Quality Excellence for Suppliers of Telecommunications Forum

Resource Handbook for Business Improvement

Version 1.0
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Foreword

As telecommunications companies mature in their use of quality management approaches to accelerate performance improvement, they often transition to the use of Business Excellence Models (BEM).

Two of the world’s most prevalent BEM approaches include the EFQM Model, administered by the European Foundation for Quality Management and the United State’s Baldrige National Quality Program, administered by the National Institute of Standards and Technology. The QuEST Forum encourages the use of BEMs within the industry and chartered a work group with the following goal:

“Identify methods to encourage and drive business improvement within the global telecommunications industry.”

The QuEST Forum has created this Resource Handbook for Business Improvement to provide assistance for the use of BEMs. The Handbook provides a resource for organizations to use in shaping strategic plans and business objectives, identifying business improvement opportunities, and providing “gap closure” ideas and resources to use following a BEM assessment.

The Handbook provides a “voice of the industry” through:

A set of key industry issues and associated guidance information, specific to the telecommunications industry for companies to reference as a catalyst for improvement ideas,

- A listing of key industry drivers for strategic planning purposes,
- Industry examples of how others have approached improvement activities and their experience solving similar problems,
- References to further information, resources, and “best practices” presented at QuEST Forum meetings.

A pilot study was conducted in late 2001 and early 2002 to gain feedback from a variety of industry participants. The Handbook was updated in 2002 to reflect inputs from those pilot activities. This Handbook may be updated periodically with industry trends, performance information, and examples of well-applied best practices that provide solutions to industry problems.

By providing this Handbook, supporting the use of BEMs, and by providing linkages to best practices and other resources, we believe that the industry will be better positioned to meet the needs of stakeholders in the global telecommunications industry.

NOTE: For more information on this Handbook and related activities refer to the QuEST Forum Web site, www.questforum.org, under “BEAM.”
Preface

The Quality Excellence for Suppliers of Telecommunications (QuEST) Forum was founded to foster continual improvements to the quality and reliability of telecommunications products and service. Initially, it established a common set of quality management system requirements and measurements by creating the TL 9000 Quality Management System Requirements Handbook and the TL 9000 Quality Management System Measurements Handbook. It has moved further along the road to quality excellence by developing an approach beyond quality management standards for the telecommunications industry that facilitates the journey toward business excellence and role-model performance.

The QuEST Forum established this document, the Resource Handbook for Business Improvement, to promote the use of business excellence methods. The aforementioned handbooks and associated support processes and mechanisms are the result of a cooperative effort of members of the QuEST Forum.

The work of the QuEST Forum yields benefits to all stakeholders within the telecommunications industry, specifically service providers, their customers, and their suppliers. The QuEST Forum is composed of members of the telecommunications industry. Members fund and participate in the Forum, have defined voting rights, and are expected to contribute to the work of the Forum. Members vote on the build and evolution of all products and services of the Forum, as well as all administrative, infrastructure, and operational issues and questions that may arise.

This Handbook will be updated as new topics and needs arise in the industry, or industry best practices are identified. The Business Excellence Acceleration Model (BEAM) Work Group maintains a Web site at the QuEST Forum’s home site of www.questforum.org. The BEAM Web site provides additional information, best-practice referrals, and resources to interested users.
Acknowledgements

Many members of the QuEST Forum contributed to the development of the Resource Handbook for Business Improvement and associated support processes. In addition, consultation and input were received from the BEM community – in particular, from the Baldrige National Quality Program in the United States and The European Foundation for Quality Management (EFQM) in Brussels, Belgium. Special thanks to Steve Welch of SBC, and Marty Lustig of Sprint, executive board sponsors, for their vision and support. It was truly a team effort by the experts that make up the Forum’s membership and the BEM community.

Personally, and for the entire QuEST Forum, I would like to thank the following individuals, companies, and organizations for their direct contributions to the creation of the Resource Handbook for Business Improvement.

QuEST Forum Project Director

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Section 1
Introduction

1.1 Purpose
The QuEST Forum recognizes that the consistent and continual use of business excellence methods leads to whole-business improvement, role-model performance, and stronger sustainability.

The Business Excellence Acceleration Model (BEAM) Work Group is the QuEST Forum’s initiative to promote business excellence and to provide documentation and resources that will help support the telecommunications industry’s drive toward business and performance excellence. One output of the work group is this Resource Handbook for Business Improvement providing helpful insights into specific areas that are critical to the success of telecommunications organizations.

The purpose of this Handbook is to provide a resource and guidance for continual business improvement in the telecommunications industry.

It does not provide a complete “how to” for the referenced elements or processes. Many good practices exist within and outside the telecommunications industry. This Handbook does not provide an exhaustive list, or, necessarily, the “best-in-class” examples or practices. However, by utilizing the information presented, users may obtain ideas that can be adapted and applied to their organizations.

The Resource Handbook for Business Improvement provides:

- A way to build on quality management systems described in the ISO 9001 family of standards and TL 9000 requirements and measurements,
- Approaches to business improvement activities,
- A tool for use with or without a Business Excellence Model (BEM), for example, Baldrige or the European Foundation for Quality Management (EFQM) Excellence Model,
- A guide to choosing improvements to make.

This Handbook provides a “voice of the industry” – from the industry to the industry.

1.2 Business Results and Industry Drivers

1.2.1 Business results
Empirical evidence demonstrates that companies that achieve high performance in business excellence outperform similar companies. That is, award-winning companies have consistently better business results than their competitors. Figure 1-1 illustrates the results of study data, gathered by Dr. Vinod Singhal and Kevin Kendricks, which clearly demonstrate this point. The study, entitled “The Financial Justification of TQM,” was published in the Centre for Quality Management Journal – Spring 1999 edition. It covered a survey/analysis of some 600 companies, over a time period from 1994 to 1999.

Much more empirical and benchmarked data are available from the study, for example, stock price performance; comparison of employees and asset utilization; and comparison with customer award benchmarks, all of which show award winners outperforming the benchmarks involved in the study.
1.2.2 Industry Drivers

In addition to the overall business drivers above, other industry drivers are signaling the importance of taking approaches that address whole-business improvement. These drivers are compelling the industry to respond and they make a strong case for organizations to adopt business and performance excellence methods to ensure future sustainability. These industry drivers are summarized as follows:

- Customer satisfaction and retention with profitable market share
- Shareholder return
- Cost efficiency and control
- High cost of poor quality
- Deregulation, liberalization, and privatization
- Globalization of market, facilities, and business operations
- Rapid and continual change in the market, regulatory authority, and technology
- Convergence (new revenue streams outside of traditional telecommunications)
- E-business models (shift to a knowledge-based society)
- Mergers, acquisitions, and divestitures
- Limited resources (human, physical, and financial capital)
- Global material shortages
- Impact of environmental considerations (social responsibility)
- Market shift to ownership of traffic from ownership of infrastructure
- First to market / time-to-market (competition)
- Capital attraction
- Need to improve resource/workforce utilization

1.3 Moving from “conformance” to “performance”

The QuEST Forum strongly advocates the use of quality management standards, such as TL 9000 and ISO 9001, as a foundation for good quality management practice. This ensures a consistent and systematic approach in the control of all realization activity involved in delivering product and service to customers.
These standards provide an ideal starting point for good-practice quality management, in that they articulate the basic requirements that need to be maintained and improved. However, following these standards, and having the requisite/appropriate certification, does not in itself ensure whole-business improvement or sustainability.

In order to address this and to provide an enhancement to the TL 9000/ISO 9001 quality management approaches, it has been determined that business excellence concepts should be articulated for the telecommunications industry. Such guidance will provide a vehicle to take the industry from thinking in terms of “conformance” to thinking in terms of “performance.” It will encourage continual improvement (on a whole-business basis) that leads to role-model performance, the meeting of stakeholder needs, and the ensured sustainability of the business.

There is also a need to develop an “open” system for the industry that builds upon and goes beyond the quality management systems standards. Such a system would be based upon voluntary participation and would provide a way to apply and enhance shared learning, as well as the means by which best-practice sharing could be encouraged, practiced, and recognized.

Figure 1-2 shows a hypothesis of the relationship between business results and quality management system maturity, together with the quality management system initiatives deployed and the movement from “conformance” thinking to “performance” thinking. However, this hypothesis does not preclude organizations from moving directly to business/performance excellence deployment. The figure does show the relative scope and impact of the various quality approaches and initiatives.

**Telecom Performance Improvement**

![Diagram](image_url)

**Figure 1-2: Hypothesis – Telecom Performance Improvement**

### 1.4 Scope

The *Resource Handbook for Business Improvement* can be used by all types of companies operating within the telecommunications industry, that is, service providers (network service providers, Internet service providers, applications service providers, and so on) and suppliers (hardware, software, service, and value-
added resellers). It can be used by large businesses, as well as small and medium enterprises. In addition, it can be used by some or all levels within an organization.

The *Resource Handbook for Business Improvement* is not intended to replace existing BEMs. It builds upon these models, by articulating key industry-specific considerations for which additional guidance is provided. The *Resource Handbook for Business Improvement* can stand alone as a reference document that provides information on key issues that the telecommunications industry may need to address. The Handbook is also designed for use in conjunction with BEMs that may be chosen and deployed within telecommunications companies. It is recommended, however, that an existing BEM be chosen and adopted by user companies to gain maximum benefit.

Initial analysis of the telecommunications industry led to the determination that a stronger emphasis was needed on several key industry issues.

The key industry issues addressed within this Handbook are:

- Managing Continual Business Improvement
- Managing Organizational and Cultural Change
- Encouraging and Managing Innovation
- Technology and Knowledge Management
- Strategic Partnering
- Strategic Supply Chain Management
- Life-Cycle Planning and Management
- Optimizing Time-to-Market
- Efficient Product Delivery and Support
- Network Reliability and Availability

These key industry issues were derived and agreed upon collectively by the QuEST Forum BEAM Work Group, which consisted of professionals drawn from across the industry and the globe.

1.5 **How To Use The Resource Handbook for Business Improvement**

The *Resource Handbook for Business Improvement* can be used by organizations within the industry in different ways. This Handbook focuses on three specific applications:

- It can be used on a “stand-alone” basis, as an aide-memoire or checklist to develop ideas for business and process improvement.
- It can be used as input in the formulation of business strategy, objectives and plans.
- It can be used on an integrated basis, merging with business excellence and self-assessment into a continual annual cycle.

1.5.1 **How the Handbook is used on a "stand-alone" basis for business/process improvement**

*The Resource Handbook for Business Improvement* can be used as a reference for process improvement or process development. There are various process improvement methodologies available including the Plan, Do Check, Act (PDCA) cycle (see Section 2) and the Six Sigma DMAIC approach. Figure 1-3 shows a typical process improvement approach including the use of the Handbook.

**Example:** If there is an initiative to improve the product development process, then Section 8, “Life-Cycle Planning and Management,” and Section 9, “Optimizing Time-to-Market,” could be reviewed to aid in determining what elements to consider when improving/changing the process. (Note: The relevant BEM criterion parts could also be used as a checklist of elements to consider or include.)
Process Improvement

Identify Process to be Improved (Can come from BEM Self Assessment, TL 9000, etc.)
Review, Understand, & Measure Existing Process - “As Is”
Identify Solution(s), Including Use/Refer to:
  • Reference Handbook
  • Business Excellence Model
  • TL 9000
  • Benchmarking, etc.
Measure Performance & Compare with Ideal or Desired Outcome
Implement Solution(s)
Modify Solution(s) if Required and Implement Controls

Figure 1-3: Process improvement flow

1.5.2 How the Handbook is used to assist in formulation of strategy, objectives, and plans

This Handbook can be used as input to the strategic planning process, along with market research, customer input, competitive analysis, and business performance results.

