QUALITY IMPROVEMENT IN THE SERVICE SECTOR:

AN EXPERT SUPPORT SYSTEM (ESS)

FOR CONTINUOUS IMPROVEMENT

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By

Beverley G. Hope

Dissertation Committee

Rosemary H. Wild, Chairperson
Laku Chidambaram
William Remus
Larry N. Osborne
Pauline Sheldon

UMI Number: 9615525

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ABSTRACT

Services play a dominant role in post-industrial economies. The strength of those economies depends upon the competitiveness of both their manufacturing and service sectors. In this research we address the challenge of improving service competitiveness through data-driven quality improvement systems.

Measuring, monitoring, and controlling service quality is an elusive task. Members of quality improvement teams frequently lack a detailed understanding of quality improvement techniques and data collection requirements. Some progress has been made toward understanding data needs in manufacturing industries, but many people believe that service organizations are different. What is needed is (a) an improved understanding of service quality data needs, and (b) a way of supporting workers in collecting relevant and valid data.

This research used a field study in the banking industry to develop a model of data needs for service quality improvement. The model describes the data needs at three levels of quality planning and implementation uncovered by our research: strategic, tactical, and operational. The preliminary model developed in the banking industry was divided into two sections for validation. The first section was validated by a series of structured interviews and a survey of service providers in a broad range of service industries. The second, more prescriptive section was validated by a panel of experts.

The validated model provided the basis for a logical model which was subsequently implemented as a demonstration prototype expert support system (ESS). The ESS uses procedural cuing to guide users through a data-driven quality improvement process. Emphasis is placed on problem-focused data needs and selection of appropriate tools and techniques to analyse data. Computerized support at the

operational level can provide on-the-job and training to teams charged with implementing quality improvement projects.

The research provides both theoretical and practical contributions. These include an improved understanding of quality-related data needs in service industries, a strategy for tying data needs to the service quality improvement process, and demonstration of computerized support to a new problem domain.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
ASQC	American Society of Quality Control
ATM	Automatic Teller Machine
CEO	Chief Executive Officer
COO	Chief Operating Officer
CSF	Critical Success Factor
	CSF Critical Success Factor specific to Bank N
	CSF Critical Success Factor (general term)
EMR	Electronic Meeting Room
ES	Expert System
ESS	Expert Support System
EVP	Executive Vice President
GSS	Group Support System
HMO	Health Management Organization
ISO	International Standards Organization
KBS	Knowledge-based System
PIMS	Profit Impact of Marketing Strategies
ROA	Return on Assets
SIC	Standard Industrial Classification
SPI	Service Process Index
SVP	Senior Vice President
TQM	Total Quality Management
VP	Vice President

CHAPTER 1

INTRODUCTION

Services play a dominant role in post-industrial economies such as the U.S. For example, the service sector currently accounts for more than 70% of the U.S.'s Gross National Product and over 75% of its employment, with these ratios expected to rise during the current decade (U.S. Bureau of the Census, 1992). By conservative estimates, 80% of American workers will be employed in service jobs by the year 2000 (Strozier, 1991b). These figures do not take into account the many hidden service workers--workers who provide service functions within manufacturing firms. The growth in service employment is shown in Figure 1.1.

The recent rapid growth in the service sector and consequent changes in the economy were recognized as early as 1963 when Regan described the "Service Revolution." This growth has been attributed to increases in affluence, leisure time, numbers of women in the labor force, life expectancy, life complexity, ecological concerns, product complexity, and the number of new products (Schoell & Ivy, cited in Groonoos, 1990). Thus today we live and work in an economy dominated by services. The strength of that economy depends upon the competitiveness and performance of both its manufacturing and service sectors.

In this dissertation, we address the challenge of improving the competitiveness of service organizations through data-driven quality improvement systems. In such systems, measures of quality and productivity provide goal-directed bases for decision

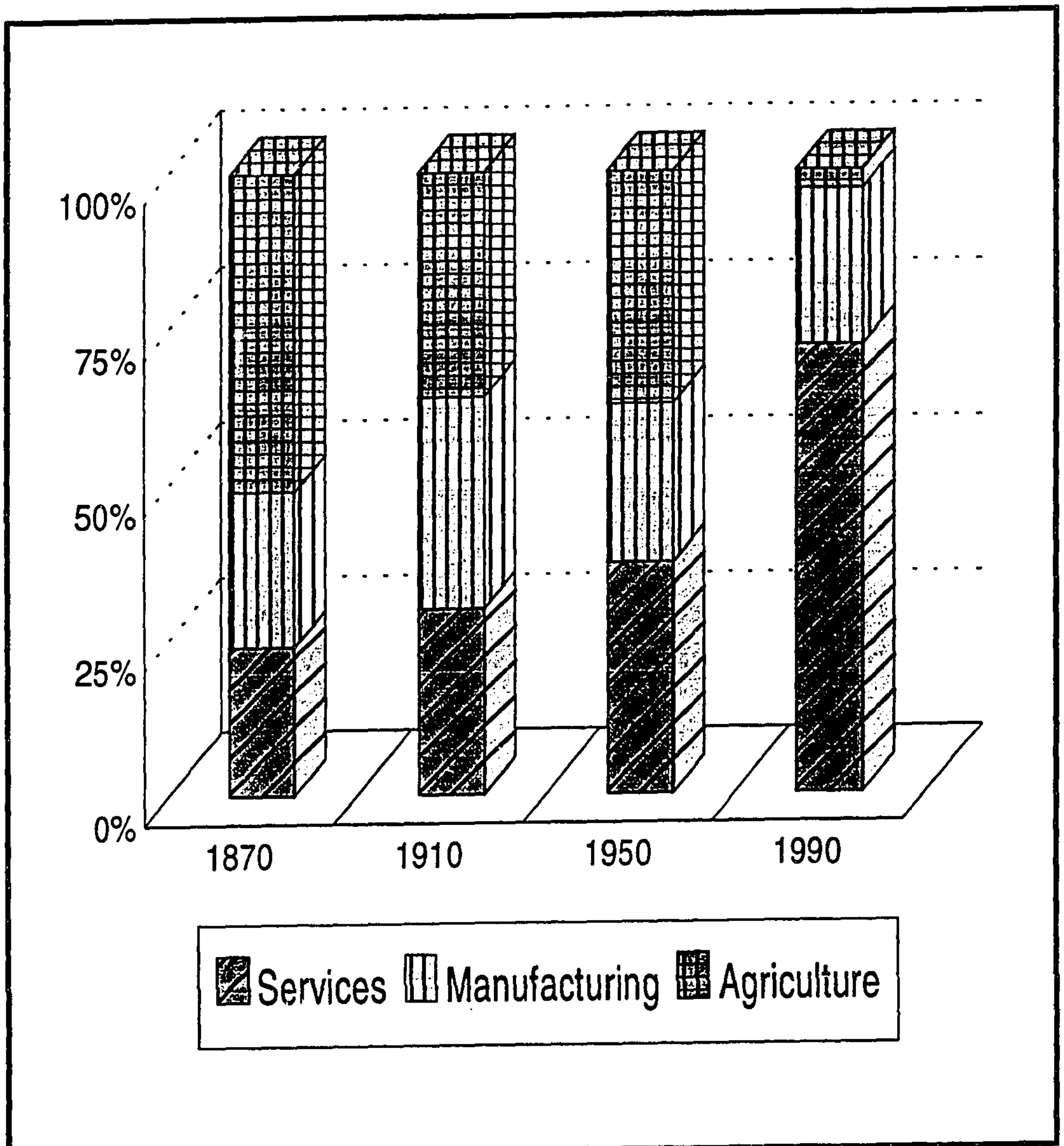


Figure 1.1: Trends in U.S. Employment by Economic Sector: 40 Year Intervals, 1870-1990. (Source: U.S. Bureau of the Census, 1992)

making. To facilitate the measurement of service quality we develop a descriptive model of data needs for service quality improvement. A section of the descriptive model provides the basis for a logical model which drives a computerized support system for continuous quality improvement. The computerized system will assist quality improvement teams in determining what data to collect and what problems to address.

1.1 QUALITY AND ORGANIZATIONAL PERFORMANCE

1.1.1 The Performance Problem

Globalization of the market place is a present day reality. Most large U.S. organizations have overseas divisions which compete with firms based in other nations. In the home market, these organizations often find foreign-based firms among their major competitors. In this global market place, competition is strong and quality becomes an important factor in market success (ISO, 1992).

The negative trade balance in the U.S.'s Current Account is a strong indication of the nation's inability to trade competitively. Economists and business leaders often attribute American businesses' poor performance to transient events such as government monetary policies or to oil price hikes. However, this does not explain the U.S.'s lack of productivity growth relative to Europe and Japan. In today's global marketplace, many of the same economic forces which affect the U.S. affect other nations (Hayes & Abernathy, 1986). Service quality and productivity is a particular problem (Bhote, 1991; Chipello, 1988; Levitt, 1972; Quinn & Gagon, 1986; Roach, 1991; Takeuchi & Quelch, 1983; Zeithaml, Parasuraman, & Berry, 1990). As Quinn and Gagon commented in 1986:

> It will take hard and dedicated work not to dissipate our broad-based lead in services as we did in manufacturing. Many of the same causes of lost position are beginning to appear. Daily we encounter the same inattention to quality, emphasis on scale economies rather than customers' concerns, and short-term financial orientation that earlier injured manufacturing. The same forces that lead to the decline of U.S. manufacturing stand ready to cut [services] to pieces.
>
> -- Quinn and Gagon (1986), p. 103

Already Japan has captured world leadership from the U.S. in banking and other financial services (Bhote, 1991).

1.1.2 The Solution

By focusing on quality in all aspects of the organization, companies can achieve the dual purposes of "superior value of offerings as viewed by customers and the marketplace, and superior company performance reflected in productivity and effectiveness indicators" (U.S. Department of Commerce, 1995, p.13). We summarize the short and long term benefits of quality in Figure 1.2. Short term benefits come from increases in gross margins arising from the ability to charge a higher price for quality services while enjoying lower costs. The fact that quality costs less has long been recognized by quality pioneers (Crosby, 1979; Deming, 1986) but has only just begun to be realized by American businesses. The long term benefit of consistent quality is increased market share arising from customer retention and word-of-mouth referral.

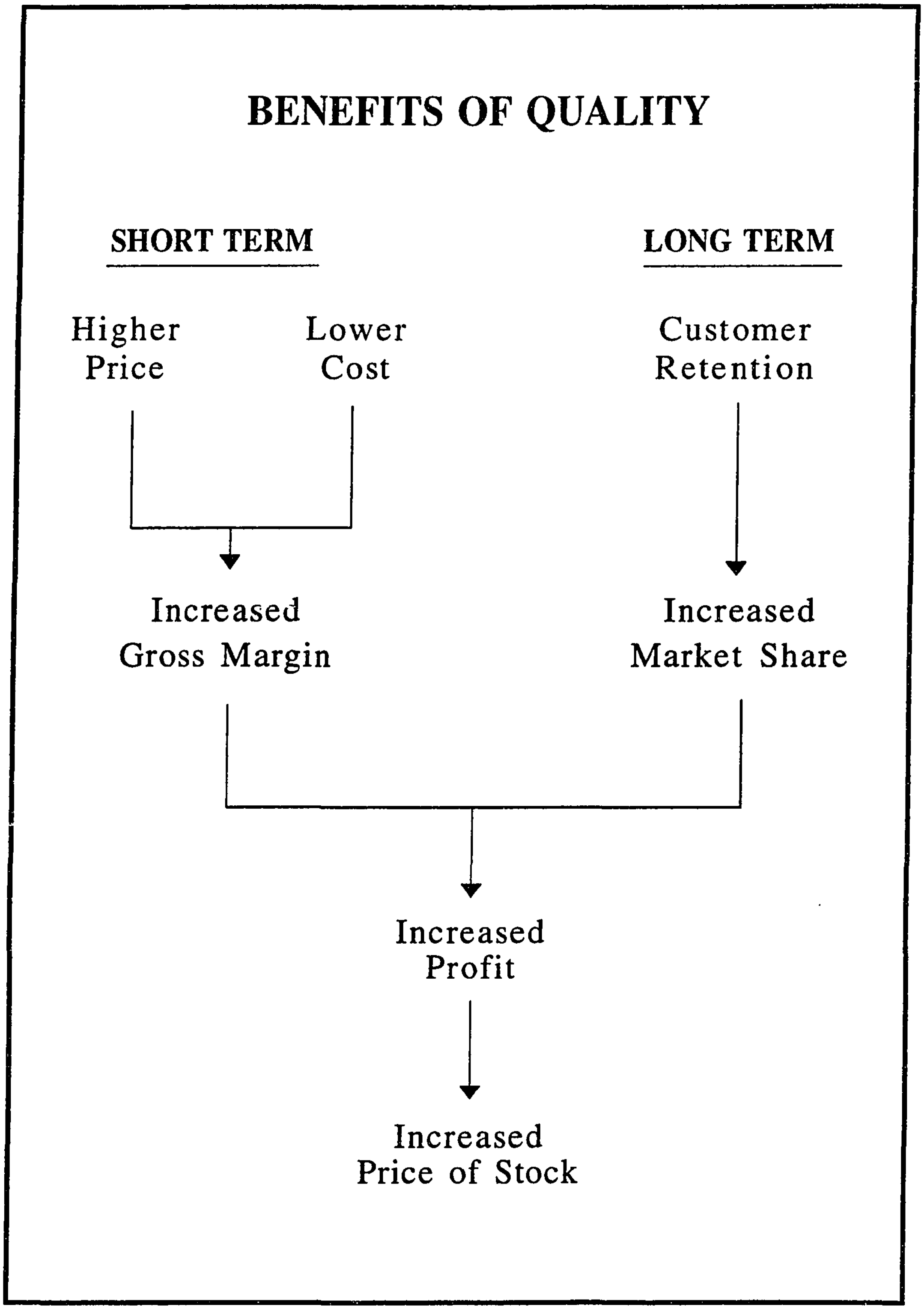


Figure 1.2: Short and Long Term Benefits of Quality

The combination of increased gross margins and market share leads to improved profitably and stock prices. These benefits of quality were recognized by Richard C. Hartnack, Executive Vice President of the community banking group at First Chicago when he stated:

> Extensive customer and employee research convinced us that providing superior quality could lower the cost of operations, strengthen cross-selling opportunities, and increase the probability of client retention and new referrals.
>
> -- Hartnack, in Sussman (1991), p. 7

Studies using the PIMS (Profit Impact of Marketing Strategies) data base have demonstrated a relationship among quality, market share, and return on investment (Bowen & Cummings, 1990; Buzzell & Gale, 1987; Buzzell & Wiersema, 1981; Schoeffler, Buzzell, & Heany, 1974). Improved quality was found to lead not only to increased market share but also to increased return on investment for any given market share. Further evidence of the efficacy of quality improvement in achieving improved financial performance was provided by a U.S. General Accounting Office analysis of 20 of the 22 companies reaching the final round of the Malcolm Baldrige National Quality Award competition. These companies boosted their market share on average by 13.7 percent in a year (U.S. GAO, cited in Strozier, 1991a). Thus quality can become a competitive weapon in domestic and international markets, resulting in increased market share and improved profitability.

1.2 DEFINING QUALITY

Quality is the buzzword of the 90's. Academics are writing about it, executives are espousing it, and businesses are including it in their mission statements. But what is quality? How should we define it? Major steps in the evolution of the definition of quality in production over the current century are summarized in Table 1.1. Beginning with "fitness for use" as required by the Sale of Goods Act, the evolution of meaning can be traced through "meeting specifications" as was common in the early period of statistical process control and "conformance to customer requirements" as advocated by Philip Crosby (1984), to "meeting and exceeding customer expectations" which is the current common wisdom.

Table 1.1
Evolution of Definitions of Quality

- fitness for use
- meeting specifications
- conformance to customer requirements
- meeting and exceeding customer expectations

These definitions reflect the two aspects of quality: quality in fact and quality in perception (Marszaleck-Gaucher, 1990; Sussman, 1991). Quality in fact involves the meeting of requirements, standards, regulations, or specifications. It is a measure of the output of a process. This quality is comparatively easy to measure quantitatively; a good or service either does, or does not, meet the specified metric. However, choosing relevant metrics can be difficult. Quality in perception refers to what the customer believes regarding the quality of the goods or services provided. It is a measure of the outcome of a customer's association with the organization. This quality is subjective, making it more difficult to measure with precision. Quality in fact is a necessary but not sufficient precursor of quality in perception. Figure 1.3 shows some of the elements which go into the determination of quality together with the strategic outcome of good quality. The elements shown are distilled from our review of the Malcolm Baldrige awards criteria (U.S. Department of Commerce, 1995).

