in its implementation
- Competence of people to perform the activities required of the organization
- Common language that permits the people to improve the way they work
- Reward systems that reinforce desired behavior and outcomes

Leading People While Managing Processes

The dichotomy between leadership and management is similar to the model of the way that a human brain operates: the left side of the brain controls logical structure while the right side of the brain influences emotions. The left side of the brain manages plans while the right side of the brain establishes and maintains relationships. The imperative of this model is clear: one should "manage from the left brain and lead from the right brain."

CONCLUDING COMMENTS

The laws of nature include entropy—that is, the principal that all things degrade over time by suffering an energy loss. This is also true of a business or work process. Left to its own, business will also decrease in performance

over time. Entropy is one reason that we pay attention to preventive maintenance and put detection systems and work monitoring devices in place. These monitors let us know that a process is degrading and someone needs to intervene. Process improvement is the counterforce to this effect of entropy. It is the positive force that is seeking to offset degradation by continuously improving the operation of our processes. This approach to continuous business process improvement combines corrective action, preventive action, and creative action to assure that a consistent, predictable performance result is achieved over time.

Only when business is fully dedicated to consistently delivering process performance that satisfies its customers will it be able to have sustained market success. Continuous improvement is one way to manage for sustained success, but will it keep pace with the challenges that confront business from technology and social change? Often, the regulated approach of continuous improvement is not sufficient and a need is presented for achieving breakthrough results through innovation. This challenge requires a new way of thinking for organizational leaders—one that goes beyond their role as stewards of resources to one that embraces chaos and challenges their creativity. In the face of these challenges, quality methods and principles will continue to be important for guiding the thoughts and actions of business leaders. The quality of leadership will always stimulate the "unnatural" acts that overcome the natural process of business entropy. Without it, organizations will shrink and die.

ENDNOTES

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6

From Continuous Improvement to Continuous Innovation

Robert E. Cole

INTRODUCTION

The present-day version of the American continuous improvement movement grew out of the Japanese quality movement as it developed in the late 1960s and evolved through the 1980s. It was brought to the attention of Westerners in the early and mid-1980s by Western observations of the corporate practices of leading Japanese companies, as well as by popularizers like Masaaki Imai.[1,2]

With time, we have come to recognize that the significance of continuous improvement goes far beyond the quality movement. Ultimately, it is about organizational renewal and efforts to prevent organizational ossification. There are significant organizational benefits associated with a series of small wins.[3]

CLARIFYING TERMINOLOGY

Many researchers contrast continuous improvement with innovation, continuous improvement with discontinuous innovation, incremental innovation with discontinuous innovation, and exploitation with exploration.[4–7] For the time being, we will focus on the most common distinction between continuous improvement and innovation.

In the 1980s, a decade of seeming Japanese emergent supremacy, the continuous improvement approach was often held up as superior to innovation.[8–10]

By the late 1990s and the beginning of the new millennium, the resurgence of American industry—especially in high tech—combined with the stagnation of the Japanese economy put renewed emphasis on the benefits of innovation.[11] A popular revisionist view was not content to argue for the weakness of the continuous improvement approach relative to breakthrough innovation. Rather, it argued that continuous improvement, slow and plodding, was downright un-American, inconsistent as it was with the American cultural emphasis on improvisation and innovation.[12]

This discussion begs the question: Just how useful is the common categorization of continuous improvement versus innovation? The common assumption is that continuous improvement is small scale and that innovation is discontinuous and large scale. Yet, there is, in fact, no logical reason to associate the term "innovation" with large scale discontinuous change. Consistent with a dictionary definition, innovation is best associated with creative solutions that can occur on small and large scales and can be more or less discontinuous. Put more bluntly, there is plenty of innovation that occurs in the course of continuous improvement.

Typically, those who juxtapose continuous improvement versus innovation see them as *trade-offs* and/or as temporally sequenced. Sutcliffe, Sitkin, and Browning summarize discussion of this perceived dilemma.[13] Reflecting on the difficulty of combining exploitation and exploration, a closely related distinction, March notes that the difficulty of balancing the two is complicated by the fact that returns from the two options vary not only with respect to their present expected values but also with respect to their variability, their timing, and their distribution within and beyond the organization. The net result is that organizations have great difficulty in even understanding and specifying the appropriate trade-offs, much less defining and creating an appropriate balance between them.[14]

What if, instead, we could see continuous improvement and discontinuous innovation as complementary? That sounds good in principle, but it suffers from the fact that some firms and industries are far better at one than the other. Some industry conditions give managers much stronger incentives, resources, and constraints to do the one rather than the other. As a result, their capabilities may be sharply skewed to one or the other. Yet, it is also clear that in many situations, those firms that can find a way to do both would be best off.

Thus, a number of scholars have tried to find some way to combine the two perspectives. Tushman, Anderson, and O'Reilly call for an ambidextrous organization that combines efficiency and innovation, tactics and strategy, and large and small.[15] Sutcliffe, Sitkin, and Browning have made an effort to clarify what a complementary balanced approach might look like.[16] They argue for a synergistic approach in which greater control (which they

associate with continuous improvement) and exploration (which they associate with disjunctive change) are mutually reinforcing.[17] Their discussion of how this is to be effected, however, is quite abstract focusing on the mutually reinforcing nature of reliability (associated with continuous improvement in their view) and resilience (associated with learning).

We have already argued that there can be a great deal of innovation built into continuous improvement efforts. Many creative solutions are associated with continuous improvement. The challenge is to see whether discontinuous innovation, in turn, can be infused with a continuous improvement approach. There is indeed good reason to think that for large scale discontinuous innovation to be successful, there has to be a great deal of continuous improvement surrounding it—before, during, and after.

Thus, instead of distinguishing between continuous improvement and innovation, we might better distinguish between continuous innovation and discontinuous innovation—with much of continuous innovation involving small scale and local innovation. This is the terminology to be used hereafter. This usage encourages us to understand that in practice there is a continuum between continuous innovation, and discontinuous innovation, even if we end up coding cases only according to these two binary categories.

THE NEW CHALLENGES

We increasingly live in a time of hypercompetition. We are witnessing an accelerating pace of technological change—an acceleration of "clock speed" in one industry after another.[18] We are witnessing the infusion of new technology even in very traditional industries, like furniture making and retail sales. Major vehicles for that infusion are the role of software and IT in determining product functionality.

The speed at which firms develop and roll out new products has become an increasingly critical competitive issue. Consider that the product lifecycles in the PC industry were approximately one year in the middle 1980s; by 1997, these were reduced to approximately three months.[19] Shorter product cycles mean that firms have less time to recoup their investments, and being first to market with the right product and quality confers major competitive advantage. Indeed, in the new economy, some go so far as to argue that we live in a world of increasing returns where those products and firms that get ahead, get further ahead over time as a result of a series of positive feedback loops. This is a world of winner-take-all markets. This exaggerated view ignores the dynamism of emergent markets and technology. Nevertheless, there is clear evidence that in rapidly changing high-tech markets, being late to market significantly reduces the

profits of late entries.[20] Every manager nowadays seeks to compress development times, production times, and delivery times, and integrates these operations into as seamless a process as possible.

To be sure, we need to distinguish between derivative, platform, and breakthrough commercial projects.[21] Derivative projects range from cost-reduced versions of existing products to add-ons for existing production products and processes. They are basically *incremental projects* often completed in a few months time; typically, examples involve new packaging or new features and/or possibly incremental process improvements. At the other end of the development continuum are *breakthrough projects.* These projects involve major changes to existing products and processes; they establish core products and processes that differ fundamentally from previous generations and may involve revolutionary manufacturing processes. *Platform projects* are in the middle of the developmental continuum. They involve more product and/or process change than derivatives but they don't involve the use of untried new technologies or materials. Well-designed platform projects hold the promise of easy migration to new derivative projects.[22]

Regardless of type, speed has become the imperative for development. Is speed, however, compatible with continuous improvement, as we have grown up with that concept—particularly in an environment of great uncertainty associated with breakthrough projects? The tools of continuous improvement were developed in fairly slow-moving industries like the automotive industry. The problem-solving protocols have stressed that in order to solve a problem, one must systematically go through a set of elaborate steps. One must first plan and decide on what the right problem is, clarify the reasons for selecting that problem, assess the present situation, collect all the relevant data, sort it, analyze it, decide on the cause of the problem, develop and implement a corrective measure, and evaluate the results. If the evaluation is positive, then one must standardize and act to prevent regression. This is impressively systematic but also incredibly time consuming. This is not an approach that works well in a rapidly changing environment.

In really fast-moving industries where managers are focused on breakthrough projects, or rapid iteration of derivative products, or rapid development of a succession of new platform products, managers are under incredible pressure to accelerate the pace of development, production, and delivery and to integrate them in a seamless process. The literature suggests that in competitive technology with intensive global markets, advantage is built and renewed through more discontinuous forms of innovation—through the creation of new families of products and businesses. One can contrast this with continuous incremental product line extensions and improvements associated with derivative products that are essential for maintaining leadership. These maintenance activities are significant, but

come into play only after leadership has first been established through discontinuous forms of innovation.[23]

The question to be addressed, however, is: Does continuous innovation have a contribution to make toward the promotion of discontinuous innovation associated with breakthrough development projects? If we first examine recent scholarships dealing with speed and product development, we find speed to be associated with an emphasis on concurrent engineering involving the use of overlapping product development stages and parallel processing, design without delay (shorten lead times by taking out all unnecessary delays), and design for manufacturability.[24–26] The focus of these efforts is on streamlining, simplification, and rationalization.

Concomitant with these approaches, the field of quality has long stressed the importance of applying quality principles to the new-product development process. Thus, Armand Feigenbaum first outlines the 16 sequenced steps in new product development and then shows how four principal quality principles mesh into this sequence.[27]

In reviewing his model, we can see first its linear character and second its focus on systematizing and rationalizing the product development process. The quality field has traditionally been focused on planning, simplification, systematization, and streamlining as the basis for insuring that the product development process will yield high-quality products.[28] Feigenbaum's approach is quite representative of this focus.

In Joseph Juran's view, structured processes such as those outlined by Feigenbaum are not enough to insure new high-quality products. Often, firms still need to increase speed, improve the competitiveness of their products, and deal with chronic wastes that are created. Juran sees these problems as resulting mostly from weaknesses in the quality planning processes and requiring continuous innovation. In particular, he focuses on the importance of eliminating chronic waste and increasing the annual rate of quality improvement faster than one's competitors.[29] Thus, the key to achieving high levels of quality in the product development process is to eliminate chronic waste (for example, rework) through better planning, simplification, systematization, and streamlining. In the end, however, the emphasis is still on the rationalization of the development process.

PROBE AND LEARN AS AN ALTERNATIVE APPROACH

There are, however, alternative ways of thinking about how to creatively build quality improvement through continuous innovation into the development process. The first step in such thinking is to understand that product

development in turbulent sectors, like high tech, is an emergent process in which the premium is on learning and rapid incorporation of that learning into subsequent, as well as previous, development processes. This severely limits the contribution of conventional planning, which is so much the hallmark of the traditional approach to incorporating quality into the product development process. It also paradoxically encourages the successive generation of error, early and often, as part of the learning process.

Implicit in this description, as well, is that product development in a turbulent environment requires that we understand it as a nonlinear process, with both backward and forward movement occurring as the development team often revisits past decisions based on new information and changing circumstances.[30] These conceptions suggest that the task of infusing continuous innovation into the processes of discontinuous change goes well beyond the traditional approach of quality experts, which is to figure out how to apply conventional quality improvement tools to rationalize and streamline the discontinuous change process. It requires understanding conceptually what we mean by continuous innovation and developing the tools to implement those new understandings.

Under these rapidly changing circumstances with high levels of uncertainties and complex interaction effects, problems and error are inevitable.[31] This seems in contrast to conventional quality thinking, which stresses seeking the holy grail of prevention. Specifically, the standard thinking that has been pounded into quality professionals is that an organization should aim to prevent errors and defects upstream by designing-in quality. Failing to do so will lead to an inevitable compounding of error that results in heavy reliance on repairing and reworking defective products downstream.[32]

Yet, one of the challenges of product development under conditions of rapid change, high uncertainty, and complex interaction effects, is precisely to surface error early and often! It is not only inevitable, but also desirable. Prevention, of course, is still a goal (in relation to errors that can be avoided, that are not part of the token that has to be paid for innovation) but it occurs only through concerted efforts to continually uncover error. In this sense, the simple view that the quality movement has historically evolved from detection to a focus on prevention is, in turbulent uncertain and interactive environments, incorrect.[33] Rather, what we see is a much more complex equation in which the generation and detection of error plays a renewed *and desired* role. Of course, the quality leaders have always advocated learning from error. We are talking, however, about something quantitatively and qualitatively different. In traditional quality control, one often carries out, for example, accelerated life testing under simulated field conditions; you seek to find the location (where) and timing (when) at which

you can generate error (failure) in the products you are testing. The purpose is to use that information to control, reduce, or prevent subsequent error.

We are talking about intentionally and successively generating error through the product development process, especially in interaction with downstream customers, so that we can learn from it. The focus is on meeting customer needs through discovery that enables heightened performance and new features, not increased reliability through control. This is especially the case with getting new technologies to customers as quickly as possible as firms seek to create new markets and carve out market leadership positions with potentially long-term positive consequences. As Geoffrey Moore puts it, companies need to "go ugly early."[34] He emphasizes that getting bad reviews for product features and quality performance is better than getting no reviews at all. Being first to market with new technology is a time in which customer intimacy and operational excellence are not the primary targets. Rather, one should be learning from ones mistakes through having the product in the field and then building that feedback into the next version of the product or service.

How does a firm manage in this environment? First, we can focus on the front end of a redefined development process to demonstrate the relevance of continuous innovation, even in the case of discontinuous product development. If we look at how companies that have developed successful products operate in this space, we see what Lynn, Morone, and Paulson, as well as others, label a *probe and learn process*.[35–37]

Early Versions of Products

Essentially, companies develop their products by probing potential markets with early versions of the products, learning from their mistakes, modifying their product, and probing again. In effect, they run a series of market experiments—introducing prototypes into a variety of market segments. When using this approach, the initial product is not the culmination of the development process as it is in traditional organizations. Rather, the initial product is just the first step in an improvement process! This first step in the development process is, in and of itself, less important than the learning and the subsequent better-informed steps that follow.[38]

Probing markets with immature versions of the product only makes sense if it is a controlled process and it serves as a vehicle for learning. You can use it to learn about the technology, and whether and how it can be scaled up. You can use it to learn about the market and which applications and market segments are most receptive to particular configurations of product features. You can use it to learn about the influence of exogenous factors like

government regulations and what needs to be done to satisfy them. Probing and learning is, above all, an experimental iterative process. The firm enters an initial market with an early version of the product, learns from the experience, and then modifies the product and marketing approach based on what they learned. Then it tries again and again, as necessary. In summary, development of a discontinuous innovation becomes a process of successive approximation, probing and learning again and again, each time trying to take a step closer to a winning combination of product and market.[39]

In conventional product development there is a single launch in which you put all your accumulated knowledge, and product designers can only hope that they will be successful—all their eggs are in one basket. If they succeed, the payoff may be quite large, but they are making a very big bet and losing will be very costly. Because the process takes so long, they run the risk that the market and the technology may have changed from the time they made their initial judgments. Thus, both the probability of failure and the cost of failure increase.[40]

With probe and learn, there is no single launch of the new product as in conventional innovation, but rather a series of launches periodically over many years. Each new launch leads to a modification of the target. In so doing, the firm reduces uncertainty and thereby reduces the financial risks for the next launch because of what it has learned at each stage. This is what continuous innovation is all about.[41]

At first glance, however, this version of continuous innovation doesn't seem to be the kind of continuous improvement quality specialists have been accustomed to thinking about. First, it occurs in the early stages of product development, while most of the applications with which quality experts are familiar are operational improvements in manufacturing environments. Second, it facilitates discontinuous technological innovation, while most applications with which quality experts are familiar deal with continuous or incremental innovation. Third, it uses the customer as the driving force for the learning process; and fourth, it doesn't use the typical continuous improvement tools that evolved out of the quality movement.

On closer examination, however, we see that the probe and learn process that we believe lies at the heart of continuous innovation in fact captures the essence of continuous improvement. Probe and learn is based on a series of continuous, small, gradual steps. If well done, it is experimental in the best sense of embodying fact-based management. Probe and learn is focused on process, not results like continuous improvement activities. The process of successively honing in on the right product through a series of iterative steps that take you closer and closer to a successful commercial product is very consistent with the spirit of continuous improvement. Probe and learn is essentially an accelerated plan–do–check–act

(PDCA) cycle. Unlike conventional PDCA, the probe and learn process underweighs *plan* and overweights *do* and *check*. Finally, probe and learn is about organizational renewal and thus totally consistent with the ultimate objective of continuous improvement. Yet, it is also associated with quick learning and the acceleration of the product development process, a prime requirement in this era where firms operate on Internet time. In summary, the probe and learn process embodies the principles of continuous improvement.

Prototypes

Earlier, I referred to probing potential markets with prototypes, but of course prototypes have a much broader role in the product development process. Prototypes are analytical or physical models that are used to test or verify aspects of the product design at different stages of the development process. They are found to be useful in early design phases to assess the size and feel of a product; at later stages, comprehensive physical prototypes can reveal interferences among components and whether everything works when connected.[42] Through the use of successively comprehensive prototypes, we see the same accelerated PDCA cycle that characterizes our earlier description of the probe and learn process.

Prototypes can be used to produce a model of the whole product or some small component. While producing virtual objects via computer aided design (CAD) has become standard practice, the production of multiple physical prototypes ranging from simple cardboard and glue models to sophisticated stereo-lithography (SLA)–produced models is recognized to add considerable value and speed to the development process. The central contribution of prototyping is its acceleration of learning and coordination throughout the development process, across diverse functional groups or geographically dispersed groups within and outside the firm. Prototyping focuses attention on problem areas needing improvement, clarifies sources of different views, and confirms common areas of understanding and agreement. It facilitates communication across cross-functional groups (inside and outside the firm) and contributes to the development of a common language.[43] Thus, prototyping can be used for streamlining the flow of a total CAD/CAM/molding/assembly operation among multiple production partners. It accomplishes this by seeing to it that the OEM and all tiers of suppliers are tuned into a common understanding of what has been, and still needs to be, accomplished.

Prototyping directly improves the quality of the product through early identification of error, and multiple iterations continually test the designer's assumptions about the product, leading to improved redesigns.[44,45] The very

incompleteness of early prototypes guarantees the generation of error. Because of their ability to facilitate early detection of error and thereby reduce engineering changes, they can reduce design iterations. The accelerating development of rapid prototyping technologies, along with the emergence of computer-aided design and engineering tools, has increased the speed and lowered the cost at which multiple prototyping iterations can occur, thereby speeding up the development process itself. At the same time, the cost of successive design iterations is reduced.[46,47] The learning process associated with rapid prototyping grows out of a process of prototype, test, evaluate, and refine the product; it embodies the probe and learn pattern that has been documented.

In the light of these observations, it is quite remarkable how little attention has been paid to the benefits of prototyping for quality improvement. In the comprehensive *Juran's Quality Handbook*, fifth edition, there is no entry under prototyping. In Feigenbaum's extensive treatment of new product development in his renowned book, *Total Quality Control*, third edition, there is only a brief 11-line paragraph, over half of which is taken up with warnings of how performance of handmade prototypes may differ from those made under actual production conditions.[48,49] This is not surprising—indeed, it is understandable—since the role of the quality professional in new product development typically has not included product planning.

Beta Testing

We can also see probe and learn being implemented at the middle and latter stages of the product development process. Notable is the growing use of beta testing. There has been an explosive growth of beta testing over the last decade in the United States. It is a practice that began in the computer industry and then spread to semiconductors and software by the late 1980s. By 1994, it was estimated that 50 percent of Fortune 1000 companies had participated in beta testing and 20 percent were said to use it regularly.[50] One can only presume that the number is higher today. One of the most dramatic examples of the use of beta testing was by Microsoft. Its Windows 2000 release was said to have 500,000 prerelease customers participating in the beta testing.[51] To be sure, this doesn't mean that beta testing guarantees the absence of bugs, as users of Microsoft Windows can well attest.

Originally, beta testing referred to the exercise and evaluation of a complete product working in the operating system environment; it would typically precede announcement and release. In recent years, however, the concept has been expanded to include customer evaluation and input prior to formal release of the product.[52] In that sense, it is about exposing users to incomplete products full of errors. Users must be aware of the risks; they

are motivated by getting the opportunity to try out and use early versions of the product with the understanding that they will report back to the manufacturer on their experiences. Best-practice companies using beta testing, however, often modify this approach when their best customers are using these products on real-world applications. In these cases, an engineering team typically monitors the test and works closely with customers to minimize the probability that problems are transferred to customers.[53]

Customers often want to participate because of the potential competitive advantage that comes from being first to install a working model and getting an early look at new technology. Product developers realize that they can get very useful feedback from customers about the functionality of the product (Does it work as intended in a diverse user environment? Does it have the most desirable product features?) and possible performance problems. The knowledge thus gathered can then be incorporated, as deemed relevant, into subsequent iterations of the product. The firm producing the product may also use it to promote its ties with those valued customers that get a first look at the new technology and to promote the sales of the product by using early positive experiences to promote sales to subsequent customers.[54] Some companies may release successive betas as a mode of successively approximating what the customer really wants.

Companies with products that have low manufacturing costs have refined this practice to a fine art. Software companies, in particular, have used the Internet to rapidly collaborate with application developers over successive beta iterations. A case in point: when Netscape developed Navigator 3.0 in just seven months time, they went through six beta iterations, learning each time from the feedback of developers over the Internet and incorporating what they learned into the next modified product version.

If well designed with careful selection of beta testers to reflect the user community, structured questions for the initial users, and with an action plan to quickly address issues raised by the beta testers, beta testing represents an opportunity for rapid learning about new products. It is an articulation of the probe and learn process used in the middle to latter part of the product development process. There can be significant risks for the firms that agree to provide sites for beta testing, and they need to carefully consider whether and under what conditions it is in their interests.

Implementation

How does one implement a probe and learn strategy? Brown and Eisenhardt provide a set of recommendations for how to create a wide variety of low-cost probes. Their recommendations are listed and only slightly elaborated as follows[55]:

- Vary the time frames for the variety of low-cost probes being pursued. This involves creating both short- and long-term probes and encouraging them to emerge from different parts of the business. Insofar as they come from different parts of the organization, they are consistent with traditional continuous improvement through their broad-scale involvement of personnel in the improvement effort.
- Choose some risky probes even if they have a high probability of failure, especially small failures. These are opportunities for learning.
- Select some probes that require implementation and measure their results.
- Solicit concrete feedback because it is a very effective mode of learning.
- Use more probes when the marketplace is highly volatile.
- If large probes are unavoidable, then seek to break them into a series of small options that serve as opportunities to learn and also provide a chance to cut your losses should overall failure become evident over time.
- Place more probes in areas that represent the most likely future, whether it be market segment or emergent technology.
- Select some unrelated probes in areas you may not know much about. Random probes are more likely to reveal the unexpected and the unanticipated (see Weick discussion earlier in the chapter).
- When feasible, build on your successful probes to create a knowledge base for emergent strategies.
- Know when to quit a series of probes in one area when diminishing returns set in, and commit to other areas.

CONCLUDING COMMENTS

If we think about continuous improvement conventionally, then we can say it works best in slow-moving industries and in industries where you are playing catch-up to a future that is laid out before you. These are industries where exploitation rather than exploration is required for success. If we widen our understanding of continuous improvement to think in terms of

continuous innovation, we see there is a place for it in the process of exploration and discontinuous innovation, as represented by breakthrough products. This emphasis has been the thrust of the previous analysis. Whenever it occurs, continuous innovation of the kind that has been described is not a natural process that automatically occurs in organizations.[56] It requires constant, active management engagement with workers in an effort to initiate and sustain momentum. Probe and learn, insofar as it takes place in different parts of the organization at different times, through multiple initiatives, has the potential to serve as a sustained energizing force.

Probe and learn, applied to the product development process, captures the essence of what we are now calling continuous innovation. It is a process well suited to fostering discontinuity and innovation. It is an experimental iterative process that operates to successively solve problems in markets characterized by turbulence, uncertainty, and complex interactions. Probe and learn teaches us that the generation of error is part of a productive learning process and should not always be avoided or suppressed (avoidable errors should always be minimized through appropriate discipline in managing the probe and learn process). How firms learn to manage error in the future will be an important indicator of their success. This is a special challenge for the quality discipline, a discipline that has grown up viewing deviance and error as the enemy.

In discussing three manifestations of probe and learn—distributing early versions of products to selected markets, prototyping, and beta testing—my intent was not to suggest that this exhausts the utility of probe and learn in the new-product development process. To the contrary, the examples were only meant to show the broad potential for applying probe and learn in the product development process. The challenge for quality practitioners and scholars is to develop a set of tools that allow us to improve the deployment and optimization of probe and learn strategies. It is no longer enough to simply look for areas within the product development process where we can apply traditional quality improvement tools to rationalize and streamline the process. Finally, if we can find a place for continuous innovation in discontinuous innovation, surely we can find a place for it throughout the production chain.

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7

Social Developments and Their Impact on Quality Performance

Edward Fuchs

INTRODUCTION

Throughout the world, people thrive on bad news: financial crashes, wars, natural disasters, terrorist acts, companies and countries in trouble, crises in the quality landscape. Where would newspapers and news broadcasters be without them? When a period of prosperity interrupts the sequence of newsworthy disasters, the natural reaction of the astute observer has been to examine it with a jaundiced eye.[1] Could it be true that the light at the end of the tunnel may be a period of unparalleled prosperity? Could the forces in play ultimately allocate resources in an equitable fashion, slowly raising the economic boat worldwide? Who will then pay attention to quality leaders, quality consultants, or quality professionals, whose usual claim to attention is rooted in present or imminent crises? Many of us remember the means by which Drs. Deming and Juran commanded the attention of the business communities in the West several decades ago, with cries that the sky is falling—and the sky *was* falling. Deming's assertions led to an NBC television special program on the challenges that the Japanese ascendancy in quality posed for American industry. The public scrutiny of what had been an insiders' issue also gave momentum to Juran's efforts, and the Juran tapes quickly became a bestseller. In Asia, ascendancy in quality arose from the ashes of devastation caused by war and revolution. In Europe, the focus on quality also was based on fear—fear of loss of markets and jobs. Of course, the present political and social snapshot of the world is very different from the view just three short years ago. One thesis of this chapter is that the quality

community, and especially its academic leaders, must invest in a framework for quality that does not rely on current events for its validity.