The key industry issues identified in this Handbook may be reviewed in conjunction with business and process performance results to determine effective focus and priorities for business planning.

1.5.3 How the Handbook is used in an integrated basis, merging business excellence and self-assessment into a continual annual cycle

The Resource Handbook for Business Improvement is designed to be used in conjunction with the self-assessment process as described in users’ chosen BEM and as a key consideration in the formulation of users’ strategy and business planning process.
These two aspects are closely linked, in that one should continuously feed the other, in order to effect continual review and improvement. Figure 1-4 shows how these aspects fit together as an integrated process for a continual annual cycle.

![Diagram](resource-handbook-for-business-improvement-used-with-bems-and-self-assessment-in-a-continual-annual-cycle.png)

Figure 1-4: Resource Handbook for Business Improvement used with BEMs and self-assessment in a continual annual cycle.

### 1.6 Measurements

All BEMs place great emphasis on the establishment and use of measurements that are relevant to the organization. In addition, there is general agreement that the design and implementation of a relevant and useful set of measurements are critical to understanding an organization’s performance and establishing improvement plans. This is evidenced in part by the inclusion of measurements as a significant portion of the TL 9000 requirements.

Several of the sections within this Handbook refer to or provide information concerning the use of measurements. However, it is the responsibility of organizations to identify and define those measurements that are appropriate for their use.
Section 2
Managing Continual Business Improvement

Managing continual improvement addresses how the elements of a business management system effectively work together to drive continual improvement and enhance value within an enterprise.

2.1 Summary

The management of continual improvement is enhanced when the elements of an improvement loop work together to improve the entire business management system. The aim of using an improvement loop is overall optimization of the entire system.

The Shewhart/Deming Cycle (Plan, Do, Check, Act), as illustrated in Figure 2-1, forms the basis of a commonly used effective improvement loop. The improvement loop within a business management system may consist of the following processes:

2.1.1 Plan

*Setting business policy/strategies.* The business policy is strategic in nature and normally includes the quality policy, organizational goals and values, and a focus on customers’ and other stakeholders’ expectations. Reorganizations of telecommunications organizations are becoming commonplace. Each time an organization embarks on a reorganization, maintenance of the business management system must be a consideration.

![Figure 2-1: The Shewhart/Deming Cycle 1 (Plan, Do, Check, and Act)](image)

*Planning and establishing objectives.* A consensus is needed on goals, timelines, and the allocation of resources. This normally includes objectives and targets for key measures (such as TL 9000 measures), a method for translating strategic objectives into action plans, and the allocation of resources for an effective, actionable measurement system.
2.1.2 Do

*Aligning the organization and completing action plans.* Policy deployment can be used to align the organization to the business policy and objectives. Top management must provide the resources needed to satisfy the business policy, objectives, and action plans.

2.1.3 Check

*Measuring performance results.* Performance results measure the status of all aspects of the business. This may include results of self-assessments, internal and external audits, data collected on internal processes and field results, customer results, financial and market measurements, human resource results, supplier and partner feedback, environmental and societal results, and organizational effectiveness results.

*Analyzing information.* Analysis of the information refers to the assessment of measured performance results and other information as a basis for setting priorities and identifying effective actions. Other information may include market analysis, competitive pressures, supply chain status and forecasts, benchmarking, new technologies, and industry innovations.

2.1.4 Act

*Performing corrective and preventive actions.* Corrective and preventive actions refer to the implementation of improvements as a result of the analysis of information. Corrective actions are used to eliminate the root causes of undesirable situations in order to prevent their recurrence. Preventive actions are used to eliminate the root causes of potential undesirable situations in order to prevent their occurrence.

*Completing a business management assessment.* A business management assessment is the process by which senior leaders evaluate the entire company’s performance and redirect resources as necessary. Key inputs normally include the analysis of information and the results of corrective and preventive actions. Outputs may include gaps with respect to goals, values, customer and other stakeholder expectations, and objectives/targets set in the previous cycle. Action items should be identified to close gaps. Inputs should be defined for the next improvement cycle.

All elements of the improvement loop processes should be evaluated for effectiveness.

2.1.5 New improvement cycle

Start the next improvement cycle with 2.1.1 (plan). Although the new cycle typically begins with 2.1.1 (plan) and ends with 2.1.4 (act), some activities may be accomplished throughout the cycle.

2.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers of managing continual improvement is driven by the following:

2.2.1 The need for continual review and improvement of the business strategy because of:
   a. The increasing demand for communications services.
   b. Advances in technology.
   c. The changing nature of the industry structure – such as acquisitions, divestitures, partnerships, new supply-chain relationships, and joint ventures.

2.2.2 The globalization of companies, which expands their complexity and complicates “span of control.”

2.2.3 The development of new data collection, data analysis, and internal communication tools as a means of competitive advantage.
2.2.4 Competitive pressures that drive the need for better productivity and efficiencies. This results in the need to optimize all activity and to drive continual business improvement methodologies, tools, and techniques.

2.3 Examples

The following examples use the improvement loop in Section 2.1 as a guide.

2.3.1 Plan

a. The telecommunications industry affects all elements of the global society. Stakeholders may include end users, service providers, members of the supply chain, key communities of interest, employees, stockholders, governments and regulatory agencies. The interests of these stakeholders should be considered in developing business policy/strategies.

b. The organizational structures of many telecommunications companies are going through major changes, which include mergers, acquisitions, the use of contract manufacturers, and other types of outsourcing. These factors should be considered when planning and setting objectives.

2.3.2 Do

Many organizations use a balanced scorecard to manage their business. The balanced scorecard gives top management a concise view of the current status of the organization. Some organizations use this tool in a bonus compensation process. Business Excellence Models (BEMs) in their results criteria provide a framework for balanced scorecard development/generation.

2.3.3 Check

a. Key measures include TL 9000 measures and the results of self-assessments utilizing BEMs, as well as internal measures, which give early warning of problems. These include outgoing hardware quality and the rate of software defects detected during tests. A tool often used to depict the status of these measures is a “dashboard.”

b. Telecommunications suppliers and service providers often market products that depend upon “state-of-the-art software.” These organizations develop sophisticated tools to measure the quality of their software and use tools such as the Software Engineering Institute Capability Maturity Model (SEI/CMM) and ISO/IEC 15504 (SPICE) to assess the maturity of their software quality management systems.

2.3.4 Act

a. Senior leaders should take responsibility for ensuring the effectiveness of the improvement loop. Management review is the key process for doing this.

b. Preventive actions are often used to improve three major areas of concern in the telecommunications industry: time-to-market, on-time delivery, and excessive product and maintenance costs.

c. An effective management review includes action items that ensure customer loyalty. A key to success in the telecommunications industry is to meet regularly with major customers and identify ways of meeting their needs.

2.3.5 Improvement cycle

a. Organizations can integrate a structured improvement process, such as that found in ISO 9001, into their management system and business review cycles. This allows for continual improvement both at the process and organizational levels.
b. Organizations may use local or state self-assessment processes to support the continual improvement process.

2.4 References

Books and articles


Properly managing organizational and cultural change is a desired response to the fast-paced business environment of the telecommunication industry. As organizations become more global in nature, it is of paramount importance that organizational and cultural change be a cornerstone in the way businesses are managed and operated.

“There is nothing more difficult to carry out, nor more dangerous to handle, than to initiate a new order of things.”

—Niccolo Machiavelli (1469–1527)

3.1 Summary

3.1.1 Understanding the need for change
Managing organizational and cultural change refers to making change in a planned and managed, or systematic manner. To be successful in today’s environment, businesses must accept change as constant, effectively recognize the nature of required changes, and plan for and manage the change in their organizations. Both external and internal forces make change inevitable for organizations today.

3.1.2 External reasons for change
Mergers, acquisitions, divestitures, entrepreneurial opportunities, market demands, new and changing work-force demographics, changing customer expectations, and the impact of new technologies can all dramatically affect and alter organizations globally.

The evolution in communication, with the rise of the Internet and e-commerce, has required companies to evaluate rapidly and sometimes change their methods of conducting business.

3.1.3 Internal reasons for change
Market opportunities, financial constraints, outsourcing, globalization, contract manufacturing, automation, downsizing, sharing and implementing best practices, re-engineering, and repositioning impose change on an organization and its work.

3.1.4 Organizational change – manager’s role
When managing change, it is critical to recognize that change situations vary, so that no one change program will fit all situations. It is also critical to recognize the level of management commitment and involvement needed to ensure the success of the change activity.

One of the first steps in managing organizational change is to develop a vision of the desired state of the organization after the change, and to know the current state so that appropriate actions can be undertaken to achieve success.

Planning the change should entail determining possible resistance to change and developing methods to deal with this resistance, as well as engaging committed resources to implement the change.
The change manager should also consider the use of measures to demonstrate the importance of the change, as well as to increase the visibility of goals and targets.

Throughout the change activity, management should continuously communicate its commitment to and provide support in removing or minimizing roadblocks to the change.

3.1.5 Cultural change – manager’s role

With the increase of globalization and an increasingly diverse work force, management must address the changing cultural aspects of the organization.

Culture refers to “norms of behavior” and “shared values.” Understanding and managing these cultural influences are important considerations in accomplishing organizational change. Embedded in managing cultural change is the recognition of diversity in the organization.

A diverse work force may affect an organization’s ability to compete in the global marketplace. If not recognized and managed properly, it could be a source of ineffectiveness.

Some areas of diversity may include:

a. Leadership styles
b. Communication styles
c. Competitive vs. cooperative behavior
d. Individualism vs. a team approach
e. Location, time zones, national/international holidays, religious customs and practices
f. “Localized” work practices, that is, starting times, breaks, celebrations, days off, and so on.

Managers should recognize the need to plan for and implement practices that will maximize the full potential of a diversified work force.

3.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers that affect managing organizational and cultural change:

3.2.1 Divestitures of products, services, or functions that are no longer considered “mainstream” to the business

3.2.2 Downsizing for a variety of reasons

3.2.3 Diverse nature of customer market groups

3.2.4 Drive for performance improvement/excellence

3.2.5 Employees with diverse backgrounds

3.2.6 Effects on the local community

3.2.7 Language as a barrier to performance excellence

3.2.8 Responsibilities to the public and community

3.3 Examples

Here are some initiatives to consider for guiding your company in managing organizational and cultural change:

3.3.1 Examples of external reasons for change

a. The impact of organizational and cultural changes on the local community
b. Public perception of organizational change

3.3.2 Examples of internal reasons for change

a. Input data from employee groups indicating a need for organizational change
b. Changes in organizational performance objectives/business directions
c. Leadership-driven organizational change

3.3.3 Examples of organizational and cultural changes

a. Define how organizational and cultural change is managed to improve your organization
b. Identify business results that showed improvement because of organizational and cultural changes
c. Performance measures that evaluate the effectiveness of change
d. Incorporate organizational and cultural changes into the strategic planning process

3.3.4 Examples of organizational changes

a. Describe how you measure the effectiveness of organizational change.
b. Assess management ability to handle organizational change.

3.3.5 Examples of cultural changes

a. Conserve, preserve, and develop cultural and language diversity.
b. Solicit input from diverse groups of employees.
c. In managing a work force with different cultural backgrounds, address differing educational needs, such as second languages, and provide training as appropriate.
d. Provide training in diversity.
e. To overcome cultural differences, provide managers with up-front training and rotating assignments through global company locations.
f. Ensure proper training in "local" cultures, customs, and business etiquette for personnel from outside the specific geographic area.

3.4 References

Books and articles

Section 4
Encouraging and Managing Innovation

Success and failure in today’s telecommunications market place hinges on an organization’s ability to transform ideas, problems, or needs into improved products and processes or new businesses and revenues.