1.3 TOTAL QUALITY MANAGEMENT

To be competitive and attain good financial performance, an organization must continuously strive to improve quality. Total Quality Management (TQM) is a term used to refer to organization-wide management strategies for continuous improvement. The term was initially used in 1985 by the Naval Air Systems Command to describe its approach to quality improvement (Quality Glossary, 1992). Since then it has been expanded, defined, and redefined but in essence it remains a management approach to long-term business success through continuous improvement. It consists of a basic philosophy, a set of generally accepted management principles, and a collection of tools for implementation. A summary of TQM is given in Appendix A. A brief overview follows:

The TQM philosophy is an amalgam of the writings and teachings of several quality pioneers: W. Edwards Deming, Joseph Juran, Kaoru Ishikawa, and others such as Philip Crosby, Armand Feigenbaum, and Genichi Taguchi. Excellent summaries of

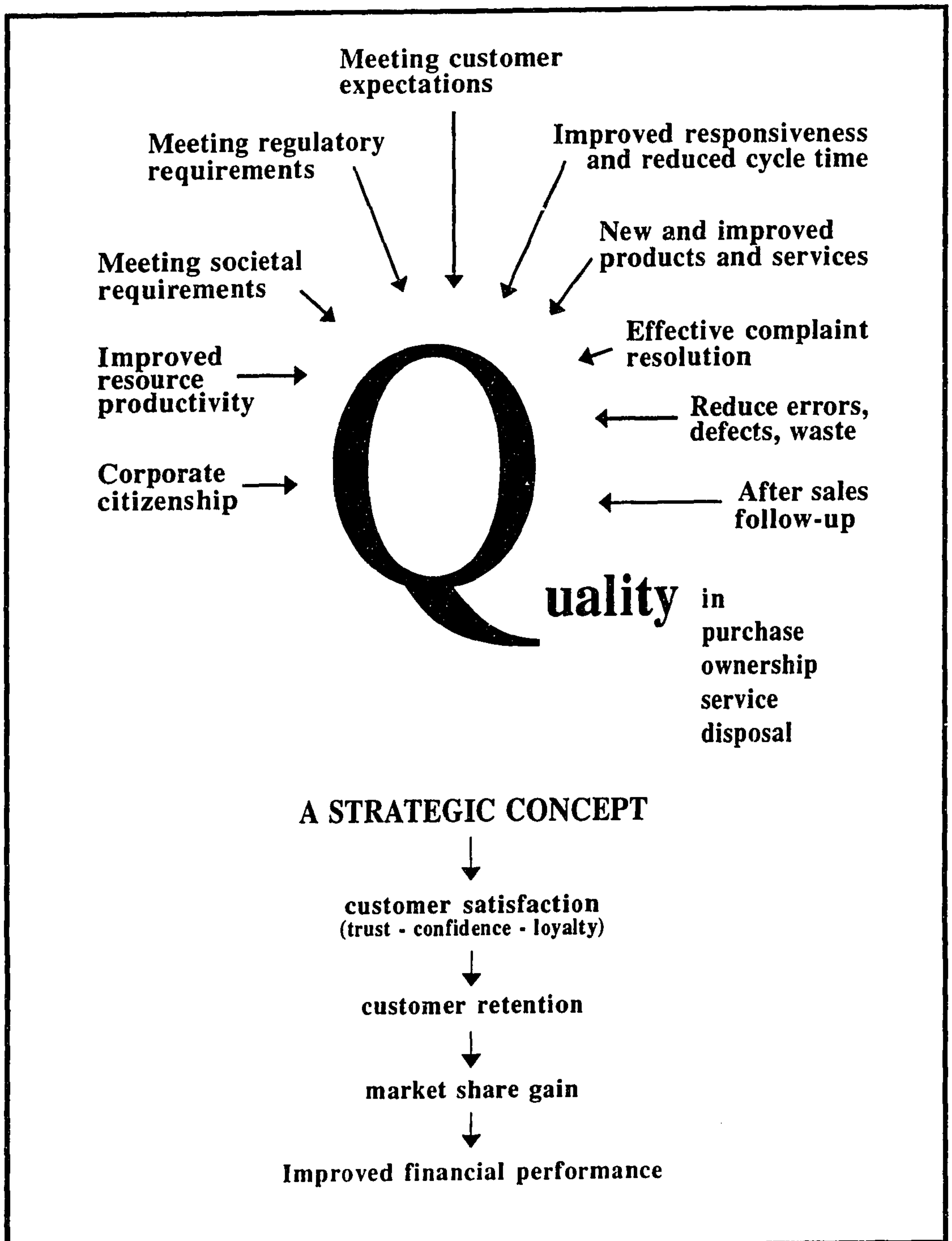


Figure 1.3: Determinants of Quality (Synthesized from: U.S. Department of Commerce, 1995)

the views of these pioneers can be found in Marsh and Garvin (1986) and Wood (1989). Although different pioneers, followers, academics, and practitioners stress different elements of the philosophy, the overriding tenet is always that of a customer focus. Other major tenets include a strategic or long-term focus on quality, a process focus, total involvement of the workforce, and objectivity.

TQM principles are essentially guides for management. Many principles can be extracted from the extensive literature on TQM. In Table 1.2 we classify these under the headings commonly used in cause and effect diagrams (Appendix A).

Table 1.2
TQM Principles

WORKERS:	**METHODS:**
teamwork	process improvement
education and training	defect prevention
safety	looking upstream
	reward systems
	standardization
	quality by design
MACHINES:	
preventative maintenance	**MEASUREMENT**:
automation	disaggregation or stratification
MATERIALS:	aggregation
single sourcing	benchmarking

The TQM tools are a series of techniques useful in the improvement of quality at the tactical and operational levels of an organization. Among the most well-known of these tools are the magnificent 7: flow charts, check sheets, histograms, cause and effect diagrams, pareto diagrams, scatter diagrams, and control charts (Ishikawa, 1982). Other commonly used techniques not included in the magnificent 7 are: brainstorming, nominal group techniques, interviews, surveys, force-field analysis, and stratification. Hoshin planning introduces seven tools useful in planning for quality: affinity diagram, interrelationship digraph, tree diagram (system flow), matrix diagram, matrix data analysis, process decision program chart, and arrow diagram.

The TQM tools support the objective focus of the TQM philosophy. By collecting relevant data and applying the appropriate analytical tools, quality improvement teams adopt a data-driven approach to problem solving.

1.3.1 Understanding Variation

Reducing variation is the foundation of quality improvement in a TQM system. A firm cannot consistently meet customer expectations if there is wide or unexpected variation in output on any significant attribute. Understanding variation is, therefore, critical to effective problem solving. In particular, it is necessary for process workers to recognize the difference between random and non-random variation. Random variation is normal and arises from factors in the system (common cause). Non-random variation arises from events outside the system (special cause) and must be corrected by process workers as they occur. A process with only random variation is said to be statistically stable. Such a process will provide measurements which vary over time in statistically predictable ways and can be expected to continue to do so unless some outside event affects the process. Only statistically stable processes can be systematically improved by reducing random variation or recentering the process. Monitoring process variation is achieved through the collection of data and analysis via statistical control charts. Determination of which process data to collect for process control is an important quality issue.

Thus TQM can be seen to be a combination of philosophy, principles, and tools which encourage an objective or data-driven approach to quality improvement in goods and services production. The selection, collection, and analysis of relevant data is a fundamental component of a TQM system of quality improvement.

1.4 THIS RESEARCH

Implementing quality improvement projects is difficult. Vincent Cannella, partner in charge of quality for Peat Marwick observed "numerous organizations have found the principles of quality are often much easier to preach than practice" (Strozier, 1991a, p. 1). Service quality improvement is particularly difficult (Haywood-Farmer, Allenye, Duffus, & Downing, 1985; Heskett, 1987; Zeithaml, Parasuraman, & Berry, 1985). The greater difficulty in monitoring and improving service quality arises from the nature of services, that is, from their intangibility, non-storability, heterogeneity, inseparability, and evaluation complexity (Section 2.1).

In service quality the outcome of interest is customer perception of an interaction rather than experience or perception of a tangible object. The perception of an interaction is a multi-faceted, subjective evaluation of the output, the provider, and the environment. Consequently, the development and use of objective measures of service quality is problematic. Yet measurement is critical to quality improvement. Without data a firm cannot know what to improve, how to improve it, or if improvement has occurred. In a TQM system, data and subsequent analysis provide the information necessary to make decisions and take appropriate action.

Harrington (1991) observed that lack of measurement was frequently an obstacle to quality improvement. Our pilot study in the banking industry confirmed that collection and use of data in quality improvement projects was a problem. In one bank in which data were collected and reported to senior management daily, an Executive Vice President commented "We are data rich but information poor." In this bank we found numerous instances of use of inappropriate measures as well as problems in collection, analysis, and presentation of data.

Inappropriate measures observed in the pilot study included those which had no demonstrated relationship to customer expectations. Often staff chose measures without asking customers which attributes were important to them or what their expectations were in those areas. Sometimes data were collected on measures which were assumed to be related to a desired objective but the relationship was not proven. For example, in one department, the orderliness of staff desks was assessed in the unsubstantiated belief that an orderly desk increased productivity. It was clear from the pilot study that assistance in selecting customer-focused measures was very much needed.

Problems in data collection included difficulties in determining sample sizes. Most common was the collection of insufficient data from which to make statistically valid inferences. Problems in analysis included difficulty in determining meaningful levels of aggregation for people at different levels of responsibility in the bank. At upper levels, wide scale aggregation of sometimes unrelated data rendered the "information" meaningless -- increases in one contributing measure could cover up decreases in another, giving the illusion of stability. The desire to aggregate data also led to an over-emphasis on attribute (dichotomous) data at the expense of potentially more information rich variables (continuous) data. Consistency and ease of data collection were also problems in some cases. From our observations it was evident that assistance was needed to guide collection, analysis, and presentation of data.

Research directed toward elucidating the data needs for quality improvement in services would add to the body of knowledge in the area of service quality improvement. Research which, in addition, leads to improved support or training for workers would greatly benefit service providers in the field.

In this research we develop a descriptive model of data needs for service quality improvement. A section of the descriptive model is translated into a logical model which drives a computerized support system to assist service providers in determining what data to collect and how to use the data to provide information for identifying service quality improvement opportunities.

The descriptive model is developed at three levels: strategic, tactical, and operational. By strategic we refer to the long term planning for quality usually performed by upper management. At this level the necessary structures are established and resources provided to enable members of the organization to achieve quality improvement. At the tactical level, upper and middle management devise and implement tactics to meet strategic goals. These include the design or redesign of organization-wide processes. At the operational level, quality improvement teams in work groups or branches plan and implement projects to improve the subprocesses for which they are responsible.

At each of the defined levels we found different stakeholder foci, quality responsibilities, and improvement processes. These differences led to differing data needs at the three levels. At the strategic level, data needs centered around the organization's strengths and weaknesses and the opportunities and threats in its environment. At the tactical level, data on customer expectations and performance of the firm and other firms in meeting these expectations were used in designing processes. At the operational level, data needs were primarily related to improving, monitoring, and controlling processes and subprocesses. Data needs were found to vary across levels with respect not only to their focus but also with respect to the type of measures collected and levels of aggregation. Sharing of data between levels was, however, common. In particular, data collected at higher levels tended to be fed down to lower levels.

The descriptive model provides a way for researchers and practitioners to think about data needs for quality improvement. The model links data needs to quality improvement process, thereby encouraging practitioners to collect data for specific purposes rather than merely to "collect data." For example, the first step in the descriptive model, identifying quality improvement opportunities, focuses attention on the need to determine customer expectations and customer perceptions of delivered services. Our field research showed that this was something often overlooked by firms. Use of the model should encourage practitioners to develop measures related to service attributes of relevance to customers. The focus on the purpose of data collection should help to reduce the collection of irrelevant and unusable data.

A logical model to drive a computerized support system is developed from the descriptive model. The logical model provides greater detail of the data needs at each step of the quality improvement process. This model was developed at the operational level. From an applied research perspective, the operational level is the one which would most likely benefit from computerized support. Modern organizations with flattened organizational structures push decision making and responsibility down the organization. Teams of non-managers are identifying and solving problems which were formerly the responsibility of management. For these teams to perform their new role efficiently, their members must have the requisite knowledge, skills, and abilities. But many employees lack the required expertise. Whereas managers at the strategic and tactical levels frequently have access to external consultants and internal specialists, this support if not often available to non-managers at the operational level. Thus support at the operational level is very much needed.

A prototype expert support system (ESS) is developed from the logical model. Expert Support Systems and their relationship to Expert Systems (ES) and Decision Support Systems (DSS) are described in Appendix B. The system developed in this research uses procedural cueing to guide teams through a data-driven improvement process. Procedural cueing is a technique in which the user is guided toward a decision by being conducted through a series of steps or smaller decisions (Silverman, 1987).

Computerized support at the operational level will provide guidance and training to team members charged with implementing quality improvement projects. The step decomposition used in the procedural cueing helps team members determine what questions to ask next and what data might be needed to help answer these questions. Inexperienced workers are provided with on-the-job support and training and experienced workers can use the system to make sure they have completed all steps. Use of the system in an organization will help achieve consistency in methods of problem selection. Future plans for expert advice on sampling strategies will further assist in encouraging the collection of statistically valid data from which inferences can be made with confidence.

To be accepted by practitioners as well as academics, the model and computer system must capture real-world practices. For this reason, field research was the method of choice. A preliminary model were developed from field research conducted in two well-established banks which are committed to quality, one in Hawaii (Bank H), the other in New Zealand (Bank N). The research focused on three divisions or functions within the banks: retail banking, consumer lending, and customer satisfaction. These areas were suggested by our sponsor in Bank H because the areas had quality projects established and the division heads were considered most likely to be supportive of the study. The selected areas tended to be areas which had high levels of customer contact, had a significant influence on customer perceptions of quality, and were highly visible divisions within the bank. Access to data sources in Bank N was considered assured. This field research is described in Chapters 3 and 4.

The banking industry was selected for model development because: (a) the industry is ubiquitous and relatively homogenous, (b) competitiveness from deregulation has created interest in quality as a competitive strategy, (c) quality initiatives in banks have emerged, and (d) high level contacts in the industry were available to the researchers. The ubiquitous nature of banking means that people are reasonably familiar with their function and operation. This familiarity makes it easier for researchers and practitioners in other industries to ascertain the extent to which findings in this research may be transferable to their industries.

The model were subsequently validated in non-banking service industries.

1.4.1 Assumptions

Achieving and sustaining quality requires corporate-wide dedication to meeting or exceeding customer expectations. Since the Expert Support System (ESS) we develop in the final phase of this research is designed to assist at the operational level, we assume that other elements of the TQM process are in place.

We assume the organization has an established quality policy which outlines the organization's intentions and directions regarding quality, is sanctioned by top management, and permeates the entire organization. We assume the organization supports a quality management function to implement the quality policy, including strategic planning, resource allocation, and evaluation. We further assume that the organization has an appropriate quality system in place. That is, the organizational structure, procedures, and processes to support quality projects are in place. These include delegation of authority to those who do the job, team approaches to problem solving, and appropriate reward and recognition systems.

1.5 ANTICIPATED CONTRIBUTIONS

This research has potential theoretical and practical contributions. The theoretical contributions include an improved understanding of quality-related data needs in services and the demonstration of a new application of computer technology to a TQM problem, including further evidence of the efficacy of procedural cueing in ESS's. Practical contributions include a strategy for implementing data-driven quality improvement projects, and a strengthening of the link between the university and the business community. These are discussed next.

Improve understanding of quality-related data needs in service industries: This research is designed to clarify understanding of the data needs of service industries seeking to implement quality improvement systems. It achieves this through the development of a model of data needs for quality improvement. This model will not only add to the knowledge in this field but it will also assist service industries in understanding the kind of data needed to improve service quality.