Now the decade of prosperity has ended, and the global community is in the grips of new crises, fomented by not one but by several events and developments. At the same time, there are new glimmers of light. Before examining the cloudy present and uncertain future, let us examine the recent past. In so doing, we will gain insight into components of a new frame for quality.

During the ’90s and the early years of the current decade, the thesis that profound changes were in the making reached the technical and managerial communities and the general public.[2] Economies moved from being driven by the production of tangible things to being driven by intangible ideas. The global economic framework, it was argued, was in the midst of a 40-year period encompassing a critical shift from an Industrial Age economy to an Information Age economy, or what is simply called the New Economy. To be sure, there are leaders and laggards in various places in the world, and within the postulated 40-year transition, there would be localized ups and downs driven by politics, economic policies, and other phenomena. These local highs and lows often distort our perspective, and often motivate contrary policies and behaviors. It remains unclear whether recent events have hijacked the 40-year transition, or whether they are temporary aberrations in the longer trend.

While remaining controversial among many other groups, the New Economy thinking was accepted in the key global technology centers by many in the global financial communities, and by some business leaders. It was reflected in the writings of everyone from Peter Drucker to Paul Hawken, whose seminal 1983 book, *The New Economy*, grew out of futurism scenarios developed at the Stanford Research Institute. Important characteristics of the New Economy that impact the quality domain follow.[3]

The Nature of Work Processes in an Information Society

The information society is one that is enabled by computing combined with telecommunications. This includes expert systems, imaging, automation, robotics, and sensing technologies. These technologies were first seen in offices, and are now moving across the landscape to encompass farming, office and factory work, medicine, and teaching. Examples abound.[4]

Almost all of the current, modern concepts about quality and all of the supporting technology were conceived and developed in the Industrial Age. The first inklings that change was needed for the New Economy was in the almost total failure of the old quality approaches when applied to

fundamental components of the new economy, software and integrated circuits, and to any market where the lifecycle is measured in months.[5] Software and ICs typify the information age in key characteristics. They encompass degrees of complexity that have never been previously encountered, and which must be addressed in miniscule concept-to-market intervals. Today, the engineering of software and ICs for quality can profoundly impact world economic systems. For example, we have already experienced instances when bugs in software or computer communications systems used for bank and other financial settlements brought national and international commercial settlements to a halt.

The efforts of all economic sectors to adapt their systems to the Information Age has created a tremendous need for appropriate quality processes and infrastructure. These needs are being addressed by many professional and technical societies. For example, new standards to facilitate the global Internet-enabled processes are being announced continually. While there are activities within the quality community addressing issues such as software quality and reliability, the quality community has made few significant contributions here, especially not to the new processes that enable electronic commerce and substantive information interchange. Changes to the knowledge base, tools, and activities of the quality community tend to take place very gradually. In contrast, new markets are developing in which product lifecycles are measured in months. Consider PCs and PC peripherals. The lifecycle of a leading-edge processor chip, or of an innovative PC add-on, is less than one year. The high-end PC you bought last Christmas is a slow boat by the time summer ends. Universities and secondary schools are changing their teaching paradigms, infrastructure, and course contents to reflect information-enabled capabilities. This is likely the most important transformation of all, and it is one for which the quality professionals' absence from the table is glaring.

The Virtual Organization

Using integrated computer and telecommunications technologies, corporations and industries increasingly are defined not by physical attributes, but by collaborative networks linking people together. The new, so-called e-business frameworks of suppliers supporting industries behave in this way. Again, this is a seminal characteristic of the Information Age for which the old quality concepts and tools fall short of effectiveness. The total quality management models have been based on the historic military hierarchical organization framework. In the hierarchical organization, leadership and authority begins at the top and devolve downward. In the networked organization, authority and influence accrue, not to individuals

high in any hierarchy, but rather to individuals whose knowledge, experience, actions, and integrity motivate others to rely on them.[6]

Networking the World

The wireless and Internet technologies are facilitating ubiquitous access to information and to sources of knowledge and learning. To be sure, access is delayed or co-opted by malign governments, as well as by limited resources in third- and fourth-world countries. But it is precisely these countries whose people will benefit the most from the information and the learning. A panel of information technology (IT) experts commissioned by United Nations (UN) Secretary-General Kofi Annan advised the United Nations to set a goal of allowing everyone in the world access to a computer and the Internet by 2005, even if they have to walk half a day to hook up with a mobile phone. Although there are now more than 22.5 billion Web sites and billions of e-commerce dollars (US$) flowing worldwide, less than five percent of the world's population was online, the report said. A global initiative led by the United Nations would jump-start the remaining 95 percent to meet the 2005 goal.

Emerging Meta-Markets

The ease of transportation of information and of information-intensive products has greatly accelerated economic globalization. Increasingly, farmers and industries are looking worldwide for markets. The markets are global for farming and industrial commodities, as well as for commoditized products such as memory chips and many consumer electrical and electronic items. Industrialized nations are seeking to sell their financial products worldwide, such as insurance, and other products as diverse as airliners and entertainment. Auctions, exchanges, and new partnerships have drastically changed business-to-business (B2B) trade. Enhanced technology will propel the use of dynamic pricing. As meta-marketplaces evolve, firms won't just participate in these venues, they will configure new forms of markets for each transaction—trading across multiple product attributes and giving favored suppliers special treatment. Sellers will no longer be able to deliver value simply by maintaining local inventory and providing product information. Instead, the networks will force distributors to focus either on product delivery or value-added services. Suppliers will become specialists in quality or delivery.[7]

It would be wonderful if the New Economy were permanent and utopian, as it appeared to be at first glance. However, the need for caution remains in order. In every economic and social transition, businesspeople,

governments, and agencies make mistakes. Ultimately, businesses hire more workers than they can employ profitably, and they invest in more capacity to deliver goods and services than their markets can absorb—at least temporarily. Governments divert resources to misguided, costly military campaigns, and they mismanage their economies. Other institutions underpay their employees and suffer poor performance and motivation. At such stress points in an economic transition, managers and bureaucrats recognize these facts. They change course abruptly. They stop hiring, which halts growth in productive employment. At the same time, they cut capital spending. Together, these actions push the economy into a self-reinforcing contraction—in a word, recession. In the earlier version of this chapter, it was forewarned that such critical turning points may occur in the Information Age economy. And that is precisely what is presently occurring.

CONSEQUENCES OF CHANGE

Some of the inevitable consequences of an Information Age economy and transitional minefields are well understood. They include:

- Displacement and replacement problems arising from the transition to the New Economy
- Near-term overinvestment and underutilization of capital caused by unfamiliarity with the behavior of the New Economy
- Globalization of markets, with concomitant deregulation of industries and opening of capital markets
- New paradigms for education, labor, and management
- Societal threats and fears, including environmental issues, privacy issues, and new forms of information terrorism

DISPLACEMENT AND REPLACEMENT

Juran's history of quality has an engaging subtitle: *The Evolution, Trends, and Future Direction of Managing for Quality.*[8] The subtitle implies that quality issues and approaches evolved over time, and that future directions may be predicted from an orderly past. The extensibility of quality is a common assumption. It allows trainers and consultants to introduce approaches and methods that have been effective in past applications with the expectation that they may be successfully repeated. However, there is little evidence to support the broad extensibility hypothesis. Unfortunately,

the quality field has no generally accepted coherent underlying theoretical framework. It was thought for a while that the statistical theories and approaches that are embodied in the scientific method comprised the underlying framework. But statistics is inadequate for modern quality issues. Many of the attributes of the New Economy are based on breakthrough technologies. These technologies are creating new products and entirely new categories of products and services at a breakneck speed (so-called "Internet time"). When the time required to assemble data with which to apply statistical methods reduces to zero, the well-known approaches cannot work. In a similar vein, we know that Deming wrote and talked about a theory which he and his followers characterized as "new" and "profound." However, most of his "points" were accepted by his followers based on faith alone, because they are intuitively appealing and because there is anecdotal evidence that they sometimes worked. While the underlying thought processes still have much merit, the new industrial and service landscapes need new approaches and ideas.

Absent an underlying framework, quality approaches and methods appear to follow economic, societal, and technological developments. In the first half of the 20th century, quality became important as a means to deal with complexity and cost in manufacturing. For examples, the theories of statistical quality control were devised by Walter Shewhart and were developed by his colleagues in Bell Labs in the 1920s and 1930s to help the manufacture of increasingly complex telephone switching gear. Also in Bell Labs, at roughly the same time, Harold Dodge developed sampling approaches to effectively separate the good from the bad during manufacture.

Later, the enormous latent demand for consumer goods that resulted from the great depression and World War II led to the deterioration of the quality of goods manufactured in the West. Japanese producers, rebuilding an economy destroyed by the war, seized the opportunity to attract Western consumers with exported goods. Japanese post–World War II exports changed the quality landscape by significantly elevating the expectation of customers for products that are aesthetically pleasing and feature-rich, products that work right out of the box, and products that are reliable. A by-product of the Japanese ascendancy in quality was worldwide attention to and adoption of many uniquely Japanese quality approaches. Quality circles, hoshin planning, and robust design are examples of approaches that derive from the Japanese culture and the post-war societal situation.

As the new millennium unfolds, it is expected that a unified Western Europe, an emerging Eastern Europe, and ascendant Indian and Chinese economies will make their social mark on the quality world. In Europe, products and labor pass barrier-free borders. In the short-run, low-cost labor will migrate to high-pay countries, lowering the costs of goods and stressing

the relations between labor organizations and governments. Exports will migrate from high-quality/low-cost countries to countries in the EU and elsewhere where they have market advantages. Customer expectations will be modified. Diversity and multilingual approaches will become important aspects of quality management.

In India and China, the sheer size of the markets and the large, literate labor forces will have global impacts. On the one hand, these countries will briskly move up the learning curve, to supply products of higher complexity, that have more technical content. India already is becoming a software powerhouse, and China is moving up the content/complexity curve in consumer electronics. Conversely, these two very large markets will be flooded with sorely needed high-quality agricultural products from Western and South Asian countries, displacing millions, perhaps tens of millions of farmers, who will migrate to the Indian and Chinese cities to enter the labor markets at the lowest rungs.

The methods of automatic control systems, and micro- and macro-robotics are helping with increasingly complex and increasingly tiny production processes. The concept of "open" systems is the most effective recent innovation contributing to reliable, high-quality software.

Breakthrough technologies that make large improvements in the quality and reliability of software, networks, and ICs will engender discontinuous change in industries and markets.[9] So too will new genomic breakthroughs and continual breakthroughs in biotechnology aimed at disease treatments. It is noteworthy that, while bioengineered foods are encountering resistance from farmers and some consumers in Europe, economists project that such foods offer hope in the New Age of ending starvation in Africa and Asia.

OVERINVESTMENT AND UNDERUTILIZATION OF CAPITAL

In the short term, projections of supply and demand engendered by wholly new economic frameworks have been overly optimistic. The results are overbuilding of production and service capacities, punctured stock market bubbles, loss of jobs, disrupted economies. At this time, there are indications of recovery in some countries. However, overhanging inventories and service capacities forecast slow recoveries. It is unclear whether the approaches to quality that pervade current literature and practice are "fit for use" to address current challenges. The most prevalent of these practices is "Six Sigma Black Belt," the very name of which is self-defeating. Would you choose for your cardiac surgery someone who characterizes himself as

a black belt surgeon? (See chapter 11 for more information about Six Sigma from a different perspective.)

GLOBALIZATION OF MARKETS, DEREGULATION OF INDUSTRIES, OPENING CAPITAL, AND LABOR MARKETS

Removal of arbitrary barriers to the movement of products and capital engenders both a global marketplace for products and an open market for capital. In order to remain competitive in such an environment, countries are gradually deregulating their industries. These forces combine to expose products and capital services to competitive pressures where quality plays an important role in making choices. The conflicts engendered by restrictive governments and agencies seeking to block open, deregulated markets may be serious quality issues in the early decades of the millennium. Similarly, imperfect rules guiding the transitions to open market are having negative consequences. The laws of unintended consequences are exposing all of the defects in our planning. We are beginning to encounter activism in universities and liberal religious institutions concerned with the quality of life of workers and farmers, and at the short-term consequences of opening borders to labor and products.

A significant consequence of the enabling characteristics of the New Economy is globalization of value-adding functions. Writing payroll checks, ordering and billing, component assembly, customer service, order fulfillment, and human resource management all are examples of functions that may be performed at a distance by specialized, outsourced entities. Increasingly, such functions are migrating worldwide to wherever the value and quality are maximized. For example, the Bangalore region of India is rapidly becoming the "Silicon Valley" of software. Well-educated, English-literate Indians write effective program modules for customers across the globe, electronically transferring and integrating those modules into remote systems. Another example of the trend is Flextronics International, a Singapore-based company, which has manufacturing facilities where workers stitch components onto solid-state electronic wafers and assemble systems for complex computer and communications systems. In 1998, 53 percent of all computer assemblies were manufactured by outsource entities such as Flextronics.[10] By specializing in one element of a value-adding sequence or network of processes, outsourcing companies are able to maximize quality. Specialization permits investments in training, tools, and

facilities, optimizing robustness of designs, and locating facilities in parts of the world where the cost–value relationship is best.

Computer equipment maker Hewlett-Packard pioneered the outsourcing practice in the 1980s, and Internet equipment manufacturer Cisco Systems made outsourcing a centerpiece of its corporate structure from the beginning. They outsource their electronics assembly to companies such as Solectron, which twice won the Malcolm Baldrige National Quality Award for its outstanding processes, quality, and customer satisfaction.

Financial transactions have traditionally involved paper, and the quality of the financial process always has been a critical issue. New paradigms for business transactions are called *e-business,* in which legally binding signatures and financial transfers take place over the Internet. Quality and security considerations of e-business are of paramount importance. European small and mid-sized businesses are expected to see sales from online commerce surge 800 percent to 3.2 billion Euros ($3 billion) by 2003, as increasing numbers of firms turn to packaged software applications to take advantage of the Internet. According to a study by Microsoft Corporation and research agency Datamonitor, businesses across the European continent are quickly building Web presences to generate online awareness of their goods and services. In Germany, 600 more small and medium-sized enterprises (SMEs) move to an online environment every day. This trend is in its infancy. Of the 2 million SMEs online in the UK, Germany, France, Italy, Sweden, and the Netherlands, only 5000 are equipped to handle online payments at present. Together, they generated transactions worth 409 million Euros in 1999.

The Microsoft-Datamonitor report also found that the packaged software industry in 1999 contributed a total of 37.8 billion Euros to gross domestic product and 13.2 billion Euros in tax revenues to the six European economies in the survey. The industry had a strong impact on employment. Last year it accounted for three quarters of a million jobs, either directly or indirectly, in the combined six countries, a figure that is expected to grow to over 1 million by 2003. Specifically, the sector was directly responsible for the creation of 154,000 jobs, with 118,000 jobs on the supply side, such as in manufacturing and printing, indirectly attributable to the industry. Wages paid to workers in the packaged software business in France, Germany, Italy, the Netherlands, Sweden, and the UK were between 73 percent and 87 percent above the average wage of their respective markets. The average wage of a packaged software worker was at 54,700 Euros, compared with the Western European average of 30,000 Euros. Wealth is highly concentrated around the more industrialized regions, such as Paris and the Ile de France, Amsterdam, southeast England, southern Sweden, and northwest Italy, the report said.

NEW PARADIGMS FOR EDUCATION

The New Economy brings opportunities for education to people everywhere on the globe using distance learning. The implications of distance learning are profound. As people acquire knowledge and skills, they (1) demand governments that permit free flow of information and democratic processes, (2) have marketable skills that they can deploy for compensation, and (3) use the compensation to purchase goods and services, thereby elevating their countries' economies. To some extent, the process is circular. A certain amount of economic progress or international help and some degree of freedom is required to bootstrap these phenomena. In India today, projects in remote villages are bootstrapping the quality of life and the economies by funding communal PCs, which are powered by solar cells and connected to the Internet via satellite. Even though most of the populations of these villages are illiterate, individuals with at least 10th-grade educations are assigned as overseers of the computers providing farming, weather, and medical information to villagers, and providing a vehicle for individuals to communicate requests and complaints to the government. Emerging, lower-cost post-PC Internet "appliances," connected via satellite and wireless networks to server farms containing application servers and vast data banks, will help to educate and bring knowledge to the remote corners of the world.

NEW PARADIGMS FOR LABOR

The impacts of the New Economy on labor are deeply troublesome in the near term and deeply beneficial in the longer term. Many labor organizations in advanced countries view globalization as a serious threat to jobs within the country that is their purview. Advanced countries generally have higher wage rates and particular cultural and economic norms. Cultural and economic norms in less advanced countries, to which many industries and jobs migrate because of lower labor costs, tend to be different. Labor organizations exert pressure on their governments to place roadblocks in the path of globalization. However, electronic commerce and activities that directly support commerce by means of electronic (networked) connections are redefining the very foundations of competitiveness in terms of information content and information delivery mechanisms.[11] Flows of information over international networks have created an electronic marketspace of firms that are learning to exploit business opportunities.[12] Those that embrace e-commerce are predicted to succeed, and those that do not are expected to fail.[13,14]

Little, however, is understood about the structure of the e-commerce industry. To compete effectively, firms need an effective paradigm for managing labor. In both high-cost and low-cost labor countries, the nature of work may change. Some examples are[15]:

- Farmers will become farm managers, overseeing extensively automated smart farms. As this change migrates from farming in leading-edge countries into less advanced countries, farmers will identify more with managers than with traditional farmers, and farm workers will identify with factory workers. The labor movement will seize upon the opportunity to unionize farms.
- Factory workers will guide robots, and utility workers will oversee automated operations. Designing, monitoring, changing, and maintaining automated operations will be the primary functions of factory and utility workers.
- Sales to consumers and businesses will be facilitated by the Internet. Remote laser scanning and 3-D visualization tools increasingly will be employed for sizing, designing online, and creating accurate quantitative and mental images of products to be ordered. The purchase costs and quality of even such mundane items as groceries may be improved by online ordering and delivery or pickup from low-cost, automated warehouses.

It is a truism of the New Economy that the ultimate success of any enterprise lies with the quality of its people. No amount of leadership or leading-edge processes can substitute for the creative minds of people. At many start-up companies, for instance, employees are asked to all but live in the office, in a closeness that would have been unthinkable in previous generations. The artifacts of the typical new office—food, entertainment, bunk beds—are not the elements of the traditional workplace. In the end, the quality of implementation of all of the new approaches will determine whether they are a boon or a bane to workers. The positive or negative effects of the approaches will hinge largely on how the quality processes are set up. Approaches will range from empowering workers to eliminating them. Systems can automate dull, routine tasks and create more challenging jobs, but they can also cut jobs and onerously monitor worker performance.

NEW PARADIGMS FOR MANAGEMENT

The world in which managers manage is changing so drastically that the traditional management paradigms do not suffice, if they work at all. In a

virtual organization where workers telecommute, major functions are outsourced, e-mail is a primary form of communication, and the "product" is ephemeral—a general cannot lead by pointing the troops to the top of the next hill. Top executives worry more about moving into new markets at Internet speed and retaining highly mobile skilled workers than about anything else. Quality professionals must present their work in ways that highlight the issues that concern CEOs. One of the main concerns for CEOs surveyed by *Business Communications Review* is creating and controlling new markets. Quality professionals can leverage the fact that CEOs are not likely to focus on cost cutting when trying to enter a new market, and are therefore prone to look at quality investments as opportunity costs rather than cash outlays. Second on the CEOs' priority list is obtaining and keeping talented employees by making the work more appealing. The quality community can use this knowledge to its advantage as well, by remembering, for example, that CEOs support projects that involve approaches that employees favor. A third front-burner issue for business leaders is strategic thinking.[16] Strategic thinking may be defined as thinking about specific future issues. It means setting aside time, preventing interruptions, and just thinking. What is it we want in the future—and how are we going to get it? Strategic thinking sets the stage for managers to take action now in order to impact specific future issues. It encompasses a range of topics, from the values and vision to the plan for organizational development, from strategic market positioning to capital planning to leadership succession, from corporate culture to leadership styles. For strategic thinking to work well, managers must understand their business purpose. This means understanding the core competencies, the products or services derived from them, and the markets for those products and services. This defines the basic business, and sets the stage for strategic thinking—thinking about how managers will go about the business.

New generations of managers are emerging that are rejecting out of hand the traditional methods, models, and truisms of management. Once seen as a perquisite of senior management or restricted to the smallest of businesses, ownership interest in companies increasingly is being shared throughout the employee base. (My youngest son works as a low-level manager/worker in a small regional chain of retail food stores. His compensation includes stock options and bonuses based on his and the company's performance.) Absent these approaches to motivate and gain the loyalty of employees, the tendencies of employees in industrialized nations is to disdain any loyalty to companies, to job-hop continually in search of more money and benefits, new challenges, changed environments, and so on. The new attitudes of the new generation of employees engender new challenges for companies and other entities: more difficult and expensive

hiring and training efforts; attention to career renewal, career redirection, and lifelong learning; and new and modified benefits containing more up-front and portable values.

OTHER SOCIAL ISSUES

It is becoming apparent to many governments throughout the world that participation in the New Economy is the only way to provide for the viability of their countries and for the welfare of their people in the new millennium. The challenge to governments of every kind is to navigate their ships of state through the tortuous shoals lining the entryway to the New Economy. The Organization for Economic Cooperation and Development (OECD) issued a thorough report on New Economy growth issues in 2001, preceded by a preliminary study in June 2000.[17] OECD experts offer advice for governments seeking to reap the fruits of the technological age: nurture competition, networking, innovation, globalization, deregulation, and inter-corporate cooperation. The OECD also advises governments to support partnerships between science and business, and to promote efficient innovation and dissemination of knowledge. Australia, Ireland, and various Scandinavian countries have been experiencing technology-associated boosts in productivity. But the United States leads the world in Internet access, with 25.1 Internet hosts per 1000 inhabitants, compared to the next highest, 5.5 in the United Kingdom. Since the late 1990s, patents granted by the United States have grown by 12 percent, compared with the previous 15 years' 3.3 percent.

Environmental Issues

For most companies, dealing with the environment is still primarily about compliance—a costly, cumbersome, and unwelcome process. For a small but growing number of others, however, environmental concerns shape every aspect of strategy and action.

There is more than one environment with which companies must concern themselves in the New Economy. The physical environment is subject to new stresses and demands. As the wealth effect created by the New Economy accelerates growth in populations and increases the global demand for goods and services, demand for raw materials accelerates and by-products such as garbage and pollution also are created. New approaches for recycling by-products require attention. Growing demands for energy and water are unsustainable, with inevitable consequences when nonrenewable sources are depleted. The dire consequences of global warming also are of

concern, although it remains unclear whether the causes are recent greenhouse effects, caused by industrial by-products and forest depletion, or whether the earth continues to be affected by 140,000-year cycles, 10,000-year cycles, 600-year cycles, and so on.[18]

The present work environment is very different from the past environment. Menial tasks are being eliminated by automation. Knowledge work is growing at an accelerating place. Specialization and outsourcing are growing. The danger of obsolescence and the need for lifelong skill renewal is accelerating.

And there is an evolving information environment. Information and knowledge once owned by private individuals or governments is now freely available on the Internet. Even protected intellectual property is easily found. A recent brouhaha concerns freely available programs which provide ready access for download to private copies of copyrighted intellectual property, such as music. The current reactions of property owners are to seek to protect their property via litigation and laws. However, absent stable global consent agreements and standards, these protections cannot be sustainable with a global Internet available to any desktop.

The attitudes of companies to these complex environmental issues in the best cases proceed from denial to data collection, dialogue, and, ultimately, delivery. Responses go beyond compliance with current mandates and address global environmental issues on a proactive, voluntary basis. Companies that ignore or minimize environmental issues, even in the most environmentally insensitive parts of the world, do so at their own risk. Sooner or later, mandates will come into place to prevent irresponsible approaches and put the companies—or entire industries—at enormous competitive disadvantages. Doors to facilities will be padlocked by governments. Negative publicity will diminish markets.[19] Companies that provide their facilities with local autonomy and bottom-up or networked organization will be better positioned to deal with environmental issues.

Privacy Issues and Information Terrorism

Privacy of personal and intellectual property and cyberterrorism, unfortunately, are two sides of the same coin. Private citizens and every kind of economic entity are seeking ways to defend themselves from attacks on their privacy that could wreak havoc on the entity or person's economic or technological infrastructure. The problem is particularly daunting because these attacks could come from any number of sources: an intrusive or hostile company or country, a terrorist organization, or even from solitary, clever hackers. Companies could be victimized by an information warfare attack unless governments and industry collaborate on

strengthening the security of the increasingly interdependent global computer infrastructure.[20]

Private information, such as one's identity, is not just being captured on the Internet. It's being collected in the physical world also. Buying patterns are being data-mined from a *supermarket club card.* Biometric body scans capture everything from inseam measurement to bust size when one is buying *a new pair of jeans.* "Smart" workspace programs *monitor one's every keystroke* for employers' security. And soon, local ATMs may be using retinal scans for user authentication. In the near future, companies may hire promising employees because of their genetic disposition toward perfect health. They may be given raises based on the results of the quarterly keystroke count and electronic badge tracking, which show the percent of the average work day spent at the terminal, and the percent of time at the computer when they are physically engaged in the act of data entry. Employees may even get bonuses because random phone call and e-mail monitoring revealed superior written and oral communication skills and not a trace of personal activity.

Today, 40 million American workers are under surveillance at the office.[21] Women make up 85 percent of that number, as they tend to occupy customer-service and data-entry positions, which are more commonly scrutinized. A recent survey by the American Management Association revealed that 40 percent of all major U.S. firms engage in some form of electronic monitoring of their employees, ranging from keystroke counting to phone and e-mail monitoring to full-scale hidden camera surveillance.

So far, lawmakers in most countries have failed to follow through on proposals that could strengthen privacy and address security. Needed are national and international process standards for privacy-related activities and for security infrastructure. It is generally agreed that many nations' "critical infrastructure" are vulnerable to attack. Governments are challenged to develop legal frameworks that would permit the owners of critical infrastructures to share information about privacy issues and attacks on security. One of the reasons that governments are slow to respond is that privacy of information also is affected by most measures to counter terrorism.