4.1 Summary

Encouraging and managing innovation is a key business process that enhances a company’s future. This has become especially true within the telecommunications industry due to the changes in the market and industry structure. According to Peter Drucker¹, there are four indicators of impending change in industry structure:

1. Rapid growth of an industry
2. By the time an industry’s growth has doubled in volume, the way it perceives and services its market is likely to have become inappropriate.
3. The convergence of technologies that were previously seen as distinctly separate
4. An industry is ripe for basic structural change if the way in which it does business is changing rapidly.

Most people would agree that the above indicators accurately describe today’s telecommunications industry. It may therefore be beneficial to look at innovation as a means for surviving the current industry changes, as well as any future changes.

According to Charles Sirois² the major driving force of the industry is the need to create new revenue streams outside of traditional telecom. The highest potential for this opportunity exists in the convergence of telecommunications, communications and information technology (see Figure 4-1). When innovation and creativity are applied to this convergence problem, the results are new markets, and the ability to deliver better products faster and more cheaply.

Figure 4-1: Convergence Triangle
Opportunities for innovation occur both externally and internally. While an organization can focus internally on improving its processes and possibly its products, it can also look to its external partnerships, especially with customers, for further areas for innovation (see Section 6, Strategic Partnering).

S-curve theory says that every technology or industry has a rate of inception, adoption, and decline (see Figure 4-2). In the classic S-curve model, there is a long, slow development-and-acceptance period, until the product or service reaches an inflection point and suddenly surges. Innovations power products up the steep part of the S-curve. Nearly all innovation programs are either about pushing a product past the inflection point or jumping to a new S-curve.6

There are three main aspects to be considered in establishing a successful innovation system: culture, organization, and process.

### 4.1.1 Create a culture that encourages and stimulates innovation

The primary way to incorporate innovation into the organization is to create a culture that fosters creativity and gives employees the freedom to take risks and try new ideas.3 According to Charles W. Prather,4 prerequisites for an innovation culture are as follows:

- Top leadership is committed to taking appropriate action to improve the climate for innovation.
- Top leadership is willing to listen to unfavorable news about their policies, practices, and behavior.
- Top leadership is willing to accept unfavorable news as fact without discounting it.

Studies have shown that the most important element in creating a lasting innovative organization is the commitment of leadership to establishing a culture where all ideas are good ideas, where incentives are given not only for successes but also for rapid failures, and where methods are used to encourage and recognize innovation results of significant value. If management undermines a bad idea, good ideas will be slow to develop.

### 4.1.2 Develop an organization to support innovation

To establish a lasting infrastructure to support innovation, an organization needs to identify innovation as a key business objective; innovation becomes one of the organization’s essential values. This infrastructure should support the development of innovation by both individuals and teams.

Individuals, whether research scientists, software programmers, or production personnel, have the ability to identify innovative opportunities, for the organization as a whole or just for their specific work areas. The organization’s infrastructure should allow its employees the freedom to be creative, as well as provide the tools and communication methods needed to express this creativity.

Adding further to the innovation structure is the use of teams. Once opportunities are identified, teams are needed to review the risks and solve the problem. It has been shown that teams will come up with the best answer more quickly and consistently than will individuals. The effectiveness of the teams depends upon a structure that allows for interaction, information, and a shared vision. To support this structure, it is
important to create a reward and incentive program that encourages risks that lead to innovative ideas, even if they result in failure.

4.1.3 Develop and use an innovation process

The third element is the deployment of a systematic innovation process. The idea is to apply methodologies and structure to innovation as one would any other business process. A defined framework could be established with an owner assigned. The owner could be a member of senior management, a functional manager, or a committee. This framework might include: market assessment, idea generation, focusing, development, prototyping and piloting, rolling out, measurement, assessment, and feedback. To help aid the effectiveness of the innovation framework an organization might improve or modify its IT structure for increased speed, connectivity and availability of knowledge, data, and other internal/external information.

As most excellent organizations have found, one of the primary keys to long-term success of processes is to actively measure, assess and review their effectiveness. The overall management of the innovation process should include measurement of innovation performance, its results, and impact on the organization’s performance. Possible measures might include; percent of sales from new or improved products, cost reduction through innovation, or customer’s perception of design innovation.

While an innovation process should be systematic and well defined, it should not be stifling and inflexible. The basic dilemma of innovation is how to structure people’s creativity without losing opportunities, time, or money. Or in the words of Tom Kelley, “Go ahead and color outside the lines, but try your best to stay on the same page.”

4.1.4 Key business areas (technology, product and service design, outsourcing)

Once an innovative culture is ingrained and the requisite tools and methodologies are in place, creativity and innovation can be applied to all business areas. The most common areas might be product development, including time-to-market and research and development (see Sections 8 and 9); supply chain management and outsourcing (see Section 7); and information technology. However, it is important that the organization identify its key business areas or processes based on customer markets and needs, in order to obtain maximum benefit from the innovation process.

Effective management of innovation may also involve mergers and acquisitions to obtain proven expertise, as well as divestitures to provide additional financial resources and focus on core businesses. Some organizations have used this model very successfully by relying on their internal expertise of networking to establish a comprehensive communications network.

To effectively manage innovation, it is crucial that innovation, and thus adaptability, be established fully in the core business, not just in exclusive “Skunkworks” or spin-offs, in order to increase the odds of long-term success in the ever-changing telecommunications industry.

4.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers creating the need to encourage and manage innovation are as follows:

4.2.1 Development and manufacturing capacity constraints for new technology

4.2.2 Diversity of technologies needed by service providers, and the need to optimize/prolong the lifetime of existing deployed assets (present technologies)

4.2.3 The need to balance short-term cost control against the long lead times involved in anticipating unpredictable increases in demand

4.2.4 The need to minimize service failures, reduce maintenance spending, and increase service differentiation

4.2.5 The need to create revenue streams outside of traditional telecommunications
4.3 **Examples**

Here are some examples to consider for guiding your company in encouraging and managing innovation.

### 4.3.1 **Culture**

a. Create office spaces that are conducive to employee and team interaction and allow for impromptu meetings. These spaces might include a décor that expresses the business or team spirit, as well as focal points that naturally draw people together.

b. Design office space around projects or teams instead of functions. Make sure the employees’ offices address power, network, and telecommunications needs. Make them completely mobile, so that employees can easily pick up and move to another team, project, or building.

c. Give out homemade end-of-project awards, as a peer-oriented way to celebrate and recognize team contributions.

d. Publicly acknowledge a risk taker, a rule breaker, even a failure, and explain why every successful organization needs them.\(^6\)

e. Hold an open house for staff members and project leaders to show off their work in process, as a way to motivate teams and encourage cross-pollination.\(^6\)

### 4.3.2 **Organization**

a. Create an organic organizational structure that initiates adaptive responses to challenges, opportunities, the need for new technology, and so on. For example, some may have an innovation infrastructure built around acquisition and integration while others may be built around research and learning incubators.

b. Speed the rate and pace of breakthrough innovations. This means achieving a level of innovation that has an exponential or breakthrough nature, rather than being derivative. Possible ways to increase the innovation rate may include:
   1. Increasing efforts to bring research and development (R&D) employees in contact with customers
   2. Perfecting methods for determining evolving customer needs
   3. Using data mining and warehousing for knowledge sharing

c. Keep a list of the barriers and bridges that either aid or hinder the flow of activities and breakthrough ideas.\(^6\)

d. Think about creating new organizational space. Do so by fencing off new structures within existing operations; by spinning off bits to start fresh; or via acquisition, by buying in the required capabilities ready-made.\(^7\)

e. Match individuals’ specific talents and capabilities to projects that challenge them.

f. Establish company wide councils to meet regularly and cross-pollinate.

### 4.3.3 **Process**

a. Use a venture capital model where start-up groups or teams present their ideas, including business and financial plans, to a venture capital board for funding and support.

b. Establish a tech box (a collection of interesting or cast-off items, such as materials, products, and technologies) to be used to jumpstart ideas or solutions to problems.\(^6\)

c. Determine critical success factors for innovation and then map them to determine the organization’s strengths and weaknesses.\(^8\)

d. Develop a process for quick prototyping, in order to test many ideas quickly and learn from them for the final solution.
4.3.4 Key business areas

a. Focus R&D innovation efforts on short-term new technology projects while giving traditional transport and hardware projects to telecom equipment and component manufacturers.

b. Outsource long-term research and development (R&D) projects, not tied to current financial goals, to university scientists, and other external resources.

c. Find new market segments based on customer needs. Help customers determine what these new segments and requirements are, as well as their economic and financial implications. An example is Virtual Private Networks (VPNs).

4.4 References

Footnotes


4. Prather, Charles. 1999. Three arenas of innovation. *Mind Play* (September). This article describes a DuPont Center for Creativity and Innovation model to guide program development.


Books and articles


Founding Fellowship Innovation University. 2000. *Innovation DNA model*. Innovation Network Inc. This article describes a model that defines what it takes to create an innovation organization.


Web sites

[www.baldrigeplus.com](http://www.baldrigeplus.com) – This Web site includes information on MBNQA criteria, with white papers on various topics including innovation.

[www.bottomlineinnovation.com](http://www.bottomlineinnovation.com) – This Web site gives information about creating a culture for innovation and offers consulting services from Charles W. Prather.
www.conference-board.org – This Web site includes information on speed, flexibility, time-to-market, and innovation.

www.thinksmart.com – This Web site is devoted exclusively to innovation.
Section 5
Technology and Knowledge Management

Technology and knowledge management is the process of ensuring that assets deployed in the organization are managed effectively to meet the current and future needs of the business. This includes management of technology, knowledge, software, firmware, and hardware.

5.1 Summary

Technology and knowledge management is the way in which a company manages its technology, its intellectual capital and property, and its knowledge base.

5.1.1 Knowledge management

In today’s telecommunications industry the management of knowledge is essential. It should be remembered that knowledge remains in the mind of the owner unless steps are taken to capture it. Knowledge management as a subject means many things to different people. In this context, the term refers to the ability to capture the knowledge of employees effectively.

Efficiency is improved by the use of knowledge capture tools, and by knowledge sharing that meets the needs of the organization. The use of focus groups, common interest groups, and networking can enhance this process.

By capturing this knowledge the company suffers less from losing its staff. In addition, by communicating this knowledge duplication of effort can be minimized.

The Harvard Computer Group\(^1\) has demonstrated that it is possible to get more than a 500 percent return on investment in knowledge management.

Also, consider the following\(^2\):

a. Establish who your customers are and which of your products and services they buy.

b. Systematically collect information from all customer contacts and share the resulting insights for the benefit of the next contact.

c. Access best practices from your entire organization when needed.

d. Apply the best expertise available to you in decision-making.

e. Become efficient in the use and reuse of know-how throughout the organization.

5.1.2 Use of technology to deliver solutions

The telecommunications industry is developing all the time, and the difference between telecommunications, information technology, and computing becomes ever more difficult to find. Just as customers require solutions, not products, so do internal customers (employees) require solutions for understanding and communicating. Technology should always be chosen with this in mind. With many telecommunication entities merging or being acquired, this is a very important area. Use the best practice you can find, rather than remaining with a traditional solution.
5.1.3 **Leveraging technology**

In the telecommunications industry it can be the case that people selling high-technology solutions do not employ the best themselves. Technology is not an end in itself, but through its wise use, for example, the provision of an e-commerce interface for customers, it can enhance the business.

5.1.4 **Control of high-technology assets**

It is important for companies to control high-technology assets for the following reasons:

a. They are highly susceptible to theft.

b. Their loss or improper use can create a serious breach of security.

c. They can easily be abused by employees for their own personal and recreational use.