Provide a strategy for collecting quality-related data: This research synthesizes knowledge from several disparate sources: from the literature on quality, from standards and award criteria, and from experts in the field. In so doing new insights are gained. The delineation of a simple strategy for improving service quality at the operational level will add to the body of knowledge in the area and also assist industries in their efforts to implement quality improvement systems.

Demonstrate a new application of computer technology to a TQM problem: Many software packages exist to assist in Quality Assurance or Quality Control (Kelly, 1993). However, these packages primarily address issues relevant to manufacturing -- the particular problems of service industries are largely ignored. In addition, existing systems generally assume that the user has already determined what data to collect. Most packages provide assistance with statistical process control charting for the factory, design of experiments, or training in the use of a specific set of TQM tools. The system developed in this research project is designed to assist workers in using data to prioritize problems for solution, determine problem causes, select appropriate solutions, and monitor and control service delivery -- areas not addressed by existing software packages.

Provide further evidence of the efficacy of procedural cueing in ESS's: Dillard, Ramakrishna, and Chandrasekaran (1987) describe a frame-based ESS utilizing procedural cueing for military procurement. Their system was well received by the client organization and the academic community. The system developed in this research utilizes procedural cueing in a different task domain. As such, it provides further evidence of the efficacy of procedural cueing as a means of providing intelligent support to industry.

Strengthen the link between the university and the business community: There are increasing calls for universities to strengthen their ties with local businesses. These calls come from governments and funding agencies, from accreditation institutions, and from faculty and students. This research brought together knowledge from academe and industry so that both informed the other. The practical contribution of the knowledge gained will serve to strengthen the ties between the university and the business community and to provide opportunities for further joint research and collaboration.

1.6 CHAPTER OUTLINE

The dissertation is presented in nine chapters. Chapter 2 contains a review of the literature on services and service quality. Chapter 3 describes the four phases of the research design: problem definition, model development, model validation, and system development. Chapter 4 profiles the organizations used in the field research and their quality improvement systems and presents the generic model of data needs for service quality improvement. Chapters 5 - 7 describe the development and validation of the model of data needs and quality improvement at the three levels: strategic, tactical, and operational. Chapter 8 describes a prototype ESS, presents a sample user session, and outlines proposed and potential future developments. Chapter 9 concludes the dissertation with a discussion of the research, its contributions, limitations, and suggestions for future research.

CHAPTER 2

LITERATURE REVIEW

Recognition of the growing economic importance of service industries coupled with an understanding of the quality imperative has fuelled a recent interest in service quality. Magazines have cover articles, special sections, or whole issues devoted to service quality (Business Week, 1992; Fortune, September 20, 1988; Time Magazine, February 2, 1987; World, 2nd quarter, 1991). Numerous texts specifically addressing service quality have been published (for example, Albrecht & Zemke, 1985; American Management Association, 1991; Bhote, 1991a; Brown, Gummesson, Edvardsson, & Gustavsson, 1991; Groonoos, 1990; Heskett, Sasser, & Hart, 1990; Mastenbroek, 1991; Rosander, 1985, 1991; Zeithaml et al., 1990). In addition, a number of industry specific books have recently been published, particularly relating to the banking and health industries (Ernst and Young & American Quality Foundation, 1992; Gray & Harvey, 1992; Grubbs & Reidenbach, 1989; Latzko, 1986; Marszalek-Gaucher, 1990).

But empirically-based research in service quality has been slow to appear. For example, only 3 of the 145 papers published in the 1988 proceedings of the annual conference of the American Society for Quality Control contained the word "service" in the title, and none of the 102 papers in the 1987 proceedings of the annual conference of the European Organization for Quality Control mentioned services in the title (Gummesson, cited in Groonoos, 1990). However, proceedings of recent conferences show a more active research effort. Some of the research pertains to service industries in general, but much of it relates to specific service industries. Apparently the research community has taken up the challenge of Haywood-Farmer and Lyth (1988) and Zeithaml et al. (1985) for more research into service management and service quality.

2.1 SERVICES

Services have been recognized as a distinct category of economic production for many years. In 1776 Adam Smith distinguished between productive and unproductive labor based on whether the labor provided goods (productive labor) or services (unproductive labor)(Smith, 1977). Clark's (1940) three sector classification of economic activity also recognized services as a distinct category. Today, the Standard Industrial Classification (SIC) furnished by the U.S. Office of Management and Budget is commonly used to classify industries for research and reporting purposes. Table 2.1 shows SIC groupings which might be classified as service industries.

Table 2.1
Service Industries

• Banking and Finance	• Personal Services
• Brokerage	• Recreation
• Business services	• Repair services
• Communication	• Retail trade
• Construction	• Savings and Loan
• Government	• Transportation
• Health	• Utilities
• Hotels and lodging	• Wholesale trade

Sources: Sasser, Olsen, and Wyckoff (1978), p. 3;
Zeithaml, Parasuraman, and Berry (1985), p. 37

While the existence of a distinct service sector has been recognized by economists for many years, acceptance by management researchers was not complete. Business management literature of the 1970's and 1980's contained a debate on the existence of and need for a distinction between manufacturing and service industries. Authors who acknowledge the existence of service industries often characterize them as being labor intensive and marked by high degrees of interaction between the provider and the customer (Chase 1978; Collier, 1983; Langevin, 1977; Maister & Lovelock, 1982; Schmenner, 1986). They are also often considered to require comparatively low levels of capital investment, and to provide more value-added than manufacturing activities.

But virtually all organizations compete to some degree on the basis of service (Groonoos, 1990; Koepp 1987; Levitt, 1972; Mastenbroek, 1991, Zeithaml et al., 1990). Mass production and modern technology have led to wide-scale production of commodities such that good technical products are no longer sufficient for businesses to remain competitive. Manufacturers must offer services as part of their total offering. Mastenbroek (1991, p.9) argues that for so-called manufacturing firms, "the art of providing service is sometimes more important than manufacturing clever products," and cautions manufacturing firms who do not consider service in their selling. Given similar products and roughly similar prices, service quality becomes important (Koepp, 1987). Similarly, many service industries involve the production or substantial use of goods. For example, a restaurant provides not only a service (preparation, delivery, clean-up) but also a product (the meal). Given the high component of service in so-called manufacturing industries and the goods component in some service industries, it is probably more accurate to speak of service activities and manufacturing activities rather than industries.

Thus the classification of production into goods and services, while common, is misleading. Pure products, either pure goods or pure services, rarely exist; most products consist of a bundle of goods and services (ISO, 1992; Judd, 1964; Rathmell, 1966; Schwartz, 1992; Shostack, 1977b; Thomas, 1978). Furthermore, it is the bundle rather than the "good" or "service" kernel which differentiates a firm's products from its competitors' products. Modeling a goods/services continuum rather than a dichotomy would be more accurate. One conceptualization of this continuum is presented in Shostack's (1977b) "Scale of market entities" from tangible dominant (good) to intangible dominant (service). Banks would be placed toward the intangible dominant end of this continuum (Figure 2.1).

Despite the bundling of goods and services into single products, the literature reveals several characteristics of services activities which are generally considered to differentiate them from manufacturing activities: intangibility, non-storability, heterogeneity, inseparability, and evaluation complexity (Bateson, 1979; Berry, 1980; Collier, 1983; Falzon, 1988; Gaither, 1992; Haywood-Farmer & Lyth, 1988; Mersha,

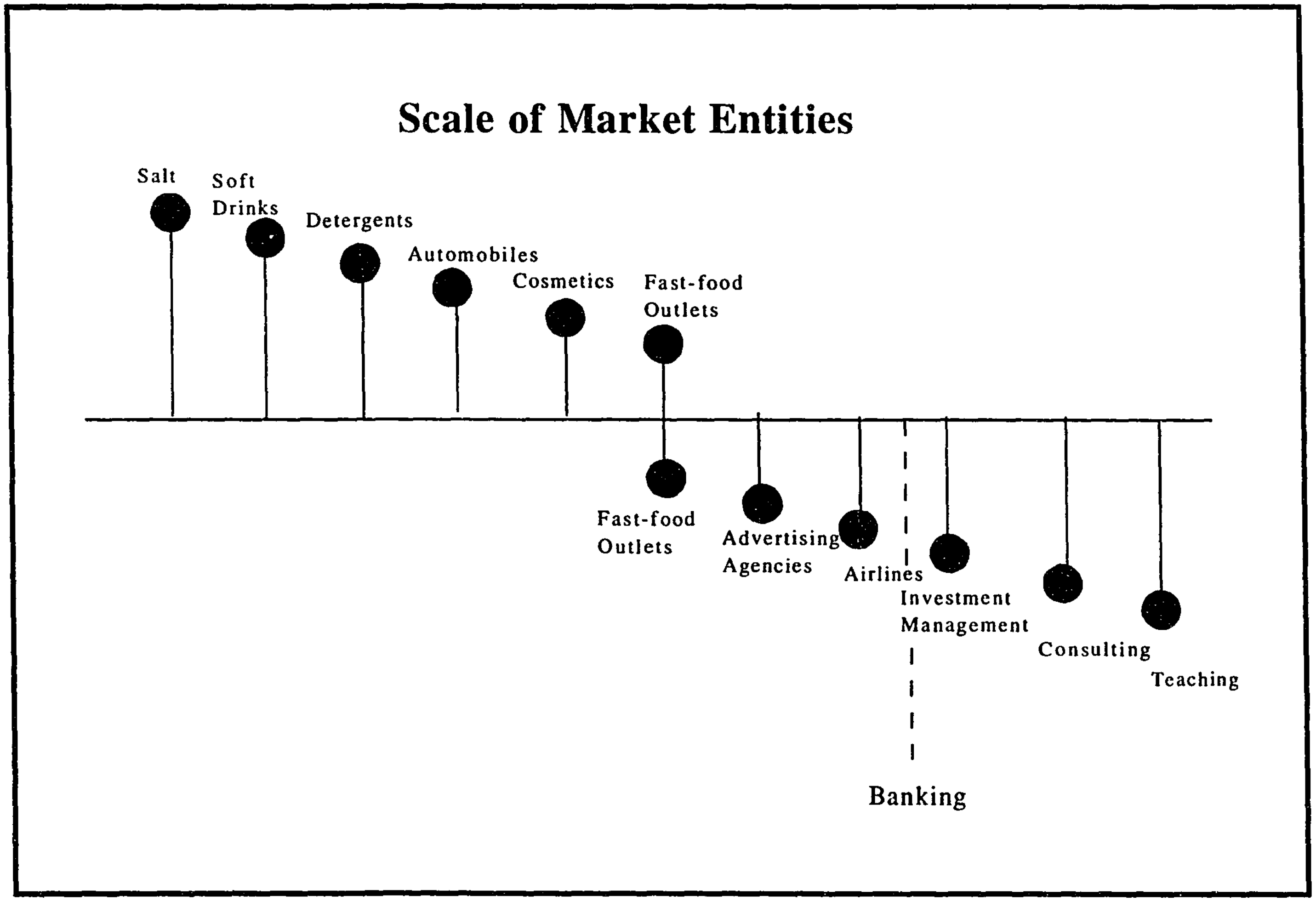


Figure 2.1: Goods/Services Continuum (Source: Shostack, 1977b, banking added)

Adlakha, & O'Brien, 1988; Sasser, Olsen, & Wyckoff, 1978; Schwartz, 1992; Shostack, 1977b; Zeithaml et al., 1990). These are described next.

Intangibility: The descriptor "intangible" as applied to services has two meanings: impalpable and indefinable (Bateson, 1979). Service impalpability refers to the fact that services are performances and experiences rather than objects. Impalpability makes it difficult for consumers to assess service products prior to delivery, that is, frequently they cannot be examined, tried, tested, or measured prior to purchase (Zeithaml et al., 1985). The term "indefinable" is used to refer to the difficulty in objectively defining service characteristics, particularly quality characteristics. Banking is one of the industries commonly considered to possess double intangibility, that is, its services are both impalpable and indefinable (Donnelly et al., 1985). Intangibility is often cited as the critical goods-services distinction from which others arise (Bateson, 1979; Judd, 1964; Rathmell, 1966; Zeithaml et al., 1985).

Non-storability: Since services are experiences or performances, they cannot generally be stored. For example, unused teller time cannot be inventoried for later use. Non-storability makes production capacity planning a critical activity in service industries since fluctuations in demand cannot be solved with inventory. Waiting lines can perform a similar function to inventory storage, that is, they can ensure that there is always "stock" for employees to work on (Fitzsimmons, 1990). However, personal experience tells us that long lines are negatively correlated to perceptions of service quality and organizations in competitive environments are reluctant to use them to overcome the non-storable nature of services.

***Heterogeneity*:** Services have the potential for high variation in production quality over different locations, producers, customers, and time. For example, service quality may vary between banks, within banks, within branches, and within teller operations on any given day. Heterogeneity results from the high degree of people involvement in service delivery and the high level of discretionary effort often found in service performance (Zeithaml et al., 1985). Consequently heterogeneity is likely to be more marked in labor intensive services.

***Inseparability*:** Inseparability refers to synchronic production and consumption of services and the consequent involvement of the customer in the production process. This is particularly common where services are performed on or with persons, for example, hair styling, restaurant service, or loan applications. It is less common where services are performed on goods, for example, repair services. In some cases the customer may not only be present, but may also take part in the service delivery process, speeding it up, slowing it down, disrupting it, and altering it (Judd, 1964; Mersha et al., 1988; Rathmell, 1966; Schwartz, 1992). Customer involvement in the production process means that the customer can evaluate not only the service output but also the process by which it is produced and the environment in which it is produced. This has important implications for providing and measuring service quality.

Quality improvement projects must consider both the process and the output as determinants of service outcomes.

***Evaluation Complexity*:** It is more difficult for customers to evaluate service quality than goods quality because of service intangibility. It is also more difficult for producers to identify and measure service quality attributes since the relative importance of attributes or dimensions of quality will differ across customers and service activities (Karwan & Rosen, 1988; Parasuraman, Zeithaml, & Berry, 1985; Shostack, 1977a,b; Zeithaml et al., 1985).

Although the characteristics of services just described are useful in distinguishing service activities from manufacturing activities, they are not universally accepted. It is easy to find examples of services which do not exhibit particular characteristics. For example, restaurants and hotel services have a strong tangible component, many repair services do not exhibit marked inseparability, and McDonald's style fast food service exhibits no more heterogeneity than many goods. As services diversify, generalizations become harder to justify (Heskett, 1990; Lovelock, 1983; Thomas, 1978). However, taken together the characteristics can be said to define a specific class of economic activity. To the extent that these characteristics exist, they present problems for service producers which differ from those faced by goods producers in management, marketing strategies, and quality assurance. An understanding of the differences can help service managers to achieve strategic advantages (Thomas, 1978)

Service classification: Service classification schemes group services by selected variables in order to recognize their diversity while permitting use of similarities for research and practice. Excellent reviews of service classification schemes can be found in Lovelock (1983) and Heskett (1990). A summary of the major classification schemes is given in Table 2.2.

The large number and variety of classification schemes show the diversity among variables associated with providing a service. They explain the difficulty many practitioners experience in controlling service quality and highlight the daunting task facing the researcher of service quality. Because of this diversity, research in the service sector has generally been limited in some way, for example, to specific industries, to particular events or processes, or to specific problems.