Online privacy is one of the thorniest issues in cyberspace today, leading to a groundswell of fear and distrust in many consumers. In some cases, Web shoppers believe that e-tailers take it upon themselves to collect and share personal information without being accountable for its use. If steps are not taken to quell these consumer beliefs, which often are well taken, confidence in e-commerce may be irreparably damaged. This is a very significant process quality issue.

Governments are becoming increasingly active in networking policy matters. Privacy, Internet sales tax, digital signatures, online alcohol sales—all are issues being addressed by governments. Several analysts and observers believe that online privacy legislation is all but a forgone conclusion at this point. Others believe that the intrusive requirements of counter-terrorism efforts will prevail. Internet sales tax is also an issue on the front burner of governments throughout the world. State coffers would have been billions of dollars richer last year had Internet sales tax been collected on out-of-region sales, according to Forrester Research. Over the next few years this number will continue to climb, claims the U.S. National Retailers Federation, which says online shopping can save some state residents as much as 8 percent in taxes. Some observers say both proponents and opponents of online taxes are overstating their cases, an assertion that appears to be backed up by recent research from Forrester and Jupiter Communications. Nonetheless, analysts predict that it is only a matter of time before sales taxes are collected on Internet sales. Meanwhile, wine retailers and car manufacturers are finding that their efforts to sell over the Internet are being stymied by outdated regulations.

Regardless of whether the privacy problems are resolved through self-regulation or the imposition of government controls, the end result will radically affect e-commerce over the next decade, and perhaps beyond. Companies that collect customer and other usage data over the Internet have grown phenomenally since 1995, increasing revenues to almost $1 billion (US$) by 1999. At the heart of the companies' success is a technology known as DART, which tracks the behavior of browsers on the Internet in order to serve advertising targeted to each browser's surfing patterns. While privacy advocates expressed concerns, most tolerate the practice because the browsers have not been linked to the identities of the people who were using them. However, the information marketing companies changed their strategies to include linking the anonymous information to Abacus's database of names, addresses, and telephone numbers. While the companies said this linkage would only happen with a user's permission, many critics claimed that such permission was gained surreptitiously—and that users were unaware that their personal information was being tracked.

Professor G. Robert Blakey, drafter of the U.S. federal wiretapping statute and noted expert on wiretapping, commented on whether the practice of collecting anonymous information about where a user visits on the networked world would constitute wiretapping. "The answer can be understood by making an analogy to searching the mail," Blakey said. "Looking at the outside of an envelope—who sent the letter and where it's going—is called a 'mail cover.' That is not a 'search and seizure' under the Fourth

Amendment to the U.S. Constitution, and so does not require a warrant. Looking inside of the envelope at its contents," Blakey continued, "is a 'search and seizure' because it is an interception of an 'electronic communication' under the statute."[22] For example, if an advertising company were to track the fact that Computer A had gone to certain Web sites and clicked on certain ads, that would be similar to looking at a mail cover, and would not be wiretapping. Tying the identity of the person using Computer A to its surfing record would not constitute wiretapping either—so long as the individual's identity was obtained without intercepting an electronic communication.

CONCLUDING COMMENTS

The changes in the global social and economic landscape are having profound impacts on the world of those who are involved with issues surrounding quality. The nature of work processes in an information society is very different from the more familiar attributes of the Industrial Age. The virtual organization performs in a very different way from the traditional hierarchical institution. And the forces that are networking the world are changing fundamental characteristics and relationships. The changes that are addressed in this chapter include: displacement and replacement problems arising from the transition to the New Economy; globalization of markets, with concomitant deregulation of industries and opening of capital markets; new paradigms for education, labor, and management; and societal threats and fears, including environmental issues, privacy issues, and new forms of information terrorism.

We have identified the pressing need for research and development of new, innovative quality approaches and technology to address the development and the performance of Information Age business, government, and other social enterprises.

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8

Challenges of e-Commerce: Privacy, Security, and Service

Chris F. Brendon, Michael A. Sargent,
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INTRODUCTION

Some pundits of progress believe that the world of George Orwell's *1984* is fast approaching and may be just around the corner. These are today's Luddites who harbor suspicions regarding the pervasiveness of information technology and fear that this ubiquitous technology will enable even greater access to our personal information at an ever-increasing rate.[1] In the face of such broad access to all of our personal information, these people have fear that others will seek to gain an advantage through such knowledge and will seek economic gain at their expense. Is this just another case of paranoia or are such conspiracies now possible? While the people holding these fears may not represent the mainstream of the world, they certainly do expose some special challenges that exist in this connected world and information age.

Noted futurist Alvin Toffler observes that today we are participating in a knowledge revolution:

> We are totally reorganizing the production and distribution of knowledge and the symbols used to communicate it. What does this mean? It means that we are creating new networks of knowledge . . . linking concepts to one another in startling ways . . . building up amazing hierarchies of inference . . . spawning new theories, hypotheses, and images, based on novel assumptions, new languages, codes, and logics. Businesses, governments, and individuals are

> collecting and storing more sheer data than any previous generation in history. But more important, we are interrelating data in more ways, giving them context, and thus forming them into information, true; and knowledge, wise. But it does imply vast changes in the way we see the world, create wealth, and exercise power.

Toffler calls this revolution the *alchemy of information*—the transition of information into gold![2]

REQUIREMENT FOR KNOWLEDGE ABOUT CUSTOMERS

In order to mine the gold from information, it is essential to have improved knowledge about the business environment and potential customer base in which an organization operates. Dr. Peter F. Drucker, management guru and overall deep thinker, described management's need for sound information in the following way: "For *strategy* we need organized information about the environment. Strategy has to be based on information about markets, customers, and noncustomers; about technology in one's own industry and others; about worldwide finance; and about the changing world economy. For that is where the results are. Inside an organization there are only cost centers. The only profit center is a customer whose check has not bounced."[3]

Bill Gates, legendary founder of Microsoft Corporation, has characterized the significance of the new information age in this way: "How you gather, manage, and use information will determine whether you win or lose." He sees this contribution in a very specific way: "The winners will be the ones who develop a world-class digital nervous system so that information can easily flow through their companies for maximum and constant learning."[4]

John Naisbitt adds, "We have for the first time an economy based on a key resource that is not only renewable, but self-generating. Running out of it is not a problem, but drowning in it is—scientific and technical information now increases 13 percent a year, which means it doubles every 5.5 years."[5]

This shifts business relationships from the actual to the virtual world; as Nicholas Negroponte, founding director of Media Lab at MIT, has said; "The change from atoms to bits is irrevocable and unstoppable."[6] But, when Negroponte asks the question, Why is being digital so hard? he observes that there is a fatal reaction and that bits and people often collide—often over aspects of the usability of the bits. "Why don't telephone designers

understand that none of us want to dial telephones? We want to reach people on the telephone!"[7] Perhaps this is why Nokia Mobile Phones uses "connecting people" for its advertising tag line! To alleviate technophobia among people, it is essential that the real application needs of customers be included in the design of products and services.

As the world becomes more digital, it increasingly relies on software to deliver the promises that are inherent in this emerging information age. This creates a new leadership challenge where quality must be delivered through "insight, foresight, and leadership," according to Pekka Ala-Pietilä, President of Nokia and strategic architect of the growth of Nokia Mobile Phones through most of the 1990s.[8] Insight is delivered by understanding the dynamics of customer needs and market moves; foresight is delivered by understanding the growth of technology and feasibility of its adaptation for commercialization; and leadership is delivered by making the right choices for sustaining success despite changes that occur in this dynamic environment. Clearly, in order for business to succeed and sustain success, it must merge its approach to technology, customers, and marketing into a coherent strategy for e-commerce.

WHAT IS e-COMMERCE?

But, does this hypothesis really hold in the age of e-commerce? To assess this, we must first describe what is meant by the term *e-commerce.* E-commerce is the buying and selling of goods and services over the Internet. In practice, this term is often used interchangeably with e-business, while online retail selling—the virtual storefronts that exist on Web sites supported by online catalogs and virtual mail—is also called e-tailing. In addition to the store, there are several other vital components that define what e-commerce is: the gathering and use of customer information through Web contacts; electronic data exchange (EDI) for the business-to-business (B2B) transaction of commerce; the use of both electronic facsimile and e-mail to reach prospects and established customers (for example, announcements of sales and publication of newsletters as well as online market research for profiling consumer behaviors of potential customers); business-to-business buying and selling; and financial data exchange via secure transactions. In addition to this financial aspect of security, there are some additional areas that raise security concerns in the e-commerce arena: authenticating the individuals who sign on to conduct these transactions; controlling access to resources such as restricted Web pages or protected sources of information; encrypting communications; and ensuring the privacy and effectiveness of all the commercial transactions.

WHAT IS e-COMMERCE QUALITY?

So what is the operational definition of quality that applies to e-commerce? We must begin this discussion by noting that e-commerce provides value to organizations because it forces them to develop more customer-focused business models—technology is used to deliver value directly to customers. Remember the theme that Bill Gates established: "How you gather, manage, and use information will determine whether you win or lose." The strategic focus of Microsoft on the Internet as a key platform of the future is also based on Gates's perspective of how to do business in the future: "The Internet is all about service—providing service to customers in a way that's faster, friendlier, and more personal than they or the company has ever experienced before."[9]

Harvard Professor David A. Garvin once proposed a construct that describes how you use quality information. He observed that there are "eight critical dimensions or categories of quality that can serve as a framework for strategic analysis: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Some of these [dimensions] are mutually reinforcing."[10] Do these dimensions of quality still hold in the e-commerce age or do they require extension into other areas?

EMERGING QUALITY DILEMMAS

Strategic planners have defined a set of "driving forces" that are influencing the organizations of the future. Today, additional forces that are focused on the technology underlying e-commerce are being added to these planning guidelines. These forces include: increased velocity, massive customization, the service-provider model, virtual value chains, reduced and eventually eliminated distance, and disintermediation (or eliminating the "middle man" in transactions).[11]

But, as designers get better at the integration of their ideas and technology contributes by becoming more powerful and able to accomplish ever more complex tasks, then we will see that systems will be able to create a form of intelligence—something that can happen in the collective behavior of a large group of highly interconnected machines (for example, the Internet). Negroponte cites an example of such a coherent form of behavior among people in an experience at MIT:

> The audience of roughly 1200 people was asked to start clapping and to try to clap in unison. Without the slightest lead from Resnik [the lecturer at this event], within less than 20 seconds, the room was clapping in a single beat. Try it yourself; even with much smaller groups the result can be startling. The surprise shown by participants

> brings home how little we understand or even recognize the emergence of coherence from the activity of independent agents.[12]

What can happen when groups of "thinking machines" are asked to share the same task? As Negoponte reminds us: "Every technology or gift of science has its dark side. Being digital is no exception. The next decade will see cases of intellectual property abuse and invasion of our privacy. We will experience digital vandalism, software piracy, and data thievery."[13]

This observation of Negroponte's raises a question about the evolution of the meaning of quality in such an information age. Is the definition of quality changing?

The key elements that are the strengths of the e-commerce age also conspire to the strength of its dark side, just as the *Star Wars* movies showed two sides to the Force that drives the universe. While ubiquitous technology is good for supporting a universal service capability, it will also provide the ability to know about all people in all markets who are connected in that network. They also have the potential for loss of privacy in their lives from an Orwellian "Big Brother" observer. Likewise, with information accessible on third-party systems, people with sinister motives can access the personal and financial information of others, leading to the new crimes that Negroponte has postulated above. One problem with these types of intrusions into the freedom and quality of life of individuals is that there is no general agreement as to the rights of individuals or into the responsibilities of data managers.

Don Tapscott, an economist specializing in the information age, observes: "Like freedom, privacy is best understood when it is undermined—you know what privacy is when someone is trying to take it away. Privacy involves the right to be left alone and to determine with whom we share the details of our personal lives or personal information. . . . Economic interests may cause consumers to trade privacy for convenience, such as occurs in credit card shopping . . ."[14] Tapscott asks: How do we protect ourselves? He suggests two underlying needs:

1. "We need a . . . rating service reflecting the different values that we hold.
2. "We need technological screens so that parents can control what information comes onto their children's workstations."[15]

The approach to such societywide requirements has been the establishment of standards that are voluntary for compliance. The motion picture industry rating system is an example of such a standard where the industry polices itself to provide a degree of protection for society's norms. On this matter, Tapscott observes: "Voluntary privacy standards, the norm in North

America, provide the flexibility for organizations in different sectors to customize their approaches in keeping with the needs of their customers, employees, and regulatory environments. Further, voluntary codes can be as strong or stronger than those enforced by law. However, the matter of enforceability raises several questions: Who is ultimately accountable? Where does an aggrieved consumer go for redress? As the value of personal information increases with the growth of the information economy, how can voluntary codes ensure protection?"[16]

Even more importantly, in the post-9/11 world, we must ask the question about balancing the needs of individuals for privacy and security against the needs for Society's security—both of these are legitimate needs, and they present a difficult conflict for resolution. Further development of this problem is required to provide a workable philosophy and set of values that will assure quality in e-commerce. Therefore, setting aside Tapscott's technology need, let us focus on the value need for protection of society through development of a quality standard for e-commerce.

ELEMENTS OF QUALITY IN e-COMMERCE

The rapid increase of transactions conducted on the Internet is an indicator of its technological adoption and signals the potential for a new global economy. The Internet facilitates trade by reducing transaction costs, reducing entry barriers for suppliers and customers, and opening up market opportunities for new niche products. These fundamental changes in business methods require revised thinking about the way business operations are conducted and that fundamental concerns such as quality of service are assured.

The evolution of electronic business interactions between suppliers and customers, which many perceive as a recent phenomenon, has in reality occurred over the past three decades. However, the changing nature and scope of electronic commerce transactions in the modern environment introduces new aspects to the relationship between suppliers and customers.

As customer interactions become more automated, there is less ability for staff to solve problems arising from poorly structured processes. Service and fulfillment systems need to be correctly designed at their inception and monitored throughout their performance life; organizations need highly trained and motivated staff and must execute to well-developed performance standards for service delivery. The value of this approach is clear when the "multiplier effect" of electronic customer interaction is considered. In the age of "bits" a poor customer action could result in communication with 16 additional customers, whereas in the Internet Age, a single negative online experience can be communicated to millions of customers as well

as potential customers, causing rapid loss of faith in the product or service as well as reducing the value of the brand of the organization behind the Web site. The customer base in a high-technology environment is much more fragile in terms of its loyalty than in the traditional markets.

The quality challenges in e-commerce are based on the need for delivering reliable results through consistent performance. But the communication of quality and assuring performance are both beyond mere virtual world issues—they exist beyond the sanctuary of the Internet. These issues require a solution that works in both virtual space and reality. What are the issues that face customers? They begin with the same proposition affecting customer service in the real world—if the customer expectation is not met, then over time customers will lose confidence in the ability of a firm to deliver on its promises, thereby destroying its capability to market its goods or services—initially destroying the company's brand, then its markets, and finally its business. If this "cycle of doom" for a business is initiated in any way, then the value proposition of customers will not present any significant advantage that warrants taking the additional risks associated with an electronic business transaction.

Thus, the starting point for designing a quality system that operates in the e-commerce age is to first create a viable business model and value proposition for customers.

BUILDING TRUST THROUGH THE VALUE PROPOSITION

Clearly, e-commerce is changing the way that business is being conducted. But what changes are the most important? A starting point for this discussion is the question:

> *How does any customer, when first interacting with a product or service provider, decide the extent to which their product or service can be trusted?*

Trust between parties is the basic principle of all commercial transactions. To create high trust levels, organizations must design their business model so that it is trustworthy. This sounds easy, but how can such an effective model be designed so customers can perceive its value?

Whether both marketing and sales channels may be conducted either off-line or online, the fundamental premise does not change: promises need to be kept if transactions and relationships are to be successful. Thus, trust in any organization that a customer does business with is prerequisite for a substantial business relationship. Traditionally, trust in business organizations has been established through a combination of social, business, and

legal practices that have evolved over time. Many of these practices cannot be replicated in e-commerce transactions. As a result, there is a need to understand how trust is created in order to design effective transaction systems for e-commerce that are based on the foundation of trustworthiness. In order to understand how trust influences future interactions between the parties and how any organization can create an environment where customers deem them to be trustworthy, customer trust needs to be clearly defined.

Trust implies an ability or assurance to rely on another's integrity to do the right thing. This will open the trusting individual to special vulnerability that comes from the relationship and their expectations of the outcome. Failure of this expectation would generate *mistrust*—exposing one's vulnerability to another party whose behavior is not under one's control, and in which the damage one suffers if the other abuses the vulnerability is greater than the benefit one gains.

However, to fully understand what influences customer trust, a broader definition of trust is needed that takes into consideration both expectations and response to these expectations by an individual. In this context trust is a "psychological state," comprising the intention to accept vulnerability based on positive expectations of the intentions or corresponding behavior of the other party. This definition implies two related trust factors: positive beliefs about product or service providers and a willingness to interact in accordance with those beliefs. The first component of the customers' intent to proceed with a transaction is called *unconditional trust*. This refers to an individual's beliefs, reliances, and assurances in regard to the extent to which a service or product provider is likely to behave in accordance with the expectations of that individual. The second key component is a *willingness to interact* with a service or product provider, which refers to making oneself exposed and vulnerable to the behavior of such provider.

Fostering the development of an unconditional trust and a willingness to interact by the customer is of special importance to small, unknown, and new enterprises that do not have an established corporate image, brand, and the market reputation of the large-size enterprises. The Internet has enabled these enterprises to compete on a level playing field by facilitating unlimited, low-cost access to the opportunities and markets that were in the past reserved only for the big enterprises. However, a strong concern for the success of these "electronic enterprises" has been voiced. The lack of customers' trust in enterprises conducting business over the Internet is a major retardant to the growth of electronic commerce. Lack of trust is a significant inhibitor to the realization of the many opportunities presented by the technology of electronic commerce.

A major barrier to trustworthiness is that customers, when doing business over the Internet, are concerned about enterprises which do not respect

the privacy of individual's personal or sensitive information that is required for completing transactions. This is the fear that Negroponte described as the "dark side" of the technology, where untrustworthy persons capture personal information to be used in ways that harm the individual who has trusted a relationship that he/she shouldn't have.

Another barrier to trustworthiness, although to a lesser extent, exists due to the novel nature of customers interfacing over the Internet with an invisible provider, invisible delivery processes, and invisible process controls. The intangible nature of the relationship in itself causes uncertainty and, when a transaction does go wrong, a complex legal structure creates unworkable enforcement of protections that customers would be entitled to receive in the world of "bits" as compared to the world of "bytes." Trustworthiness in the service provider and its ability to operate effectively and consistently are needed to overcome the lack of confidence caused by the intangible nature of the customer–supplier relationship.

Customers are more inclined to proceed with online transactions if they perceive that the benefits and financial rewards outweigh the risks associated with e-commerce. However, the difference between the benefits coming from the online purchases and the conventional way of procuring products and services is still currently so small and indistinguishable that many customers will question the value proposition behind e-commerce offerings.

While it is reasonable to expect that some portion of customers will use the Internet technology regardless of these risks, the fact remains that the bulk of the population will avoid it whenever possible or when other alternatives are available. For e-commerce to grow, the issue of the trustworthiness of customer–supplier relationships must be addressed adequately from both the customer and market perspectives.

CHANGES IN CUSTOMER–SUPPLIER CONTRACTS

Until just recently, online transactions typically included electronic document exchange, ordering, invoicing and payments processes between organizations that maintained off-line (real world, not virtual) private contracts that defined their business relationships. Effectively, all of these transactions were electronic implementations of paper-based documents and systems, conducted on a one-to-one basis or a one-to-few basis, where one large party participated as the host for a number of supplier organizations. In this environment, the quality aspects of these transactions were mirror images of the standard quality management system, and any additional risks

that required management were satisfied by technology solutions such as secure networks, firewalls, encryption, digital signatures, and so on.

Stimulated by the growth of capacity and penetration of the Internet, the nature of all online business has changed completely. We are now faced with multiple interacting organizations, typically small players involved in niche markets, where markets are often transient (that is, the markets have short lifetimes or short product-refresh times). Effectively, the Internet has created a many-to-many market, with active participation between small businesses and individual end customers. Another significant characteristic of this market is its global scope and the use of intermediaries and/or aggregators, both overt and covert, to create these relationships between the customer and supplier, rather than the use of the system provided by a dominant organization—either the customer (like the American automotive industry) or supplier (such as a dominant supplier of electronic components). Along with this expanded reach of the Internet come a number of key contractual questions for organizations and customers, for example:

- What is the relevant legal venue for the contract?
- What is the currency that will be used as the economic basis of the contract?
- What taxes are applicable to the transaction, when are they paid, and who makes the payment?
- What country has legal jurisdiction in the event of a dispute?
- What commercial regulations (for example, labor dispute cooling-off periods) are applicable?
- What standards apply to the product design?
- How is the warranty managed in the various countries of use?

MARKET AND CUSTOMER IMPACTS

In addition to these commercial conditions, there are a number of relationship issues that deal with markets and customers that are introduced by the electronic medium of commerce:

- Does the organization have a known and trusted identity?
- Is it clear where the organization is located?
- How current are the documents, contract terms, prices, and other commercial information in the online offering?

- Are the terms and conditions of contract clear and complete, and easily found and understood?
- What privacy standards are applied to the use of any information customers provide?
- How secure is the site?
- Who is responsible for delivery?
- What are the delivery commitments?
- How do customers contact/complain to the organization?
- What is an appropriate expectation for response to customer concerns?

Customer trust in the commercial promise and reliable performance according to that promise are essential ingredients in the sustainable success of any organization. What are some of the factors that can engender trust in e-commerce?

- Transactions are secure and conducted by authenticated parties (security).
- Personal details are kept private, stored safely, and only used as agreed (privacy).
- Levels of service received are at least as specified and up to an acceptable standard with access to effective systems for complaint handling and redress (service).

These three requirements form the focus areas for quality expectations in an e-commerce business relationship.

FOCUS AREAS FOR e-COMMERCE QUALITY

How can an organization design be created to assure consistent delivery of quality in such an environment? We propose that there are at least three new dimensions of quality that must be focused upon in this e-commerce age in order to assure customer trust in an e-commerce value proposition:

1. Security
2. Privacy
3. Customer service

These three key concerns, which are outlined in more detail below, must be addressed in a manner which is internationally accepted and performed to a level that is an internationally accepted standard of performance in order for an enterprise's e-commerce initiatives to reach their full potential.

Security

Throughout the world, one of the principal inhibitors to the growth of e-commerce is concern about the security of doing business on the Internet. Numerous surveys conclude that fear of information theft is the major deterrent to shopping online. Identity theft is recognized as the world's fastest growing fraud. Organizations that want to survive and succeed in the coming years will need to develop a comprehensive approach to information security embracing both the human and technical components of this complex challenge, and build customer trust through independent certification of their information security measures. Customers want to be certain that the information that they divulge is maintained only for its intended purpose.

Organizations should be required to "guarantee" the level of security, which corresponds to risks involved. This would go a long way toward building a highly desirable environment that is based on customer trust in the product and service providers. Currently, a number of certification bodies offer third-party certification of security systems to the ISO/IEC 17799 standard. While its acceptance by the marketplace has been slow, this scheme nevertheless provides international recognition and status in regard to security, which should with time translate into increased trust by customers.

However, building and maintaining customer trust in relation to security can only be effectively achieved through an independent third-party certification of an organization's physical structure and technical information security management system. Without a physical inspection and a documented security management system, most organizations will not be able to convince their customers that they have met the requirements for a value proposition that contains guarantees in relation to maintenance of security during the transaction as well as the protection of privacy after the transaction.

Privacy

The privacy concerns of Internet users are complex and have arisen from a distrust of Internet technology and the level of privacy and information security that this technology might provide. Doubts have also arisen as organizations and consumers have understood the greater potential for enterprises engaging in e-commerce to misuse, disclose, or otherwise

improperly handle personal information or information gathered about customers via their use of the Web.

The privacy concerns for Internet users involve:

- Concerns about the security of sensitive personal information disclosed across the Internet
- Uncertainty about how personally identifiable information will be used or disclosed by the recipient organization
- Desire to avoid unsolicited advertising material and other intrusions into an individual's personal cyberspace

Only when individuals feel confident that information they might provide will be handled in a way that is consistent with the use for which it was originally intended, through the application of sound privacy protection practices, will potential customers be willing to take full advantage of e-commerce opportunities.

Currently, there are a number of programs designed to enhance the trust in privacy through voluntary adherence to requirements. These programs may issue a TrustMark—a third-party logo posted on the Web site of the service provider—to declare that this organization adheres to the principle of commitment to protect personal information. Such a mark from organizations operating this system is a formal recognition, like a seal or certificate, indicating the organization's commitment. These services are adding value and will expand and further improve with time as the meaning of such TrustMarks becomes standard and their value proposition becomes more widely understood.

Customer Service

The quality of service enterprises offer to their customers through the Internet will provide the greatest competitive advantage. The conduct of business through the Internet poses particular challenges for enterprises, as the anonymity of the interaction requires fresh consideration of the key elements of customer service: ease of access, quality of product offerings, certainty of fulfillment of requirements, as well as efficient dispute resolution and service recovery.

With the diffuse and often obscure supply chain in online transactions, fulfillment of customer requirements and the management of defects is a much more complex matter. For example, if a critical electronic document fails to arrive, is the problem a communications issue, an addressing issue, in the supplier's system, in an intermediary's system, or in the customer's systems—and can it be easily traced?

A single negative online experience can cause customers to lose faith in e-commerce technology and the organization behind a Web site. *Any inability to establish a direct, person-to-person relationship with a product/service provider causes further, highly undesirable anxiety and frustration among customers, who then start to question the value proposition of using the Internet to satisfy their needs.*

HOW TO IMPROVE e-COMMERCE QUALITY

Over the last five years, there has been a significant increase in the level of exposure to new business risks affecting product and service providers and their customers. These new risks have arisen from the increased use of Internet technology and the mistrust by customers in security, privacy, and service fulfillment when purchasing online. The Internet has been touted as the greatest enabler of the explosive birth of the New Economy, where many business deals will be negotiated and transacted through electronic online facilities. While the potential for rapid adoption of e-commerce was always there, its realization and the speed of uptake has been very disappointing to date. Many questions can be raised as to why the new economy is not growing at a faster rate. The New Economy's way of doing business offers customers product and service features not previously available.