Consider operating data security measures such as those defined in ISO/IEC 17799:2000 Information Technology – code of practice for information security management.

5.1.5 **Intellectual capital**

Associated with high technology and knowledge management is intellectual capital. This is the hidden asset value based on the knowledge of the people, and the brand and image of the company. To this extent intellectual capital is similar to “goodwill” in a business context – something that is inherent in the company but difficult to quantify. It may also be considered to be the difference between the total market capitalization of the company and the value of the real assets of the company.

It is the value inherent in the knowledge of the people within an organization that creates value for a company. In telecommunications, this capital may be of higher value than the tangible assets of a company. Therefore, these assets should be protected.

It is crucial to manage this asset so that it is protected, developed, and grown. Initiatives and plans that address this area pay benefits, not only to shareholder/stockholder value, but also to the reputation of the organization’s brand image and its employee’s knowledge and skills.

5.1.6 **Intellectual property**

Intellectual property may be defined as patents, copyrights, trademarks, trading secrets, and related interests. It may be branding, or a technology solution, or any other knowledge that might compromise the company if it fell into the wrong hands.

In telecommunications, it is essential that steps be taken to protect this property through the right use of patents and data protection.

Training in guidelines for file/document naming and structure techniques is of paramount importance in supporting a technology asset vision that must consider the storage and retrieval of intellectual property, whether on personal computers or on a sophisticated configuration management system.

The process to manage intellectual property should be used to leverage the maximum return during ownership.

5.1.7 **Use of legacy assets vs. new assets**

It should not be assumed that because an asset is old it is of no value to the company. For example, within a company, the person responsible for IS/IT must decide whether to stick with old software and maintain company wide compatibility, or whether to upgrade, which is usually a staged process. The latter will undoubtedly affect business efficiency for a while. Thus in many instances a strategy must be developed regarding asset management if the company is to survive.

5.2 **Industry Drivers**

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers creating the need to encourage technology and asset management are:
5.2.1 Software solutions that make knowledge retention essential,
5.2.2 Capital invested in legacy product.

5.3 Examples

Here are some examples to consider for guiding your company in technology and knowledge management:

5.3.1 Knowledge management
   a. Use a search engine to find tools that are readily available to manage knowledge in the company. Determine what the key knowledge sources in the company are, and develop a strategy for capturing that knowledge using available tools.

5.3.2 Use of technology to deliver solutions
   a. Use electronic data interchange in the supply chain.
   b. Use Internet, intranet, and extranet technologies to build on e-commerce opportunities and increase efficiencies.

5.3.3 Leveraging technology
   a. Establish information technology standards, guidelines, and conventions to ensure uniformity and compatibility.

5.3.4 Control of high-technology assets
   a. Use electronic asset management tools. Search the Web on “technology and knowledge management” for examples.
   b. Establish a technology and knowledge management review council.

5.3.5 Intellectual capital
   a. Intellectual capital can be protected by a forward-looking human resources strategy coupled with an effective knowledge management system. The aim should be to retain good people and the key knowledge that each member of the organization potentially has.

5.3.6 Intellectual property
   a. Set up an intellectual property team to ensure that inventions are properly patented and that others are not infringing patents.
   b. Develop a policy on branding and image.
   c. Consider use of an electronic document management system.

5.3.7 Intellectual capital
   a. Consider use of an electronic document management system.
   b. Use tools to create a knowledge-sharing environment.

5.3.8 Use of legacy assets vs. new assets
   a. One operator had to decide whether to use its existing copper infrastructure or develop a new fiber system. The keys to this decision were:
      - Knowledge of the copper infrastructure,
      - Knowledge gathered by a marketing effort to determine the cost and revenue basis of the options,
      - Knowledge of the reliability and performance of the copper infrastructure,
Knowledge of the technology for both enhancing the capability of the copper and implementing the new fiber systems.

5.4 References

Footnotes

Books and articles
Holtham, C. 1998. Converting the knowledge of a distributed workforce into a competitive weapon. From EMG Knowledge Manager.
Section 6
Strategic Partnering

The process of strategic partnering considers the long-range goals of the organization. Prospective strategic partners are broadly defined as customers, suppliers, distributors, alliances, mergers, acquisitions, divestitures, joint ventures, and contractual partnerships. Strategic partnerships are working relationships between two or more parties aimed at creating added value for all parties.

6.1 Summary

6.1.1 Determining the need for strategic partnering

Achieving and maintaining a substantial market share often requires implementation of well-managed strategic partnerships. The need to create and manage strategic partnerships may be considered because of technological innovations, service requirements, feature demands, and the limited availability of resources within the global telecommunications industry. It should be noted that partnerships might be short- or long-term, depending on the needs of both parties.

6.1.2 Developing strategic partnerships

The partner should be considered and treated as a critical in-house organization. Partners need to know about strategic and tactical planning objectives and be part of the decision-making process at a high level.

Before implementing a strategic partnership, a business case or strategic plan should be developed that includes identification of the areas of potential failure. The business strategy should contain a process for managing the risks associated with business partnerships. Also, this process should include methods of selective decoupling or divesting parts of the organization.

6.1.3 Implementing strategic partnerships

Key considerations include the alignment of the business management systems in the two organizations. The following business management systems may require alignment:

- a. Communication channels
- b. Quality and environmental management systems
- c. Measurement systems
- d. Human resources
- e. Financial
- f. Legal
- g. Information systems
- h. Production
- i. Others

It is important to develop means of measuring the results of strategic partnering. Some possible results to be measured are:
a. Customer results  
b. Success in gaining entry into new markets  
c. Success in obtaining added technological advantage or capability  
d. Success in acquiring needed personnel  
e. Success in exploiting new synergies as a result of partnering  
f. Improvements in the bottom line as a result of the partnering strategy  
g. Results of benchmarking with strategic partners

6.1.4 Evolution of strategic partnering

Once your strategy includes strategic partnering, you will need to evolve the strategy on a continuing basis. During the evolution, things to consider include the following:

a. The risks and benefits of the strategy, and its relationship to the long-range vision of the corporation  
b. The potential impact of obtaining new partnerships such as joint ventures, mergers, acquisitions, contract manufacturing, and strategic divestitures

Periodically, the strategic plans should be reviewed.

a. The evolution of the partnering strategy should be accomplished in conjunction with the elements of managing continual business improvement (see Section 2).  
b. The status of strategic partnering should be considered during the management review activity.

6.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers that affect customer-supplier strategic partnerships:

6.2.1 Increased profitable market share  
6.2.2 Changes in marketing strategies as a result of entries into new markets  
6.2.3 Utilization of skilled personnel, perhaps more effectively  
6.2.4 Technological diversity  
6.2.5 Necessity of prolonging the service life of present technologies

6.3 Examples

6.3.1 Determining the need for strategic partnering

a. Strategic partners should be trained to identify key strategic issues, prioritizing them and leading their resolution. One key strategic issue is the availability of components and other supply-chain products in short supply.

6.3.2 Developing strategic partnerships

a. Organizations are outsourcing their production to contract manufacturers (CM) and then purchasing the manufactured products from the CMs. This saves inventory and labor costs and improves the stability of their organizations. On the negative side, the risks associated with their products increase.  
b. Partnerships may include competitors jointly developing new components and products. In these circumstances the partners may use their marketing resources to publicize each other’s related products.
c. One global organization has opened branches of its world-renowned research laboratories in many countries where it has offices and factories. The organization partners with universities in those countries and with government agencies.

d. One process for developing strategic partnerships includes the following:
   • Benchmarking the elements of the partnering strategy
   • Plans for managing communication and synchronization of partnering activities
   • Plans for integrating the elements of the management system between the partners

6.3.3 Implementing strategic partnerships

a. Measurements can be taken to show the following:
   • Improvement in business performance, that is, customer results, operational performance, and financial performance
   • Evidence of the success of the strategic plans
   • How cultural differences were addressed (see Section 3, “Managing Organizational and Cultural Change”)
   • How employee satisfaction and leadership attrition were addressed
   • The effect of the partnership on customer satisfaction
   • Effectiveness of the combined operations (see Section 3, “Managing Organizational and Cultural Change”)

b. Decisions need to be made on what tools, facilities, and processes should be retained, replaced, or outsourced, and the time frame of the actions.

c. Organizations that are very effective in acquiring other organizations have processes for aligning the management functions first.

d. Partnering organizations work out processes for sharing manufacturing and marketing information.

e. Service providers need to select as their partners suppliers that can provide products and services that meet their expectations for performance, delivery, and cost, and provide continued product support, maintenance, and necessary upgrades for their products. Similarly, suppliers need to select supply-chain partners that can meet the same expectations.

f. Some legal issues to consider when implementing a strategic partnership are: 1) warranties of the technology, 2) indemnification, 3) non-soliciting and non-hiring of employees, 4) potential conflicts of interest, 5) patent royalties from cross-licensing, and 6) incomplete restrictive covenants.

g. When dealing with a foreign country, distributors are of great value as strategic partners.

6.3.4 Evolution of strategic partnering

a. Meetings should be set up with strategic partners to discuss the following:
   • The results of the partnering strategy
   • The need for expanding or changing the partnering relationship
   • The effectiveness of communications between partners

b. The status of the partnering strategy should be analyzed, along with that of the improvement loop (see Section 2).

c. Provide inputs to the management review process (see Section 2).
6.4 References

Books and Articles


Tong, Gregg. *outsourcing/strategic partnering for NPD*. www.interaction.brunel.ac.uk/idforum/98_04/0173
Section 7
Strategic Supply Chain Management

Strategic supply chain management encompasses every effort involved in managing, realizing, producing, and delivering products and services, end-to-end.

7.1 Summary

Strategic supply chain management is concerned with strategies, partnerships, and processes that deal with the product offering, product realization, and product maintenance. The core of SCM is concerned with how well one manages and executes the flow of product and information not only from order entry to paid invoice, but also from market requirements capture to post-installation. Thus, excellence in supply chain management can become the foundation of customer satisfaction and competitive advantage.

As Charles H. Fine says in Clockspeed, “A supply chain can determine the fate of companies, of industries, of profit, and power."

7.1.1 Defining and modelling the supply chain

Managing supply-chain operations involves such key process areas as sourcing, procurement, making, distributing, storing/warehousing, and installing, but could also extend further into defining (before sourcing), integration/evaluation activities, and caring (following installation). The end-to-end extent of this chain is as defined by the organization and its interconnected multitiered customer-supplier needs.

Included in Appendices A and B are examples of ways to model and define the supply chain. Key and support processes would then be defined along with a set of critical result and process measures. These would be aligned both across and within the supply chain, including customers and suppliers as appropriate. The need for defined and improved processes and process measures is becoming even more critical with the accelerating increase in e-commerce and business-to-business (B2B) practices.

See Appendix A for the Supply Chain Operations Reference Model (SCOR). The model is generic but includes, at more detailed levels, descriptions of processes, sample measurements, and sample best practices.

See Appendix B for a Supply Chain Approach and Improvement Model from a telecommunications service provider perspective.

7.1.2 Setting supply chain business objectives

It is important to examine how the company manages, and needs to manage, its particular end-to-end supply chain. Defining a strategy and set of business objectives around supply chain management is a fundamental activity, as is monitoring the results of the end-to-end supply-chain performance and its contribution to overall business success.

7.1.3 Managing and improving customer/supplier interactions

It is also critical to identify periodically (using a systematic approach) the organization’s key customers and suppliers, and its potential customers and suppliers in light of future technology and business demands. Some key processes within this fluid supply chain may have been outsourced, so how the resulting relationships are subsequently managed for optimal performance will also be critical. It may be necessary to carry out process alignment activity along the supply chain, and to create linkages into the SCM
processes of customers and suppliers, taking into account how any underlying organizational culture issues are resolved (see Section 3).