2.2 MODELS OF SERVICE QUALITY

Several authors suggest that strategic options for services management, including the assurance of quality, differ from those available in manufacturing management (Bateson, 1979; Berry 1980, Bowen & Cummings, 1990; Collier, 1983; Groonoos, 1983, 1990; Haywood-Farmer & Lyth, 1988; Karwan & Rosen, 1988, Shostack, 1977b; Thomas, 1978). Others hold that there is no essential difference (Langevin, 1977; Levitt, 1972). Those recognizing a difference cite the limitations of traditional manufacturing approaches to quality in dealing with the intangible elements of service and the inseparability of the customer from the service process. Those who recognize no essential difference tend to hold that assuring quality is a discipline, a

Table 2.2
Service Classification Schemes

Source	Basis of Classification	Classification
Judd ('64)	Object of service	*Categories* rented good services owned good services non-good services
Lyth & Johnson ('88)	Object of service	*Categories* customer processing operations material processing operations information processing operations
Hill ('77)	Effect of services	*Dichotomies* goods/people permanent/temporary reversible/irreversible mental/physical (change) individual/group
Thomas ('78)	Degree of labor intensity	*Continuum*
Chase ('78)	Degree of customer contact	*Maturation Continuum*
Schmenner ('86)	Degree of customer contact Degree of labor intensity	*Matrix, 2x2* (Hi/Lo)
Maister & Lovelock ('82)	Degree of customer contact Degree of customization	*Matrix, 2x2* (Hi/Lo)
Lovelock ('83)	*Multiple*	*Matrices, 2x2*
	Nature of the service	tangible/intangible on people/things
	Nature of the relationship	continuous/discrete formal/informal
	Amount of customization	customization (Hi/Lo) provider judgment (Hi/Lo)
	Nature of supply & demand	demand fluctuation (Hi/Lo) supply constraints (Hi/Lo)
	Manner of service delivery	single/multiple sites provider/customer travels

pattern of behavior, and therefore service quality is not different from manufacturing quality. There appears to be merit in both views. The overall philosophy and principles of quality management are universal and much can be gained by applying to service production, directly or in modified form, many of the manufacturing quality techniques. However the special characteristics of services change the relative importance of some management tasks (Haywood-Farmer et al., 1985).

Klaus (1985) identifies two commonly accepted conceptualizations of service quality: product models arising from the product-attribute approach to quality and process models arising from the customer-satisfaction approach to quality.

Product Models view services as special kinds of goods. This view is common in management (Chase & Garvin, 1989; Deming, 1986; Lawton, 1991; Levitt, 1972; Sasser et al., 1978). The focus of these models is on service definition, resource use, and production technology. Quality is viewed as the sum of performance on identified attributes. It is achieved by compliance with standards (Crosby, 1979; Hostage 1975).

Process Models view services as an interaction between the service provider and the customer. This view is common in marketing (Bitner, Booms, & Tetreault, 1990; Groonoos, 1983, 1990; Heskett, 1986, 1987, 1990; Klaus, 1985; Parasuraman et al., 1985; Shostack, 1977a,b). The focus of these models is on the subjective perceptions of consumers which, in turn, depend upon individual personalities and situational and temporal factors. Quality is viewed as customer satisfaction. It is achieved by measuring and monitoring customer perceptions and changing processes in response to information obtained. Process models recognize the dynamic, situational, and subjective nature of service quality but they do present problems, not the least of which is the difficulty in measuring subjective evaluations.

Letihan (cited in Berry et al. 1985) combines product and process. In his model, the customer judges process quality during service delivery and product quality after service delivery. Thus the smile of the teller during service forms part of process quality: the accuracy of the recorded transaction forms part of output quality.

Considering both output and process requires consideration of both internal and external customers' needs. Only the external customer defines quality (Kerklaan 1991; Lawton, 1991). However, acceptance of the end-consumer as the *only* focus ignores two factors. First, while the goal of service production is to meet or exceed customer expectations, the means to achieving that goal is the process. Consistently high quality can only be attained when a focus on external customers is backed up by good internal organization. Second, for many services the external customer is inseparable from the production process and can, therefore, evaluate not only the end-product but also the process. Thus, quality improvement requires consideration of both output and process, and both external and internal customers.

The focus may shift according to the task or problem at hand. A focus on external customers is appropriate at the first and last steps of service production, that is, in designing the product or service and evaluating outcomes. A focus on process and internal customers is appropriate in daily operations (Figure 2.2).

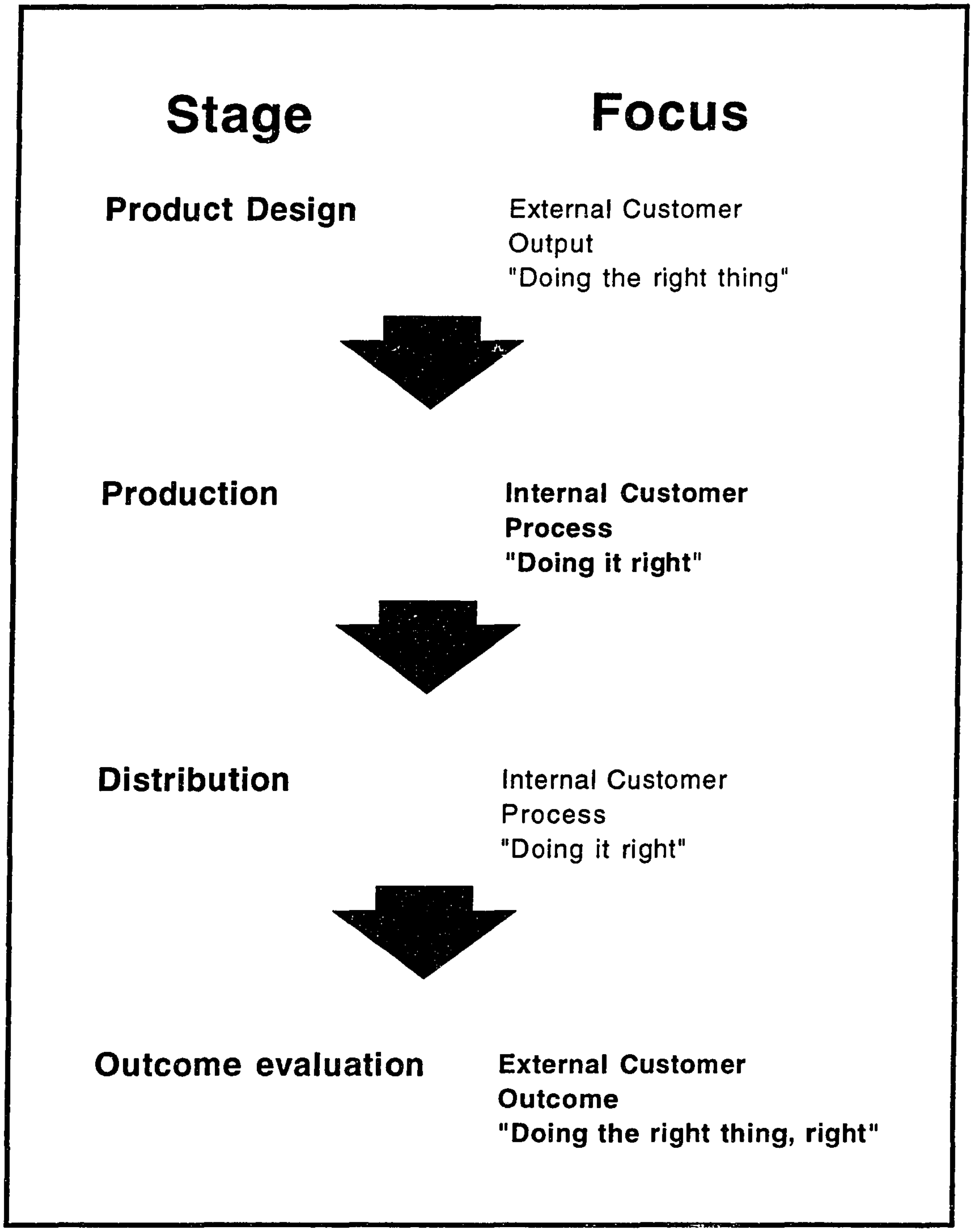


Figure 2.2: Organizational Focus by Task

A well-accepted model which considers internal and external customers, outputs and processes is the gap model of Zeithaml et al. (1990) shown in Figure 2.3. In this model, service quality is defined as the degree and direction of the discrepancy between expected service and perception of a delivered service (Gap 5 in Figure 2.3). To close Gap 5 and attain service quality the service provider must close Gaps 1-4. Management must have an accurate perception of customer expectations (Gap 1), these expectations must be correctly translated into service quality specifications (Gap 2), and employees must produce services which meet these specifications (Gap 3). In addition, management must ensure that personnel do not promise more than can be delivered and that all that is promised in advertising, personal selling, and other communications with customers is delivered (Gap 4). Thus the model successfully combines an external and internal focus. The external customer evaluates the discrepancy between expected and perceived service delivery, and an internal focus is used to narrow this gap.

An advantage of Zeithaml et al's (1990) model is that it suggests a logical process by which companies can measure and improve service quality: determine customer needs, translate needs to service standards, provide service consistent with the standards, and communicate service information to customers.

This research assumes a combined product/process model of quality consistent with Zeithaml, et al's (1990) model. It recognizes the need for consideration of both external and internal customers.

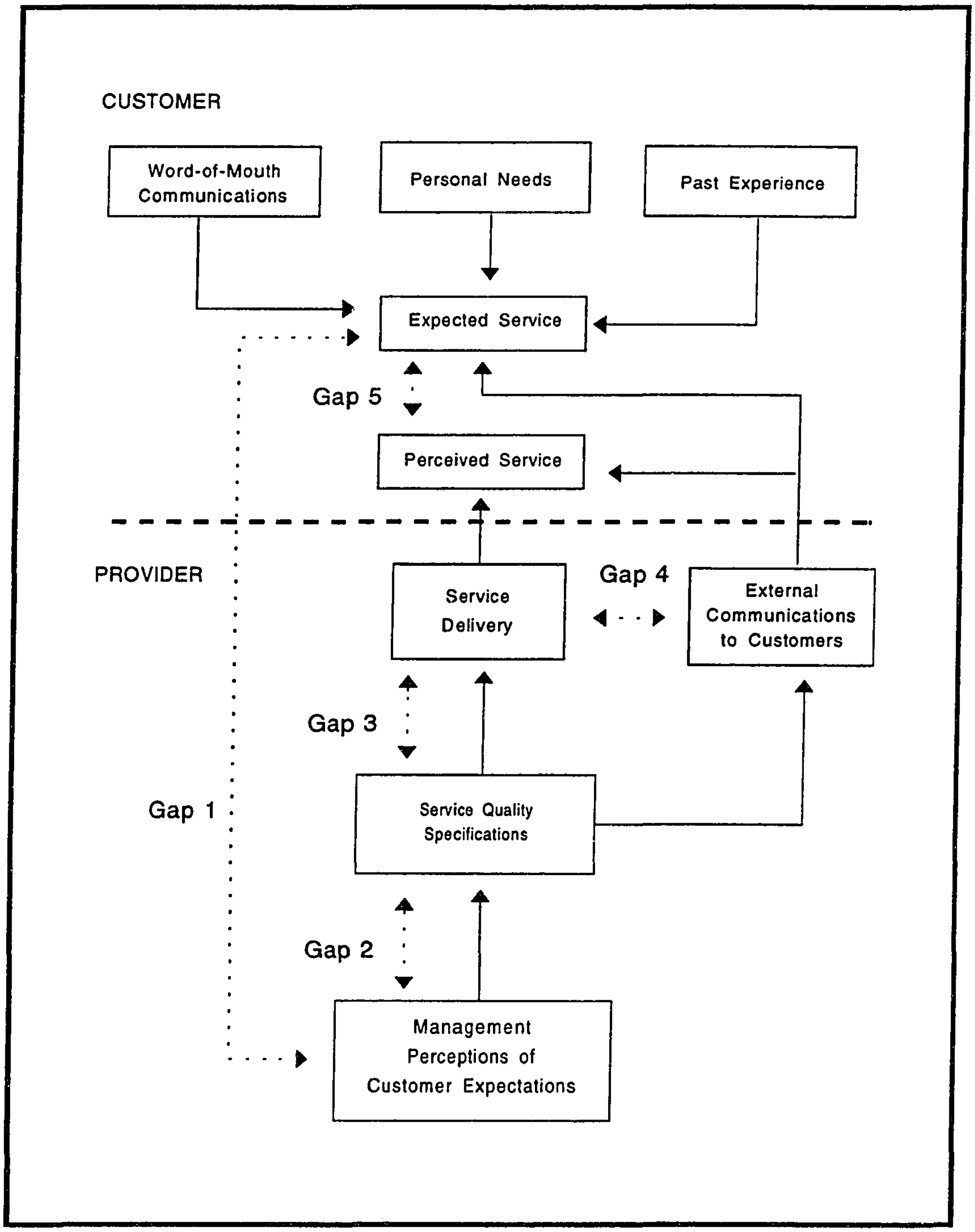


Figure 2.3: The Gap Model of Service Quality (Source: Zeithaml, Parasuraman, & Berry, 1990, page 46)

2.3 DIMENSIONS OF SERVICE QUALITY

Quality has many dimensions. As Deming points out:

> The quality of any product or service has many scales. A product may get a high mark, in the judgment of the customer, on one scale, and a low mark on another.
>
> -- Deming (1986), p. 169

Sasser et al. (1978) offer for discussion seven potential elements of quality derived from the literature on basic psychological needs. They hypothesize that service quality might consist of: security (of the consumer and his or her property), consistency, attitude (in interpersonal relations or other communications), completeness (in the array of services provided), condition (of the service environment), availability (in terms of time and location), and timing (required for access to and completion of a service). They suggest that the competitive service provider should offer a variety of mixes of these attributes to meet varying customer needs. More recently, a study of an airline revealed four factors of importance to customers: care and concern (or empathy), spontaneity (the willingness of staff to approach customers and to think for themselves), problem solving (or competence), and recovery (the special effort needed to fix things which go wrong) (Albrecht & Zemke, 1985).

Lyth and Johnson (1988) grouped 10 elements of service quality identified by Groonoos (cited in Lyth & Johnson, 1988) as either tangible (communication, tangibles, access, reliability, and security) or intangible (responsiveness, competence, understanding, courtesy, and credibility). However, they offered no rationale for their grouping. Groonoos (1990) offers a revised and simplified list of six criteria of perceived service quality: professionalism and skills, attitudes and behaviors, accessibility and flexibility, reliability and trustworthiness, recovery, and reputation and credibility.

The recently most cited framework is that of Parasuraman et al. (1985). From customer focus-group interviews they identified ten determinants of service quality: reliability, responsiveness, tangibles, competence, courtesy, credibility, security, access, communication, and understanding. These were later collapsed into the five dimensions shown in Table 2.3.

Table 2.3
The Five Dimensions of Quality

***Reliability*:** ability to perform the promised service dependably and accurately.

***Responsiveness*:** willingness to help customers and provide prompt service.

***Empathy*:** caring, individualized attention a firm provides its customers

***Assurance*:** knowledge and courtesy of employees and their ability to convey trust and confidence.

***Tangibles*:** appearance of physical facilities, equipment, personnel, communication materials.

The Parasuraman et al. study consistently showed reliability to be the most important dimension and tangibles the least important. According to them, the low ranking given by customers to tangibles reveals a mismatch between customer priorities and service firm priorities. However, their results rely upon customer self-reports and it is possible that members understated or did not recognize the impact tangible elements had on their evaluations. By contrast, Karwan and Rosen (1988) demonstrated that the importance of the dimensions identified by Parasuraman et al. varied across service industries. This finding alerts us to the need to identify the important dimensions for particular service industries. Table 2.4 maps the quality elements identified in the other studies to Parasuraman et al's (1985) dimensions.

But how do customers use these dimensions? Sasser et al. (1978) offer three models of how consumers make judgments. They are:

> 1. ***One Overpowering Attribute.*** One attribute basically determines the value. All other attributes receive only nominal or no consideration.
>
> 2. ***Single Attribute with Threshold Minimums for Other Attributes.*** An alternative must achieve at least the threshold condition for certain attributes to be considered. But the final ranking is made among the qualified candidates on the basis of a single attribute.
>
> 3. ***Weighted Average of Attributes.*** The alternatives are ranked on the basis of a weighted average, so that a high score on one attribute may offset a low score on another.
>
> -- Sasser, Olsen, and Wyckoff (1978), p. 179

Different attributes may attain prominence at different stages in a consumer's acquisition of a service (Bojanic, 1991). Adopting a consumer behavior perspective common in describing goods acquisition, Bojanic (1991) suggests three types of

Table 2.4
Mapping of Quality Factors from Various Models to the Five Dimensions of Quality

1	**2**	**3**	**4**	**5**	**6**
Reliability	accuracy	consistency	recovery	reliability	reliability & trustworthiness, recovery
Responsiveness	promptness	timing, availability	spontaneity	responsiveness, access	accessibility & flexibility
Empathy	-	attitude	care & concern	communication, understanding	attitudes & behaviors
Assurance	employee courtesy	security	problem solving	security, competence, courtesy, credibility	professionalism & skills, credibility & reputation
Tangibles	delivery environment	condition	-	tangibles	-
-	government regulations	completeness	-	-	-

<u>Models</u>:
1 Parasuraman, Zeithaml, & Berry (1985)
2 United States Department of Commerce (1992)
3 Sasser, Olsen & Wyckoff (1978)
4 Albrecht & Zemke (1985)
5 Groonoos (1986), cited in Lyth & Johnson (1988)
6 Groonoos (1990)

attributes: Search attributes (used prior to acquisition, for example, price), experience attributes (used after purchase, for example, courtesy), and credence attributes (which are difficult to evaluate even after purchase, for example, taxation or medical advice). Bojanic (1991) does not attempt to link specific factors to each stage.