New technologies enable smaller enterprises to develop business relationships with customers in geographically distant markets. Access to these markets until recently was reserved exclusively for large and financially strong companies that could afford to set up their presence through the representative channels of sales and distribution. The excitement of being able to access these previously untapped markets by both product and service providers and customers is gaining momentum together with the exponential growth of awareness of the enormous commercial potential. However, concerns about trust in security, privacy, and service fulfillment while doing business over the Internet have been identified as significant impediments to the rapid adoption of online commerce and growth of the new economy.

Uncertainty about the behavior of the product or service provider, especially when that behavior has had adverse consequences for the customer, is of major concern. Here, risk can be defined as "the extent of uncertainty about whether potentially significant and/or disappointing outcomes will occur within the interaction between the parties." The rate of development of this risk adversity and its relationship to trust is a function of customer perception of the levels of exposure to both known and unknown business risks. There is an overwhelming reluctance by customers

to provide personal information, including credit card details, even though they are interested in purchasing products or services over the Internet. As many as 67 percent of Internet "browsers" terminate ordering transactions by abandoning the Web site when asked to provide personal information and credit card details.

A standard for e-commerce quality needs to be developed to provide a consistent international framework for assessment of progress made by organizations in conducting e-commerce activities and to establish benchmarks for best practice in e-commerce. Such a standard could provide recognizable benchmarks for key performance areas along with guidelines for implementation of appropriate systems and standards for the commercial use of the Internet and outline best practice implementation of business-to-business e-commerce. In order for the organizations' e-commerce initiatives to reach full potential, it is imperative that these key concerns be addressed in an internationally acceptable manner and that e-commerce services are performed to appropriate assurance of quality performance in the areas of security, privacy, and customer service.

CONCLUDING COMMENTS

As many companies move into e-commerce, the global reach of processes and transactions inherently involves new customer relationships, more complex supply and distribution channel management requirements, and the need to be cognizant of multijurisdiction legal requirements.

While the quality parameters and methodologies of ISO 9000 continue to be essential foundations for customer satisfaction, the nature of online business processes requires organizations to give additional attention to matters of information security, customer privacy, and service needs for the fulfillment of customer orders and management of customer relationships. Traditionally, trust in business organizations has been established through a combination of social, business, and legal practices that have developed over time. Many of these practices cannot be replicated in the less tangible world of e-commerce transactions. As a result, organizations need to establish processes specifically designed to achieve quality in e-commerce transactions that can be internationally recognized and trusted.

Successful organizations operating in the online environment need to be cognizant of the special issues that need to be addressed in both the inferred and the explicit contractual arrangements with customers. The diffuse nature of the interactions, the invisibility of many intermediaries and agents in the transaction, and the need to gather and secure customer information means that organizations have to build and sustain customer trust in

this new environment. A systematic approach is necessary to identify and respond to quality and legal issues faced in implementing online transactions, and to ensure that online and off-line systems and processes are integrated.

The real question that requires an answer from the global business community is: To what degree would customers trust the product or service providers if these providers were independently certified for these emerging dimensions of quality of the e-commerce age: security, privacy, and customer service? If this certification carried an appropriate digital assurance seal, what would be the impact of such recognition of the providers' trustworthiness on accelerating growth of customer trust in the online economy?

In summary, greater trust in organizations doing business on the Internet, particularly with respect to the vital areas of security, privacy, and customer service, is required for the full potential of e-commerce to be realized.

ENDNOTES

1. The original Luddites formed a British protest against the automation of the textile industry, primarily through the use of Jacquard looms. Their technique of protest was "collective bargaining by riot." In other words, they destroyed the machines that threatened their livelihoods. Some groups branched out and pulled up railroad tracks and destroyed other machines that were taking the place of semi-skilled labor. The group was organized under an apparently fictional leader named Ned Ludd, sometimes referred to as General Ludd or King Ludd, who, like Robin Hood, was reputed to have lived in Sherwood Forrest. The Luddites were deposed in 1816 when the English Parliament sent 12,000 troops to stop the rioting. The leaders were executed or transported to Australia. The term Luddite has come to refer to anyone who is anti-technology.
2. A. Toffler, *Power Shift: Knowledge, Wealth, and Violence at the End of the 21st Century* (New York: Bantam Books, 1990): 85.
3. P. F. Drucker, "The Information Executives Truly Need," *Harvard Business Review* (January–February 1995): 61.
4. B. Gates, *Managing @ the Speed of Thought* (New York: Warner Books, 1999): 3.
5. J. Naisbitt, *Megatrends* (New York: Warner Books, 1982): 24.
6. N. Negroponte, *Being Digital* (New York: Random House, 1995): 4.
7. Ibid, 94.
8. A. Pekka, "Software Quality through Insight, Foresight, and Leadership," *EXBA—Quality Connection Special Issue* (May 2002): 2.
9. Gates, *Managing*, 102.
10. D. A. Garvin, "Competing on the Eight Dimensions of Quality," *Harvard Business Review* (November–December 1987): 104.

11. Disintermediation is giving the user or the consumer direct access to information that otherwise would require a mediator, such as a salesperson, a librarian, or a lawyer. The Internet technologies give users the ability to look up medical, legal, and travel information, or comparative product data directly, in some cases removing the need for a mediator (doctor, lawyer, salesperson) or at the very least changing the relationship between the user and the traditional (pre-Internet age) product or service provider.
12. Garvin, "Eight Dimensions," 157–58.
13. Ibid, 227.
14. D. Tappscott, *The Digital Economy* (New York: McGraw-Hill, 1996): 272.
15. Ibid, 272–73.
16. Ibid, 279.

9

Case Study: Software Quality in the Development of Linux

Robert E. Cole and Gwendolyn K. Lee

INTRODUCTION

The Linux kernel development project was among the first attempts that made a deliberate effort to use globally connected software developers as the main source of talent and input to create important, open source software (OSS).[1] How did thousands of talented volunteers, dispersed across organizational and geographical boundaries, collaborate via the Internet to produce a knowledge-intensive, innovative product of high quality? This development process stands in stark contrast to the approaches used in commercial software development, with significant implications for product quality. Understanding these differences is the challenge we have set for ourselves in this chapter.

Linux is considered to be a serious threat to UNIX systems and to Microsoft Windows NT's market dominance in operating systems. It is actively being promoted by such major firms as Sun Microsystems, Oracle, Hewlett-Packard, and IBM. It is remarkable that a system which started as a hobby in 1991 and as an open source software should become, by 1999, the World Wide Web's leading operating system, running 31 percent of Web servers (versus 24 percent for Windows and 17 percent for Solaris).[2] Moreover, Linux continues to penetrate new markets. It is particularly popular for scientific and academic computing, and history suggests that successful adoption in these arenas tends to lead to widespread business usage (witness UNIX). Given its current and prospective usage alone, Linux must be regarded as a success. Its high and growing utilization rate alone suggests

high quality. More direct data are available, however. Survey results, based on interviewing business-technology professionals, show that after "relatively low cost or no licensing fee," "reliability" is cited as the second largest motivator for why companies decide to use Linux.[3] The "performance" of Linux follows closely behind as the third-ranked factor. In a recent U.S. Department of Defense study of open source product procurement, including Linux, capability and reliability were found to be the strongest deciding factors for choosing open source products.[4] The importance that adopters assign to reliability is understandable given that operating systems scored highest when business-technology professionals were asked: "In which custom or commercial applications did your company find bugs or errors?"[5] Moreover, there is ample evidence that these errors impose significantly higher costs on firms.

This is not to say that Linux is without quality problems. These same surveys of business-technology professionals stress the limited availability of business software (can be seen as a lack of features desired by customers) for Linux, limited availability of training and education, and not enough outside technical support available.[6] Linux has found its markets, especially for Web serving, file and printer sharing, application development, and other front-end applications.[7] Yet, its usage appears to be expanding to more back-end operations as more and more applications are being written for Linux and sources of technical support grow.[8] Overall, the quality of its operating system must be regarded as one of its major selling points.

This chapter aims to demystify the source of the high quality characterizing OSS by empirically examining the process of Linux kernel development. Our objective is to compare and contrast the OSS development model with the conventional commercial software development model and, more generally, with the traditional model of research and development (R&D). Through comparison, we identify the conditions that enable the high quality associated with the OSS development model as manifested in Linux development processes.

OSS development has captured the imagination of computer programmers around the world, irrespective of their employment, politics, economic status, or nationality. No single firm has been able to accomplish this magnitude of collaboration of like-minded individuals, because their selection of employees is limited to the extant labor pool or, at best, members of their extended production chain and customers. In contrast to conventional software development and R&D models, one of the most distinctive features of the OSS development model is that users can participate as developers.

What distinguishes OSS from other software is that its source code is distributed to its users. When software is distributed in source code versus machine code, users can modify and/or extend the computer program. By

contrast, commercial software is typically distributed in machine code, which is the only language that computers understand and execute. From a commercial software development firm's perspective, distributing only in machine code protects the ownership of intellectual property because machine code is in a binary form and software users rarely have the capability to reverse engineer the product. This limits, however, the ability of outside programmers to improve product reliability, customize product features, and innovate product functionalities. Yet, three of the primary features of a high-quality product are recognized to be performance, features, and reliability.[9]

Our analysis of the Linux kernel development process shows that OSS users carry out two important functions in the software development process: (1) quality assurance and (2) innovation. For quality assurance, OSS users perform the tasks of bug reporting, identification, correction, and testing. For innovation, they make suggestions for new features and write patches of computer code to enhance the usefulness of the software. Both are critical to enhancing quality competitiveness. In contrast to the conventional/firm-based software development process, where end-users mostly serve as a source of bug reports and complaints, the OSS development model encourages users to become problem solvers and serve as a source of solutions and innovations.

From a quality perspective, the advantage of users/developers as problem solvers is enormous.[10] With conventional commercial software, unsophisticated users often fail to detect bugs or fail to detect them at an early stage; or, when they do detect them, they may report them inexactly and in a language that needs translating. This information is often passed through intermediaries until it reaches the experts who must then diagnose the problem based on the filtered information they have received, try to recreate the bug, and forward the information to those in authority, who make the decision as to whether to seek remedies and, if so, what remedies (if any) are required. In this extended process, the opportunities for distortion, noise, delay, and inaction are large. Introducing unsophisticated users into the problem identification process and extending the number of intermediaries who process information about problems, all things being equal, will increase the probability of poor, late, and no solutions. It is not surprising then that software firms report that the no fault found (NFF) and can not duplicate (CND) codes are the most frequently reported reasons for failure in their failure facilities. Often, these two categories of "defect codes" will exceed 30 percent of all reported defects (other codes could include codes for specific equipment failure—keyboard, CRT, system board, memory, and so on).[11] These outcomes reflect the disconnect between the person experiencing the original problem and the person who is trying to solve the

problem, whereas the user/developer model of Linux drastically reduces this kind of disconnect and thereby eliminates most NFF and CND codes. Indeed, with conventional software, the hierarchy becomes involved in the decision of whether and how to respond. Those higher up in the hierarchy tend to bring in different criteria for their decisions, such as how much will it cost and where will I get the otherwise occupied resources to deal with this problem?

By contrast, sophisticated users/developers of OSS are more capable of early and more exact identification of problems, and of communicating that information accurately and quickly to peers in ways that lead to collectively arrived at and timely remedies. For example, it is generally expected for Linux user/developers reporting bugs that they also include some information on how to recreate the problem. Generally speaking, peer-to-peer problem resolutions are more likely to be based on the facts arising from the specific problem, and peer-to-peer resolutions usually take place more quickly than those that require negotiating the hierarchical ladder. In summary, the OSS model operates to minimize a large, nontrivial source of distortion common to how commercial software firms tend to handle bugs.

OSS projects are hardly the only setting where user-driven innovations take place. OSS development, however, represents an extreme case of this user-driven phenomenon, pushing the limits of the value that users add to the product. This is consistent with one of the most modern definitions of quality.[12] OSS's reliance on users is of central importance because it adds value to the software as perceived by customers, thereby enhancing customer satisfaction.

To lay bare the organizational dimensions that enable the emergence of a robust high-quality product, we will ask and answer three questions: (1) Who contributes to OSS development and why do they volunteer? (2) How do they organize and coordinate their development activities? And (3) How do they insure high product quality in the development process? The first question sharpens our focus on the mobilization of knowledge workers, dispersed across organizational and geographical boundaries, to contribute to a large-scale development community. The OSS development community is not a random collection of computer programmers. Among five million computer programmers worldwide, fewer than 50,000 of them participate in open source projects.[13] What are the motivation and incentives for a disparate group of geographically and organizationally dispersed individuals to cooperate in ways that enable the emergence of a high-quality product like Linux?

The second question focuses on organizational practices and structures used to coordinate development activities. Moon and Sproull used a "strong-man" leadership perspective to explain the success of Linux,[14] and

Markus and associates identified the governance model of several OSS projects.[15] Both the leadership view and governance models are top-down decision-making frameworks. Generally speaking, top-down models of quality improvement are quickly implemented but limited by the reluctance of those lower down in the hierarchy to accept ownership of top management–imposed solutions. Those lower down in the organization often question the relevance of these top-down imposed directives.[16]

Moreover, a top-down perspective on Linux does not fully capture the role of the most important actor in the OSS phenomenon, the users, and how their activities lead to successful innovations. We examine the practices and structures that the developers apply to coordinate development tasks. Specifically, we examine the practices and structures by which the process of innovation accommodates an increasing number of contributors who have diverse interests and skills.

The third question we address is how product quality is attained in the innovation process. In Raymond's account of the Linux development process, what sets Linux apart from other operating systems in the levels of quality and performance is its open and evolutionary process of product development.[17,18] Most software products, both commercial and noncommercial, have been produced in a "cathedral," by isolated teams of programmers, who worked on the code until releasing a final, finished version. Linux, on the other hand, is assembled in a "bazaar," where each development cycle is short as versions are released frequently (Raymond's terms are in quotes). Moreover, the traditional/commercial model of software development remains largely firm-based, although software development firms do share some common characteristics with the Linux model. They do make increasing use of the Internet (a many-to-many, digital, knowledge-creation platform), they do involve application developers from multiple firms (ensuring distributed cognition and geography), and they do increasingly leverage leading customers to assess product features and identify bugs. In developing Windows 2000, Microsoft trumpeted a joint development program that included 50 of Microsoft's biggest customers offering ideas for bug fixes and new features.[19] Still, these numbers pale by comparison with the number of those involved with Linux development.

Consistent with Raymond, we see the Linux kernel development process as an evolutionary process by which improvements are made continuously and incrementally. This stands in contrast to the weak incentives of commercial software companies to provide high-reliability systems. Such companies are under constant pressure to get to market early with new product, often sacrificing quality checks in the process. Moreover, the cash cow model implicit in many commercial off-the-shelf (COTS) systems provides a constant counterincentive to making highly reliable products.[20]

Extending the evolutionary framework inherent to OSS such as Linux, we will examine our findings of organizational practices and structures in the context of how variations of the source code are generated, selected, and retained to produce a product of high reliability with innovative features. We turn now to the case study on the Linux kernel development project, where we respond to the three questions that we just posed.

CASE STUDY: THE LINUX KERNEL DEVELOPMENT PROJECT

We assess the Linux kernel development project along three dimensions: (1) the mobilization of a large-scale user base who have the skills to develop the product; (2) the organizational practices and structures that coordinate between developers who generate innovations and those who select and retain innovations; and (3) the open and evolutionary product development process.

We use a variety of data sources to study the Linux development process. A direct source of data is the artifacts that the Linux developers produced. Artifacts are key outputs of innovative activities and the most important artifact, of course, is the Linux operating system source code.[21] Source code is the programming code that computer programmers use to write a software program. We chose Linux 2.2.14, released in March 2000, as our main source of data because the Linux kernel development project was stabilized by version 2.2, which was developed between 1999 and 2000. More exciting developments for the Linux operating system now take place outside the kernel.[22] The Linux 2.2.14 source code has a size of 62.7 megabytes and approximately 1.9 million lines of code in 5186 files and 266 folders. Along with the source code, a "Credits" text file and a "MAINTAINERS" text file are distributed to the users. For easy user reference, these files are located at the first level of the directory (2.2.14/Linux/) next to the folders containing modules and documentation. The Credits file is a public recognition of the people who have substantially contributed to the development of the Linux kernel.[23] The file lists the names of recognized developers as well as a description of their major contributions. Similarly, the MAINTAINERS file keeps a record for each subsystem and its maintainer.

In addition to the Linux 2.2.14 source code, the Linux-kernel mailing list archive is another useful source of data. The Linux kernel mailing list was created for the purpose of discussing development issues, and we use the archived e-mail discussions to analyze the size of the community as well as the patterns of development activity over time. The mailing list functions as a virtual environment where Linux developers send their contributions, discuss

implementation details, and interact with other developers.[24] More specifically, we focus on people who have sent at least one e-mail to the Linux kernel mailing list over the five-year period between 1995 and 2000. We identified a total of 14,535 people and estimated that on average, each person has sent 14 e-mails over five years.[25]

Yet another important source of data is the developers' e-mail suffix that we extract from the Linux kernel mailing list archive, Credits file, and MAINTAINERS file. Using the e-mail suffix as a proxy, we analyze the developers' organizational affiliation and nationality. Furthermore, we use the raw data downloaded from an online survey (we call it "the Linux kernel survey") as another key source of data. A research team at the University of Kiel in Germany collected the survey data between February 2000 and April 2000 by announcing their research project via an e-mail to the Linux kernel mailing list and asking the e-mail recipients to fill out a survey located on the research project Web site. Using the survey data, we examine the developers' demographic distribution, employment status, and motivations.

THE MOBILIZATION OF THE LINUX KERNEL DEVELOPMENT COMMUNITY

To date, the Linux kernel development project has attracted and utilized thousands of volunteers, who are distributed across organizational as well as geographical boundaries. As a natural experiment, the Linux project has demonstrated the feasibility of a large-scale online collaboration effort where developers and users can be one and the same. As of the year 2000, there were more than 12 million Linux users worldwide, approximately 90,000 of those were formally registered as Linux users.[26] That is, approximately 16 percent of the registered users participate as developers.[27] However, over time, the proportion of "nondeveloper users" grows more rapidly than that of "developer users." In this section, we will show who these volunteers are and what motivates so many of them to participate in this OSS development project.

Next, we examine what attracts these diverse volunteers and how their participation is sustained. We know from the existing quality literature that how employees are motivated and the nature of incentives play a critical role in determining organizational quality. Consistent with Markus and associates, Linux volunteers are motivated by both social and economic incentives.[28] By comparing the incentives of volunteers with those of employees, however, we see subtle shifts in how incentives operate.

Both economic and social benefits are *extrinsically motivated* rewards. Among the statements listed in the Linux kernel online survey with which

respondents strongly agree, we consider statements such as "improving programming skills," "facilitating daily work," "gaining career advantages," and "interacting with other software developers" to fall under this category (see Table 9.1). An employee's benefits in a for-profit firm typically range from salary, stock options, and career development opportunities, to working on an interesting project. In contrast to the salary that employees receive, the volunteers receive economic benefits in the form of a better software product to use. Using a better software tool leads to enhanced personal work for private users as well as improved job performance for corporate users whose business interests are closely linked to the success of Linux.

However, the volunteers need to collaborate and engage in solution exchange so as to develop a high-quality tool because the system complexity is such that it requires more than an individual's work. More specifically, the developers contribute their time and skills to the development of a higher-quality tool because they have a common problem to solve. The developers collaborate in joint problem solving and contribute their solutions and feedback to others, expecting that they will receive solutions and feedback from others when they post their problems in the future. So, an individual's need of a higher quality tool is satisfied through a social exchange process where anticipated reciprocity mediates the exchange. In the process of exchange, the volunteers develop a sense of identity in relation to the community and derive a sense of satisfaction from social interactions with other like-minded developers.

Gaining fame/reputation also translates to both economic and social benefits for volunteers. Practically, fame/reputation and improved skills increase a volunteer's economic value in the labor market outside the development community.[29,30] Inside the development community, however, reputation is a signal of quality that attracts attention and confers social status. More importantly, reputation represents, psychologically, the satisfaction of personal needs for attention, cooperation, and recognition by one's peers. In contributing to the greater good, " social status is determined not by what you control but by what you give away."[31] It is the satisfaction of these needs that sustains a volunteer's participation. Or else, a volunteer would exit the community once he establishes enough of a reputation to be recognized in the external labor market.

The other category of motivation is *intrinsic motivation.* In contrast to extrinsic motivations, intrinsic motivations lead volunteers to contribute because the participation itself carries its own rewards. Unlike economic or social benefits, features such as novelty, entertainment value, satisfaction of curiosity, and the attainment of mastery characterize this type of reward. We consider statements like "having fun programming," "believing that information should be free," and "dismissing the importance of monetary

Table 9.1 Motivations and beliefs of Linux developers (as of year 2000).

Percentage of Survey Respondents "Agree Strongly"	All Respondents (154 Cases)	Student (36 Cases)	Never Paid (93 Cases)	Paid Sometimes (26 Cases)	Paid Regular Salary (26 Cases)
Intrinsic Motivations					
Having fun programming is very important to me	66.2 %	75.0 %	67.7 %	76.9 %	61.5 %
I contribute to free software because I believe information should be free	57.8 %	66.7 %	63.4 %	61.5 %	46.2 %
Lack of payment for my work in Linux projects is a significant inconvenience to me	1.9 %	0 %	2.2 %	0 %	7.7 %
Extrinsic Motivations					
Improving my programming skills is very important to me	66.2 %	77.8 %	68.8 %	73.1 %	61.5 %
Facilitating my daily work due to better software is very important to me	64.9 %	63.9 %	63.4 %	73.1 %	73.1 %
Improving the quality of the Linux kernel in general is very important to me	53.2 %	69.4 %	51.6 %	69.2 %	53.8 %
Personal exchange with other software developers is very important to me	42.2 %	38.9 %	46.2 %	34.6 %	46.2 %
Career advantages due to experience gained in Linux projects is very important to me	23.4 %	25.0 %	20.4 %	15.4 %	42.3 %
Gaining a reputation as an experienced programmer inside the Linux community is very important to me	22.1 %	27.8 %	23.7 %	11.5 %	34.6 %

Data Source: Raw data was downloaded from http://www.psychologie.uni-kiel.de/linux-study/writeup.html

compensation" to fall under this category. More specifically, the joy of craftsmanship comes from expressing one's talents and abilities to oneself.[32]

How is such a motivational framework capable of producing a robust high-quality product, which Linux has come to be? This leads us to our next question.

THE STRUCTURE OF THE LINUX KERNEL DEVELOPMENT COMMUNITY

Having shown whom the Linux developers are and what motivates them to contribute, we now analyze how these motivated developers coordinate their efforts to develop a useful product in a seemingly anarchic community staffed by volunteers. More specifically, our objective is to examine empirically how the Linux kernel development community is organized to accommodate increasing size and diversity so that a large volume of contributions can turn into a high-quality product. An annual count of the e-mails in the Linux kernel mailing list shows that the size of the development community grew four times between 1995 and 2000. The larger the size of the community, the more difficult it is to coordinate and understand all the possible interactions among software components developed by different parts of the community. That Linux has been able to meet this challenge without sacrificing quality is all the more impressive.

The formal structure adopted in this community to deal with coordination problems is modularity. Decision making is decentralized at the module level. Modularity grants developers the freedom to work on different parts of the system simultaneously without the risk of interfering with one another's progress. Without modularity, when a large number of people jointly develop a computer program, minor modifications in one part of the program may give rise to major quality problems requiring significant changes and major rework in other parts of the program. Torvalds decided to add loadable kernel modules in Linux 2.0.0, released in 1996, to set the boundaries within which the developers of each module have full control over its design and implementation. Consequently, with modularity, coordination is achieved across different parts of the system in ways that minimize quality problems.

In addition, modularity helps the project continue over time with consistency. Without modularization, if the original developer of a module were to leave the community and someone else were to join the community later, he or she would have a hard time continuing the work because of the level of complexity. We know that, all things being equal, firms with high turnover tend to have greater problems maintaining quality.[33] Particularly in a virtual setting where Linux developers can easily join and exit the

community as they please, modularity makes tasks clearly defined and easily understood for new members. Therefore, modularity is an important structural design mechanism that serves to minimize quality problems through reducing task complexity and discontinuity resulting from personnel flow.

Another formal structure adopted in the community is two code trees running in parallel: one for experimental development and the other for stable development. The experimental tree is where developers can experiment with advanced technology and try new ideas. The process of learning from error can easily be tolerated in the experimental tree without disturbing mainstream users. In the experimental tree, more innovative features and solutions are tested, while in the stable tree, more mature code is refined. New features are tested in the experimental tree first and then become included in the stable tree. This formal structure adopted in the Linux kernel development community appears quite capable of achieving the objectives of encouraging variation, incremental improvement, and gradual accumulation of learning. These are the essential ingredients of successful innovation.

In addition to formal structures, the Linux kernel development community relies on an informal and implicit structure to coordinate their activities. This structure is informal and implicit because categories of developers emerge in the process of performing tasks. There are no formal assignments of tasks to the volunteers. To observe this informal and implicit structure, we developed a novel method to identify the volunteers' relationship with one another based on the subject headings of the e-mails they sent to the mailing list archive. We see in the mailing list archive that developers make contributions for a wide range of tasks: finding bugs, fixing bugs, testing features, writing manuals, adding capabilities, adding utilities, and porting the operating system to different computer platforms.

It is common that different individuals perform different tasks because some tasks require specialists with certain types of programming skills. For example, most users can report bugs or request new features, but only some are capable of sending in patches of code to fix certain problems. The Linux kernel survey shows that the majority of respondents have contributed in forms that do not require computer programming. Less than half of the respondents have actually been involved with writing computer code. Only 30 percent of the respondents have ever submitted a patch of code to the mailing list. In addition, only 45 percent of the respondents have written at least one line of code for the kernel. Further, only 45 percent of the survey respondents are involved in some subsystem project, but 47 percent are not involved in any subsystem development at all.

From our task analysis, we identified four categories of developers organized in a two-tier development structure (see Table 9.2).

Table 9.2 A two-tier structure with four categories of developers.