A common component of developing an integrated supply chain management strategy is holding periodic meetings with key customers and suppliers, perhaps in strategy and objective sharing sessions, in order to discuss combined supply chain requirements and performance, and to work on specific improvement projects. These may also be useful forums for setting target objectives for TL 9000 measurements and other performance criteria. This dialogue can help all parties understand each other’s requirements and perceptions, and realize the impact on each other of reduced supply chain performance, as well as the mutual benefits of improved supply chain performance. Within the organization, this knowledge would be shared within relevant functional groups, and appropriate improvement actions would be tracked. An additional aspect of this involves utilizing the supply chain in building product offerings, marketing activities, innovation, and process improvements.

### 7.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers affecting supply chain management are:

- **7.2.1** Accelerating rate of change
- **7.2.2** Shrinking product life cycles
- **7.2.3** Need for agility and velocity (a particular difficulty for the larger service providers and suppliers)
- **7.2.4** Legacy systems that impair agility
- **7.2.5** Management of diverse assets
- **7.2.6** Nontraditional suppliers
- **7.2.7** More demanding service providers and end-user requirements and perceptions,
- **7.2.8** Shortage of skilled people
- **7.2.9** Demand exceeding forecasts (unforecast demand), and forecasts exceeding demand
- **7.2.10** Competition by supply chain (not just individual companies) that exposes weak elements in the supply chain

### 7.3 Examples

Here are some examples to consider when guiding your company in supply chain activities:

#### 7.3.1 Defining and modelling the supply chain

a. Define your supply chain and management scope, considering customers, suppliers, and the types of products and services involved. Define your major “production” and support processes.

b. Involve supply chain partners in the visioning, planning, and implementation of modern and innovative business methods. Consider the following methods:

- Moving from *vertically-integrated* to *virtually-integrated* (outsource, alliance, and so on) supplier operations,
- Using e-commerce and B2B,
- Utilizing asset management in improving your supply chain capability chain,
- Applying demand chain principles (upstream material flow capability) to enable improved supplier performance,
- Moving from asset ownership to asset management through outsourcing.
7.3.2 Setting supply chain business objectives

a. Establish high-level balanced scorecard measures for your overall supply chain, including customer- and supplier-focused measures. Establish linked lower-level measures for key production and support processes. Include both in-process and results measures. Ensure that the scorecard is linked to organizational strategies and goals.

b. Establish current and long-range goals for improvement based on the selected measures. Use these to drive improvement (linking with 7.3.3 below), to track progress, and to compare or benchmark with other organizations.

7.3.3 Managing and improving customer/supplier interactions

a. Set up periodic customer focus groups and forums with the participation of key suppliers. This could be helpful in forging supply chain partnerships.

b. Establish methods of communication with suppliers, such as periodic one-on-one meetings and collective meetings, to enhance cooperation within the supply chain. Electronic formats of communication, including EDI and real-time data transfer, may also be established.

c. Recognize individuals and teams within the supply chain for their performance.

d. Promote participation of the supply chain in relevant professional bodies, conferences, and seminars, particularly those that promote, share, and support excellence.

e. Many organizations provide training for their subcontractors. With the increase in contract manufacturing, supplier training becomes even more important.

f. Involve key players in the supply chain for creative problem solving, such as in dealing with the need to find a solution to customer needs or supplier problems.

g. Form joint teams to investigate bottlenecks to delivery performance issues, difficulties your customers have in doing business with you, and significant quality and reliability issues.

h. Share and deploy key recent performance review findings, priorities for improvement, and opportunities for innovation with your suppliers/partners and key customers, in order to ensure supply chain alignment.

i. Involve the supply chain in process and system improvement programs, in such areas as forecasting, order management, supply and demand analysis, and resource planning tools.

7.4 References

Books and articles


Web sites


www.sei.cmu.edu -- Software Acquisition Capability Maturity Model (SA-CMM)
Appendix A
Supply Chain Operations Reference Model

Figure A-1 illustrates the Supply Chain Operations Reference Model (SCOR). The model is generic but includes, at more detailed levels, descriptions of processes, example measurements, and example best practices.

The SCOR-Model Scope

The SCOR Model has been developed to describe the business activities associated with all phases of satisfying a customer’s demand. The model itself contains several sections and is organized around the four primary management processes of plan, source, make, and deliver, as shown in Figure A-1. By using these process building blocks, the model can describe supply chains that are very simple or very complex, using a common set of definitions. As a result, disparate industries can be linked to describe the depth and breadth of virtually any supply chain. The model has been able to successfully describe and provide a basis for supply chain improvement for global projects as well as site-specific projects.

Figure A-1: SCOR is organized around four major management processes.

The SCOR Model spans all customer interactions (from order entry through paid invoice); all physical material transactions (from supplier’s supplier to customer’s customer, including equipment, supplies, spare parts, bulk product, software, and so on); and all market interactions (from the understanding of aggregate demand to the fulfillment of each order). It does not attempt to describe every business process or activity. Specifically, the model does not address sales and marketing (demand generation), product development, research and development, or post-delivery customer support.

It should be noted that the scope of the model has changed and is anticipated to change based on council member requirements. In version 3.1 of the model (described in this Appendix), specific language has been introduced to expand the model to include service transactions, as well as physical material transactions, based on council member requirements to bundle goods and services in offerings to their customers.
Additionally, there is significant technical activity underway that is likely to lead to the evolution of the model into post-delivery customer support.

The latest information on the SCOR Model can be found at the Supply Chain Council Web site at www.supply-chain.org.
Appendix B
Supply Chain Approach and Supply Management Improvement Model

Figures B-1 and B-2 illustrate a Supply Chain Approach and Supply Management Improvement Model from a telecommunication service provider perspective.

**SUPPLY CHAIN APPROACH**

Figure B-1: Supply Chain Approach

1) **Internal organizations plan and determine their needs**
   
The demands for goods and services are triggered to meet customer requirements or internal needs. Examples include equipment and services for the network, computer equipment, and other products and services for internal needs, and maintenance products and services.

2) **Needs are converted into product and service requirements**
   
Requirements from various organizations are clearly defined through specifications, performance criteria, standardization, and other methods. Opportunities to leverage corporate volume are identified.

3) **Market and industry analysis quadrant approach**
   
Major markets in the supply chain are analyzed and monitored to track trends in technology, prices, costs, quality, and other key factors. This effort positions the supply chain management organization as a “knowledgeable buyer” in these markets. A procurement strategy is selected, using the quadrant model (commodity, distinctive, generic, and critical) that matches the industry and particular supply stream. Note: There are several approaches to selecting procurement strategies based on the nature of the supply stream, the competitive environment, and specific customer-supplier situations. At the end of this section are two examples of quadrant models.
4) **Sourcing decision**

A supplier is selected using the appropriate process and based on the customer needs, technical requirements, dollar value, risk, and other factors. A contract document is used to define the responsibilities of both the supplier and user. Procurement systems and procedures streamline this phase, as well as provide links to legal and data collection to record the transaction and track performance.

5) **Delivery/deployment/installation**

The physical flow of products and services follows one of two primary paths. Network products and services are delivered from suppliers, deployed to the appropriate geographical location, and installed by the company or supplier’s technicians. Internal needs are delivered to the employee’s work location or point of use.

6) **Maintain**

Monitor the performance of the telephone network using internal technical data as well as external customer feedback. Replace and upgrade equipment to deliver high-quality products and services to customers and employees.

7) **Disposal**

Implement current procedures to recover, recycle, and sell obsolete equipment or other assets.

8) **Manage the supplier arrangement/relationship**

Establish a collaborative relationship with key suppliers using various tools, including alliances, commitments, two-way report cards, performance incentives, communication routines, and so on.

**SUPPLY MANAGEMENT IMPROVEMENT**

Supply management is an improvement cycle in the supply chain approach. It is focused on managing and improving specific supply streams within the overall context of the chain.

9) **Procurement**

This focuses on supplier optimization with the “best of the best” suppliers.

10) **Continual improvement**

This involves guiding suppliers’ resources to improved product and service efficiencies.

11) **Innovation**

Innovation engages suppliers’ research and development to locate/develop leading-edge technologies for innovation in the company.

![Figure B-2: Supply Management Improvement](image)
Example Quadrant Approach

The chart in Figure B-3 combines two very similar approaches to strategic sourcing strategies: The first is based on risk and value assessment, and the second is based on the level of customization required and the market impact.

The approaches outlined in the chart represent activities that are not confined to the procurement organization, but require the participation of the appropriate logistics group, for example, the users, IT (as an enabler), marketing or product development organizations, and the supplier.

Sourcing strategies are developed for every supply stream in priority based on an understanding of the “spend” and “total cost of ownership.” The strategies provide analysis of the cost drivers and value elements of the products or services, and detail market and industry conditions for suppliers and other customers. These plans depict the value chain of the acquired product or service as it flows through the supplier (and potentially the supplier’s supplier if appropriate), through the company, and through its customers to include repair, reuse, and recycling to end disposition. The strategy details a plan of action, opportunity for impact, priority for execution, contingency plans, and exit strategies.
As another example, the following is a different version of a quadrant approach that is used to segment supply streams and apply appropriate strategies:

<table>
<thead>
<tr>
<th>Risk/ exposure</th>
<th>Strategic security (ensure supply)</th>
<th>Strategic critical (manage supplier)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Long-term contracts</td>
<td>Medium-term contracts</td>
</tr>
<tr>
<td></td>
<td>Volume conscious</td>
<td>Supplier analysis development</td>
</tr>
<tr>
<td></td>
<td>Stockholding</td>
<td>Price management</td>
</tr>
<tr>
<td></td>
<td>Cost insensitive</td>
<td>Contingency planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partnering relationship</td>
</tr>
<tr>
<td>Tactical acquisition (minimize attention)</td>
<td>Systems contracting</td>
<td>Tactical Profit (drive profit)</td>
</tr>
<tr>
<td></td>
<td>Stockless purchasing</td>
<td>Market knowledge</td>
</tr>
<tr>
<td></td>
<td>Consignment stock</td>
<td>Active sourcing</td>
</tr>
<tr>
<td></td>
<td>Credit cards</td>
<td>Market exploitation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Short-term contracts</td>
</tr>
</tbody>
</table>

Relative cost ➔

Figure B-4: Supply Positioning
Section 8  
Life-Cycle Planning and Management

Life-cycle planning and management make up a framework that contains the processes, activities, and tasks involved in the development, operation, and maintenance of a product or service. This framework spans the life of the product or service from the definition of its requirements to end of life.

8.1 Summary

The life-cycle process is an essential part of a company’s ability to supply its products and services to the marketplace successfully. To provide a foundation for success, the life cycle framework must include the processes, activities, and tasks that lead from a company’s strategic direction to product/service introduction and end of life.

Many factors affect a company’s ability to be successful. The ability to prioritize resources effectively, in the selection and deployment of projects, is of fundamental importance. This prioritization is closely linked to the product strategy determined for the business.

8.1.1 Business management

An important part of the life cycle is the business management of product strategy, and its deployment through decisions regarding the timing of product release, service introduction and market announcements. Timely announcements stimulate and inform the market, in order to create customer interest and shareholder value. This is, however, dependent on efficient life-cycle processes that have quick turnaround time and accurate product-introduction projections.

Effective product management requires the identification of discrete process steps or phases to rationalize costs, sales projections, and so on, and to optimize the timing of management decisions to continue or cancel a project.

8.1.2 The planning process

A sound planning process will ensure effective communication with the market and customers. The planning process should utilize sound project management techniques such as coordination of activities, efficient sizing, risk management, and resource management with appropriate measurements of progress and performance. Many companies use a “gate process” to step through each phase.