In highly competitive situations, achieving customer loyalty may require service providers to concentrate on secondary factors because everyone is performing well on the primary factors (Lovelock, 1983). For example, if all airlines have a good safety record, consumers will concentrate their attention on less important attributes, such as comprehensiveness of ground service or friendliness of staff. Achieving excellence requires the meeting of basic expectations on all dimensions and the provision of optional extras or unexpected services. To do this requires measuring, monitoring and improving performance on those dimensions which are important to customers.

2.4 SERVICE QUALITY IMPROVEMENT

2.4.1 Quality Standards and Guidelines

Guidance for developing quality improvement systems to assure quality in manufacturing or service can be found in quality standards such as the Malcolm Baldrige National Quality Awards guidelines (U.S. Department of Commerce, 1995) and International Organization for Standardization (ISO) standards (ISO, 1992), commonly referred to as ISO 9000. The Malcolm Baldrige award criteria are written in general terms designed to be equally applicable to service and manufacturing firms.

The Awards have had a marked impact on the quality revolution in the U.S., but they have attracted some criticism. Criticisms include the failure to include financial performance in assessments, the time required to prepare for the award, and the competitive nature of the award (Debate, 1992).

ISO 9000-9004 is an international standard for quality management and assurance. It is identical with ANSI/ASQC Q90-94, the American standard, and has been adopted in more than 60 other nations (Durand, Marquardt, Peach, & Pyle, 1993). Increasingly ISO registration is becoming a requirement of doing business (Schnoll, 1993). Although applicable to any organization, the standard was written primarily with the manufacturing sector in mind, and its terminology reflects that bias. The more recent ISO 9004-2 deals with quality of service activities.

According to ISO 8402 a total quality system consists of a quality policy, quality management, and a quality system (ISO, 1992). The ***quality policy*** sets out the overall intention and direction of the organization with regard to quality; it is the organization's quality map. ***Quality management*** refers to management's function in determining and implementing the quality policy; it is the quality driver. The ***quality system*** consists of the organizational structure, responsibilities, procedures, processes, and resources for implementing quality management; it is the quality vehicle. Success depends upon strength in all three areas. Kalinosky (1990) in summarizing ISO standards and going beyond them, describes a total quality system as:

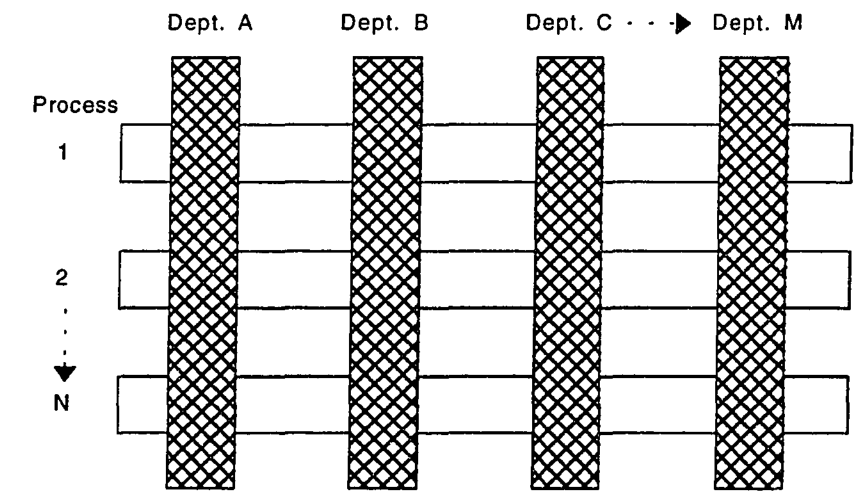
> The integrated plans, procedures, processes, activities and organizational, competitive, and technological structures that are established and maintained to ensure that product, process, and service meet the requirements of the customer.
>
> -- Kalinosky (1990), p. 52

This research is concerned with the quality system, that is, with responsibilities, procedures, and processes of implementing quality management.

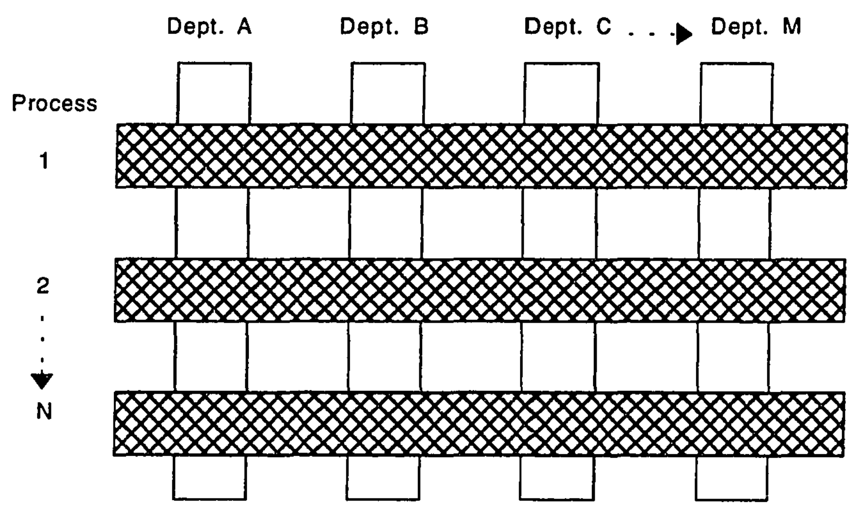
2.4.2 Focusing On Process

Traditionally authority, ownership, budgets, promotional opportunities, and change in organizations have centered on functional departments. But production is accomplished by processes -- processes which frequently cross departmental borders. A departmental focus can cause problems and delays to occur at departmental boundaries. A key to achieving quality improvement is to shift operational focus from departments to processes as shown in Figure 2.4 (Harrington, 1991; Marszalek-Gaucher, 1990; Mastenbroek, 1991).

ISO 8402 defines a process as "a set of interrelated resources and activities which transform inputs into outputs," and notes that "resources may include personnel, facilities, equipment, technology, and methodology" (ISO 1992, page 34). For service activities inputs of processes are likely to be information or data rather than the material or assemblies of manufacturing activities (Tenner & DeToro, 1992), and outputs are likely to be intangible dominant rather than tangible dominant.



Traditional approach with focus on department



Process improvement approach with focus on process

Figure 2.4: Process vs. Departmental Focus of Operation

Service processes generally consist of several sub-processes linked together. A subprocess view is shown in Figure 2.5. It is customary to label the provider of input to the process (or work group) as the "supplier" and the receiver of the process output "customer." However, the work group itself is in fact a customer of the "supplier" and the supplier to another "customer." This is the concept of "next process as customer" (Ishikawa, 1982) or "next operation as customer" (Bhote, 1991a). Thus roles switch for different transactions and every person or group within the chain is both a customer and a supplier. Each customer must make its requirements known to its supplier and provide feedback on performance. The key to quality improvement is to understand each transaction so that the customer's requirements can be met by the supplier (Marszalek-Gaucher, 1990).

Each link adds some value but each link also creates its own risks. Since each link creates a risk it is advisable to simplify processes and reduce, as far as possible, the number of links in the service chain. Process simplification is an important aspect of achieving quality (Harrington, 1991; Kerklaan, 1991). A useful way to understand, simplify, and improve service processes is service blueprinting (Shostack, 1984, 1987). Service blueprinting is a visual representation of a process, displaying and linking subprocesses in the order in which they occur. It is essentially a detailed flow chart of the service process. In outlining service blueprinting methodology, Shostack (1984, 1987) outlines two concepts useful for improving service quality: lines of visibility and fail points. The line of visibility in the blueprint separates those activities or

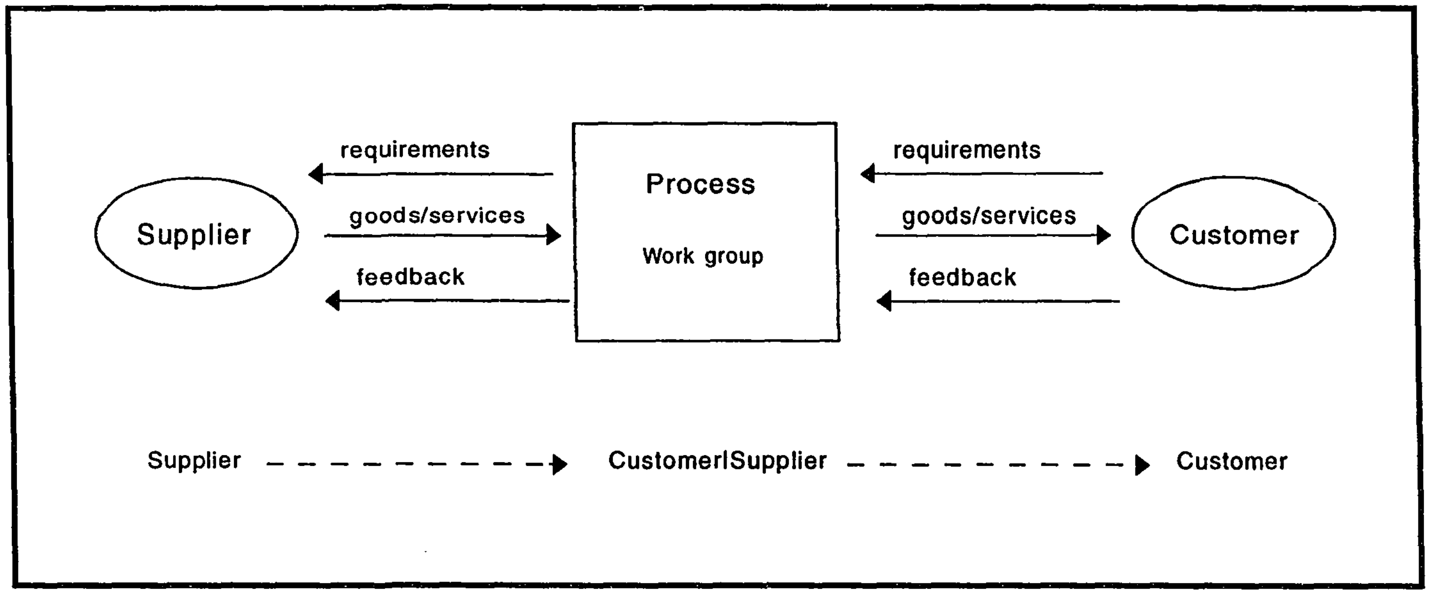


Figure 2.5: Microview of Subprocess

subprocesses which are visible to the customer from those which are not. Processes above the line of visibility are observed and experienced by the customer directly, for example, the acceptance of a deposit. An associated below the line activity would be the processing of the deposit to the correct account. Total quality requires attending to all activities both above or below the line of visibility. Fail points are positions within the process at which errors or problems are more likely to occur. The identification of fail points highlights areas where training and measurement may be required.

2.5 MEASURING QUALITY

Management shows what it values by what it chooses to measure and in choosing, sends a message to employees, suppliers, and customers (Callaghan, 1992; Lawton, 1991; Trogdon, 1988). Neal Trogdon, Executive Vice President of The First National Bank of Chicago, put it this way:

> We've learned that people respect what you inspect and that what gets measured gets done. If you measure, analyze, and correct, the result will be performance improvement.
>
> -- Trogdon (1988), p. 68

Firms with different cultures value and measure different things. Producer-centered firms favor financial information and are likely to measure profitability, productivity, standards, and meeting schedules. Customer-centered firms will favor attributes of importance to customers such as consistency, timeliness, and product ease-of-use (Lawton, 1991). ***Financial measures*** are not useful in the operational management of an organization. They are lagging indicators, that is, measures of past performance (Greig, 1993a; Strozier, 1991b). Omdahl (1992) likens the use of financial measures for organizational management to "driving the car using the rearview mirror." Thus, while the goal of measurement is improved financial performance, financial measures are not useful in operational management. ***Customer satisfaction*** measures are useful in achieving quality and organizational performance improvements. They are leading indicators, that is, they are drivers of future financial results (Greig, 1993a). A concentration on quality and customer satisfaction can lead to the required financial performance. The choice of focus is a policy issue determined by upper management.

Tenner and DeToro (1992) outline a measurement model useful at the implementation level. The model incorporates measurement at three levels: process, output, and outcome. ***Process measures*** define variables of the work process including process inputs. Process measurement is common in the line function of manufacturing but is often overlooked in other areas of an organization. ***Output measures*** define attributes of a completed product or service. In examining output, an organization needs to compare the characteristics desired by the customer with the characteristics actually delivered by the system. ***Outcome measures*** define the ultimate impact of the process on the customer and take into account what the customer does with the service or product. Outcome measures are the most difficult to assess and are, therefore, frequently simplified as "customer satisfaction." Outcome measures differ from output measures in that they are more global and tend to be firm specific, whereas output measures are transaction specific.

Measurement requires the selection of performance indicators, collection of relevant data, and analysis of that data to provide information for some specific purpose (U.S. Department of Commerce, 1995). We diagram this process in Figure 2.6. **Indicators** must be clear, objective, and measurable characteristics of products, processes or operations related to customer satisfaction or operational performance. Once performance indicators are determined, **data** for quality assessment or improvement are collected. These data will be of many types as indicated in Figure 2.6. Data are **analyzed** to extract larger meanings which support evaluation and decision making at all levels within the organization. **Information** extracted may include trends, projections, and cause-and-effect relationships. This information supports a variety of **purposes** such as planning, reviewing performance, improving operations, and comparing organizational performance to competitors or "best in class."

Thus measures provide data for decision making. But a decision is only as good as the data upon which it is based. If the wrong data are collected, or if data are not reliable, time and money are expended for no gain (Munoz & Nielsen, 1991). Data collection plans are designs for the collection and subsequent analysis of data such that required information is obtained and valid inferences about the state of a product or process can be made with desired levels of confidence. Well-designed plans ensure ease, accuracy, and timeliness in both collection and analysis.