Emergent Roles of Linux Developers	Number of People	Total Number of E-mails[4] Sent to the Mailing List	% of Total E-mails Sent
Project leader	1	2840 (the third highest number)	1.4%
Maintainers	121[1]	37,387 (including the project leader)	18.8%
"The development team"	2605[2]	20,563	12.3% 10.3%
"The bug reporting team"	1562[3]	4216	2.1%

1. Size estimation is based on the names listed in the MAINTAINERS file available in the source code file.
2. Size estimation is based on the names of e-mail[4] senders who wrote the word "PATCH" under the subject heading.
3. Size estimation is based on the names of e-mail[4] senders who wrote the word "OOPS" under the subject heading.
4. Source of e-mails: Linux-kernel e-mail archive from June 1995 to August 2000.

The two-tier structure consists of a small "core," which has a project leader and hundreds of maintainers, and a large "periphery," which has thousands of developers, including "the development team" and "the bug reporting team." It is through the two-tier structure that the evolutionary process of software development plays out.[34] Variations of the source code are generated and tested from the periphery, and then selected by the core to become useful additions to the product. While project leaders in the conventional model of R&D make the decisions on the design as well as the details of implementation, those decisions are made separately in the OSS development model. The periphery of the development community generates improvements and implementations of innovative features; the core selects among these innovations to produce an official release, which goes through more cycles of improvements and implementations.

The Core. Linus Torvalds is the founder and default project leader who controls the official source code release. In principle, the project leader, Torvalds, has the final authority to decide which code becomes included in the kernel for official release. Although some popular myth equates his centralized decision making with dictatorial control,[35–37] Torvalds, in practice, typically consults with maintainers who are responsible for various subsystems on key decisions, particularly on issues that concern subsystems in which maintainers have invested time.

The 2.2.14 MAINTAINERS file lists 121 maintainers in charge of 132 subsystems. Some subsystems have co-maintainers and some maintainers

watch over more than one subsystem. Our analysis shows that the distribution of maintainers across modules is highly uneven. Across all nine modules listed under 2.2.14/Linux/, the largest one (the device drivers module) has 72 percent of the maintainers. The device drivers module represents 55 percent of all the subsystems, 58 percent of total kernel size in megabytes, and 63 percent of total lines of code. The second largest module is only a quarter of its size. Compared to other modules, device drivers are relatively less complicated to write, but they tend to be difficult to debug. Therefore, it is reasonable that most of the development activities in the Linux development community focus on creating an interface to each peripheral device that some developer is interested in attaching to the computer, given the very large number of manufacturers and hardware models available to computer users.

The Periphery. We define the development team as the developers who have sent at least one e-mail with the word "PATCH" in the subject heading between 1995 and 2000 either to send a patch of code or to discuss a patch. Their tasks include creating patches, adding features, and fixing bugs. We identified 2605 people in the development team over the five-year period. The other team of developers is "the bug reporting team," and we define it as the developers who have sent at least one e-mail with the word "OOPS" in the subject heading either to report a bug or to fix a bug.[38] Their tasks include identifying bugs, characterizing bugs, and eliminating bugs. We found 1562 people in the bug reporting team between 1995 and 2000. Furthermore, the development team and the bug reporting team have overlapping members. Forty-nine percent of the bug reporting team has sent an e-mail with the word "PATCH" in the subject heading, while 29 percent of the development team has sent an e-mail with "OOPS" in the subject heading.

Popular belief has it that there is neither control nor accountability in OSS development.[39–41] Indeed, problems of coordination can result in delays and lead to chaos. Our analysis, however, shows that the Linux community has in place formal structures, as well as informal/implicit ones, in the form of coordination mechanisms. Although large size is typically associated with more highly centralized decision making,[42] in this case, the mechanisms adopted in the Linux-kernel development community set the boundaries where only certain decisions, such as official code release, are made centrally and others, such as design decisions, are made locally with full control in each module. Additionally, an evolutionary process acts out through the two-tier structure, where the core select the variations generated from the periphery, as well as the parallel development structure, where more innovative experimentations are conducted separately from, but at the same time with, more stable refinements.

These structures together show that the Linux kernel development community can be characterized as a system that has many smaller modules and each module operates on an implicit two-tier structure. This system is highly flexible and scalable because each module is an organic subsystem, where individuals perform their tasks "in the light of their knowledge of the tasks of the [community] as a whole."[43]

Fred Brooks identified a positive correlation between organizational size and the delay in time to market, typically known as "Brooks's Law."[44] Our analysis, however, shows this correlation is moderated by the tasks assumed by the additional developers. What is critical is where the new developers are added, and what types of developers are added. Brooks reasoned that the complexity and communication cost of a project increase with the square of the number of developers, but the amount of work done only rises linearly. In the case of the Linux kernel, adding more members to "the bug reporting team" in a module neither interferes with the activities in other modules nor increases the complexity of the module or the system. Moreover, communication cost is lower with the Internet and Web-based applications (something understandably not predicted by Brooks) where a mailing list mediates many-to-many communications. In short, the structural features of this system as shown help the Linux kernel development community accommodate increasing scale and diversity.

THE OPEN AND EVOLUTIONARY PRODUCT DEVELOPMENT PROCESS OF THE LINUX KERNEL

As discussed in the previous section, the two-tier structure of the Linux kernel development community embodies an evolutionary process where the core selects and rejects the many variations generated from the periphery, and retains the useful additions in the next official code release.

A key step connecting the process of generating variations to that of selecting is peer review, under which improvements are made continuously and incrementally. As suggested in the MAINTAINERS file, "Always test your changes, however small, on at least four or five people, preferably many more." Peer review shifts quality control from a downstream detection process to an upstream prevention process by testing code at the level of initial and small changes, when bugs can be more easily observed. This is consistent with what we know about organizations that achieve the highest quality.[45,46] A collective learning process takes place in the knowledge such interactions can provide. As such, the product development mechanisms of Linux kernel development exemplify the process of incremental, continuous improvement, a critical theme in high quality and learning organizations.

Torvalds described peer review in the Linux development community as not only an evolutionary process, but also an open process[47]:

> Common mistake: peer review does *not* mean that the code should be looked at by the same people who write it. Peer review is meaningless under those circumstances. The whole point of getting peer review is to find different people who have a different background to look at your code . . .

Peer review is an open process, under which all the changes to the source code and critiques are publicly available for reference and debate. The openness of the development process allows participants with different backgrounds to review changes to the source code. By having many different peer developers review the posted code, the original developer(s), who may overlook certain glitches or lack the experience to solve the problems, gain extra sets of eyes to catch mistakes, identify problems, and improve quality. It leverages the diverse background and work experience of many developers, who in aggregate have a broader set of tools to perform bug identification, characterization, and elimination.

One way to encourage peer review is to increase product release frequency and shorten the product cycle. The sooner the feedback is incorporated, the more developers are encouraged to contribute. As such, quick responses keep developers engaged—embodying, therefore, a basic principle of reinforcement theory.[48] Compared to commercial software, Linux is a continuously evolving product of a higher update frequency (see Table 9.3). Most commercial software companies release their products and/or follow-up upgrades only every few years and the releases are often delayed. Although commercial firms use daily build to update progress, the released information is only circulated in the firm internally. (In daily build, every file is compiled, linked, and combined into an executable program every day, and the program is then put through a "smoke test," a relatively simple check to see whether the product "smokes" when it runs.)

The Linux kernel development process is one of continuous improvement with none of the releases ever being final. In one of the e-mail discussions on the Linux kernel mailing list in August 1999, Linus Torvalds elaborates the merit of letting "people see what's going on" and argues forcefully for the importance of frequent submission of small patches with incremental change. He wrote:

> *The point of open development is that people see what's going on* (emphasis in original). You don't get that if people see just the end result after a year. *You want to have random people just see small updates—because they will often catch silly mistakes.*[49] Now, with huge mega-patches, people just go numb. . . . With the regular

Table 9.3 A chronology of stable releases.

Version	Starting-Ending Releases	First-Last Release Date	Release Frequency
1.0	Linux-1.0.	12-Mar-94	
1.2	Linux-1.2.0 : Linux-1.2.13	6-Mar-95 : 1-Aug-95	14 releases in 5 months
2.0	Linux-2.0.0 : Linux-2.0.38	8-Jun-96 : 25-Aug-99	39 releases in 40 months
2.2	Linux-2.2.0 : Linux-2.2.16	25-Jan-99 : 7-Jun-00	17 releases in 18 months
2.4	Linux-2.4.0-test1 : Linux-2.4.0-test7	25-May-00 : 23-Aug-00	7 releases in 3 months

> "let's release this as it is developed" support, there have been Web sites with commented patches, people who read the incremental stuff and comment on stupid things [that] I and others do.[50]

This approach exemplifies the continuous improvement model.

Our analysis shows that the project leader and maintainers select conservatively among submitted patches and bug fixes to incorporate into official releases. Only 23 percent of the Linux kernel survey respondents report ever having their submitted patches selected to be a part of an official kernel release. On the one hand, that suggests the robustness of the existing product. On the other hand, it might suggest that the product development efficiency seems to be rather low. Seventy-seven percent of the contribution seems to have been wasted. However, in an open peer review process, the rejected submissions provide a fertile ground for developers, both the contributing authors and other community participants, to learn what the required acceptance criteria are for further improvement. This distinctive practice creates a public forum to learn from peer review comments posted to the mailing list on how to improve their work.

Since the first release of Linux, our analysis shows that there has been on average one new version of the system released every week. Tables 9.3 and 9.4 show a chronology of the official code release frequency for the stable version and the experimental version of the Linux kernel source code, respectively. Between the two parallel versions, the experimental one has a much shorter cycle than that of the stable one. In 1996 alone, the experimental version had 80 official releases while the stable version had nearly 30.

This almost continuous stream of releases stands in stark contrast to the very controlled and highly spaced rate of release of new versions of commercial software. These differences get reflected in the ongoing controversy over "security holes." There is a great deal of debate over how software bugs should be disclosed to the public and fixed. Vendors say that they

Table 9.4 A chronology of development releases.

Version	Starting-Ending Releases	First-Last Release Date	Release Frequency
1.1	Linux-1.1.13 : Linux-1.1.95	22-May-94 : 01-Mar-95	83 releases in 11 months
1.3	Linux-1.3.0 : Linux-1.3.100	11-Jun-95 : 09-May-96	101 releases in 11 months
2.1	Linux-2.1.0 : Linux-2.1.132	30-Sep-96 : 22-Dec-98	133 releases in 27 months
2.3	Linux-2.3.0 : Linux-2.3.51	11-May-99 : 10-Mar-00	52 releases in 10 months
pre-2.0	Linux-pre2.0.1 : Linux-pre2.0.14.	11-May-96 : 05-Jun-96	14 releases in 1 month
pre-2.2	Linux-2.2.0-pre1 : Linux-2.2.0-pre9	28-Dec-98 : 20-Jan-99	9 releases in 1 month
pre-2.4	Linux-2.3.99-pre1 : Linux-2.3.99-pre9	14-Mar-00 : 23-May-00	9 releases in 2 months

Note: The releases are numbered using a hierarchical numbering system where the first number denotes a major version, and the second number gives the version tree in question. The stable releases have even version numbers (for example, 2.0, 2.2, 2.4) and the development releases have odd version numbers (for example, 2.1, 2.3).

must be given enough time to fix a problem before its disclosure alerts hackers to its vulnerability. Security researchers, however, prefer to get information to users as soon as possible to pressure software makers to come up with a patch (fix).[51] These concerns are of a lesser magnitude with Linux than with commercial software. Linux software does, of course, experience security vulnerabilities, but in the words of one user: "the Linux community is far more responsive than traditional operating system vendors when security issues have cropped up. Linux fixes and patches are issued quickly and publicly."[52] The MITRE report takes an even stronger position concluding that the ability to change and fix security holes quickly in the face of new modes of cyberattack "is intrinsic to the open source approach and generally impractical in closed source products."[53] Open source products have the notable security advantage that their source code is always available for detailed inspection and analysis. Commercial products generally have less incentive for modifying the code base.[54]

CONCLUDING COMMENTS

In this paper, we provide empirical evidence from our analysis of the process of Linux kernel development to capture the essential conditions

enabling Linux to perform as a robust, high-quality product. Beyond the enabling framework provided by OSS licensing, additional factors are critical to successfully develop products of superior quality and performance. The essence of the OSS development is that a diverse set of talents is mobilized and coordinated through both formal and informal structures. Among these structures, modularity, the use of two parallel code trees, and the two-tier development structure facilitate the incremental and continuous improvement of the product's reliability and add innovative features through an open and evolutionary peer review process.

ENDNOTES

1. The kernel of the operating system schedules tasks, which include the execution of end-user applications (for example, Web browsers, word processors, and database management systems) by allocating the computer's system resources to the programs in execution. To end-user applications, the kernel is a housekeeping unit that handles process management and scheduling, interprocess communication, device input/output, and memory management for the operating system. To underlying hardware, the kernel converts operating system calls into lower-level hardware programs through hardware-specific drivers.
2. The Internet Operating System Counter, http://www.leb.net/hzo/ioscount/index.html.
3. A. Ricadela, "The Challenge That Is Linux," *InformationWeek.Com* (6 May 2002): 2.
4. MITRE, *Use of Open Source Software in the U.S. Department of Defense* (Washington, D.C.: MITRE Corp., 2002).
5. M. Hayes, "Quality First," *InformationWeek.Com* (20 May 2002): 3.
6. Ricadela, "Challenge That Is Linux," 3.
7. A. Ricadela, "Open for Business," *InformationWeek.Com* (6 May 2002): 4.
8. P. McDougall, "Businesses Turn to Open Source Systems as Vendors Add Offerings," *InformationWeek.Com* (11 February 2002): 1–3.
9. D. Garvin, *Managing Quality* (New York: The Free Press, 1988): 49–50.
10. We are indebted to Terry Bollinger of MITRE Corp. for stimulating the following analysis.
11. These observations were made by Gregory H. Watson, quality consultant and former president of the American Society for Quality.
12. See J. M. Juran and A. B. Godfrey, *Juran's Quality Handbook*, 5th ed. (New York: McGraw-Hill, 1999).
13. B. Behlendorf, "Open Source As a Business Strategy," *Open Sources: Voices from the Open Source Revolution*, eds. DiBona, Ockman, and Stone (Sebastopol, CA: O'Reilly & Associates, 1999).
14. J. Moon and L. Sproull, "Essence of Distributed Work: The Case of the Linux Kernel," in *Distributed Work*, eds. P. Hinds and S. Kiesler (Cambridge, MA: MIT Press, in press).

15. M. Markus et al., "What Makes a Virtual Organization Work?" *Sloan Management Review* (2000): 13–26.
16. M. Zbaracki, "The Rhetoric and Reality of Total Quality Management" (Ph.D. diss., Stanford University, 1994).
17. E. S. Raymond, "The Cathedral and the Bazaar," *First Monday: Peer-Reviewed Journal on the Internet* (1998).
18. ———. *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (Sebastopol, CA: O'Reilly & Associates, 1999).
19. D. Hamilton, "Finally Microsoft Finishes Windows 2000," *Wall Street Journal*, 16 December 1999, B12.
20. See note 4.
21. Anyone has free access to the source code stored in a publicly accessible Web site called The Public Linux Archive at http://www.kernel.org/pub/ for free-of-charge download.
22. L. Torvalds, "The Linux Edge," *Open Sources: Voices from the Open Source Revlution*, eds. DiBona, Ockman, and Stone (Sebastopol, CA: O'Reilly & Associates, 1999): 111.
23. Only 28 maintainers are listed in the Credits file.
24. www.uwsg.indiana.edu/hypermail/linux/kernel/.
25. As of August 26, 2000, there were a total of 199,374 e-mails archived in the mailing list.
26. www.linux.org/info/index.html.
27. We found that 14,535 people have sent at least one e-mail to the Linux kernel mailing list between 1995 and 2000 to participate in the discussion of Linux development. Since approximately 90,000 people have registered themselves as Linux users, we estimate 16 percent of the registered users participate as developers.
28. See note 15.
29. E. S. Raymond, "Homesteading the Noosphere," *First Monday: Peer-Reviewed Journal on the Internet* (1998).
30. J. Lerner and J. Tirole, "The Simple Economics of Open Source," *NBER* (working paper, 2000).
31. Raymond, "Homesteading," section 6 on the hacker milieu as gift culture.
32. See T. Veblen, *The Instinct of Workmanship and the State of Industrial Arts* (New York: Viking Press, 1914).
33. R. E. Cole, "Learning from Learning Theory: Implications for Quality Improvement of Turnover, Use of Contingent Workers, and Job Rotation Policies," *Quality Management Journal* 1 (October 1993): 9–25.
34. G. Lee and R. E. Cole, "The Linux Kernel Development: Cultural and Evolutionary Processes of Knowledge Creation" (working paper, University of California-Berkeley, 2002).
35. T. O'Reilly, "Ten Myths about Open Source Software," www.opensource.oreilly.com/news/myths_1199.html (1999).
36. N. Drakos, "Debunking Open Source Myths: Development and Support," www.gartnerweb.com/public/static/hotc/hc00088469.html.

37. N. Drakos and M. Driver, "Debunking Open Source Myths: Origins and Players," www.activestate.com/data/Gartner%20Group (2000).
38. "OOPS" differs very slightly from a bug. A bug exists when something (in the kernel, presumably) doesn't behave the way it should, either with a driver or in some kernel algorithm. When the kernel detects that something has gone wrong, it generates an oops message. So, oops is a specific case of a bug. A person can find a bug, but the kernel may not generate an oops message.
39. See note 35.
40. See note 36.
41. See note 37.
42. See J. Hage, "An Axiomatic Theory of Organizations," *Administrative Science Quarterly* 10 (1965): 289–320.
43. T. Burns and G. Stalker, *The Management of Innovation* (London: Tavistock, 1961): 5–6.
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47. "Code Freeze; ISDN Perennial Lateness," *Kernel Traffic*, Aug. 3, 1999–Aug. 10, 1999 (44 posts): Re: no driver change for 2.4?; http://kt.linuxcare.com/kernel-traffic/kt19990819_31.epl#9.
48. Quoted from an e-mail sent by Linus Torvalds to the Linux kernel mailing list in August 1999.
49. R. Steers and L. Porter, *Motivation and Work Behavior* (New York: McGraw-Hill, 1991): 88–89.
50. LINUXCARE, "Code Freeze: ISDN Perennial Lateness," *Kernel Traffic* (3 August 1999): 11.
51. L. Rosencrance, "Bug-Reporting Standard Proposal Pulled from IETF," *Computerworld* (21 March 2002): 1–3.
52. T. Weiss, "Users: Linux Security Flaws Won't Mar Linux," *Computerworld* (18 March 2002): 14.
53. MITRE, *Use of Open Source Software*, 53.
54. Ibid.

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10

Policy Deployment: Consensus Method of Strategy Realization

Gregory H. Watson

INTRODUCTION

Policy deployment has been called the secret weapon in the Japanese management system. It is the strategic direction–setting methodology used to identify business goals, as well as formulate and deploy major change management projects throughout an organization. It describes how strategy cascades from vision to execution in the workplace, including implementation details like performance self-assessment and management review. This chapter describes the relationship between strategy development and the organization's daily imperative to measure and manage its operations using a system that aligns the actions of its people to produce collaboration among the various business functions and processes to produce requirements for customers.

HISTORICAL DEVELOPMENT OF POLICY DEPLOYMENT

What were the circumstances under which policy deployment originated? Interest in strategy, market focus, and long-term, balanced planning were generated by visits of Dr. Peter F. Drucker to Japan in the early 1950s.[1] As a result of his teaching, "policy and planning" was added to the Deming Prize checklist in 1958. Bridgestone Tire Corporation first used *hoshin kanri*, the Japanese term for policy deployment, in 1965. In 1976, Dr. Yoji

Akao and Dr. Shigeru Mizuno were involved in the Yokagawa Hewlett-Packard (YHP) implementation of hoshin kanri as part of its pursuit of the Deming Prize. By 1982, YHP had used hoshin to manage a strategic change that moved it from the least profitable Hewlett-Packard division to the most profitable. This hoshin methodology was introduced to the rest of Hewlett-Packard in 1985 as a lesson learned from the YHP Deming Prize journey. From HP, this methodology was transferred to other leading companies, including: Proctor & Gamble, Ford, Xerox, and Florida Power & Light, involving several advisors and counselors of the Union of Japanese Scientists and Engineers (JUSE). The work of the GOAL/QPC Research Committee also extended the managerial technology of policy deployment and was a key ingredient in introducing policy deployment across North America and, through multinational companies, into the world.[2]

FOUNDATIONS OF POLICY DEPLOYMENT

Mizuno defined hoshin kanri as the process for "deploying and sharing the direction, goals, and approaches of corporate management from top management to employees, and for each unit of the organization to conduct work according to the plan." Hoshin kanri is a comprehensive, closed-loop management planning, objectives deployment, and operational review process that coordinates activities to achieve desired strategic objectives. The word *hoshin* refers to the long-range strategic direction that anticipates competitive developments, while the word *kanri* refers to a control system for managing the process.[3]

Hoshin does not encourage random business improvement, but rather focuses the organization on projects that move it toward its strategic direction. It builds strength from its relationship with the daily management system that is focused on *kaizen*—continuous improvement. Hoshin seeks breakthrough improvement in business processes by allocating strategic business resources (both financial and human resources) to projects that balance short-term business performance with sustained improvement toward its long-term objectives. In a policy deployment management system, this two-pronged approach integrates operational excellence in the daily management system with the architectural design of its long-term future. This planning process contains two objectives: (1) *hoshin*, the long-range planning objectives for strategic change that allows an organization to achieve its vision, and (2) *nichijo kanri*, the daily, routine management control system (or daily management system) that translates the strategic objectives into the work that must be accomplished for an organization to fulfill its

mission. The blending of these two elements into a consensus management process to achieve a shared purpose is the key to success for the policy deployment process. In a hoshin planning system, strategy is observed through the persistence of its vision—how it is deployed across cycles of learning in improvement projects that move the performance of the organization's daily management system toward its direction of desired progress.

The fundamental premise of policy deployment is that the best way to obtain the desired result for an organization is for all employees to understand the long-range direction and participate in designing the practical steps to achieve the desired results. This form of participative management evolved and was influenced by the Japanese refinement of Drucker's management by objectives (MBO) through the birth and growth of the quality circle movement. In order for workers to manage their workplace effectively, they must have measures of their processes and monitor these measures to assure that they are contributing to continuous improvement as well as closing the gap toward the strategic targets. Policy deployment became the tool that Japanese business leaders used to align the work of their front-line organizations to the strategic direction of their firm. When HP first implemented hoshin planning, many of its business leaders explained how it worked by calling it "turbo-MBO."

Policy deployment links breakthrough projects that deliver the long-term strategic direction to achieve sustainable business strength while at the same time delivering an operating plan to achieve short-term performance. The methods of policy deployment anticipate long-term requirements by focusing on annual plans and actions that must be met each year to accumulate into long-term strength. Policy deployment processes begin when senior management identifies the key issues or statements of vulnerability, where improvement will have its greatest impact on business performance. This perspective is an essential starting point for policy deployment. As Dr. Noriaki Kano of the Tokyo Science University points out, without direction "the ship would be rudderless." The communication of the focus area or theme for improvement provides a cohesive direction to assure alignment of the entire organization and to build consensus among the management team on business priorities.

Hoshin helps to create the type of organization that William McKnight, former CEO of 3M, expressed as his desire: "an *organization* that would continually self-mutate from within, impelled forward by employees exercising their individual initiative."[4] In short, an organization where creativity is managed through a combination of self-initiated continuous improvement projects with engaged teams that combine individual capabilities to achieve strategic projects that make a difference on the larger organizational scale. How does this change management process work at the front line, where

these strategic hoshin projects engage the routine work processes of the organization? Typically, policy deployment is coupled with a measurement system (either a customer dashboard or balanced scorecard).

Perhaps the reason hoshin kanri took hold within Hewlett-Packard is that this methodology demonstrated its ability to translate the qualitative, directional, or strategic goals of an organization into quantitative, achievable actions that focus on fundamental business priorities achieving significant competitive breakthroughs—in short, the leaders at HP recognized hoshin kanri as MBO done right![5] The extension of this methodology beyond HP to other leading firms came about because HP was recognized as possessing a best practice for linking its strategic direction with its operational management systems.

DAILY MANAGEMENT SYSTEM

Policy deployment uses a systems approach to manage organizationwide improvement of key business processes. It combines the efforts of focused teams on breakthrough projects with the efforts of intact work groups who continuously improve the performance of their work processes. All change occurs in projects that accomplish those changes necessary to achieve stretch business objectives that assure sustained success for the organization. Policy deployment systematically plans ways to link strategic direction with those business fundamentals that are required to run the business routine successfully. Policy deployment allows management to commission change projects for implementation and to review the implementation of a system of projects and thereby to manage change. It seeks opportunities disguised as problems—and elevates those high-priority changes required for the improvement of the daily management system and work processes into business change objectives that are accomplished as hoshin projects.

Routine operation of the daily management system requires a foundation in management by fact, or the combination of business measurement with statistical analysis and graphical reports that illustrate the current state of performance and historical trends, and is able to extrapolate trends through statistical inference. A key ingredient is the business fundamentals measurement system that includes the set of basic process results measures that are monitored at control points within the organization where the flow of its throughput can be managed based on the requirements that are driven (using a pull system) by the customer requirements. This measurement system should include both predictive and diagnostic capabilities.

Hewlett-Packard embedded its daily management system into a work process measurement system that they initially called “business fundamentals

tables." Other companies refer to the set of measures that translate strategic goals into operational measures of work (in units such as quality, cost, and time) as either a customer dashboard or a balanced scorecard. These systems are used to monitor the daily operations of a business and to report to management on the progress of the process of developing and delivering value to customers. This measurement process must operate in close to real time to permit process owners to take appropriate corrective action that will limit the "escapes" of defects, errors, or mistakes to external customers. Such measures of core work processes are called *business fundamentals* because they must operate under control for the business to achieve its fundamental performance objectives.

These measures must also be captured at the point where control may be exercised by process operators in order to adjust the real-time operation of the process and assure meeting the customer's performance requirements on a continuing basis. As the great Dutch architect Mies van der Rohe once observed, "God is in the details." It is in these details that businesses must effectively operate. A daily management system defines the details of an organization's operations. Thus, the measurement and the point at which it is both monitored and controlled are parts of the daily management system, and at this point they must be related to their contribution to deliver organizational performance objectives. In the language of Six Sigma, a "business Y" (such as *profitable growth*) that must be achieved is the strategic goal, while a "process X" (such as *creditworthy customers*) delivers this performance in the transfer function $Y = f(X)$ and is therefore a business fundamentals measure in the daily management system.