Life-cycle planning with strategic customers and suppliers throughout the life of the product is also essential. This planning enables customers and suppliers to be more effective in managing their product life cycles, and ensures a mutual business advantage.

8.1.3 Life-cycle cost modelling

Cost modeling is also an essential part of life-cycle planning and management. The model should include balance of cost against the return on investment (ROI) and other contributing factors. Often ROI will be considered against the value of business potential, rather than just the revenue from a specific release. Business potential can relate to market share or the potential for a new technology. Either way, cost and business justification needs to be tracked during the life of the product, and will drive decisions such as project cancellation, extension of product life, and so on.
8.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers creating the need to encourage life-cycle planning and management are as follows:

8.2.1 Competitive position and desire for competitive advantage (first to market)
8.2.2 Sales and revenue projections developed with confidence and accuracy
8.2.3 Changing customer requirements and schedules
8.2.4 Customer desire for cost-effective solutions
8.2.5 Customer desire for innovative solutions to satisfy their customers; also, with particular focus on new opportunities such as the Internet, the value of innovation to specific market areas such as the consumer market, the banking world, other high-technology end users, and so on
8.2.6 Need to provide service providers and end-user customers with strategic advice and direction for future business solutions
8.2.7 Reduction of customer service support and maintenance costs
8.2.8 Need to utilize changing technology
8.2.9 Impact of environmental considerations on product introduction, withdrawal and disposal, including consideration of global and national environmental legislation, such as the World Trade Organization (WTO) provisions and agreements and the regional EU Directives Global Telecom Initiative on Environmental Impact and Sustainable Development

8.3 Examples

Here are some examples to consider when guiding your company in life cycle planning and management:

8.3.1 Business management

a. The use of project approval councils, wherein senior management, acting as an investment body, provides project approval or disapproval to the team. This method effectively impacts the teams involved and stresses the importance of addressing the business aspects, that is, project costs and ROI, as well as the technological innovation advantages of the product.

b. A key aspect of success is having the right selection of product concepts to be realized, together with the appropriate development expertise, and the effective resource planning necessary to ensure a return on the investment. These aspects come together in a process involving concept selection, funding and project initiation. This will typically be called a pipeline process (see Figure 8-1).
c. Successful companies have many concepts and, through systematic evaluation, select those projects that can be supported with available resources and also reflect the overall product strategy. Companies that do not do this may initiate too many projects, which cannot be supported, and typically will not be cancelled, therefore using valuable resource and cost without the opportunity for any revenue return. This situation also jeopardizes the potential for successful products from other projects because of the misuse of resources.

d. Recognition of the need for different development processes, for example, those aimed at revenue-driven projects (short-term return), and those with a strict research or new-technology objective (potential or long-term return). Examples may include: 1) the development of a new software process based on object-oriented design, and 2) a decision to move from a classic “waterfall,” or sequential, software development process using structured design, to a more iterative “spiral” process with an emphasis on software reuse.

e. Continued monitoring of the business attributes after initial product release to enable effective decision-making for further development, maintenance, and product discontinuation. Ability to analyze and learn from past history and retrospective reviews to positively impact the future is a key factor here, and is often crucial for continued success.

f. Monitoring of some detailed product attributes affecting customer satisfaction is also important from a market and business perspective. Examples are product reliability, network availability, service, performance, interoperability, and so on. (See Section 11 for further information.)

h. Effective business decision-making, and ultimate success, will utilize key measures. These measures provide the information needed to make timely “go or no-go” project decisions, as well as appropriate announcements to the market and to customers in general.

8.3.2 The planning process

a. Effective planning will result in business targets that will be viewed by the market with confidence, and hence will have a positive impact on shareholder value.

b. Product planning (portfolio management) associated with managing product families, and release plans.

c. Identification of phases aligned for key business decisions such as concept, project approval, requirements and planning, design and development, customer acceptance, market broadcast, general availability, operation and maintenance, and disposal.
d. Environmental considerations built into product life cycle. Materials with low environmental impact should be utilized. Withdrawal mechanisms, reuse, and recycling are major considerations.

8.3.3 Life-cycle cost modelling

a. Provide a smooth progression between the end of life of one product and the release of a new product. This needs to be considered from a market and customer perspective that shows innovative progression in product evolution. Many new products are a natural progression of older products, especially software bug-fix releases that also include new features or functionality. This progression can give rise to specific problems related to maintaining legacy product. This approach may also encounter difficulties in ensuring that the new release contains all the bug fixes and functionality contained in previous maintenance releases.

b. Establish life-cycle cost models that utilize measures, actual and projected, for sales, project costs, and revenue returns.

c. Provide business-focused measures to determine the effectiveness of the life cycle, during the initial projects as well as the overall product life. For example, identify the revenue from new products released during the last two years, compared with revenue from products older than two years. This type of measure is of particular interest to the stock market and will stimulate new investments. Appropriate reviews should be conducted in between phases for early capture of issues.

8.4 References

Books and articles

The objective of a time-to-market (TTM) initiative is to reduce the time to delivery for new products/services, and upgraded current products/services (features, patches, and so on), in order to become increasingly competitive in satisfying customer requirements.

9.1 Summary

The search for speed to market goes beyond an accelerated supply chain. It embraces decision making in every part of the organization, including the strategy team, planning, human resources, communication, finance, and product development and production. The goal is to meet market windows without sacrificing the quality, reliability, and cost of products/services and support.

The steps needed to bring products/services to market include the use of innovation in creating the concept (see Section 4), life-cycle planning (see Section 8), supply chain management (see Section 7), and delivery and support management (see Section 10). Each step provides opportunities to optimize business processes. Additionally, organizations must consider customer/supplier relationships, stakeholders’ interests, and the company strategy for product entry. Optimizing these processes gives a company improved flexibility and competitive advantage in bringing new products to market.

The organization’s structure and culture will likely be impacted in the quest to continually improve TTM capability. Market success will be measured by the extent to which the organization effectively introduces new products on time and in sufficient quantities to meet the market needs.

9.1.1 Life-cycle planning and management

Section 8, “Life-Cycle Planning and Management,” describes the research, development and production-realization portion of the life-cycle model. Optimizing TTM depends on using innovation to develop these processes without compromising quality, reliability, and customer support.

Also, at the start it is necessary to understand your major customers’ long-term strategy and planning. Section 6, “Strategic Partnering,” discusses how improved and systematic communication with key customers, suppliers, and the market in general can provide clear expectations and problem resolutions. Input from customers and suppliers early in the product life cycle will reduce unforeseen issues and delays during product realization.

Identification of state-of-the-art core competencies such as technology, tools and communications is critical when introducing new products/services. For example, working on convergence of voice, data, and wireless will not be effective if your company does not have core competency in these areas. Outsourcing and obtaining acquisitions may be needed to address competencies that are missing (see Section 6).

9.1.2 Innovation

Many market-leading companies have become the victims of new-market entrants that use innovative technologies and management practices. Innovation ensures that the company will be on the threshold of technology and will positively impact TTM. (See Section 4 for more detail on encouraging and managing innovation.) However, it is important to make sure that TTM is not accelerated at the expense of product/service quality and reliability.
9.1.3 Development strategy

In fast-moving industries such as telecommunications, a development strategy that focuses on a project approach to meeting customer and market needs is more effective than traditional projects organized by functional organizations. A cross-functional project team structure helps to focus efforts around product. This approach also tends to optimize product excellence, instead of emphasizing historical functional structures.

Organizations that are structured around teams rather than serial development strategies tend to communicate better, and have greater overall efficiency and speed. This shift impacts the organization structure and organizational culture, and significantly influences both the approach and the overall speed of development activities.

There are a number of considerations to make when structuring product realization activities. A preliminary list includes the following:

a. Benchmarking of competitors’ performance and the performance of relevant best-in-class processes. These can be either internal or external to your organization.

b. Considering the extent to which you have introduced parallelism between phases (concurrency), instead of relying on purely sequential activities.

c. Examining the strategic linkage between R&D, manufacturing, and sales, general and administrative (SG&A) investments.

d. Considering reliable and realistic ways of forecasting revenues and profitability curves.

e. Ensuring that products, projects, and solutions focus on customers rather than on internal functions.

f. Developing time-to-profitability measurements, and monitoring and reporting on them as part of management review activities at a senior executive level.
Figure 9-1 summarizes the thinking behind optimizing TTM.

Figure 9-1: How TTM changes the way products are brought to market

9.1.4 Project management and organization

Effective project management is a critical aspect of TTM. Great process management equips people with tools for accurate estimates of workloads, scheduling, and resource allocation while providing for product visibility. Make sure that resources are included to provide the extended support needed during early deployment of the product/service. Project management combined with an organizational structure suited to project-based methods provides the backbone of an effective strategy.

9.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers causing increased importance for optimized TTM operations are:

9.2.1 Responsiveness to severe price and cost pressures brought on by shorter product life cycles, development cycle times, and efficiency improvements,

9.2.2 The needs to quickly pay back premiums and bring new efficiencies of scale as a result of mergers and acquisitions,

9.2.3 Convergence in the wireless, wireline, and data industries,

9.2.4 Discontinuity of market segments brought on by the success of the Internet and newly emerging, 3G technologies.

9.3 Examples

9.3.1 Life-cycle planning and management

The following issues often impact the TTM process and are aspects of the process that need to be considered in optimization:
a. **People**
   1. Early cross-functional and stakeholder involvement, which provides for the least amount of rework and defects found late in the development cycle
   2. Cross-functional teams, effective project management, and portfolio management
   3. Open and dynamic interactive communication channels within the supply chain between customers and suppliers, and within internal business functions
   4. Clear authority and accountability with minimal delays for approvals
   5. Shared goals and purpose – a culture of speed and increased collaboration
   6. Team members’ stretching outside of their traditional disciplines, utilizing experience, and developing multiple skills and high-value knowledge management

b. **Process**
   1. Early customer engagement
   2. Sound, business-focused investment decision-making
   3. Product commercialisation discipline
   4. Well-thought-out product definition
   5. Integrated project and business plans
   6. Reliable schedules and clear measurements of success
   7. Early subcontractor involvement in the design and development of required products and services

c. **Portfolio strategy**
   1. Alignment of the product portfolio with actual/anticipated customer needs
   2. Resources balanced across projects, according to priority
   3. Management dashboard to monitor progress
   4. Decisions based on increased return on investment
   5. Continual forecasting and realignment

### 9.3.2 Innovation

See Section 4 for examples of innovation.

### 9.3.3 Development strategies

a. It is beneficial to identify specific roles and activities within your business’s speed-to-market/TTM process. These arrangements vary in style, depending on the organization’s management style (matrix vs. project-based, or functional vs. hierarchical) and culture (see Section 3). Some examples of TTM-enabling responsibilities and roles include the following:
   1. Use dedicated, expert TTM team members in support of specific projects for both core and extended team members.
   2. Provide training in TTM process fundamentals.
   3. Establish clear documented team roles and responsibilities in the TTM business model and within the project team.
   4. Use a defined, perhaps standard, TTM product introduction process.
   5. Create opportunities to provide feedback to functional managers or the implementation team.

b. If your business relies more on functional managers:
1. Ensure that functional managers are briefed on TTM fundamentals.
2. Establish a clear documented understanding of the functional manager’s role within the TTM business model.
3. Ensure that functional managers understand their role whenever they work in a matrix- or project-based environment.
4. Clarify the major responsibilities of a functional manager, as defined in documented roles and responsibilities.
5. Help the TTM business model work more effectively by providing feedback via the functional manager.

9.3.4 Project management and organization

a. Finally, determine the key indicators for important milestones within the project. Establish readiness gate-points and look for the following desirable outcomes at each decision point:

1. Strategic readiness
   - Is the market worth pursuing? Form an “opportunity team” to research the market.
   - Does the concept fit our core competency? Develop a business case.