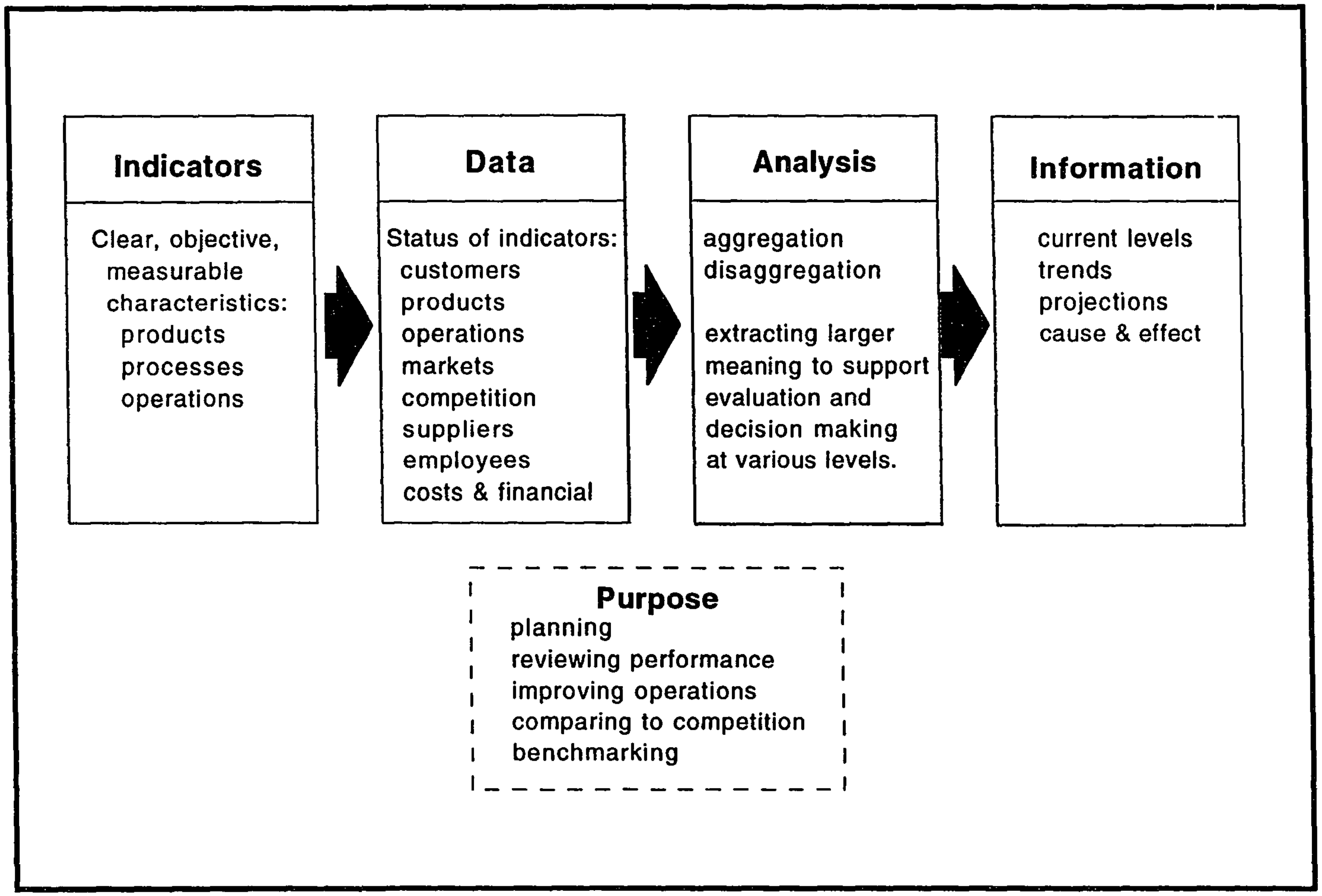


Figure 2.6: Measurement Process for Managing by Fact (Adapted from: U.S. Department of Commerce, 1995)

Designing data collection plans requires answering the questions of what to collect, when to collect it, who should collect it, and how much to collect (Harrington, 1991). Strategic planning determines what data are needed (Marquardt, 1992). The data collection plan specifies this need in more detail. The question of how much data to collect is a question of sampling. It is neither necessary nor desirable to collect data on every transaction or event. To do so would not only be wasteful and costly, it is likely to lead to greater error. Discussions of sampling theory can be found in most standard statistical texts, for example, Madsen and Moeschberger (1986) and Montgomery (1991).

Munoz and Nielsen (1991) report a data definition process used for statistical process control at the Boeing Fabrication Division which has potential for wider use. After flowcharting a process and developing a problem statement, a team uses a data definition model which considers four aspects of data collection: scope of the study, parameters to measure, data analysis requirements, and data collection resources. ***The scope of the study*** defines the boundaries of the study in terms of the process, the population of interest, and the time period. ***Parameter definition*** involves selecting and operationally defining attributes and variables to measure. ***Data analysis requirements*** specify the methods and tools to be used in analyzing data. ***Data collection resource requirements*** define who collects data, how it is collected, sampling techniques, and cost factors such as time. This approach to defining data needs in manufacturing could be translated to defining data needs for improving service processes.

When it comes to reporting measures, more is not necessarily better. To provide information it is necessary to condense available data into a few figures that offer management and workers a good indication of performance (Deardon, 1983; Mastenbroek, 1991). If data are not organized and filtered, a large quantity of data can be reported which relate weakly with success in the problem domain. Mastenbroek (1991) recommends that each work unit have a limited number, say 3-4, available indicators. These measures should be simple, visible, and able to be influenced by the work unit.

2.6 THE IMPORTANCE OF FEEDBACK

Measuring quality in products and processes provides a goal-directed basis for decision making and quality improvement. But measurement by itself is worthless. To have impact, measurement must be accompanied by an effective feedback system which informs workers, enabling them to correct problems and effect improvements (Harrington, 1991). Combining performance measurement with feedback empowers workers by providing motivation, information, and identification of training needs.

Motivation: Feedback engenders a sense of accomplishment (Harrington, 1991). Harrington (1991) asks us to consider the sport of bowling. Enjoyment in bowling does not lie in tossing the ball, but in knowing how many pins are knocked down. Motivation to continue playing come from the sense of accomplishment provided by direct and immediate feedback. At work also, motivation can be achieved through a clearly defined measurement system which provides immediate, relevant, and fair feedback of performance.

Information: Information is the basis of power. With knowledge and understanding of system performance workers are able to use their detailed process knowledge to improve performance for the benefit of the firm and its customers. Feedback empowers workers to act independently by providing them with the information they need to:

- understand the present system
- evaluate the need for change
- set priorities and focus attention on important issues
- identify root causes of problems they face
- set goals for personal performance
- evaluate the impact of change
- maintain improvement through monitoring

-- Harrington (1991), Ishikawa (1982)

Training: Needs-based training is less costly and more effective than blanket training of all workers. Measures of performance can highlight the areas where further training is needed thus saving a company time and money.

Thus performance measurement and feedback can improve worker performance.

2.7 CHAPTER SUMMARY

Service activities are pervasive in modern economies. While the distinction between goods and services is blurred, service activities can be distinguished by a set of characteristics which, taken togeth er, define a distinct class of activity. Classification schemes for services show the diversity among variables associated with providing service. These factors in combination make the controlling of service quality a difficult task.

Several models of service quality can be found in the literature. This research adopts a model which considers both process and output, and both internal and external customers. We accept that focusing on customer satisfaction can drive improvement in organizational performance.

Measurement is fundamental to quality improvement. Measurement includes the need to determine indicators, collect data, and analyze data to provide required information. Defining data needs requires the definition of the scope of the study and parameters of interest, and specification of data analysis and data collection resource requirements.

Implementing quality improvement projects which use objective data as their base requires special knowledge, skills, and abilities. Many employees lack expertise in this domain. One way to empower workers is to provide support in the form of procedural cues which ensure that all required steps of the process are considered. Where this can be accompanied by training, employee effectiveness and morale can be improved. This research achieves these objectives through the development of an Expert Support System (ESS) which provides procedural cueing and serves also to train workers. The research design is described in Chapter 3.

CHAPTER 3

RESEARCH DESIGN

Since the 1950's many service providers followed a manufacturing production model based on mass production techniques (Schlesinger & Heskett, 1991). In the face of stronger competition and increased customer expectations, the old model is proving inadequate. To follow the old model is to risk dissatisfied customers and poor company performance. The literature on services clearly shows that service activities differ from manufacturing activities. Consequently, management and improvement of service quality differs from the management and improvement of manufacturing quality. Service quality improvement requires models which recognize this difference.

In line with current common wisdom, we define quality as "meeting or exceeding customer expectations." Customers will have expectations on several dimensions of performance and the relative importance of these will vary across service types and over time (Albrecht & Zemke, 1985; Groonoos, 1990; Karwan & Rosen, 1988; Lyth & Johnson, 1988; Parasuraman et al., 1985). To improve service quality, a provider must know (a) the relevant quality dimensions for a given service, (b) customers' expectations on these dimensions, and (c) customers' perception of the firm's performance relative to these expectations. To know these things requires data. To modify processes for the purpose of improving performance requires data. To assess performance requires data. In short, without data it is difficult or impossible to know what to improve, how to improve it, or if improvement is achieved.

Our pilot study showed that data collected in service organizations to measure and improve service quality was often of limited use. Data were often inappropriate in that they were not related to customer expectations. Poor sampling strategies and high levels of data aggregation often meant that few if any inferences could be made from the data obtained. In addition, ease and consistency of data collection were problematic. Assistance to guide the data collection process is clearly needed.

This research seeks to address some of these problems. The research is an exploratory study of data needs for service quality improvement. The specific objectives are to develop a model of data needs for service quality improvement, and to demonstrate that this knowledge can be effectively captured in and disseminated by an Expert Support System (ESS). In this chapter we first present an overview of the research plan (Section 3.1) and discuss field research methodology (Section 3.2). Next we describe the strategy in the four phases of the research: problem definition (Section 3.3), model development (Section 3.4), model validation (Section 3.5) and system development (Section 3.6).

3.1 RESEARCH PLAN

The research plan used in this dissertation consisted of four phases as shown in Figure 3.1 and described next.

Phase 1, problem statement: An initial survey of the literature and pilot interviews in banks led to the identification of the research problem. The literature

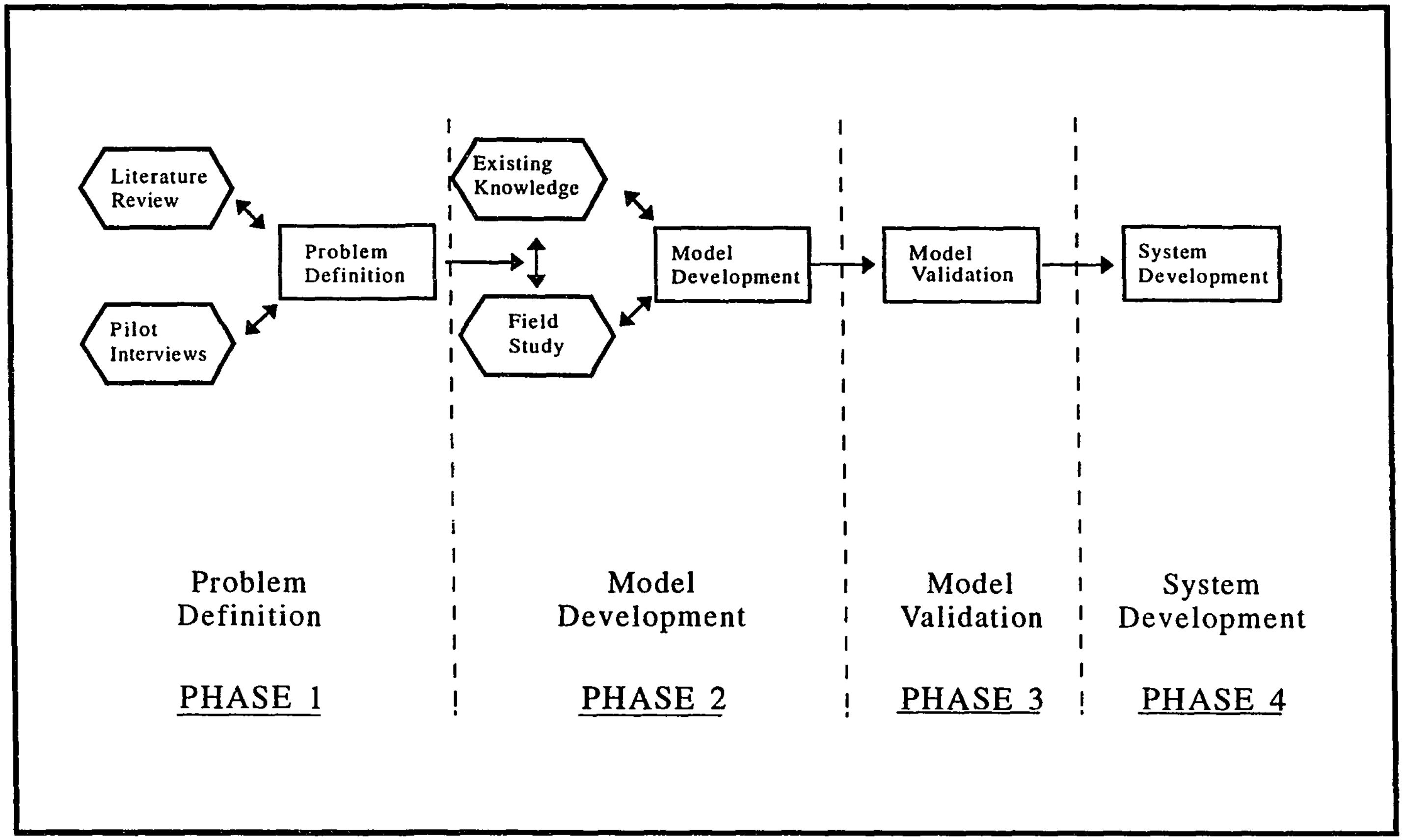


Figure 3.1: Research Design

survey suggested that service quality improvement was necessary but difficult to accomplish. The pilot study confirmed the findings of the literature survey with respect to perceived importance of service quality. Pilot interviews further revealed that the determination of data needs and data analysis to provide required information pose problems in practice.

Phase 2, model development: Model development consisted of an iterative cycle among the existing body of knowledge, an industry field study, and the emerging model. The plan for this stage called for an emergent research design. As the field study progressed, the model would begin to take shape, questions or issues would be raised, and insights gained would serve to refine the model and determine future research directions. The preliminary model developed in this phase was presented to participating field experts in order to secure face validity of the model. This model was subsequently redrawn to highlight the data needs aspects.

Phase 3, model validation: The data needs model was divided into two sections for the purpose of validation. The first section, data needs to identify quality improvement opportunities, was validated through a series of structured interviews and a survey of service providers. The interviews served to verify that the model was accurate, complete, and free of redundancy and the survey provided data on the strength of the major links within this section of the model. The second section of the model, data needs for the quality improvement process, was validated by a panel of experts.

Phase 4, system development: The validated model provided the basis for a logical model which was implemented in the ESS. Development of the ESS formed part of the research method and was not merely a research outcome. ESS development was intended to clarify and refine the model, to encourage full and clear specification of key concepts, and to force logical organization of knowledge. Davis described the contribution of system development with respect to expert systems as follows:

> The programs we write will probably not be the ultimately important thing, though extensive pragmatic benefit may result from them. Perhaps more important will be the role of system construction in encouraging the accumulation, organization, systematization, and further development of knowledge about a task.
>
> -- Davis (1989), p. 73

3.2 FIELD STUDY AS A RESEARCH STRATEGY

The method of choice for model development in this research was a field study. Field studies use unobtrusive operations of particular behavior systems in natural settings (Runkel & McGrath, 1972). They are suited to research problems which do not require researcher control over behavior and ask *how* or *why* questions about contemporary events (Yin, 1984). They can have particular value in applied areas where the research aims to provide practitioners with tools (Gummesson, 1991). The research reported here is the beginning of a research stream intended to both add to theoretical knowledge and to provide tools to practitioners. Therefore, we considered it important to retain the contextual complexity of the implementation environment. The research trade off was the gaining of realism at the expense of some precision and statistical generalizability.

The dissertation study uses an embedded, multiple-case design. That is, it uses more than one unit of analysis (embedded design) and more than one case site (multiple case design). Ten case sites in two banks were used. Units of analysis included the organization, regions, subregions, departments, branches, and work groups. The design permitted retention of a holistic view of the quality process while incorporating findings from sub-unit levels.

A description of some of the problems inherent in field studies and their relationship to this research is given in Appendix C.

3.3 PHASE 1: PROBLEM DEFINITION

The objectives of the first phase, problem definition, were to (a) understand the context of service quality implementation, (b) identify problem areas which presented opportunities for research, and (c) select an area for study. This was achieved through a survey of the literature and pilot interviews with bank employees.

The initial literature survey included articles in academic journals, trade journals, and popular media as well as books intended for both practitioners and academics. The literature survey provided an understanding of the nature of services and an awareness of issues in service quality. In addition it provided us with a set of concepts with which we could think about service quality and which sensitized us to unusual events in the pilot interviews and subsequent field study. The literature survey helped us to formulate questions for the pilot interviews and to construct the problem statement.

Pilot interviews were conducted with bank employees, primarily in New Zealand. A convenience sample was drawn. By convenience sample we mean a non-random selection of employees in close geographic proximity who were readily available and sympathetic to the notion that these interviews represented a very early stage of the research. The interviewees, two female and three male, were long-time employees with 8 to 36 years of bank employment. Sites used for pilot interviews were not used in the subsequent field study.