Collins and Porras point out that leading companies stimulate progress through *evolutionary progress,* where the word "evolutionary" describes progress that resembles how organic species evolve and adapt to their natural environments. Evolutionary progress differs from the big hairy audacious goals (BHAG) of strategic progress in two ways. First, whereas BHAG progress involves clear and unambiguous goals ("We are going to climb *that* mountain"), evolutionary progress involves ambiguity ("By trying lots of different approaches, we're bound to stumble onto something that works; we just don't know ahead of time what it will be.") Second, whereas BHAG involve bold discontinuous leaps, evolutionary progress begins with small *incremental* steps or mutations, often in the form of quickly seizing unexpected opportunities that eventually grow into major—and often unanticipated—strategic shifts. Evolutionary progress represents a means to take advantage of unplanned opportunities for improvement that are observed at the point of application—the daily management system. The accumulation of many evolutionary improvements results in what looks like part of a brilliant overall strategic plan.[6] Both types of change are

needed to stimulate the organic growth of an enterprise. If an organization can make improvements in the "right X's," then it will improve its performance on the critical business Y.

CHOOSING STRATEGIC DIRECTION

Hoshin kanri is the process for choosing strategic change. In most firms, this process is called *strategic planning.* Proposed changes are usually identified to either increase the competitive performance of a process or to create the competitive "attractiveness" of a product to its targeted market. Strategic choice in both dimensions is essential in order to have a globally competitive organization. As pointed out by Dr. Hiroshi Osada, many Japanese companies have not paid enough attention to the critical aspects of strategy formulation as they have to the deployment of their strategy using hoshin kanri. This leads to an error of effectively deploying a poorly chosen strategy. When management confuses the mechanistic aspects of policy deployment with its own crucial obligation to establish strategic direction, then they create a grievous error that is truly an abrogation of leadership. An organization may effectively deploy management's strategic choice; however, if the choice of strategy is not carefully directed it will not lead to improvement.[7]

Osada notes that in traditional Japanese management systems, ideas flow "bottom-up" from the workplace to the management. However, in policy deployment there is also a top-down approach to planning change. As Osada comments, policy deployment "is a simple tool for effectively deploying a given policy, and has therefore been broadly adopted by Japanese industry. It does not aid in policy formulation. Even when employing MBP, therefore, the question of whether or not a given policy is appropriate will remain. It is thus possible for an inappropriate policy to be effectively deployed—to a counterproductive effect."[8] Strategic direction must be determined by discovering the alternatives for achieving the organization's vision and choosing the direction that will accomplish it. This direction is modified through the power of the incremental change to act as the "rudder" that steers the ship by making "finely tuned" changes to the general direction of the strategy.

What are the essential ingredients in choosing strategic direction? This process of management integrates strategic planning, change management, and project management with the performance management methods that focus on delivering results. Some specific subprocesses include:

- Identifying critical business assumptions and areas of vulnerability
- Identifying specific opportunities for improvement

- Establishing business objectives to address the most imperative issues
- Setting performance improvement goals for the organization
- Developing change management strategies for addressing business objectives
- Defining goals project charters for implementing each change strategy
- Creating operational definitions of performance measures for key business processes
- Defining business fundamental measures for all subprocesses to the working level

Once a strategy has been set, the next challenge is to align the strategic direction with the work that is being performed in the daily management system.

ALIGNING OPERATIONS WITH STRATEGIES

A critical challenge for organizations is to align their strategic direction with their daily work systems so that they work in concert to achieve the desired state. Alignment must include linking cultural practices, strategies, tactics, organization systems, structure, pay and incentive systems, building layout, accounting systems, job design, and measurement systems—*everything*. In short, alignment means that all elements of the company work together much like an orchestra leader integrates the various instruments to conduct a coordinated symphony. Organizations that apply the most mature aspects of policy deployment do not put in place any random mechanisms or processes, but they make careful, reasoned strategic choices that reinforce each other and achieve synergy. These organizations will "obliterate misalignments." If you evaluate your company's systems, you can probably identify at least some specific items that misaligned with its vision and impeded progress. These "inappropriate" practices have been maintained over time and have not been abandoned when they no longer align with the organizational purpose. "Does the incentive system reward behaviors inconsistent with your core values? Does the organization's structure get in the way of progress? Do goals and strategies drive the company away from its basic purpose? Do corporate policies inhibit change and improvement? Does the office and building layout stifle progress? Attaining alignment is

not just a process of adding new things; it is also a never-ending process of identifying and doggedly correcting misalignments that push a company away from its core ideology or impede progress."[9]

SYSTEM FOR MANAGING BY POLICY (MBP)

Instead of referring to this system with the historical term of *policy deployment*, a much more descriptive term should be used to define the entire management system that is built around the ideas of policy deployment—*managing by policy (MBP)*. MBP recognizes business change initiatives, selects goals for change, identifies the critical performance measures, defines projects that deliver these goals, and allocates resources to assure project completion. It combines both the "target and means to achieve the target" into a consensus-generating management decision-making process. Improvement targets are described using four elements: a performance measure to be improved, direction and rate of improvement desired, targeted improvement magnitude, and timeframe for achievement of the target. A means to achieve the target describes a set of specific actions that will be taken to deliver desired results. These means may differ across the organization, based upon the initial, local management self-assessment or "current state analysis" that is conducted to assess the business area's starting point for change, and determine the magnitude and nature of the performance gap to be closed by the change management or 'hoshin' project in order to deliver the desired state condition.

There are five elements in an annual MBP plan:

1. Statement of desired outcome: a statement of an improvement theme to be accomplished
2. Metrics to measure progress: the measurement that describes progress toward a desired outcome (as expressed by the targeted value)
3. Target value: the value or level of the metric that you want to attain
4. Deadline date: a date by which the target value must be achieved
5. Means: a strategy (approach) to accomplish the target—what must be done to achieve a desired result or outcome (the target value)

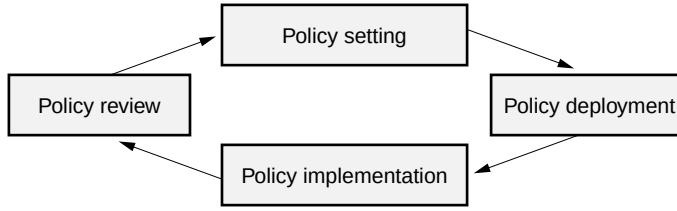

Figure 10.1 The management by policy system.

As Peter Drucker once commented, "for full effectiveness all the work needs to be integrated into a unified *program for performance*."[10] The program for performance is designed by the top management team to provide a specific, effective course of action to achieve its desired results. In order to achieve these results, then all the dimensions of the business must be consistent with each other. This is the job of the policy deployment system that we will call managing by policy.

The management by policy system consists of *kanri*, or control mechanisms, that deploy business policy through four essential steps, which will execute management's program for the business direction to achieve hoshin project objectives within the constraints of assigned resources. These four steps are: policy setting (or establishment of hoshin projects), deployment (or propagation of these projects throughout the organization), implementation (or integration of the results of change into the daily management system), and review (or assessment of the results achieved from the process). These four steps will be described in the next four sections of this chapter (see Figure 10.1).

Policy Setting

Policy setting is the step in an MBP system where top-down management conducts "strategic dialog" with employees to collect ideas and opinions about chronic major problems and (the employees') aspirations regarding the business future, and then processes this information in conjunction with environmental data analysis and scenario analysis to formulate the annual business change objectives (which some organizations call their hoshin projects): strategic change projects (identified by both targets to be achieved and means for achievement). In this MBP phase, organizations recognize which are the most critical projects that must be accomplished in order to eliminate vulnerabilities or capture the benefits from potential change initiatives or newly emerging improvement opportunities. For MBP

to succeed, the organization must undergo a rigorous analysis of both its fundamental work processes, to identify business imperatives (things that must change), and its strategic direction, to determine potential business vulnerabilities from competitive, economic, or technological changes.

MBP structures the application of continuous improvement into both its strategic and operational dimensions. David Packard incessantly used the term "continuous improvement" beginning in the early 1940s; it is not a new term. But as Collins and Porras describe the adaptation of MBP to leading companies that have adapted to change, it is an essential structural ingredient in those companies: "Visionary companies apply the concept of self-improvement in a much broader sense than just process improvement. It means long-term investments for the future, it means investment in the development of employees; it means adoption of new ideas and technologies. In short, it means doing *everything* possible to make the company stronger tomorrow than it is today."[11]

Most organizations tend to operate using three levels of managerial thinking: enterprise-level thinking that focuses on the long-term viability of the organization; strategic-level thinking that focuses on products, markets, and customers; and operational-level thinking that focuses on the daily work required to deliver the output of the organization. Strategies align to these three areas of focus:

> Management strategies can be classified into three types—corporate strategy, business strategy, as well as functional and cross-functional strategy—depending on the level of the corporate organization to which they apply. The corporate strategy, which delineates the fundamental direction of the whole company, is certainly very important for realizing a management vision; but it would be no exaggeration to say that the success or failure of the corporate strategy is determined by the particular business strategies, since it is through these business strategies that the aims of the corporate strategy are actually implemented.[12]

The portfolio of specific strategies that any organization pursues must be managed to deliver the risk–benefit performance desired by the organization in order to achieve its desired results—whether for breakthrough results or just to incrementally improve in a specific business area.

How is such planning conducted? The corporate planning process should deliver increasing business brand value to balance financial risk and reward. This planning process consists of three elements: strategic planning, business planning, and functional planning that must all fit together in an integrated planning system. The strategic planning process is conducted at the enterprise level of the business thinking to identify which

business opportunities to exploit and how to sustain the ability of the organization to meet or exceed its annual performance objectives. The business planning process is conducted at the business level of thinking, and its objectives are to drive market share to accelerate financial payback, build customer loyalty, and decrease market risk. At the operational level of thinking, the functional planning process improves all process performance to reduce cost, cycle time, and defects while enhancing responsiveness to customers and delivering customer satisfaction.

A business strategy should deliver "visionary" performance: strategic planning is the persistence of a vision over the long term—and includes both vision setting and vision deployment, the first two steps in an MBP system. Performance management using MBP to provide the direction that guides individual plans is one way to assure that an organization keeps moving in the right direction. The more effective a plan for required change, then the more robust the organization's ability to accomplish its plan. Robustness is a function of the management team's ability to see beyond its operating horizon and understand what may occur in its planning horizon that requires its focus and attention today.

What is a planning horizon? It is the distance that an organization "sees" into the future in order to study and understand the potential impacts of events on its policies and prepare it for evolving situations that may impact its performance. In general, organizations have four distinct planning horizons:

• *Business foresight.* Managing for the long term to assure that the organization is not surprised by changes in the assumptions that it has made in the design of its business model and product line strategy (focusing on a three- to ten-year business outlook).

• *Strategic direction.* Managing changes in technology and competitive dimensions for the intermediate term to assure that vulnerabilities in the business model are not exploited and to bridge the chasm that may exist between product line introductions (focusing on the next three to five years of business operation, depending on the degree of change that is anticipated in the business environment).

• *Business plans.* Managing the short-term fluctuations of the market—a planning horizon that delivers against short-term fluctuations in demand or supply (focus on quarterly and annual operating plans).

• *Business controls.* Managing the current state of a business—a planning horizon that delivers today's performance and assures rapid responses for corrective actions required to sustain advertised service levels (focus on the daily/weekly/monthly/quarterly operating plans).

How is strategic policy formulated? Strategic direction is best established using cross-functional dialog to capture all the inputs of the organization and to build a common direction based on the consensus of how organizational strengths overcome organizational weaknesses in the face of critical business threats to capture the most important market opportunities. Most organizations have just two kinds of strategic decisions: those that may be executed within the areas of direct oversight of top management (for example, personnel decisions, budgeting, merger, capital budgeting, and so on) and those that require cross-organizational collaboration for implementation. These cross-functional projects require special attention and project management in order to realize the objectives of the change initiative. Such change strategies that require mutual consent and collaboration are ideal for a policy deployment system. In addition to planned continuous improvement that is a result of problem solving, continuous improvement may also result from process management, whenever a process is consciously enhanced over time.

Osada encourages strategic engagement of all employees through:

- "Recognition of product life stage (product lifecycle analysis)
- "Objective analysis of business and product position (positioning analysis)
- "Analyzing competitiveness (competitive analysis)
- "Perceiving strengths and weaknesses of products (S-W-O-T analysis)
- "Forecasting future competitiveness using time series data (time series analysis)
- "Maintaining transparency through visualization (visual method); involving all employees"[13]

Osada encourages the use of seven strategic tools (the S-7 tools) in policy setting. These are:

1. Environment analysis
2. Product analysis
3. Market analysis
4. Product-market analysis
5. Product portfolio analysis (or PPM for product portfolio management)
6. Strategic elements analysis
7. Resource allocation analysis[14]

But, all of these tools and methods are employed as preconditions for strategic planning in the MBP approaches of Western organizations, where they link the three planning systems (strategic, business, and functional) with the business and environmental assessment analyses that precede strategic decision making. While this linkage may be a bit weaker in Japanese firms, such issues do not appear to be a critical shortfall in Western firms. However, without complete integration of these planning processes it is difficult to obtain the degree of effectiveness in deployment of shared resources that permits breakthrough achievement to occur. What is breakthrough achievement in management? Breakthroughs represent at least an order-of-magnitude change in performance that is accomplished over a relatively short period of time. Such a breakthrough is achieved by first developing a capability to choose the right objectives for planned change. This requires two factors: identification of what to change and the timing of when to change it. The job of top management is to decide: Which lever of change must be pulled in order to accomplish the desired result?

Other success factors that are significant in achieving breakthrough plans include the right action to achieve the desired state of change. Right does not mean comprehensive or exhaustive, but it implies a budgeting of energy that focuses an organization on catalytic actions that stimulate organizational response in the desired direction—applying a limited capital budget and the best people to accomplish those important objectives that have been personally developed for them to concentrate on. A second success factor in management of breakthrough projects is the capacity of an organization to convert objectives into results. Excellence comes from execution of plans, not just from planning. To execute, an organization must be mobilized to consolidate their energy and coordinate their actions to achieve shared objectives for the common good of the organization as an organism—a living entity that requires appropriate nourishment and execution of all its bodily functions. A third critical success factor for breakthrough management is the capacity of an organization to integrate specific improvements into standard operating practices that are consolidated across the entire organization for maximum leverage effect. This success factor is based on the existence of a business control management system that holds the gains from improvement projects and is able to assure that performance degradation does not occur—that people do not slip back into their "old way of doing things," but rather, embrace the new methods as their routine way of working. This success factor is addressed in an MBP system through the policy deployment and policy implementation steps.

It should be noted that breakthrough change projects can only be accomplished if the daily work processes are operating under reasonable

control. If a business is not operating under control, then the "breakthrough" activity should focus on bringing itself under control before making a significant investment in strategic change. When an organization's daily management system is operating under control, then more time is available for strategic change because management is not "fighting fires" or "expediting execution" of routine work. This observation can help the top management team to focus on the starting point of their MBP process by evaluating its readiness to accept strategic change into the operational system that the next steps of MBP will require.

In order to maximize business benefits of Six Sigma deployments, the organization's strategic direction-setting and follow-on implementation processes of MBP should be used to define the highest-priority business process improvement projects that require the degree of diagnostic sophistication that is available from a Black Belt analyst. Only when management chooses Six Sigma change projects that focus on improving the infrastructure of its business processes—typically work processes whose performance contributes to the common cause variation of the business performance—can the most significant gains be realized from a comprehensive Six Sigma improvement effort. How does management achieve this focus? The short answer is that management must put in place the methods to "recognize" their priority business improvement needs by linking their choice of Six Sigma projects to the strategic direction of their business so that the portfolio of projects offered to Black Belts drives the policy changes that are necessary to achieve the long-term performance objectives.

Some of the questions that must be addressed during policy setting include:

- What is our business and what results do we expect to achieve? How will we know that we have achieved these results? Is this the best we could do?
- What are our assumptions about society, the economy, market and customers, and technology and knowledge? Are they still valid?
- Has anything happened that would change the dynamics of our industry or markets?
- What would change mean for our business position?
- Are there any opportunities that we should anticipate and capitalize upon to our long-term advantage?
- Where should we choose to excel? Can we take action on this opportunity?

Policy Deployment

Whereas the policy-setting step of MBP sets organizational policy, the policy deployment step will then deploy changes in policy to the organization to achieve the desired results of the policy by changing the way that effective work is accomplished in the daily management system.

How are the *hoshin*, or strategic change objectives, deployed? Policy deployment is the heart of the MBP system and has received much attention due to the "catch-ball" approach that aligns the objectives of the organization and then balances work by resource leveling and prioritization of improvement activities. An implementation plan for a change project is a living document—it acts like a compass to guide an organization while allowing employees to take ownership by participating in choices that define the reasoning behind the project as well as the steps in the project's execution. Change projects can identify two types of improvement effort—either by a breakthrough project or a continuous improvement project—to change the way work process activities operate.

Breakthrough activities are strategic change projects that make a significant shift in the organization's capability to perform routine operational work processes or deliver products (either goods or services) to the marketplace. Work process continuous improvement (*kaizen*) activities are part of a daily management system that defines how work is accomplished. The *kaizen* change activities are the responsibility of all work process owners. (Note that MBP provides a guideline for pursuit of major improvements, while small incremental or continuous improvements are made through the regular course of daily routine work.) The distinctions between these two types of activities are twofold: first, more of the organization's resources are focused on breakthrough projects and, second, accomplishment of a breakthrough project usually occurs over a multiple-year period (or as a series of coordinated improvement projects). One important management consideration in choosing breakthrough projects is that the combination of all the annual breakthrough projects (also called the portfolio of change projects) will define the steps that an organization chooses for accomplishing strategic change in the range of its mid-term planning horizon (one to three years).

In order to achieve "saturation" of policy (which consists of both targets and the means for their achievement)—or deployment of the change projects throughout the whole organization that is affected by the defined policy change—and assure collaboration of all the affected work groups, the objectives cascade of an action plan for a particular improvement project must involve not only functional deployment of policy but also its cross-functional aspects. It is across the functional seams of an organization

where most significant difficulties are encountered, and these boundaries represent focus areas for management to assure continuous collaboration in the execution of change projects and consensus among the various functional organizations that engage all the decision-making managers in the areas where the change will have a direct effect. To understand the difficulty that the boundary condition dynamics have, consider what happens as change is managed when organizations shift work activities from internal to external units (for example, from internal manufacturing to an external contract manufacturer). At such boundary conditions, conflicting objectives and political issues of the organizations often can interfere with performance improvement work, and it is the job of the management team to eliminate any such barriers to the success of their project team.

Catch-ball is the process that is used to build a consensus through dialog about the targets and means to achieve the change. This process is data-driven and uses tools that permit management by fact. Catch-ball links annual change projects to mid-range and long-term plans—deployment prior to annual fiscal year commencement, incorporated into target setting, and annual employee objectives cascade; coordinated both vertically within functions and horizontally across processes and negotiated across the processes to allocate resources (competence, funding, and equipment) to achieve the shared and agreed-upon objectives. The catch-ball process includes four activities:

1. Building alignment through linked cascade of means
2. Setting business performance targets and objectives
3. Cascading business objectives to the workplace (*gemba*)
4. Achieving alignment of improvement and effective resource allocation

Policy deployment in MBP is a structured, systematic, and standardized process. This step has an ability to empower organizations for achieving strategic change. Policy deployment consists of several key elements that assure an organization is properly and fully engaged in change projects. These elements are defined in the following list:

• *Policy.* A general rule or operating principle that describes a management-approved process to approach a business condition or situation based on how it chooses to control its work and manage risk. Once the right policy has been determined, then the organization can handle similar situations with a pragmatic response by adapting its policies to the concrete situation that it faces. Truly unique business situations, that run counter to the critical business assumptions, require the full attention of the senior

management team to evaluate how these situations challenge the boundary conditions of the business model and threaten its operations policies with externally imposed change. Policies consist of targets and means.

• *Target*. The measurable results that are to be achieved within a specific timeframe for performance. Targets have checkpoints.

• *Checkpoints.* A measurement point that is used to evaluate an intermediate state in the policy deployment process to demonstrate that progress is being made. The data collected at a checkpoint can be reported to management in interim project status reports. The checkpoint of one process is the control point of the next process—the checkpoints and control points work together to formulate a "waterfall" that cascades across the implementation plan flow and is part of the business measurement system.

• *Check items.* Process or project variables that are evaluated in order to enable organizations to understand the causes that contribute to the outcome of a particular policy.

• *Means.* The sequence of actions that an organization will take to implement a policy or choice of the management team that is an outcome of the strategic direction setting process. Means have control points.

• *Control points.* A point in the sequence of work activities where corrective action may be taken or countermeasures put in place to resolve a concern or issue that has been identified at a checkpoint.

• *Control items.* Verify whether results agree with the established goals—does the work demonstrate progress in accomplishments that will enable the final achievement of targets?

• *Deployment.* The process of engaging the entire organization in an appropriate participation in the strategic direction, both vertically (within functional areas) and horizontally (across the functional areas), by creating shared ownership of the implementation actions. The entire system of deployment is "connected" from the long-term vision to the daily management activities. The plans are progressively more detailed as they are refined in deployment from the top levels of the organization to the frontline employees and teams. The plan is deployed through an organization by negotiating the means between management layers (levels) as well as across the functional departments. Targets are not negotiated.

• *Catch-ball.* The joint analysis process that encourages a strategic dialog between levels of organizational deployment. The means at one level become the desired outcome of the subsequent level. This cascading of targets and means establishes the linkage and alignment of objectives across

organizational levels. Mutual discussion between the parties—a two-way communication that is both top-down in general direction and bottom-up in adaptation to the workplace—uses the existing hierarchical management structure and matrix process structure to engage all parts of the organization in the dialog. This dialog is a negotiation process (see *nemawashi* and *sureawashi* below) that arrives at a collective wisdom to develop and refine the implementation plan.

• *Nemawashi* (negotiation). Prior consultation to achieve consensus. Similar to careful preparation of the roots of a plant for transplantation. Seeking to achieve *wa*, or harmony, creates consensus and absence of conflict.

• *Sureawashi*. The use of data makes the objectives cascade a fact-based process, not just a subjective negotiation process. Mutual consultation between levels tests the feasibility of plans using a progressive refinement process for conflict resolution. Measurement is the basis for establishing agreement and aligning the way that people work, as well as providing the foundation for conducting assessments of progress. This dialog is necessary to obtain buy-in and define achievable plans that middle managers are committed to implement.

• *Shibui*. A state of uncluttered, beautifully efficient austerity, the perfect balance or harmony (*wa*) between not enough and too much, used to describe the desired state or vision of the business system.

Peter Drucker quotes Roman law in order to focus management on the things that are most important: "*De minimis non curat praetor* [The magistrate does not consider trifles]."[15] This warning to management against what has been called *micromanagement* is a reason for senior executives to focus on the vital few issues that are critical in the business that they manage. If they don't take the time to manage these important things, then no one else will. If they choose to spend their time focused at the detail level of project execution, then they will squander a more effective use of their time on those vital activities that engage the higher thinking levels of the organization that cannot be reasonably delegated to others for effective action. Management must work the long term of the planning horizon in order to deliver sustained organizational strength. It must also review current actions to assure that short-term profitability is being achieved. But, whenever management spends more time on the short term than it does on the long term, then it sacrifices future strength in favor of current results—and displays to the entire organization its lack of trust in the ability of the organization to perform its daily work. This behavior signals to the entire organization that a crisis exists and reinforces stagnation as the workers

wait for the top management to intervene and make the decisions that are actually theirs to make. A very important benefit of an effective policy deployment system is delegation of appropriate decision rights to the proper place in the organization where the best information exists and where action will be taken to implement that decision.

Some of the questions that are addressed during the policy deployment step of MBP include:

- What are the consequences of not doing this project?
- What risks are inherent in this project?
- What would happen to the business if this project would not succeed?
- What would success in this project commit the business to?
- How does this project add to the total economic results of performance?
- Have we assigned our best people to work on breakthrough opportunities?
- Have we communicated clearly and taken into consideration all objections before chartering the project?

Policy Implementation

Policy implementation in an MBP system consists of the execution of the project plan—both the actions taken by the team involved in the change and the in-process management reviews. All change is implemented on a project-by-project basis according to the priorities established by management and the logical sequence for attacking each project. The project plan typically will use a Gantt chart to assign clear responsibility for each improvement item in the implementation plan and record its activity progress in accomplishing the project subtasks. Senior managers should also conduct regular progress reviews of each change project to monitor team progress in improvements, assure that the projects advance, and eliminate any possible barriers, roadblocks, or bottlenecks that restrict advancement of the project. In this phase of MBP, senior management also monitors the execution of the change projects that they sponsor to assure that these projects will make the desired improvement in the daily management system of work processes. If the management project review indicates that insufficient progress is being made, then they can assign countermeasures or reallocate resources so that appropriate corrective actions are taken to assure continued progress.

Another activity that occurs during the policy implementation phase of MBP is that management must publish information about change projects so that the entire organization is informed of the actions being taken to improve performance. This communication can help the organization to align other activities with progress being made on these strategically focused change projects. As a guideline for communication, management should inform all involved parties of any changes to the change project team's mission, vision of the outcome, guiding principles, or objectives. If the management team communicates effectively and often, then it will translate the planning rhetoric into action realities. As Peter F. Drucker observed: "The most time-consuming step in the process is not making the decision, but putting it into effect. Unless a decision has degenerated into work it is not a decision; it is at best a good intention."[16]

Some of the questions addressed during the policy implementation step of MBP include:

- Have we placed the right people in the right jobs to give the project the best opportunity to succeed?
- Does this project team have everything that it needs to get the job done?
- Are all the people who need to know about this project being informed?
- Are all the right actions being taken across the organization to assure success?
- Is this project implementation the best utilization of the knowledge and ability of the organization's people?
- Does this project implementation make the best overall contribution from use of the organization's limited resources (people, time, and money)?

Policy Review

Toward the completion of the annual change projects, the results of the project implementation efforts are evaluated to determine completion rate, performance against targets, shortfalls from expected performance, and causes for both under- and overachievement. Specific action must be identified to compensate for performance deficiencies and prevent recurrence of such problems in future change management projects. Diagnosis of the performance of the policy planning process is conducted to drive improvements in planning systems. "Feedback has to be built into the decision to

provide a continuous testing, against actual events, of the expectations that underlie a decision."[17]

Policy review is conducted in two ways: through management self-assessment, both by senior management as well as by local managers reviewing their activities to determine where they have opportunities for improvement (either performance enhancements or problem resolution), and through operating reviews of the results produced by the local organization, in which senior managers identify areas where results are not aligned with expectations for performance. Policy review applies two subprocesses to perform these duties: performance review and business measurement.