2. Market readiness
   - Is the business case valid? If confident, form the team and plan the project.
   - Do we have competitive advantage and can we maintain it? Proceed with high-level design.

3. Business readiness
   - Does the customer accept the product? Develop and prototype the product.
   - Strategic assessment: can we win on cost, volume, price, and so on? Move to production phase.

4. Customer readiness
   - Is the product ready for introduction? Beta test, or verify the product in a customer environment.
   - Is there market differentiation and clear user acceptance? Implement support processes and ramp-up production.

5. Channel readiness
   - Do we have a successful production ramp? Move to volume production, make customer service ready. Are all processes ready for full deployment? Is product reliable, with capacity in line with forecasts? Move to full market-launch.

9.4 References

The agenda-fast change. 1999. Fast Company (April)


Section 10
Efficient Product Support and Delivery

Performing product and service delivery and support efficiently means meeting customers’ expectations and contract requirements for quality, timeliness of delivery, product identification, invoice accuracy, reliability, and continuing support.

10.1 Summary

Figure 10-1: Product delivery at all levels of the supply chain.

10.1.1 The criticality of product/service delivery and support

Efficient delivery and support of a product or service is a critical requirement in today’s market. Customers measure the value of delivered products and services by their quality and reliability, the delivery experience (timeliness, ease, and correctness of identification and invoice accuracy) and the quality of support offered throughout their life span. Note that for some products or services, roles will be reversed and a traditional supplier may be the customer and a traditional customer may be the supplier. Figure 10-1 describes the complexity of product and service delivery:
10.1.2 Customer’s needs and requirements
Customers at all levels of the supply chain expect suppliers to deliver and support their products and services, in order to gain the maximum value. Each of these customer subgroups has a required ROI based on the products and services supplied. The competition in the marketplace drives TTM and requires the supplier to deliver on time, install and integrate products and solutions into the customer’s infrastructure, train the customer’s personnel, and provide the needed problem solutions in the shortest possible time, consistent with the customers needs being met in a quality and reliable manner.

Suppliers and their customers need to form a working partnership to ensure efficient product or service delivery support. Active communication with customers is needed, in order to study, research, and understand their needs and expectations. This information is used in the suppliers’ and customers’ companies to set goals and priorities and to satisfy the following business needs: delivery of the correct product when and where it is wanted, and support of the product after the delivery.

10.1.3 Management of efficient delivery and support
Management of efficient delivery and support involves many functions working smoothly together. The key is the planning and implementation of delivery and support enabler functions: order management, project management, installation, technical support, training, new product introduction, invoicing, management, and resource planning.

It is important that the supplier’s subcontractors and partners be included in the main processes. The whole supply chain should understand the needs and requirements of all customers, and should meet the customer’s expectations in delivering the product and support. The organizations should understand the fragility of the supply chain, evaluate the risks, and prepare contingency plans to cover disruptions.

The supplier must know the customers’ needs and requirements to be able to develop its supply organization. A process-oriented organization of competent and committed individuals is crucial, because delivery and support are complex interlinked processes. Rapid order management is required by the customer from order entry to product delivery. This requires communication with other functions, such as manufacturing, engineering, distribution, and installation. The organizations’ obligations do not end at delivery. Support during installation and operation are important parts of the product/service experience.

10.1.4 Suppliers, subcontractors, and partners
The ever-shortening TTM dictates that the organization take the needs and maturity of their partners into consideration. For those partners that are emerging without the required skills and knowledge to deliver what they promise, the organization may have to train their staffs in the tools and techniques of product delivery and support. Good subcontractors and suppliers should be cared for, and should be closely involved in the organization’s plans and processes.

10.2 Industry Drivers
Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers of delivery and support activities:

10.2.1 Traditional deliveries of products are changing to integrated solutions that involve the various suppliers in the supply chain.
10.2.2 The telecommunications environment consists of many new companies in addition to the traditional service providers and suppliers.

10.2.3 The Internet has provided a new dimension (e-business) to the ordering process.

10.3 Examples

10.3.1 The criticality of product/service delivery and support
   a. Identify the most critical external stakeholders and develop a process to communicate with them.
   b. Define the greatest risks. These may include those affecting processes, business, and resources, and the risks produced by internal and external customers. Make an action plan to remove or diminish them and provide an input to the risk analysis of the whole organization.

10.3.2 Customer’s needs and requirements
   a. Set up a regular review of product delivery and support strategy, based upon the customer’s current needs and future requirements. Facilitate it with a joint customer-supplier review of the outcome of the strategy. Keep customers well informed on the status of critical success factors during each phase of the product delivery process. Collect feedback to enable quick corrective actions.
   b. Develop and define service agreements based on the customers’ needs, requirements, and maturity to ensure common understanding with the customers. A service agreement can consist of varying levels of technical support (on-call expertise, communication channels, and on-site support); training; repair and return (duration, warranty); documentation; and other services.
   c. Define a process to ensure internal commitment to the service-level agreements with the customer. Include regular communication with appropriate organizations in your organization and in the customer company, to ensure that all processes associated with delivery are up to date.
   d. Gather feedback from customers and take corrective and preventive action. Use the feedback and action plans to provide an input to internal and external audits and assessments.

10.3.3 Management of efficient delivery and support
   a. Define the internal stakeholders (sales, marketing, R&D, manufacturing, and so on) and establish a process of reliable sharing of information and strategic planning. This may require regular meetings to share plans and expectations of sales growth, and to provide for active participation in negotiations with customers and suppliers.
   b. As part of the planning process (see Section 7, “Strategic Supply Chain Management”), input channels and dependencies should be defined and linked to the resources, tools, and people used to fulfill customer needs quickly and efficiently. Use project management tools to efficiently track the delivery of products.
   c. Establish growth management plans to achieve product and support delivery based on the future needs and requirements of the customers, partners, suppliers, subcontractors, and internal stakeholders.
   d. Define the core competencies, processes, and resources (tools, equipment, facilities), and engage in an ongoing process to ensure that these are available when needed. Ensure that all phases of product delivery and support have the appropriate resources and personnel with relevant competencies.
   e. Understand and plan means to maintain the core competencies and to create an environment that attracts new hires.
   f. Define and develop e-business processes for product delivery and support from the customer’s point of view. Develop these processes in cooperation with the whole organization.
g. Define a new-product introduction and launch process that ensures that the processes, skills and knowledge, and tools of the delivery and support organization are up to the task of efficient product delivery.

h. Define a means of providing the customer with continuing support of the product or service. Examples of such support are 24/7 call centers, e-mail addresses, and Web sites.

10.3.4 Suppliers, subcontractors, and partners

a. Develop and establish a program on how to choose and support suppliers, subcontractors, and partners. The program can consist of quality requirements, audits, financial assessments, reporting process, training, interaction plan for top and senior management, cooperative planning of each customer shipment, and certification-level plan or report card.

b. Devise a method by which to communicate the customer’s actual demand of product delivery timetable to the whole supply chain. Ask the customer for the end-user delivery timetable deadlines. Get management’s commitment to the critical process milestones and deadlines.

c. Define assessment mechanisms for your supply chain. Assess the operational processes for their financial feasibility using cost management principles. Seek better ROI by making alterations in the processes. Concentrate on those areas where the most can be gained with the smallest effort.

10.4 References

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www.foodsci.rutgers.edu/ipds -- Rutgers University, Intelligent Product-Delivery Systems (IPDS): IPDS was developed to expand the role of packaging in the information age. IPDS concentrate on the food service industry, but provides a benchmarking tool for the telecommunications industry.

www.gte.com/aboutgte/organization/supply/index.html -- Verizon Logistics: Verizon Logistics specializes in providing domestic and international logistics, procurement and electronic repair services to national telecommunications service providers, original equipment manufacturers and contractors.

www.hud.ac.uk/sas/trans/index.htm -- Huddersfield University Transport and Logistics: The Transport and Logistics Research unit undertakes a great deal of industrially relevant research.

www.iolt.org.uk/whoweare/who_fr.htm -- The Institute of Logistics and Transport: The Institute of Logistics and Transport was formed in June 1999, after the integration of the Institute of Logistics and The Chartered Institute of Transport in the United Kingdom.

www.logistics.about.com/industry/logistics -- Logistics/Supply Chain Web site. Provides information and links to other sites on logistics and supply chain management.

www.productsasia.com/16ELECTRICAL/16720.htm -- Product delivery requirements. Provides information on telephone and intercommunication equipment.

www.sole.org -- Society of Logistics Engineers. A nonprofit international professional society composed of individuals organized to enhance the art and science of logistics technology, education and management.
Section 11
Network Reliability and Availability

Network reliability and availability is one of the most significant areas affecting customer satisfaction and end-user revenues. It is a direct result of the reliability and maintainability of the component products of the network, the architecture of the network, and the ability to detect and correct faults.

11.1 Summary

This Handbook applies to all organizations in the industry. It is not only about service providers and their approach to “network reliability and availability,” it applies to all those involved in the supply chain.

11.1.1 Designing-in network reliability and availability

Network reliability and availability (NR&A) is a combination of product reliability and maintainability, and the structure of the network. Network planners use tools such as simulation, human factors, and multiple routing techniques to design-in the desired NR&A.

11.1.2 Estimation of network reliability and availability

Tools exist for estimating reliability and availability of network elements. These estimates have a major effect on the architecture of the network and the maintenance strategies of the network operators.

11.1.3 Improving network reliability and availability

Improved NR&A is often achieved through redundancy and/or alternate routing within the network. This approach should also include consideration for the potential impact of natural disasters and periodic overloads.

a. A key to improved NR&A is the ability to detect faults and provide corrective action through product improvement and/or network reorganization. B.

b. In real time, network operators can change routing schemes to reduce or eliminate problems.

11.1.4 Customer perception

The perception of quality is a combination of the contributing processes that so often appear, from an end-user perspective, as being a random occurrence rather than a carefully thought out and designed plan. Understanding the contributing factors of these opposing concepts and the various organizational interfaces is often just as important and as complex as network design and availability calculations.

11.2 Industry Drivers

Industry drivers common to the telecommunications industry can be found in Section 1.2.2. Some specific drivers that affect network reliability and availability:

11.2.1 Competitive position, that is, the need to better manage products and services, reduce costs, and provide easier maintenance
Customer satisfaction and retention. A service provider’s network is one of their most valued resources and is the backbone of the service provided to their end customers.

Customer safety through support of public-safety services (that is, E-911 and fire protection systems)

Emerging technologies, including new architectures and products

A need to provide service providers and end-user customers with strategic advice and direction for future business solutions.

A need to provide clear and workable solutions to the customer

A need to quickly resolve problems and minimize resolution time. This requires that networks must be reliable and available—this includes being dependable and available 24 hours a day, seven days a week. In addition, failures need to be isolated and recovery must be invisible to the end user.

A need to improve network maintenance and better utilize resources. Reduction in problems will allow for a redeployment of extremely valuable technical resources to such areas as the design of new solutions and products. Competitive and budgetary issues have forced engineering and operations organizations to function minimum staffing in some cases.

A need to reduce internal costs

Avoidance of regulatory body action

Consideration of total cost of ownership concepts

Networks must be accessible, yet secure. This includes the capability to enable a variety of different types of connections to the network (dedicated, dial-up, and switched services) while maintaining network integrity.

Networks must be adaptable to accommodate a variety of independent technologies, as well as to integrate legacy technologies.

Increased network complexity has resulted in a greater vulnerability to service outages.

In ever-increasing cases network infrastructure is not under 100 percent control of one service provider. Service providers may share or lease space from another service provider resulting in reduced control over infrastructure that could affect network reliability.