Interviews were designed to elicit views on the meaning, nature, and problems in providing quality in banking. They also provided an opportunity for us to become familiar with basic bank terminology and general bank operating procedures. Interviews were loosely structured around key issues (Appendix D). In most cases broad, open-ended questions were used; questions of the type sometimes referred to as *grand tour* questions (Lincoln & Guba, 1985; McCracken, 1988). For example an interviewee would be asked to "Tell me about quality at Bank N." Prompting questions were used to keep the interview flowing and to ensure that desired aspects of a topic were covered. For example, a prompt question regarding quality at Bank N was "How do you know you are achieving quality?"

The pilot interviews confirmed that achieving quality improvement was difficult and time consuming. They further suggested that data collection and analysis was a problem worthy of investigation.

3.4 PHASE 2: MODEL DEVELOPMENT

The objective of the second phase, model development, was to model the data needs for service quality improvement. The model was to emerge from a synthesis of existing knowledge and new insights from an industry field study. Primary emphasis was on data from the field study.

3.4.1 The Field Organizations

Two banks took part in this research phase, one in Hawaii (Bank H) and one in New Zealand (Bank N). The banks were chosen because of their commitment to quality improvement and their willingness to openly share information with us. The two banks provided a contrast because banks and financial environments differ between the U.S. and New Zealand. In general, New Zealand banks provide a more integrated banking service than their American counterparts. Also, the New Zealand financial market is less regulated than the U.S. financial market; indeed, the New Zealand financial market is among the most deregulated in the world.

Both banks in this study have upper management commitment to quality improvement and have instigated quality improvement programs. The banks operate in island nations of the Pacific and both have recently been taken over by larger, off-shore banks but retain independent subsidiary functioning.

Bank H is a large savings and loan company with 33 outlets. It has been established in Hawaii for 64 years. The Hawaiian subsidiary has a typical organizational structure with divisions for Commercial Markets, Retail Banks, Consumer Lending, Marketing, Credit, Operations, Community Development & Compliance, Finance, and Human Resources & Quality Service. Retail branches are divided into three markets, each with a market manager who reports to the Senior Vice President (SVP) Retail Banking. Research at Bank H was conducted at the Head Office, Central Operations and Support, and in two branches.

Bank N is New Zealand's largest commercial bank with over 300 outlets and accounts held for about 25% of the population. It has been established in New Zealand for 132 years. The New Zealand bank operates as three separately functioning banks: Corporate Bank for very large accounts, Business Bank for large business accounts, and Consumer Bank for small businesses and individuals, and the provision of transactional services for clients in the other two banks. Our interest was primarily in the Consumer Bank. Consumer Bank branches are clustered into geographically determined families of branches, each with a hub branch and 2 to 9 spoke branches. The families are grouped into three regional groups, with the regional office supplying support and centralized servicing of many operations. Research at Bank N was conducted at the Regional Sales and Support Office and within one family of branches.

3.4.2 Data Collection

Data collection began at Bank H. A research proposal was presented to the Executive Vice President (EVP) Human Resources and Service Quality at Bank H (Appendix E) and an informal meeting was held to set initial boundaries on the study. Following this meeting interviews were arranged with three division heads nominated by the Executive Vice President. The division heads nominated were: Vice President (VP) Customer Satisfaction Center, SVP Consumer Lending Operations, and SVP Retail Banking. These divisions were recommended because (a) they were important to the quality initiative at Bank H, (b) they had quality projects established, and (c) the division heads were judged by the Executive Vice President to be most likely to be supportive of the research project. Summary proposals were sent to division heads prior to the meetings (Appendix F). The purpose of these meetings was to gain support for the research and arrange for access to division employees. An executive level meeting of staff involved in quality assurance at Bank H further clarified and delimited the study. Following researcher participation in a new associate (employee) training program, formal interviews began at Bank H.

A research proposal, substantially similar to the Bank H proposal, was also sent to executives at Bank N. Prior to commencing fieldwork in Bank N, a meeting was held with the sponsoring Hub Manager and a statement of requirements was supplied (Appendix G). The Hub Manager provided initial contacts in the hub and in the wider region.

Data at both banks were collected from interviews, documentation, direct observation, and group meetings. These are described next.

Interviews: Interviews were the primary research technique in this phase. Interviews were held with employees at all levels in the banks from executive vice presidents to entry level operators. We wished to learn about quality planning and implementation practices as well as what information or data these people thought they needed, why they thought they needed it, how often they wished to see it, and how they would use it. Another general area for exploration at all levels was the role of computer technology in task performance, and ways in which respondents felt technology could be used to assist them in their jobs.

The semi-structured interviews contained a core of questions which the interviewer followed but from which she could branch off as needed to explore issues in depth. Lists of questions used at the organizational/divisional and branch/work unit levels are given in Appendices H and I. The core of questions contained open-ended questions designed to encourage interviewee disclosure, prompting questions to ensure that all points of concern were covered, and detailing questions where detail was desired. With this technique we sought to obtain accurate and complete information while retaining the flexibility to adapt an interview to individual cases or to emergent themes. The interviews took 45 - 60 minutes each. They were audio-recorded and subsequently transcribed. In addition field notes were taken during the interviews. The field notes provided a place to record insights and observations and gave readily available on-site access to information obtained.

In total, 24 informants were selectively sampled to provide informational diversity and access to knowledge at different levels of the organization. Sampling continued to the point of redundancy, that is, to the point where the marginal utility of another interview was assessed to be greater than its cost in time (Gummesson, 1991, Lincoln & Guba, 1985). Table 3.1 summarizes the sites used and numbers of informants at both banks. The numbers of informants listed in Table 3.1 include those who participated in groups as well as the 24 informants individually interviewed. Thus the number of informants totals 32. Definitions of position titles are given in Appendix J.

Documentation: Examination of documents was the second major source of evidence. The purpose of examining documents was to corroborate and expand information obtained from interviews. Documents examined included mission statements, strategic plans, operational plans, service standards, rating and evaluation schedules, job profiles, training manuals, product brochures, annual reports, research reports, bank award criteria, and data collection records.

Direct observation: Observations included casual observation, for example, while conducting interviews, copying material, or walking around the buildings, and some purposive observation. The purpose of direct observation was to gain an awareness of unit functioning and insights to generate further questions.

Group meetings: Four group meetings were held. A few group members had also been interviewed individually. Group meetings functioned as informal focus-group interviews in which participants inspired ideas in each other.

From these multiple sources of evidence a database was compiled consisting of field notes, audio-tapes, transcribed interviews, and documents.

Table 3.1
Case Sites at the Two Banks

#	Level	Bank	Site	Informants*	(#)
1	Org.	H	Headquarters, Central Support & Operations	EVP Human Resources & Service Quality, SVP Consumer Lending, SVP Marketing, SVP Retail banking, VP Center for Quality Service, VP Customer Satisfaction, VP Information Systems.	(7)
2	Dept	H	Consumer Loan Office	3 informants from 3 work groups.	(3)
3	Dept	H	Customer Satisfaction Center	Project Officer, Service Manager. 3 informants from 2 work groups.	(5)
4	Branch	H	Branch A	Market Manager.	(1)
5	Branch	N	Branch B	Branch Manager, Customer Service Manager.	(2)
6	Region	N	Regional Headquarters	Regional Manager - Sales & Support.	(1)
7	Subregion	N	Hub Office	Business Bank Manager, Hub Manager, Consumer Business Manager.	(3)
8	Branch	N	Branch C	Manager, 2 PB's, Acting Head Teller.	(4)
9	Branch	N	Branch D	Acting Branch Manager, PB, Teller.	(3)
10	Branch	N	Branch E	Branch Manager, PB, Head Teller	(3)
				TOTAL	(32)

* Individual interviewees and group members
Abbreviations: Org. = Organization; H = Bank H; N = Bank N; PB = Personal Banker; VP = Vice President; SVP = Senior Vice President; EVP = Executive Vice President

3.4.3 Data Analysis

To develop the model in this dissertation we looked for *chunks of meaning* within the database (Gummesson, 1991). This was achieved by comparing incidents, reported practices, and interviewee comments both during and after data collection. Significant ideas or comments were recorded and grouped by topics or themes. From the combination of this procedure and personal reflection, relationships emerged and the model of data needs for quality improvement was developed.

3.5 PHASE 3: MODEL VALIDATION

Ongoing validation was part of the iterative model development process. After several weeks of investigation, an initial model was developed. Items in this and successive versions of the model were validated by inserting specific questions into subsequent interviews and by re-examination of the growing document collection. Investigation continued to the point where minimal new information was emerging and the model became fixed. Face validity of the resulting model was obtained from a structured walk through of the model with key informants at both banks. Modifications were made in response to feedback and acceptance of the model was obtained. From this validation we wished to show that the model was considered credible by the informants as suggested by Lincoln & Guba (1985).

The validated model was later redrawn to highlight its data needs aspects. This new model broke down to two sections: data needs to identify quality improvement opportunities and data needs for the quality improvement process. While both sections contained descriptive and prescriptive elements, the first section was more descriptive, while the second section was highly prescriptive. For this reason different validation strategies were employed for the two sections. These are described next.

3.5.1 Validating Data Needs to Identify Quality Improvement Opportunities

In this phase of the research, the model was taken to a wider sample of service providers. Validation included (a) structured interviews to determine the accuracy of the model, and (b) an industry survey to determine the relative strengths of key links in the validated model. These are described next.

Structured interviews were completed with key informants at each of three levels (strategic, tactical, and operational) within selected firms. Their purpose was to validate the key components of the model. Interviews followed a well-defined format allowing clarification and elaboration within narrow limits. Questions tended to be brief, factually oriented, and aimed at eliciting specific information pertaining to the model (Appendices K, L, and M). Interviews took 30 - 60 minutes each. Responses were recorded on prepared sheets during the interviews. In addition, interviews were audio-recorded and subsequently transcribed.

Five service firms in Hawaii were selected for the purpose of completing validation interviews. These included a bank, a consulting firm, a car dealership, a hotel chain, and a health management organization (HMO). The firms were all large organizations in service industries characterized by high customer contact (see Chase, 1978). The five firms were well-known within the Hawaii business community for their commitment to quality improvement programs. The hotel chain had previously won the Malcolm Baldrige National Quality Award. Firms and initial contacts within firms were chosen on the recommendation of an officer of the Hawaii Chapter of the American Society of Quality Control (ASQC). All firms contacted agreed to participate in the study.

In total, 12 people were interviewed with 4 people providing information at more than one level. Table 3.2 summarizes the sites and informants used in this phase. In most cases, the initial contact person in the firm suggested others in the firm to interview and facilitated the arrangement of interviews. Most interviews were held in the greater Honolulu area with the exception of the hotel interview. The single hotel contact was located on Maui and was interviewed by phone. At the completion of the interviews, interviewees were shown the model and their comments solicited.

The model was modified in response to information obtained in the interviews.

The validation survey was designed to assess the strengths of key links in the model. The survey took the form of undisguised, structured questionnaires at each of three levels (Appendices N, O, and P). By undisguised we mean that questions were factual and their intent was obvious. The survey used graphic rating scales anchored by polar adjective pairs with otherwise undefined scale positions. The polar adjective pairs, important/unimportant and weak/strong, were chosen from among those researched by Osgood, Suci, and Tannebaum (1957). The number of scale positions, five, meets the commonly accepted criteria of 'seven, plus or minus two' and appeared

Table 3.2
Validation Sites

Level	Organization	Informant
Strategic	Bank	SVP, Human Resources & Quality Service
	Consultancy	Senior Partner
	Car Dealership	President and Chief Executive Officer
	HMO	Manager, Quality Support Services
	Hotel	Quality Leader
Tactical	Bank	SVP, Human Resources & Quality Service
	Consultancy	President, in charge of training
	Car Dealership	VP, Quality Assurance & Marketing
	Car Dealership	Total Quality Adviser
	HMO	Manager, Quality Support Services
	Hotel	Quality Leader
Operational	Bank	VP, Customer Satisfaction
	Bank	VP, Branch Manager
	Bank	Assistant VP, Branch Manager
	Car Dealership	VP, Quality Assurance & Marketing
	HMO	Clinic Manager

Abbreviations: VP = Vice President, SVP = Senior Vice President refined enough to transmit most of the information available from informants (Cox, 1980). Questionnaires and accompanying information sheets were pretested by graduate students and one faculty member. A convenience sample of Hawaii firms was drawn from the membership list of the Hawaii Chapter of the American Society of Quality Control. The sample was restricted to large firms in specific industries, namely, the travel industry (hotels, airlines, restaurants), hospitals or HMOs, and military establishments. In addition to the Hawaii sample, a call for participants placed on the listserve group, Quality, yielded six respondent firms. In total 36 firms were sampled.

The contact person in each organization was mailed a survey package containing the letter of transmittal and information sheet (Appendix Q) and one questionnaire package at each of the three levels. The ***letter of transmittal*** was designed to elicit the maximum number of returned questionnaires by appealing to the recipients' professional interest and responsibility and by the offer of a summary of report findings. The ***information sheet*** was designed to help the contact person select suitable respondents within the firm. At the bottom of the information sheet was a detachable form which the contact person could use to request a summary of the research results and acknowledgment of the firms contribution to the research. Each of the three ***questionnaire packages*** included:

1. Instruction sheet (Appendix R)
2. Relevant questionnaire (Appendices N-P)
3. Stamped addressed envelope for reply
4. Researcher's business card
5. Identification tag stating the level (for ease of distribution)
   all held together by a
6. Clip top pencil (golfing pencil)

Response rates ranged from 57 - 61% (Table 3.3). We considered these response rates to be acceptable, particularly given that each questionnaire had two potential failure points: (a) the contact person could fail to distribute the forms and, (b) selected individuals could fail to complete and return them. From the 36 firms sampled, 18 firms had all questionnaires returned, 6 had partial returns, and 12 firms had no questionnaires returned. The zero responses from some firms suggests a possible failure on the part of the contact person to distribute the forms. Follow-up letters (Appendix S) were sent to non-respondents after 6 weeks. Four responses were received after the follow-up mailing. Table 3.3 summarizes the numbers of packages mailed and responses received by organization type.

Table 3.3
Number of Survey Packages Mailed and Responses Received

Organization Type	Packages Mailed	Responses Received		
		Strategic	Tactical	Operational
Military	7	5	5	5
Hospital/HMO	15	7	9	10
Hotel	2	1	1	1
Other*	12	7	7	6
Total	36	20	22	22
Response Rate		57%	61%	61%

* Includes: Power Generation, Software, Technical, Car Dealership, and unidentified returns (3)

Responses were recorded in a spreadsheet and the number, minimum, maximum, mean, and standard deviation of each question response calculated. These results are presented in Chapters 5 - 7.

3.5.2 Validating Data Needs for Quality Improvement Processes

In this phase of the research a panel of experts in quality principles and practice was assembled to validate those sections of the model which dealt with data needs for the quality improvement process. The panel included three university faculty members interested in quality improvement strategies and involved in consulting on quality with firms in Hawaii. A fourth expert drawn from the Hawaii business community attended the first session but was unable to attend the second session. Validation was initially scheduled for a single two-hour session but had to be spread over two sessions due to a computer network failure in the first meeting. Validation of the data needs for the quality improvement process was a four step process comprised of (a) brainstorming, (b) mapping brainstormed ideas to model categories, (c) analysis of comments, and (d) follow-up interviews. These steps are described next.

Brainstorming: Two questions were separately brainstormed. The first question was related to quality improvement strategies at the tactical and operational levels: "What are the activities or tasks which must be completed to achieve quality improvement?" The second question was related to enabling strategies at the strategic level: "What must top management do at the strategic level to enable a total quality management system in an organization?" The tactical and operational levels were combined to save time and thus retain the support and cooperation of the experts. The tasks at these levels were similar.

Brainstorming was completed in the electronic meeting room (EMR) using group support system (GSS) software. Questions were written on a flip chart at the front of the room and also appeared on each expert's individual computer screen. Experts entered their ideas at their keyboards and the growing list of ideas was visible on the large communal screen at the front of the room. In addition, a new subset of ideas appeared on each expert's screen following each idea submission. Training in the use of the software was given at the start of the first session. The GSS software captured and stored the experts' ideas.

Mapping ideas to model categories: In this step, experts were asked to map their brainstormed ideas to a list of categories supplied by the researcher. The list of categories was compiled from steps in the relevant sections of the research model (Appendix T). When all experts had individually completed the mapping task they were invited to call out their responses while the researcher recorded them on a master sheet. The responses and ensuing discussion were audio-recorded.