Aligning Objectives through Performance Review

The review process in policy deployment seeks to identify conformance to plans (for example, is there any shortfall or overachievement in targets?). Once nonconformity is identified, then the root cause of the deviation is found in order to establish an appropriate response to the out-of-control type of condition. Both corrective actions and countermeasures are identified to realign the process and assure that process integrity and stability are achieved in the business control system. The actions taken in response to an out-of-control condition may be:

- Emergency countermeasures to alleviate the immediate issue, concern, or problem
- Short-term corrective action to prevent the specific problem from recurring
- Long-term preventive action to remove the root cause of the problem and mistake-proof the process, thereby providing a permanent solution for preventing the problem from recurring

MBP planning facilitates organizational learning by examining problem areas and critical success factors to discover what directional shifts need to be accomplished in order to achieve the desired end state or vision of the business. Strategy is the persistence of the vision, achieved one project at a time through exercising constancy of purpose in the business planning process.

MBP project reviews are conducted to determine the achievement of the organization relative to the following elements of its plan:

- Change project objectives
- Business planning objectives and corporate commitments

- Business improvement plans
- Economic plans and projections
- Customer requirements and expectations
- Competitive performance analysis
- Business excellence self-assessment

Questions addressed during this policy review step include:

- What results have been demonstrated from this project?
- Which results were expected and which results were unexpected?
- What does this project outcome do for customers?
- What have we done well that our competitors have done poorly?
- What have we done poorly that our competitors seem to have no problem with?

Business Control and Management Responsibility

The ultimate objective of management by policy is to establish a reliable organization that creates predictable results through the effective coordination of value-adding work that customers perceive as meeting their needs. In this environment, all employees are aware of their personal contribution to the objectives of the entire organization and are able to make local choices that are aligned with the strategic direction because they understand how the strategy affects their work and vice versa. To assure that these local decisions are aligned with strategic direction, it is the responsibility of the management team to develop a measurement system that provides employees with the visible line of sight from their work activities to their strategic direction contribution. In this measurement system, it is essential that causal linkages (for example, built on a $Y = f(X)$ transfer function) be established so that effective control can be executed at the local operating level.

BENEFITS OF MBP

MBP orchestrates continuous improvements with breakthroughs to assure that the organization attains its long-range goals. Those elements of long-range plans that can be achieved in a one-year period are identified and

become the focus or "vital few" goals to be achieved during that year. MBP plans change the way that daily management processes operate. Accomplishments of the MBP planning system include:

- Communicating the vision required for sustained success
- Identifying and choosing breakthrough activities or projects required for the vision
- Orchestrating the direction of an organization's change
- Developing plans and projects that support the business objectives.
- Aligning the organization's change efforts both vertically and horizontally
- Ensuring that the plan is effectively and efficiently executed
- Reviewing the progress in executing plans
- Changing plans as required to achieve targets
- Learning from the experience of planning and executing

"If you can think of new methods to preserve the core, then by all means put them in place. If you can invent powerful new methods to stimulate progress, then give them a try. Use the proven methods *and* create new methods. Do both."[18] The imperative for organizations that endure is to do both breakthrough improvement and evolutionary improvement—both change management and routine management—at the same time. This is what Collins and Porras call "the genius of *and*"—an inclusive approach to planning and executing change that requires organizations to embrace both aspects of change simultaneously.[19]

The most important thing about priority decisions that face a business is that they are made and communicated deliberately and conscientiously. In a system for management by policy, all of the important decisions are visible. There is an opportunity for dialogue to guide these decisions into the direction that the organization, as a whole, will find is influenced by the knowledge of all its members. In such a system, the key decisions that drive the organization toward its common goals are not made haphazardly, but with the full awareness of the organization. Such open decision processes elicit cooperation of the entire organization in the implementation and review of its activities to assure that it will be able to meet its desired outcomes. The responsibility of management is to put in place a system of decision making that generates this degree of collaborative work toward the common end.

CRITICISMS OF HOSHIN KANRI, POLICY DEPLOYMENT, AND MBP

Despite their application in many leading companies, MBP planning systems have been criticized for their mechanistic use of forms and templates that some see as restricting individual creativity. Some also believe that these planning systems lack strategic emphasis and do not engage the full organization as participants in strategy formulation. Osada summarizes shortcomings of policy deployment as observed in some Japanese companies:

1. "It is difficult for those at the middle management level and below to understand the process of formulating strategic policy. Compared with [the process for] policy deployment, the process of policy formulation is unclear [poorly understood and communicated] an indication of management's view that such form of communication is of little value.

2. "Strategic policy is ostensibly based on the long-term interests of the firm, but there is no way to judge whether a policy is appropriate or even truly 'strategic' [in the essential nature of the policy itself].

3. "Several problems in formulating a long-term strategic plan are not addressed, for instance:

   a. "Changes in operating environment and other uncertainties are not adequately accounted for; possible difficulties are therefore not foreseen.

   b. "Positioning of business is not perceived objectively. The question of whether business aims are optimum and clear is not addressed.

   c. "Only one part of the staff, at the top level, participates in strategic policy formulation; it is therefore difficult to judge whether a policy reflects the reality at the 'front line' of operations."[20]

It must be observed that not all of these objections are strongly negative. Organizations must ask if they really want frontline employees actively involved in formulating strategy. Nokia Mobile Phones uses a current state analysis for self-assessment of frontline operations and then rolls this data into their strategy-setting process. They also create a "strategic dialog" that builds participation of mid-level managers in conversations about strategy. Other organizations open communication lines through e-mail forums and internal surveys. In such instances, the objection is not critical to the total impact of MBP implementation. Additionally, any argument that says "every employee

should have an *interest* in matters of strategic policy" is a very different argument than saying that "every employee should be actively involved in *formulation* of business strategy." Satisfying employee interest in strategy can be addressed by improving communications. But, a broad involvement of employees in formulation of strategy increases risk of inappropriate public statements or inadvertent disclosure of the company's strategy in venues where competitors may discover sensitive information that can be used against the organization. Whenever this occurs, a company loses its competitive advantage. The challenge for management is to build a strong consensus without risking disclosure of their strategic direction to competition.

CONCLUDING COMMENTS

Policy deployment, or more specifically MBP, when it is coupled with a statistically based business measurement system, has been demonstrated to create a robust management process that engages an entire organization in the strategic planning process. It assures line of sight from the strategic goals of the organization to the operational tasks that workers perform at the front line as they do the work that produces the organization's goods or services. The nature of this process can be described using the term *robustness*—a statistical state in which a process is able to accept variation in its inputs without influencing the variation of its outputs. Such a process is capable of performing consistently—delivering consistent results according to its design intent. Because policy deployment engages the workforce to achieve the common goal of sustained success, it is a strategic tool for assuring sustained competitive advantage over both current and potential business rivals.

Sustained success must be "dynamic" to achieve its enduring state. That is, it must provide continuous advantage despite changes in the environment, regulatory shifts, technological breakthroughs, or competitive market. Anticipating potential actions by rivals is critical to delivering sustained success. To enjoy such sustained success, an organization must master the skills of priority setting and project management to assure that they effectively define and deploy the right initiatives that result in sustained success. Advantage means staying ahead of rivals, and this requires that organizations not only make continuous improvements but also use "breakthrough" opportunities to distinguish themselves in their marketplace as a differentiated provider of products and services. This type of management requires managerial competence in three areas: business vulnerability analysis, action planning administration, and operational excellence. The best implementations of policy deployment thus will fully engage the strategy-setting processes as well as the organization's change management process.

ENDNOTES

1. P. F. Drucker, keynote address, 56th Annual Quality Congress, 20 May 2002.
2. Y. Akao, ed., *Hoshin Kanri: Policy Deployment for Successful TQM* (Portland, OR: Productivity Press, 1991): xxx.
3. See note 2.
4. J. C. Collins and J. I. Porras, *Built to Last: Successful Habits of Visionary Companies* (New York: HarperBusiness, 1994): 156.
5. It must be noted that Peter F. Drucker initially discussed MBO in Japan in the mid-1950s. Drucker taught management concepts to the Japanese along with Dr. Joseph M. Juran and Dr. W. Edwards Deming. At that time Dr. Juran and Dr. Deming worked in the graduate management school of New York University under the supervision of Dr. Drucker.
6. Collins and Porras, *Built to Last*, 146.
7. H. Osada argues this point effectively in his article "Strategic Management by Policy in Total Quality Management," which appeared in *Strategic Change* 7 (1998): 277–87.
8. Ibid, 277.
9. Collins and Porras, *Built to Last*, 215.
10. P. F. Drucker, *Managing for Results* (New York: Harper & Row, 1964): 193.
11. Collins and Porras, *Built to Last*, 186.
12. Osada, "Strategic Management," 278.
13. Ibid, 279.
14. Ibid, 281.
15. P. F. Drucker, *The Effective Executive* (New York: Harper & Row, 1985): 156.
16. Ibid, 114.
17. Ibid, 139.
18. Collins and Porras, *Built to Last*, 216.
19. Collins and Porras, *Built to Last*.
20. See note 12.

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11

Six Sigma: An Evolving Stage in the Maturity of Quality

Gregory H. Watson

INTRODUCTION

Six Sigma was initially defined in 1983 by the late Motorola engineer Bill Smith, who used it as a practical means to quantify the business improvement strategy of CEO Bob Galvin: to improve the performance of Motorola by a factor of 100 over a five-year period. Motorola worked with a number of companies in the semiconductor industry through their participation in the Six Sigma Research Institute, headed by Dr. Mikel J. Harry, to define the methodology that would deliver this stretch performance objective.[1] CEO Larry Bossidy successfully applied the resulting methodology as a turnaround strategy for the AlliedSignal organization. After Jack Welch adapted the Six Sigma methods for General Electric, Six Sigma rapidly became a mainstream management methodology that has been applied at hundreds of organizations around the world. Why has Six Sigma taken such a successful journey? In the words of Jack Welch, "Six Sigma gives us a route to the business control function, the hardest thing to do in management." While Welch's statement focuses on one aspect of Six Sigma, there is much more to the initiative. Six Sigma provides discipline for executing a total quality management strategy in the areas of change management, problem solving, innovation (or the design of products and processes), and project management. It supports the fundamental business processes that operationally define an organization's mission with a methodology that links its individual change projects to the overall change management strategy, which is designed by management to deliver its vision.

WHAT IS SIX SIGMA?

The phrase *Six Sigma* has taken on several different meanings. As an overview, it is more of a business strategy than a quality program. Six Sigma improvements should be tied to an organization's corporate strategy and goals for business performance in order to achieve the maximum benefit from its analytical power. But, just what is Six Sigma? Consider the following four meanings of Six Sigma[2]:

As a metric, six sigma (6σ) is a statistical measure of process performance. Sigma is an indicator of variation. Statisticians use the Greek letter sigma (σ) to express standard deviation, which refers to the difference between a given point in a set of data and the average of all other points. The higher the sigma value, the better a process is performing. Using sigma as a common metric across processes permits comparison of relative quality levels across similar and dissimilar products, services, and processes. The current competitive level of performance in business is in the range of three to four sigma, with many companies operating below this level. The sigma scale is exponential when translated into defects per million opportunities. Performing at a one-sigma level means that a process is producing more defects than good results according to a customer-defined standard of goodness. So, Six Sigma means near-perfect quality performance for a particular process characteristic. The sigma performance scale can also be translated into measures of process capability for both indices of C_p (capability for design performance relative to customer requirements) and C_{pk} (capability for real world performance in the presence of variation), as well as a corresponding estimate of the cost of poor quality that an organization bears at each level of sigma performance (see Table 11.1).

While C_p describes intended or design performance, it also expresses the short-term performance of a process, while C_{pk} describes its long-term performance. Here the time period is a function of factors that degrade performance of the process—the corrosive effect of natural variation on the original design performance. Note that there will be a higher defect level in the long-term distribution (indicated in the C_{pk}) than in the short-term distribution (indicated in the C_p). As Dr. George E. P. Box observes, "The authors of the Six Sigma concept wisely assume that the process does not have a fixed mean value but undergoes drift—specifically, that the local mean may drift on either side of the target by about 1.5 standard deviations."[4]

Second, Six Sigma is also a data-driven, statistical analysis methodology for achieving these levels of near-perfect performance. This methodology combines a rigorous, step-by-step analytical approach to statistical problem solving with a library of statistical tools that address multivariable problems, and are used in a specific sequence in order to expose the sources of

Table 11.1

Sigma Performance Level[3]	Defects per Million Opportunities to Make a Defect	Process Capability (C_p)	Process Capability (C_{pk})	Cost of Poor Quality (% Revenue)
1.0 σ	670,000			
1.5 σ	500,000			
2.0 σ	308,300	Not capable	Not capable	30–40%
2.5 σ	158,650			
3.0 σ	66,807	1.0	0.5	20–30%
3.5 σ	22,700			
4.0 σ	6210	1.33	0.83	15–20%
4.5 σ	1350			
5.0 σ	233	1.67	1.17	10–15%
5.5 σ	32			
6.0 σ	3.4	2.0	1.5	< 10%

variation and demonstrate how they may be put under control in a way that optimizes and controls process output. This sequence of application of the statistical tools has been demonstrated to provide profound knowledge of both engineering and business processes, and represents a significant breakthrough as a learning sequence for discovering how these processes operate and building an understanding of the interrelationships among the various process factors that influence its performance.

Third, Six Sigma is a philosophy of management. As a philosophy for business operations, Six Sigma recognizes the direct linkage between the number of product defects, wasted operating costs, and the level of customer satisfaction with a company's goods and services. As an operating philosophy, Six Sigma provides a framework that ties together business improvement and quality initiatives and aligns the organization to a common set of goals that are evaluated using measures of productivity, cost-effectiveness, and quality. Six Sigma improvement targets should be linked to both an organization's strategy and its business results through a firm relationship with customer expectations and market requirements as the defining point for all improvement projects.

Finally, the Six Sigma analysis process becomes a culture in and of itself, motivating teams to work on a common problem to achieve higher levels of performance effectiveness and productivity at lower cost. In mature organizations (after about three years of operating the Six Sigma way), management by fact, root cause analysis, and definition of problems according to the source of variance become part of the business language and form a

common bond among all levels of employees. Each different level of decision making (enterprisewide, business area, and frontline operations) has a unique contribution to Six Sigma and, with their joint efforts, a long-term process for problem prevention and corrective action can be put into place built around Six Sigma thinking and its action-oriented philosophy.

Six Sigma may be summarized as a business improvement approach that seeks to find and eliminate causes of mistakes or defects in business processes by focusing on outputs that are of significance to customers. The concepts underlying Six Sigma deal with the fact that process and product variation are known to be strong factors affecting production lead times, product and process costs, process yields, and, ultimately, customer satisfaction. One of the most important aspects of the work of a Six Sigma Black Belt is to define and measure variation with the intent of discovering its causes and to develop efficient operational means to control and reduce variation. The heart of the fresh approach that is implicit in Six Sigma lies within packaging the toolkit relative to its rigorous problem-solving approach, the dedicated application of trained business analysts to well-structured process or product improvement projects, and the attention to bottom-line results and sustaining those results over time.

A Six Sigma improvement initiative contains both management and technical components. On the management side, it concentrates on getting the right process metrics and goals, the right projects and people to work on them, and the use of management systems to complete the projects successfully and sustain the gains over time. On the technical side, it focuses on enhancing process performance (for example, improving the average level of performance and reducing variation) using process data, statistical thinking and methods, and a disciplined approach to process improvement methodology, which has four principal phases: measure, analyze, improve, and control. The statistical and quality improvement tools are linked and sequenced in a unique way that is both easy to use and effective in analysis. This Six Sigma approach focuses on the identification of the key process drivers (primary sources of variation), and relies on statistical software to simplify the calculations.

THE ESSENCE OF SIX SIGMA

Six Sigma thinking begins with the customers of a business—an organization must understand what is critical to quality in the business outcome that leads to customer satisfaction, financial return for shareholders, and competitive advantage in the market. By understanding customer requirements as the starting point in a Six Sigma analysis, the definition of an opportunity

for defects is anchored directly to a facet of performance that is significant to customers and their experience with a product or service.

There are three aspects of Six Sigma that may be considered either "new" or not properly emphasized in past approaches to quality improvement: integration of the human and process aspects of business improvement, clear concentration on obtaining bottom-line results, and a structured method that links the analytical tools into an overall framework and a fixed analytical "recipe" for resolving chronic work problems and attacking emerging issues.

Six Sigma integrates both process and human improvement aspects. Some of the human issues that are involved include: leadership by all levels of management while operating with a sense of urgency to both evaluate and correct issues; focus on customer concerns by working in project teams, driving for bottom-line results, and deploying the program to assure a cultural change toward management by fact; and the emphasis of continuous improvement of business as a natural aspect of everyone's work experience. Some of the process issues that are included in Six Sigma include: a disciplined approach to issues at hand, dedication to process improvement, use of quantitative measures, methods for understanding the sources of variation, statistical methods, and emphasis on process management to sustain the gains. Six Sigma creates "constancy of purpose" in an organization by adding a new dimension to business process measurement: variation as an indicator of process performance. Sigma now stands alongside financial indicators as a business metric indicating systemic excellence in execution of the management improvement agenda.

Management in Six Sigma companies has come to understand that their chief responsibility is to foster and encourage such improvement efforts. They do this by making it absolutely clear that improvement of business processes and product (both goods and services elements) are part of the everyday job of all employees; providing appropriate training at all levels of the organization; and making improvement of quality into a "competitive sport" through the application of the roles of "Champions" and "Black Belts" to drive these improvements.

CULTURAL ARTIFACTS OF SIX SIGMA

While the name of this quality initiative has received much publicity in the past five years, Six Sigma, along with its associated martial arts "artifacts"—Black Belts, Green Belts—has become part of the language used within many global businesses, and it is important to understand what this language means. However, in many organizations and national cultures this is a foreign language and is associated with negative connotations. Therefore, not all

organizations that have implemented Six Sigma have accepted these artifacts as they have implemented the core elements of Six Sigma. For instance, Bombardier calls their Black Belts "Agents," while Toshiba refers to them as "Quality Experts," and other organizations call them "Improvement Specialists" and "Process Advisors." But, whatever terms are used within a local culture, it is very important to understand the following individual roles found in successful Six Sigma implementations.

Executive Sponsor

The organization's business leaders serve as executive sponsors, provide strategic alignment for Six Sigma projects, and assure that the initiative is focused on improving critical business area problems while the organization's routine continuous improvement efforts are addressed by its embedded, team-based quality processes. The senior management team sponsors Six Sigma, but it typically designates one individual to serve as their focal point for Six Sigma implementation activities and communication focal point. Typically, the organization's CEO is the spokesman for Six Sigma while the Deployment Champion manages the logistics of implementation.

Deployment Champion

Deployment Champions serve as "implementation coordinators" in a Six Sigma initiative. This person is responsible for the logistics of implementation for the Six Sigma effort across the organization—that means scheduling training, assuring management has selected Black Belt candidates and defined their training projects prior to training, tracking improvement project progress, and communicating about the Six Sigma initiative and its results through a wide variety of internal communication channels (including intranet or internal Web sites, as well as more traditional means such as success stories published in organizational newsletters). Many times, the Deployment Champion will also serve as the contract administrator for consulting services related to Six Sigma.

Project Champion

The Project Champion is a process owner who provides "business focus" for Six Sigma projects. They have the primary responsibility for identifying, selecting, and defining projects for the Black Belts. In cooperation with the Master Black Belts, Project Champions perform the "define" phase in both the DMADV (see Six Sigma Innovation section) and DMAIC (see Six Sigma Problem Solving section) processes. Project Champions also conduct

regular project progress reviews at each of the milestones to assure that the project meets its intended business objectives. When a process owner is also the Project Champion, then they are charged with implementation of the recommendations of the Six Sigma project.

Black Belt

Black Belts are the "analytical engines" of Six Sigma: Black Belts lead the improvement project teams and conduct the detailed analysis required in both the DMADV and DMAIC methodologies. Black Belts can also serve as instructors for their project team members and Green Belts, educating them in the tools and methods of Six Sigma. It is important to know that successful Six Sigma implementations occur more frequently when the Black Belt is not charged with responsibility for implementation of the project's recommendations—this role remains for a line manager or process owner. This is why most organizations choose the Project Champion as one of these two individuals, to assure that they understand the analysis and build familiarity with the insights provided through the Six Sigma analysis.

Master Black Belt

Master Black Belts are the internal technical consultants to Black Belts and provide coaching in the use of tools and assistance in getting through "stuck points" in their project analyses. In addition, Master Black Belts can help coordinate "mega-projects" which breach functional and process areas, assist business leaders and process owners in definition of projects, and provide routine technical milestone reviews for Black Belt projects. Master Black Belts can also serve as the organization's measurement owner for implementation of their Six Sigma customer dashboard or business scorecard, as well as training future generations of Black Belts.

Green Belt

Green Belts provide the "multiplier effect" in Six Sigma. Green Belts are not trained to the same depth as Black Belts, but are focused on learning some of the basic tools that permit an acceleration of projects. Two different strategies are taken to implement this approach. In one, Green Belts receive two weeks of training and are asked to conduct their own Six Sigma projects, while in the other they receive an even more abbreviated training in basic quality and statistics, process mapping, failure analysis, data collection, and report preparation. In this role, they serve as a journeyman to a Black Belt,

who mentors them in their development and provides them with on-the-job training to improve their proficiency and ability to operate independently, facilitating the more routine continuous improvement projects.

THE CORE ELEMENTS OF SIX SIGMA

There are four major processes in conducting a Six Sigma implementation: change management, Six Sigma innovation (typically referred to by its process steps as DMADV), Six Sigma problem solving (also referred to by its process steps as DMAIC), and Six Sigma project management.

Six Sigma Change Management

Implementing Six Sigma requires cultural change, which emphasizes accountability for results, measurement, and management by fact. When doing Six Sigma, business processes will shift from "theory O" (opinion-based decision making) to fact-based, statistically supported analyses. As Six Sigma becomes part of an organization's process of management, there are some tools and processes that help management control the transition to a Six Sigma company:

• *Six Sigma readiness assessment*. This management-level assessment is conducted to evaluate the readiness of an organization for implementing Six Sigma. It assesses the organization's history of deploying quality systems and the lessons learned from these experiences, the human resources system and the organizational culture, the Six Sigma related skills and competence available inside the organization, and the ability of the organization to assimilate change.

• *Six Sigma deployment plan.* This plan is an outcome of the readiness assessment. It identifies the proposed deployment sequence with performance milestones and describes the requirements for assigning Black Belts to training classes as a function of coverage of the key business areas. In addition, a deployment plan also addresses the education of senior business leaders, process owners, Master Black Belts, Green Belts, and generic training for the organization. Deployment plans can also include the communication plan for the initiative (see below).

• *Six Sigma cultural alignment and program customization*. Once the readiness assessment has been conducted, the management team must evaluate how their own organizational culture aligns with the expectations for a successful implementation of Six Sigma (for example, customer-focused,

learning organization with knowledge base, value achievement and results-orientation, respect for individuals, and so on). The culture of the organization and historical linkages to previous improvement initiatives should be integrated with the Six Sigma training program so employees perceive that Six Sigma is a natural extension of previous improvement efforts—that the current effort amounts to "sharpening the blunt tools" deployed in the previous efforts.

• *Customer requirements analysis*. Research must be conducted by the organization to determine where it fails to either understand customer requirements or to satisfy the level of performance desired by customers. Organizations can use quality function deployment (QFD) as a methodology to describe customer requirements and to translate them into business actions. This analysis is needed to assure that critical-to-satisfaction characteristics are identified and that Six Sigma projects can be aligned to the customer's experience with the organization's products and services.

• *Enterprise map*. This value stream analysis of the business describes the high-level operation of a business and how core business processes are decomposed into work-level processes. Completion of an enterprise model (which makes "hidden factories" more evident as unnecessary feedback loops) and long, decision-authorization pathways are two key indicators of work that customers would not pay for if they were aware of its existence. Together with the business measurement system, the enterprise map helps to identify projects for Black Belts by illustrating where performance gaps are first noticed in the work process flow.

• *Business measurement system*. The business performance indicators (Business Y's in the language of Six Sigma) that indicate excellence have been achieved from the point of view of the overall organization (sometimes called a balanced scorecard or customer dashboard) are identified and translated into measures of the work process (for example, quality, cost, and cycle time). This system identifies problems.

• *Strategic benchmarking of key performance indicators.* Benchmarking key business processes to understand the performance of the business Y's should be done using external validation of observed problems noted in the business measurement system. External comparisons help to validate current performance capabilities and establish where excellence really exists while also serving as a valuable source for discovering new improvement ideas.

• *Business governance self-assessment.* A self-assessment using the criteria of the Malcolm Baldrige National Quality Award or the European Quality Award is a good way to identify opportunities for improvement.

Gaps in performance between the best practices outlined in these business models are a potential source for defining Six Sigma improvement projects.

• *Policy deployment planning system*. Policy deployment, also called *hoshin kanri*, provides a system for defining strategic direction and then arranging the organization's resources to achieve this direction, one project at a time. This management system presents opportunities for defining Six Sigma projects that are fully aligned with the business change management strategy.

• *Reward and recognition system.* It is important that the work of Black Belts and Six Sigma project teams be recognized for their valuable contribution to improving organizational performance. Human resource specialists and staff compensation managers should develop an appropriate reward and recognition system that is aligned with the culture of the organization and its policies for payment of salaries and compensation.

• *Quality management system*. The organization's quality management system is part of its framework for business control and represents a natural means to deploy the improvements from Six Sigma projects and to assure that they become part of the routine operations of the organization.

• *Six Sigma communication plan*. The communication plan describes the messages that must be presented to the organization along with the channels that can be used to best communicate these messages. This plan will include such support mechanisms as an intranet site for news, project information, and training materials. Other aspects of this plan include networking sessions among Black Belts and Project Champions, as well as annual internal meetings where Black Belts can compete for the "project of the year" or other recognitions.