**Examples**

**11.3.1 Designing in network reliability and availability**

a. Recognize the value of “designing in” product elements that can optimize network performance as well as the more traditional product reliability objectives.

b. To impact the architecture utilizing techniques such as self-testing, software self-healing, and fault and error reporting techniques.

c. Within the early phase of concept and design carry out conceptual behavioral modeling and trials to verify that the specified architectural models can support the expected behavior of the product.

d. Develop and deploy standards for selection and qualification of highly reliable equipment and periodic re-qualification based on age and service life.

e. Establish a model for requirement allocation in design and testing that optimizes selection of designer skills and expertise with critical configuration items.

f. To ensure effective test coverage and the avoidance of gaps use a consolidated approach in the planning for all test stages from code inspection, unit testing, through to acceptance testing and end-user network environment testing. This consolidation should include input from end users.
g. In providing a viable solution to a customer, contract manufacturers (CM) are often selected without determining the effects on NR&A. A focus of NR&A issues is also important for “interoperability” aspects with other CM products. Interoperability is an intrinsic part of design and post-release design service.

h. The role of suppliers, their quality processes, and management of change and obsolescence often slip through well-developed monitoring processes with adverse results. Look for new opportunities to address this type of problem.

i. An important part of network design is the consideration for use of emergency control center’s and similar redundancy concepts for natural disasters, for example, earthquakes, typhoons, and so on. Also for human factors in risks for over loading of the network, for example, peak telephone operation for holidays or natural disaster linked. With emergency planning consider the inclusion of adequate power backup generation, reserve equipment, and highly trained emergency response teams. Additionally, regular drills are established to test emergency team preparedness and response time.

### 11.3.2 Estimation of network reliability and availability

a. In the establishment and improvement of development processes there is a need to recognize those areas likely to impact NR&A and evolve the process together with the appropriate metrics.

b. Use measurement techniques to determine the efficiency of software architectures to optimize operational performance as well as feature and architecture test coverage.

c. Use tools such as failure mode analysis, reliability prediction modeling, network flow theory, and fault tree analysis as part of the NR&A methodology.

### 11.3.3 Improving network reliability and availability

a. Recognize and implement best practices designed to reduce the probability of service outages and improve network reliability. Review technical publications by such organizations as the Network Reliability Council and their reports such as “Network Reliability: A Report to the Nation” published in June 1993.

b. Use known quality tools such as those identified in 11.3.2c to look for new opportunities to improve the network design.

c. Configure systems in the factory to customer specifications, test them under field conditions, and ship the whole system to the customer.

d. Hold a user’s forum to work for common customer satisfactions to drive cost down and improve interoperability.

e. An important part of the network improvement is the analysis of natural disaster and network overload situations and the ability of the designed network to deal with the situation. Regular drills need to be established to test emergency team preparedness and response time, especially with today’s changing environment.

f. One major cause of reliability problems is the lack of qualified installation personnel. Often errors in installation do not show up for months or even years. Adequate training and performing installation audits can improve installation quality.

g. Installation and upgrades can be complex, especially because of the interoperability aspects. Therefore defining procedure and implementing training is key to improved and effective network operation.

h. The use of service management tools and products that can also provide significant improvement for network operation and availability and assure performance to required industry standards.

i. A fundamental aspect of sound NR&A design is the ability to effectively trace requirements throughout the development process together with an effective configuration and change management system.
11.3.4 Customer perception

a. Recognize the important role of the problem management process, the related service and support processes, and open communication with customers.

b. Recognize the importance of strategic partnerships in understanding and dealing with situations and processes that can help resolve NR&A problems (see Section 2, Strategic Partnering).

c. Customer and end-user training is a vital component of NR&A. This helps to ensure that work is effectively carried while avoiding the perception of poor NR&A.

d. NR&A includes the security and reliability of the information being transmitted. If the information is compromised or lost, customer perception will deteriorate.

11.4 References

Books and articles


Web sites

www.nric.org -- *Network reliability. A report to the nation*. 1993. Additional information on this and other current industry reports can be found by referencing the Web site of the Network Reliability and Interoperability Council.
Glossary and Acronyms

GLOSSARY

Asset management – how an organization’s assets are administered. Organizations should develop a strategy regarding asset management.

Business-to-Business (B2B) – describes a good or service that is provided from one business organization to another.

Balanced scorecard – a tool used by top management to gain a concise view of the current status of the organization. Some organizations use this tool in a bonus compensation process. A balanced scorecard focuses on financial measures that give the short-term view and on long-term measures such as customer satisfaction, employee satisfaction, and product/service quality and reliability. This combination gives rise to a balanced view of the health of an organization.

Breakthrough – an event that causes or marks the breaking down of a barrier to progress, for example, in negotiations.

Capability Maturity Model (CMM) – a software tool used by organizations to assess the maturity of their systems.

Caring – the care of a product after it has been installed. Caring is a key process area in the supply chain.

Convergence – coming together, a coming together from different directions, especially a uniting or merging of groups or tendencies that were originally opposed or very different.

Core competencies – the key skills defined by the organization that it considers necessary for its success.

Creativity – imaginative ability: the ability to use the imagination to develop new and original ideas or things, especially in an artistic context.

Cross-pollination – the transfer of ideas: the transfer of ideas and methods from one organization or group to another.

Dashboard – Representation of measurements shown in a graphical display similar to that of an automobile’s analog dashboard.

Data mining – search for hidden information: the locating of previously unknown patterns and relationships within data using a database application, for example, the locating of customers with common interests in a retail establishment’s database.

Demand chain - The string of customers and processes creating demand for products that in turn drives the supply chain to produce and deliver goods.

Derivative – unoriginal: copied from somewhere and not original.

e-commerce – the conducting of business over the Internet and other Web-based networks.
Evaluation activities – activities used to evaluate a product or service. A key process area in managing supply chain operations.

Extranet – Electronic data interchange within the supply chain.

High-technology assets – those parts of the company that are advanced hardware and/or software used in order to conduct its business.

Incentive – something that encourages somebody to action: something that encourages or motivates somebody to do something.

Innovation – the act or process of inventing or introducing something new.

Integration activities – activities used to integrate a product or service. A key process area in managing supply chain operations.

Intellectual capital – The hidden value in an organization represented by inherent knowledge, the brand and the image.

Intellectual property – that which is patentable.

Intranet – an organization’s internal IS infrastructure.

IS/IT – Information systems/information technology.

Legacy product – a product that has existed for some time. Also a product that has become the property of a company through mergers and acquisitions.

Market requirements capture – the determination and capture of what a particular market requires. A first step in the supply chain.

Plan, Do, Check, Act (PDCA) – the Shewhart/Deming Cycle. Forms the basis of a commonly used effective improvement loop.

Product – result of a process (See ISO 9000 for full definition.)

Note 1: There are four generic product categories, as follows:
- services (for example, transport)
- software (for example, computer program, dictionary)
- hardware (for example, engine mechanical part)
- processed materials (for example, lubricant)

Product realization – all processes required to make a product available to the customer, from initial requirements capture to availability for delivery. (Note that ISO 9001 uses the term to include post-delivery activities)

Skunkworks – a group of people whom, in order to achieve unusual results, work on a project in a way that is outside the usual rules. It is usually a small, isolated team that assumes or is given responsibility for developing something in a short time with minimal management constraints.

Sourcing – selecting a supplier, based on the customer needs, technical requirements, dollar value, risk, and other factors.

Supplier (external) – an outside organization that supplies a good or service.

Supplier (internal) – a part of an organization that supplies a good or service to another part.
Supply chain – all the customer/supplier relationships that link together in a chain.

Supply chain management – the management of all linked customer/supplier relationships.

Telecommunications service provider – an organization that offers and provides telecommunications services.

Time-to-market (TTM) – The time from the conception of a product or service until the product or service has been introduced and delivered to the market place.

Third-generation wireless format (3G) – high-speed data transfer and state-of-the-art radio terminal technology enabling multimedia communications.

Virtual private networks - a private network for an organization with remote sites through renting or acquiring some part of someone else's network (phone company, Internet provider). To do this the organization might use a combination of software, dialing codes, and some equipment.

Virtually integrated supply chain – is one where the core competencies of individual organizations are linked, so that they can act as a larger, single entity. Outside of the virtually – integrated entity organizations are free to pursue other business interests. This can include partners, outsourcing, alliances, and so on.
# ACRONYMS

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<thead>
<tr>
<th>ACRONYM</th>
<th>EXPLANATION</th>
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<tbody>
<tr>
<td>24/7</td>
<td>24 hours a day, seven days a week</td>
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<td>3G</td>
<td>Third generation</td>
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<td>APICS</td>
<td>American Production &amp; Inventory Control Society</td>
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<td>B2B</td>
<td>Business to Business</td>
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<td>BEAM</td>
<td>Business Excellence Acceleration Model</td>
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<td>BT</td>
<td>British Telecommunications plc</td>
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<td>CM</td>
<td>Contract manufacture</td>
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<td>CMM</td>
<td>Capability Maturity Model</td>
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<td>DMAIC</td>
<td>Design, measure, analyze, improve, control</td>
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<td>EDI</td>
<td>Electronic data interchange</td>
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<td>EFQM</td>
<td>European Foundation for Quality Management</td>
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<td>Information systems</td>
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<td>Information technology</td>
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<td>Quality Excellence for Suppliers of Telecommunications</td>
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<td>ROI</td>
<td>Return on investment</td>
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<td>SCOR</td>
<td>Supply Chain Operations Reference Model</td>
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<td>SEI</td>
<td>Software Engineering Institute</td>
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<td>SG&amp;A</td>
<td>Sales, general &amp; administrative</td>
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<td>Software Process Improvement and Capability dEtermination</td>
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<td>Virtual private network</td>
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<td>WTO</td>
<td>World Trade Organization</td>
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**Web sites**

[www.asq.org](http://www.asq.org) – This Web site is the home of the American Society for Quality


[www.baldrigeplus.com](http://www.baldrigeplus.com) – This Web site includes information on MBNQA criteria, with white papers on various topics including innovation.

[www.bottomlineinnovation.com](http://www.bottomlineinnovation.com) – This Web site gives information around creating a culture for innovation and offers consulting services from Charles W. Prather.

[www.conference-board.org](http://www.conference-board.org) – This Web site includes information on speed, flexibility, time-to-market, and innovation.


DLMBC™ is currently a free association of distribution and logistics organizations within major corporations. DLMBC™ conducts benchmarking studies to identify practices that improve the overall operations of the members.

[www.foodsci.rutgers.edu/ipds](http://www.foodsci.rutgers.edu/ipds) – Rutgers University, *Intelligent Product-Delivery Systems (IPDS)*. IPDS was developed to expand the role of packaging in the information age. IPDS concentrate on the food service industry, but provides a benchmarking tool for the telecommunications industry.

[www.gte.com/aboutgte/organization/supply/index.html](http://www.gte.com/aboutgte/organization/supply/index.html) – Verizon Logistics. Verizon Logistics is the leading supply chain management company, which many of the industry's most successful companies rely on to improve their competitive stance. They specialize in providing domestic and international logistics, procurement and electronic repair services to national telecommunications service providers, original equipment manufacturers and contractors.

[www.hud.ac.uk/sas/trans/index.htm](http://www.hud.ac.uk/sas/trans/index.htm) – Huddersfield University Transport and Logistics. The Transport and Logistics Research unit undertakes a great deal of industrially relevant research.

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www.strategis.gc.ca.com - BC’s IT Industry. Francis, June N.P.

www.supply-chain.org - Supply Chain Operations Reference model (SCOR) Published/Managed by the Supply Chain Council.

www.sei.cmu.edu - Software Acquisition Capability Maturity Model (SA-CMM)