• *Employee environment.* Teamwork and employee involvement are essential aspects of Six Sigma projects. In order to reduce resistance to change and to encourage a more positive working environment, the participation of those employees who will be implementing the change is essential. All Six Sigma projects are team projects, where the Black Belt facilitates the team using the statistical and management tools of Six Sigma to stimulate improvement ideas of the team. This collaborative work environment is essential for successful project work.

Six Sigma cultural changes require the satisfaction of strategic work. *Strategic work* is defined as an effort that is valued by its customers and the organization while being personally satisfying to the workers (see Figure 11.1). If strategic work receives the support of management by provision of adequate resources and applies the skills of the organization's human

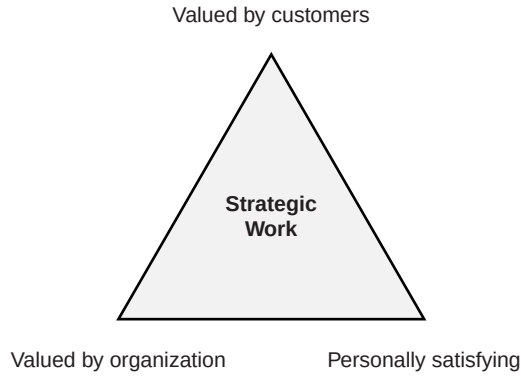

Figure 11.1 Strategic work.

resources effectively, then this work will make a difference and provide the climate for successful Six Sigma projects. In order to meet this definition, Six Sigma projects must be officially sponsored by management and receive support in terms of a written charter and regular management reviews (see Six Sigma Project Management section).

This human environment exists in both Six Sigma innovation projects and in Six Sigma problem-solving projects.

Six Sigma—Innovation

While the steps of the Six Sigma innovation process (also called design for Six Sigma [DFSS]) are named in a similar way to those of the Six Sigma problem solving process, their objectives are very different. DFSS is a comprehensive set of strategies, tactics, and tools that enable an organization to characterize, quantify, and mitigate the risk in all phases of development of its products, processes, and services. It is implemented as a part of an overall Six Sigma strategy and relies on an infrastructure of Black Belts to support the design projects. DFSS does not replace an organization's design process—it is typically developed as a customized application of the organization's product development process, integrating Six Sigma methodologies into the basic engineering and business requirements of product design.

The overall objective of the Six Sigma innovation process is to design products, processes, or services to consistently meet customer expectations. This objective requires knowledge of both the customer requirement and the organization's inherent capability to produce results (such as process output) that meets that requirement. In order to meet the customer's requirement (which, once known, becomes a fix variable), the process must be

designed so that the variation in its output is consistently better than that performance level. When the design goal for this process capability is specified to be six standard deviations beyond this requirement, then the product can be declared a "Six Sigma design." Once statistical data has been presented to validate that the product meets this design goal, then the product can be described as a "Six Sigma product." The process for creating such a product, process, or service follows the following five-step sequence that is typically called DMADV—based on the first letters of the five steps as described for a new product development process of a hardware product (DFSS applications for software, process, and service are different):

• *Define.* The *define* step engages the program planning process to establish the product concept. The design management team begins a project by developing a business case for capitalizing on an opportunity that is presented from its technology portfolio or its product line plan. They must determine, through customer and market research, how this opportunity can address commercial needs of the marketplace. The initial assessment of the product concept and its commercial viability is presented in the business case, along with the projected budget and a multigenerational product line plan that identifies how features and concepts will be sequenced for introduction into the market (as new product variants). Upon completion of the initial conceptual design review, the product budget and project plan are approved and a development team is assigned to staff the project.

• *Measure.* The *measure* step evaluates the market requirements for both the product concept and the potential market demand for the product. During this phase, research is planned to determine customer needs and competitive performance as well as to identify those features and options that are differentiators of the product. The team seeks to identify those design elements that are critical-to-quality for the product in that they deliver satisfaction for identified customer requirements. This step in the design process is documented using quality function deployment (QFD) matrices as well as design scorecards that are used to record the progress of the project. Design control is managed through tollgate reviews of checklists for critical activities to assure that adequate progress is made toward the planned product launch date.

• *Analyze.* The *analyze* step completes characterization of the product and includes the following key activities: functional analysis of the features and their capability to address the identified customer requirements, benchmarking of performance for these features, conceptual design of the product, process maps of both the production and service delivery processes, and a design requirement specification. The milestone or tollgate review that completes the analyze step evaluates the design scorecard,

along with a comparison of the design requirements, against the business plan to authorize the detailed product design.

• *Design.* In the *design* step, detailed process maps are created for the production facility layout, along with the engineering detail of the product specification. All the critical process parameters are identified, failure analysis is conducted to determine the potential risks, capability analysis is conducted to determine design robustness, and statistical analysis is used to establish tolerances for critical parameters. Value analysis is conducted to assure that the product value proposition is optimized. In this phase, reliability testing of prototypes is conducted to demonstrate growth in the stability of the design as well as its readiness for the commercial marketplace.

• *Verify.* The *verify* step engages the customer in product testing through pilot tests that demonstrate the marketability of the product as well as its production readiness. Pilot tests are used to verify the details for transition to full production, as well as the implementation of the control procedures for routine production after ramp-up to the full forecast volume is achieved. The control plan for the product is embedded in its assembly procedures, test procedures, and acceptance criteria. The product finishes development and transitions to full production upon completion of the verify step, which is marked by an official product launch.

Once a product completes the design process, any subsequent problems, issues, or concerns about its performance or its business management are managed using Six Sigma problem solving.

Six Sigma—Problem Solving

The Six Sigma problem solving process is normally called DMAIC, the acronym formed by its five sequential steps: define, measure, analyze, improve, and control. The specific activities of these steps are highlighted below:

• *Define.* Translate a current business problem into a Six Sigma improvement project. Charter a team to conduct the analysis and implement the recommendations. Establish a schedule for the project reviews and determine resources required to perform the analysis. Gain the active participation of process owners and other significant stakeholders in the project outcomes. Do a high-level definition of the business problem from the perspective of its customer, determine what is critical-to-satisfaction for customers, and provide input to the team to align the project to the original business problem. The project charter is a Black Belt's formal "variation

hunting license" and demonstrates that this project has the power of the organization, and its management team, supporting it.

• *Measure.* Identify those characteristics of the product or process that are critical to the customer's requirement for quality performance and which contribute to customer satisfaction with their use of the product or process output. These are the response variables that will be improved during the Six Sigma DMAIC phases ("Y's" or output variables). Clarify how the process operates by developing a map of the activities and determine how the process can fail using a failure mode and effects analysis (FMEA). Evaluate which process factors are controllable and, therefore, desirable aspects of a final solution. Define a performance standard for the delivery process of products or services to the customer and measure the current performance against this standard and available external benchmarks. Determine the cost of poor quality and establish a target for improvement. Validate the inherent capability of the measurement system to detect significant changes in process performance. At the completion of the Measure phase of the analysis, a Black Belt should know the nature of the statistical problem (needing to shift the mean for the "Y," reduce its variation, or do both).

• *Analyze.* Evaluate the current operation of the process to determine the potential sources of variation for critical performance parameters ("X's" or independent variables). Link the sources of variation to the control points in the process to provide physical "levers for improvement" once the analysis indicates how the process must be set for optimal performance results. Characterization consists of sequential "data mining" with statistical tools to identify factors that impact variation. Begin with hypothesis testing to evaluate differences between factors, move on to analysis of variance to determine if samples come from the same population, and apply regression analysis to determine how much of the total variation is explained by the factors that have been identified. Agree on improvement objectives once the process characterization has been completed.

• *Improve.* Screen potential sources of variation to determine their effects on shifting the process mean and reducing the total process variation. Discover interrelationships and dependencies between the process variables (solve the equation "Y = f (x)") and determine which factors ("X's") drive process performance ("Y"). For the critical parameters of the process, determine the best operating characteristics (set points and tolerances) and the range over which optimal process performance can be maintained. The principal tools of the improve phase include: design of experiments, simulation analysis, and the tools of lean management for setup time

reduction, cycle time reduction, and value enhancement. Conduct a pilot study to demonstrate the performance of the recommended solution.

• *Control.* Based on the recommended process changes, validate the measurement system to assure that it is capable of detecting and accurately reporting significant changes in process performance for the critical parameters. Calculate the process capability achieved by making the recommended changes. Develop a control plan to maintain the improved level of process performance. Implement the process controls on the revised process and train the operators to assure their personal capability to interpret instructions and execute the process improvements.

Following the control phase, there is an additional project activity that may involve the Black Belt: conducting the "realization review" after a protracted implementation phase where the process owner is making the recommended changes. The objective of this review is to conduct an assessment of benefit capture by the process owner. Were all the projected benefits of the project realized? Did these benefits transfer to the bottom line? In many organizations, this is a review that is conducted by the finance organization or an internal audit.

Six Sigma—Project Management

When organizations turn the steps of DMADV and DMAIC into tollgates or milestones in order to manage project reviews, they have taken a step toward Six Sigma project management. These milestones are aligned with the steps of the Six Sigma project (either DMADV or DMAIC) for technical reviews by the assigned Master Black Belt and business progress reviews by the Project Champion. In addition, senior management may initiate projects during the strategic planning cycle at the end of the *recognize* step (precedes *define*) and approve experiments to be conducted that may interrupt production operations. Executive sponsors conduct a final review to assure benefit capture and determine that budgets reflect the financial improvements (this is called a *realization review*).

CONCLUDING COMMENTS

Where is Six Sigma heading? The next tools that are being integrated into the Six Sigma process for problem solving are the tools associated with Japan's lean management processes. Indeed, many organizations are finding that the use of these tools prior to a Six Sigma analysis can help clarify the issues that must be resolved and make the sources of variation even

clearer.[5] Another very significant direction of Six Sigma is the integration of the concept of the balanced scorecard, but with a distinctive "Six Sigma" flavor—assuring statistical connectivity between top-tier metrics of business performance and the frontline measures of operational activities, and assuring that the top-tier metrics are all "critical-to-satisfaction" for an organizational stakeholder (customers first, then shareholders, employees, government, and so on—see chapter 1). Many organizations are using Six Sigma as a means for defining and implementing their Internet strategies in addition to their new product development efforts. Some proponents of Six Sigma believe that this methodology will generate the ubiquitous "total" aspect of TQM—assuring that quality management finds its way into all parts of the organization. Indeed, some companies have integrated their business excellence models with Six Sigma change management to "recognize" areas or opportunities for improvement, just as ISO 9000 quality management systems have been integrated with Six Sigma "control" to assure that process monitoring and routine management are implemented and sustained. No matter how the future unfolds, it is clear that the Six Sigma initiatives of the 1990s have helped to establish a total quality way of doing business that has attracted the attention of the world's top managers—a feat that is difficult to achieve and one that signals an enduring impact on business thinking.

ENDNOTES

1. In 1981, Bob Galvin, Chairman of Motorola, followed the example of Hewlett-Packard's CEO John Young and established a "10X" improvement program. He outdid Young in that he asked Motorola to achieve 100X in five years, instead of the decade that HP chose to achieve its 10X goal. Motorola went looking for ways to make these improvements by cutting waste and also improving process efficiency. Bill Smith, a Motorola engineer, was studying the relationship between a product's field life and how often the product was repaired during the manufacturing process. In 1985, he presented a paper concluding that if a product were found defective in the production process and repaired; then it was likely that other errors would escape the test process and be found later by the customer during their early experience with the product. However, if the product was assembled free of errors, then the likelihood of failure during initial customer usage was significantly lower. At this same time, Motorola discovered that the best-in-class manufacturers (such as Hewlett-Packard) were making products that required no repair or rework during the manufacturing process. The challenge of producing defect-free products is the fundamental challenge of Six Sigma. Motorola joined forces with Texas Instruments, IBM, Digital

Electronics, Intel, and Harris Semiconductor to establish and fund a Six Sigma Research Institute in Schaumburg, Illinois. Dr. Mikel J. Harry headed up this effort to clarify the statistical meaning of Six Sigma and develop the specific tools and tactics that delivered on the promise of improvement.
2. Six Sigma is a federally registered sales mark and trademark of Motorola.
3. Note that this table is built using the Six Sigma convention of applying a 1.5σ shift to the short-term value that is found in statistical tables. This means that the numerical value for Six Sigma taken directly from a statistical table would be 0.002 ppm, but applying the 1.5σ shift would shift this value to 4.5σ or 3.4 ppm in recognition of the extra effect of long-term variation. This is a much-debated heuristic and it is always advisable to calculate the shift as the performance difference between observed short-term (variation within a short-term sample) and long-term (variation between short-term samples collected over a long time period) variation.
4. G. E. P. Box, "Six Sigma, Process Drift, Capability Indices, and Feedback Adjustment," *Quality Engineering* 12, no. 3 (March 2000): 298.
5. G. H. Watson, "Cycles of Learning: Observations of Jack Welch," *Six Sigma Forum Magazine* 1, no. 1 (November 2001): 13–17.

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12

Quality Management: Current Issues and Future Trends

Tito Conti, Yoshio Kondo, and Gregory H. Watson

INTRODUCTION

Mankind, *homo sapiens*, possesses genetic characteristics that appear to be unique among all living creatures. As thinking beings we have learned to preserve knowledge through recorded communications and to transfer this knowledge for use by future generations. Thus, mankind is capable of continuous learning across individuals and organizations. Learning is an adaptive and collaborative process whereby lessons come from both our successes and failures—as well as through the success and failure of others—so we steer our future direction more soundly and do not repeat historical catastrophes. Where patterns exist in learning, it is important to understand how these patterns are created and what they imply—to an analytical thinker such patterns can identify potential root causes of process failure.

When a business or work process is continuously changing, it is necessary to generate adaptive learning in order to discern the meaning of the entire system in which the process exists as it undergoes transformation, and thereby learn the potential effects of change on the system as a whole. This is the problem that businesses encounter—a continuously changing environment that its working processes must learn and then adapt to its desired strategy so it can maintain progress toward achievement of its chosen performance target.

As the world moves from a value proposition based on "atoms," where value comes from the physical nature of products, to one based on "bytes," where value is a function of services or software provided to

support products which have become more generic, customization becomes deliverable concurrently in mass production processes. Today, this phenomenon is observable in the cellular phone industry, where both aftermarket custom cases and user programmable options allow the phone to become truly unique and personalized. But, how will value be delivered in the future as we learn more about quality? At some point, will the knowledge of customer needs become so complete that correct insights into customer requirements are always gained, so that value will be taken for granted? Will flawless execution of work become possible so that customers consistently receive the value that they individually desire? These two conditions define a utopian state for quality that is potentially closer now than it has ever been before.

Since mankind is able to learn and can both preserve knowledge and communicate, we must ask these questions: Given the perspectives on quality that have developed over the past century, what will be the next developments? What is the obligation of our current generation of quality experts to preserve this knowledge for the future and how should our knowledge be presented so that its meaning is most clearly communicated? This chapter provides some insight into these questions and focuses on both the current state of quality and describes what, from our perspective, appear to be the coming developments.

Throughout the history of quality there has been a dialectic-like debate about the relative significance of the analytical and human dimensions of quality. The desired synthesis of these perspectives has been sought as a definitive combination of an analytically based "systems and statistical engineering approach" and a psychologically based "human relations approach." One thing is certain: the thesis and antithesis have not yet become integrated into this long-awaited synthesis. How well prepared are we for such an integrated quality management system? To understand this, we will discuss first the current state of quality and then the future trends that will influence such an integrated system.

CURRENT STATE OF QUALITY

The purpose of this entire book has been to define the current state of quality—the context within which quality exists, the concepts and principles that establish the framework for a progressive quality management system, as well as the methods, tools, and techniques that facilitate the performance of a quality management system. All the chapters that precede this one have set the stage for the next discussion, where a brief

assessment is made of the lessons that should be learned and leveraged into the future.

LEVERAGING LEARNING FOR THE FUTURE

Where is quality today? As described in this book, quality is becoming an integrated system where the best of all approaches are merged into unique quality systems that engage the entire business, rather than a single function, and an entire related operating philosophy and organizational culture is developed by the management team as the core dimension of its way of working. The formalization of toolkits and bodies of knowledge are only the beginning steps toward this integration. Development of customized business models, based on quality system models such as business excellence and ISO 9000, is another step in this direction. The resultant business systems integration will be centered around the human cultural dimension of an organization and based on a process model for its critical business processes, while using measurement control points to link balanced scorecard metrics to indicators of actionable operating conditions that drive the routine performance, which produces the desired output of the business value chain.

Such a business system integration will not be driven by selection of an enterprise resource program (ERP), but it will represent a choice for doing business that is identified and desired by management (process definitions, measurement systems, and people systems), and then embedded into the ERP. While the current generation of ERP systems can provide consistency of operation across a business, their generic solutions to operational problems may not provide competitive advantage if all the competitors are using the same process. Competitive advantage will come when the organization chooses a direction—different from the competition, yet aligned with the realities of the desired customer experience—and then focuses its energies and talent in making this choice work well.

Service quality will be a growing dimension as the world becomes more and more technologically capable and customers can directly reach out to all competitors in a particular market. In the final analysis, all organizations are service organizations and all customer relationships require personal attention. Future business leaders will learn that customer relationship planning (CRP) is more than a software package that identifies customers and their buying patterns, and customer satisfaction measurement requires more than doing a survey to determine the average response

to a couple of questions. Each customer will become viewed as an individual with unique needs that must be identified, addressed, and then reviewed to assure that they experience the level of service that they require. The focus of technology on behalf of the customer will be the true driver of sustainable competitiveness in the coming century.

While the current age is technological, technologies will become increasingly integrated and able to deliver electronically to the point of need the knowledge required for specific operating work. In the near future, technology will enable quality—placing solutions into the hands of workers at the time that they are needed, and anticipating problems through smart monitoring of all process performance parameters that contribute significantly to the customer-perceivable output. In order to achieve this integration, organizations will utilize knowledge-based learning.

In order for quality to be taken to the grassroots level of organizations, it must be assimilated into the entire business system and, most especially, into its senior leadership and their process of management. Continuous learning must be a value of the organization of the future—leaders must create an environment where everyone is a learner, everyone is a teacher, and everyone takes responsibility to mentor those who need development. Such a proactive human-focused business environment can only be developed when both the "hard, analytical dimension of quality" and the "soft, psychological dimension of quality" come together in a unified approach for managing results through people. How will the future provide the context for this integration?

FUTURE TRENDS IN QUALITY

Some of the enabling factors in the future are already visible in the marketplace. Perhaps one of the biggest enablers of a new learning society will be the technological convergence of personal computing and telecommunications—providing wireless connection and access to knowledge and content through information technology. This convergence is a fact of the current technology environment. Cellular phones now serve as personal data assistants, are able to send e-mail, and can take and transmit photographs. Personal computers download and play music and movies with similar acoustics to high-fidelity stereo systems, and the games that the personal computer can play are as lifelike as any arcade. The next step is integrating these two distinct, but related, technological pathways and providing them with meaningful content to accomplish productive work. The direction has been set, but the implementation timing for convergence of these pathways is uncertain.

When these technologies do converge, then the various dimensions of quality improvement will become engaged. Innovation, the quality that comes from creative destruction of our past ways of delivering value based on our knowledge of the true requirements of customers and the ability to formulate the market promise, and operational quality that is delivered through consistency of performance of these promises that organizations make to their customers combine with the human dimension that enables an organization to unfold its power from the technology, innovation, and operational quality. When these dimensions of quality together drive organization performance, then they define the new value-delivery proposition of the future.

Organizations will evolve over time as stimulated by the catalyst of technological change that makes possible new directions and challenges the horizon of today's business goals. It will be the management's challenge to stimulate meaningful innovation that makes a difference to their targeted customers—to find what future markets will value—and then define what will be their own organization's unique value proposition or promise to the market. The operational challenge of management will remain essentially the same—once a promise has been made to the market in the form of a new product or specified service, then management must assure that it has processes that will consistently keep their promise to their customers. However, the underlying challenge of business leaders will be to engage the power of their people to develop a collaborative effort that facilitates the shared vision.

Organizations are like weak casks that contain two powerful bubbling wines: rapid technology development and social development. Organizations also badly need progress in cask and barrel technology to provide reinforcement for their growth. In plain terms, organizations must be reinforced to make them able to manage continuous and turbulent technological and social change. Too many companies considered as quality champions have slipped back to performing business as usual. In general, this was not because of technology, but because quality was not really integrated into business.

There is no doubt that, for any organization, a culture that pursues a common vision—basically the direction in which the members of the organization are headed—and the consequent identification of shared values can be an advantage over the approach that advocates living for the day and everyone for himself. This is another example of how the quality culture, like any cultural concept, will be a factor for differentiation in the future. It will not spread in a uniform fashion around the world . . . some areas will be more receptive to the cultural factors that encourage quality results than others; and the scene will change over time in unpredictable cycles, as all cultural seasons do.

One thing we know, however, is that the future will not be sluggish—it will be fast-paced and complex as markets produce alternative technologies and applications diverge from the traditional knowledge base. This means that rapid choices must be made in the face of many types of risk—not just financial risk, but also operational risk, market risk, and technological risk. Managing in this complex web of interrelated opportunities for both success and failure will become a strain on business leaders. The complexity of the environment will force leaders to address new or emerging quality issues, such as quality in governance and ever-improving the management of organizational change. It seems as though organizations have become proficient at defining the changes that they want to make, but fail during the implementation. Excellence in the future will be observed only through the actions taken by organizations as all these dimensions of quality are addressed simultaneously. The manager of the future must become the "changemaster" that was identified as a business need in 1983 by Rosabeth Moss Kanter in her book by the same title. Perhaps the challenge for the quality professional of the future will be to become more like a "professional change manager" than a quality manager!

Technology is not the only stimulus for change in the future. A second is the increasing emphasis placed on finance in interpreting the meaning of organizational performance. Nowhere is this more evident than in the Six Sigma initiative of General Electric. As quality becomes expressed more like a management concept in the language of finance (note that the "cost of poor quality" is still the language of quality, as most financial management systems do not recognize it as a topic that is meaningful), it will become an imperative for quality professionals to learn and embrace this knowledge, even as today business professionals are learning and embracing the quality body of knowledge through their participation in Six Sigma initiatives.

Quality business cultures incorporate a number of key factors that will tend to differentiate one company from another. The first of these is the value attributed to long-range visions (five to ten years). Since we live in a constantly changing, unstable environment, some commentators believe there is little sense in talking about the long term. This may be true of products and services, but it is certainly not true of intangible critical success factors, which take time to be developed (and very little time to be destroyed). The first of these factors are the organization's distinguishing *values*, which are shared by its people and provide the foundation for creating a sense of belonging, of being part of a team, especially when major challenges arise. Strong leadership is necessary to implant these values, but when they are absorbed into the fabric of the organization, then the contribution of the organization's people increases enormously, in both qualitative and quantitative terms. The world is full of examples of enterprises that have not only

managed to react quickly to severe competitive attack, but have turned the problem into an occasion for extensive renewal. Even in large organizations, deeply shared values can multiply the ability to achieve results.

Perhaps the next major catalyst for change in the future will be the combination of environmental and social responsibility of organizations. Organizations produce value in three different dimensions: value for markets and customers, value for shareholders and investors, and value for society. In this final area, there are no real measurement systems that define the overall "balanced scorecard" for performance. Many small indicators are used to determine if an organization is fulfilling its responsibility to employees, communities, government, and the public in general (including the future generations of mankind). Will there be an indicator for the social value-added contribution of a firm as there are for market value-added (MVA, or the brand value-added contribution) and economic value-added (EVA, or the shareholder value-added contribution)?

Leaders will not be credible quality champions if they do not convert their unique focus on "the bottom line" into a focus on "a multiple bottom line" that extends the scope from financial results to people- and society-related results. Perhaps the almost exclusive focus of many American companies on shareholder value will become a big obstacle on the road to sustainable excellence. Conversely, many European countries focus more on stakeholder value than on shareholder value—and that too is an obstacle to excellence. "Society" as a stakeholder is going to become particularly important whenever the interest of mankind in a global world is at stake. Not just protection of the environment and social responsibility, but also in the areas of biogenetics and international relations. Mastering these changes will become more and more a quality-related issue. Quality will assume the role of protecting humanity from the risk of disruptive changes to the environment.

Customer satisfaction is the final goal of quality activities and the ultimate enabler of enduring competitiveness. While we have discussed stakeholder satisfaction, there is a distinction between these two types of satisfaction that must be made. Stakeholder value focuses on intrinsic characteristics of an organization, to display creativity within the framework of restrictive conditions that are imposed by society; it is compliance- or obedience-based. However, customer satisfaction is based on extrinsic characteristics and is the aim of work—it is achievement based. While the importance of stakeholder satisfaction will rapidly increase in the near future, it must be emphasized that when we achieve stakeholder satisfaction, this performance is nonsense if we have not first achieved customer satisfaction.

Quality models are used in both business excellence and ISO 9000 approaches for defining a quality system as an indicator of differences

between alternative implementations. Such models are always simplified representations of reality, but they can be useful to understand and interpret the business environment of an organization. While we can have physical, economical, social, and organizational models, we can also have models for organizational performance improvement, and the choice of the model used depends on the objective or the organization. Organizations with the cultural breadth to choose the right model at the right time have a competitive advantage, while organizations that turn a model into a dogma typically find themselves penalized. No model can provide an ideal, one-size-fits-all solution for all requirements. Indeed, the latest organizational theories advocate a contingency view, whereby the business model is adapted to the specific organization. Useful business models are simplified representations of the real organization on which its people are going to apply quality tools to make change happen. These models aim at understanding the links between organizational causes and effects on customers, stakeholders, and the company itself. Models help to move observations from empiricism to science—from personal opinion to shared perspective—and provide a basis for communicating abstract meaning about how organizations should function. Quality models will help to clarify the roles, responsibilities, and actions of the next generation of managers.

No matter how this future becomes a reality, there will be a continuing need for professionals in the quality field! There appear to be two specialty areas for future quality professionals: one in the technological area, with emphasis on statistical engineering and technology, and the other with a more project management approach to manage organizational change in business processes.

CONCLUDING COMMENTS

What will be the role of the IAQ in shaping and defining the future of quality? Today, the IAQ has defined a project to address the subject of quality in governance and to help develop a new operating definition that has universal meaning across the world's business cultures. As new quality subjects and emerging topics of concern become evident to the Academy, we will continue to develop, comment, and publish in order to assure that the most useful concepts, methods, and techniques survive the test of rigorous assessment and that the "best of quality" is preserved for future generations.

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