Analysis: The purpose of the analysis was to check for omissions and redundancies in the model. Omissions could be indicated by uncategorized ideas, that is, ideas (quality improvement tasks) which the panel believed necessary but which did not fit any category currently in the model. Redundancies could be indicated by empty categories, that is, categories (steps in the model) for which no tasks were generated by the panel. The strength of mapping was denoted by the number of experts who mapped a particular idea to a particular category. The audio recording was transcribed. The discussion of the experts was useful in verifying the mapping and in pointing out where clarification was needed, where changes might be useful, and where categories might be collapsed or expanded.

Follow-up Interviews: In individual follow-up interviews, the results of the mapping and the researcher interpretation of them were shared with the experts. The relevant sections of the model were also shown to the experts. The experts' comments on the model and the validation process were solicited, and other thoughts or comments encouraged. Interviews were audio-recorded and later transcribed.

The model was modified in response to information obtained from the panel of experts.

3.6 PHASE 4: SYSTEM DEVELOPMENT

The research plan called for development of a demonstration prototype ESS to test ideas and representations, and to show that this technology could effectively assist in the use of data for quality improvement. To achieve this objective, a logical model was developed from the data needs model at the operational level. The logical model served as the basis for the computational model for the ESS.

3.6.1 System Choice

Initial research indicated that a potentially useful architecture for the system would be a knowledge-based system. A good part of the problem domain met Smith's definition of a systematic domain likely to lead to development success: it was clean, delimited, unambiguous, and could be captured in a finite set of axioms or rules (in Davis, 1989). The second step involved selection of a specific development tool. To obtain easier, faster development, we decided to use an expert system shell rather than a programming language. Modern, hybrid shells offer these advantages with minimal loss of design flexibility and functionality. The Microsoft® Windows™ version of LEVEL5 OBJECT 3.0 was selected. LEVEL5 OBJECT is an object-oriented development environment supplied by Information Builders, New York.

3.6.2 System Development

The generally preferred methodology for ES development is prototyping (Agarwal & Tanniru, 1992; Budde, Kautz, Kuhlenkamp, & Zullighoven, 1992; Budde & Zullighoven, 1992; Doyle, 1985; Waterman, 1986). Prototyping consists of the evolution of a system over a series of successively more complete versions, each of which gives a clearer indication of the evolving system's appearance and functionality. Several advantages are claimed for prototyping: the ability to tailor systems to user needs, the obtaining of user support for the system, and prototyping's suitability for ill-structured problems due to its provision of concrete examples to which the expert(s) can react and by which they can structure the problem.

However, we believed that these advantages would be lessened in our development environment where there were multiple sources of expertise, multiple users, and a large problem domain. In addition, the procedural cueing employed in our implementation implied a known or desired structure which needed to be specified, in outline at least, in advance of coding. Thus we used a semi-structured development methodology consisting of three stages: requirements analysis, knowledge acquisition, and system development. Development of a field prototype would require a fourth step, system assessment. We describe the three steps we used next.

Requirements analysis consisted of interviewing upper management at Bank H, including the corporate Executive Vice President and several division heads. This was done early in the field study, prior to model development. Agreement was reached on the overall functional requirements for a system to provide organization-wide support for the quality improvement process. The required functions of the system were:

- to support decision making in the task domain, and
- to provide formal and informal training

The benefits upper management sought from the system were (a) consistency throughout the organization in problem selection, data collection, and reporting, and (b) the obtaining of relevant and statistically valid data for quality improvement. Consistency was to be achieved among system users through the structure imposed by the system on the decision task. Obtaining relevant and statistically valid data was to be realized through the provision of expertise in the system.

Knowledge acquisition: Since our methodology assumed an understanding of overall global design prior to commencing coding, knowledge acquisition was particularly important. A potential hazard existed if the design was specified too early and a less than optimal design was implemented. Knowledge acquisition was described earlier under model development (Section 3.4).

System development: System development resulted in a demonstration prototype. System development is described in Chapter 9.

Although a stepwise methodology was used some iteration between stages was required. For example, questions arose during system development which called for clarification (further knowledge acquisition). Similarly problems in system validation are likely to necessitate further system development.

3.7 CHAPTER SUMMARY

This study used a four stage research plan. In the first phase, a literature survey and an industry pilot study led to the formulation of a research problem. That problem was the elucidation of data needs for service quality improvement. A secondary objective was to be the development of a demonstration prototype computer support system for quality improvement teams. In the second phase, a field study was used to gain an understanding of data needs for service quality improvement and to develop a preliminary model. The data needs model broke down to two sections: data needs to identify quality improvement opportunities, and data needs for the quality improvement process. In the third phase, the two sections of the model were validated. The first section, data needs for quality improvement opportunities, was validated in structured interviews with quality-conscious service providers and in an industry survey. The second section, data needs for the quality improvement process, was validated by a panel of experts. In the fourth phase a logical model was developed from the data needs model at the operational level. The logical model served as the basis for the computational model in the ESS.

In the remainder of this dissertation report we present our findings from phases two, three, and four. We begin, in the next chapter, with a description of our findings in the field study and the presentation of a generic model of data needs for service quality improvement.

CHAPTER 4

QUALITY INITIATIVES AND DATA COLLECTION IN THE FIELD SITES

To develop a model of data needs for service quality improvement, we undertook a field study in the banking industry. Banking provided a useful development environment because of the extent of homogeneity in the industry, the competitiveness created by deregulation, and the fact that banking was among those service industries in which quality initiatives were emerging. The model was later validated in a wider selection of service industries.

This chapter provides an overview of the findings of the study. First we summarize the quality initiatives in the banks (Section 4.1) and define the two elements of service quality recognized by informants (Section 4.2). We then describe quality-related data collection and data use in the banks (Section 4.3). Finally, we present the levels of quality planning and quality measures (Section 4.4) and our generic model of data needs applicable across all levels (Section 4.5). Succeeding chapters will elaborate our model at each of the three levels.

4.1 QUALITY INITIATIVES IN THE TWO BANKS

Two banks were studied, one in Hawaii (Bank H) and the other in New Zealand (Bank N). An overview of the quality initiatives in these sites follows.

4.1.1 BankH

Bank H is a large savings and loan company in Hawaii with 33 outlets. Twelve months prior to this study it became a wholly owned subsidiary of the second-largest Bank Holding company in the U.S. This research is restricted to the Hawaiian subsidiary, and the term "Bank H" refers exclusively to that subsidiary.

The quality initiative at Bank H was instigated toward the end of 1988 by the Chief Executive Officer (CEO). The CEO was a strong advocate of quality as a competitive strategy. The bank chose a technocratic approach to quality improvement -- one which emphasized team development and team solution of technical problems. The initiative began with upper management training in TQM philosophy and principles. Subsequent training for all employees emphasized the use of data to identify problems, determine solutions, and monitor performance. According to the EVP Human Resources and Service Quality, the primary objective of the first five years was to get staff into the habit of measuring, that is, collecting and using objective data for monitoring and improving service processes.

To support the quality initiative the bank appointed a Service Quality Manager and established a Quality Steering Committee comprised of executives appointed from the CEO's executive team. The Service Quality Manager was later replaced by a Center for Quality Service under the direction of a Vice President and the Quality Steering Committee was expanded to a Quality Council which included all senior executives. At the time of our study the Quality Council set the strategic direction of the quality initiative while the Center for Quality Service provided training and support to quality improvement teams in work units.

Bank H supplemented the work of the Center for Quality Service with expertise from outside the organization. Two well-known quality consulting firms were engaged. The first advised on setting up the quality initiative and the early phases of training. The second initiated advanced team leader training. The philosophy and advice of these consultants had a strong impact on the direction of Bank H's quality initiative. The bank also brought in speakers from well-known organizations such as the Juran Institute, sent managers to workshops and lectures, and exchanged knowledge, experiences, and strategies with other service organizations. Thus learning at Bank H was strongly influenced by external experts.

Quality improvement at Bank H was accomplished through the work of self-selected teams of employees within work units. These teams selected and worked on projects to solve particular problems within their units. Eighteen months after the initiative began, the Bank Had 74 quality improvement teams registered. Three and a half years after the initiative began, the bank received a U.S. Senate Productivity Award for its achievement in improving productivity and quality.

4.1.2 Bank N

Bank N is New Zealand's largest bank with over 300 outlets. Six months prior to the study it became a wholly owned subsidiary of a large Australian Bank.

The quality focus at Bank N began in late 1990 following major financial difficulties at the bank. At that time, Bank N wrote off many bad loans and required government funds to re-establish a stable financial base. In return, the government required the bank become more efficient and more profitable. Bank N's management chose to use quality as its improvement strategy. The bank chose a socio-technic approach to quality improvement -- one which involved a structured reengineering of corporate culture, systems, and management. Development programs were established to educate staff about bank products and to train staff in better meeting individual customer needs. According to the Regional Manager (Sales & Support), the primary objective of the first three years was to effect cultural change through internal marketing.

A major thrust of Bank N's quality initiative was a change to relationship banking, a strategy which the bank chose after examining best practices in other banks. Relationship banking focuses on customers and meeting their total financial needs in a long-term, multiple-service relationship. It emphasizes customer retention and expansion of services to existing customers rather than acquisition of new customers (Berry, 1991, Donnelly, et al., 1985). Selling to existing customers was considered important at Bank N because the bank already had a large customer base.

The switch to relationship banking required changes to the organizational structure and to reporting relationships. In the revised structure, Bank N provided differentiated services to niche markets by dividing service delivery among three separately functioning divisions or banks: Corporate Bank, Business Bank, and Consumer Bank. Corporate Bank operated from the nation's capital to provide highly specialized service to a few very large corporations. Business Bank Had offices in major centers to provide specialist services to high volume business customers. Consumer Bank provided mainstream banking services to small businesses and to individuals as well as transaction handling for Corporate and Business Bank clients.

Our research was primarily within the Consumer Bank. Consumer Bank was divided into three regions with regional offices providing centralized services and specialist support to branches in their regions. A secondary level of centralization was provided through the concept of bank families. Each geographically determined family had a hub branch and several spoke branches. The new structure simplified centralization of services such as payroll and typing and removed much of the back office paperwork from branches. This enabled staff downsizing at branches while at the same time freeing staff to focus on selling and service to clients. The result was improved service at a lower cost to the bank.

Most training at Bank N was provided in-house at the branch level. Mandatory weekly branch meetings provided product and service training. Other training included computer-based product training and one-on-one discussions between management and staff concerning targets and service performance. Externally based courses were more common in the initial stages of the switch to retail banking.

Quality improvement at Bank N was accomplished through organizational change and effective staff training in product knowledge and service requirements. The consistency of attitudes and responses among informants in this research was testimony to the effectiveness of the in-house training. Market research had not identified a clear leader for quality in the New Zealand banking environment, however, it had found increased customer satisfaction with Bank N's service.

4.1.3 A Comparison

It was clear from our interviews that both banks faced similar problems in daily management. For example, both banks were concerned with meeting variable customer demand, maintaining quality in cross-town servicing of accounts, retaining customers, and increasing penetration of current banking relationships. The tactics employed to overcome problems were also sometimes similar. For example, both banks used part-time staff and overlapping shifts to help alleviate the problem of variable customer demand in some branches. In other areas tactics differed markedly. For example, Bank N stressed relationship banking to encourage customer retention. Bank H had not made this change. Bank H stressed technologies and procedures which kept customers out of the branches, for example, ATMs and telephone services. This was a fundamental difference between the approaches of the two banks.

Bank H's technocratic approach emphasized process measurement and management. The technocratic approach was effective for Bank H in meeting the bank's initial quality objective -- getting staff into the habit of measuring. By contrast, Bank N's socio-technic approach emphasized a cultural change from an order-taking mentality to one which emphasized sales and service excellence. The socio-technic approach was effective for Bank N in meeting its initial quality objective -- culture change.

Some of the differences may be more apparent than real in that they reflect differences in emphasis or in starting points rather than differences in philosophy, principles, or intent. The quality improvement process can be viewed from the perspective of the Gap model (Zeithaml et al., 1990). This model suggests a four step process as follows:

1. Understand customer expectations
2. Establish standards (congruent with 1)
3. Monitor performance (relative to 2)
4. Provide accurate information to customers about offerings

In relation to this model, Bank N began its service initiative at step 1 (understanding customer expectations) and is proceeding to step 2 (establishing service standards). By contrast, Bank H began at step 3 (monitoring performance) and, not surprisingly, has now decided to move back to step 1 to better understand customer expectations.

Bank N's approach has resulted in gains for the bank in terms of staff morale, consistency of staff attitudes and actions, and a feeling among staff that they [the bank] are on the right track. Staff know what is required of them and quality indicators are improving. By contrast, Bank H staff seemed unclear of the use made of some of the data they collected and desired more feedback on their performance.

Management at Bank H recognizes that their measurement of performance without first understanding their own customers' expectations was premature. Recently, Bank H has drawn back from the depth of process measurement previously undertaken. The Vice President, Center for Quality Service noted:

> We need to get back on line. We need to determine from customers what it is we should be measuring.
>
> -- Vice President, Bank H

We found that Bank N's approach led to greater staff acceptance, more lasting change, and greater improvements in terms of both quality and productivity. We believe that the greater improvement at Bank N came from two sources: (1) the bank's commitment to understanding customer expectations, and (2) an emphasis on communication and ongoing training.

4.2 THE TWO COMPONENTS OF SERVICE QUALITY

According to our informants, quality in banking has two components: products and service. **Products** are the packages of options available to customers such as account types, loan types, investment options, and payment methods. **Service** is comprised of the processes, procedures, and behaviors involved in providing and maintaining those products for customers. For example, a Retirement Income Account is a product; the collection of behaviors involved in recommending it to meet a particular customer's financial needs is a service. The product/service distinction in banking was alluded to by Neal Trogdon, EVP The First National Bank of Chicago. Trogdon (1988) reports that to determine customer definitions of quality, his bank asked two questions: What do you consider good quality features of banking products? What do you consider good quality in the delivery of those features?

Our finding of a product/service distinction in banking differs from opinions commonly expressed in the marketing literature. Shostack (1971b) is adamant that banks "are not in the product development business at all," and Thomas (1978) includes banks in his list of "pure service businesses." These writers were emphasizing the differences between service-intensive and manufacturing-intensive industries. They used the term "product" to refer to tangible things. Our informants used the term to refer to bundles of intangible things -- service options. "Products" were clearly distinguishable from "service" in the eyes of our informants.

The product/service distinction identified in the banking industry can be applied to other service intensive industries. We found examples in organizations studied in the validation phase of our research. In a health management organization (HMO), membership contracts were considered products to be sold, while the delivery of health treatment and interactions with members were considered service. In a car sales dealership, warranty and servicing contracts were sold as products with vehicles, while recommending suitable packages to clients, interacting with clients, and servicing of vehicles were considered service.

The distinction has significance for quality management. We found that responsibility for product design was often separated from responsibility for service delivery. For example, the car dealership in this study was a franchise operation;

product design (warranty and servicing contracts) was in the manufacturer's domain, service delivery was the concern of the dealership. As another example, bank product design was the responsibility of upper management, while work unit employees were concerned with service delivery. The role of non-managers in service delivery does not excuse upper management from responsibility for providing resources and designing processes to enable quality in that service delivery.

Bank employees recognized that quality requires both product excellence and commitment to service. However, several employees identified quality in service delivery as a particularly important competitive strategy to differentiate a bank from its competitors. One employee put it as follows:

> Basically, banks are all offering the same products, with perhaps some pricing differences, so the only thing which can differentiate banks is service. [Quality service] in the end will bring in more customers and more revenue
>
> .-- Personal Banker, Bank N

Our research is concerned primarily with service and the ESS is developed to assist in delivery of quality service rather than quality products (Section 1.4).

4.3 DATA COLLECTION AND DATA USE IN THE FIELD SITES

4.3.1 Data Collection and Data Use at Bank H

Quality measurement at Bank H consisted of both centralized and independent measures. Centralized measures were used to compare performance of similar units, for example, branch managers compared their performance with the performance of other branches. From this comparison, they were able to identify quality improvement opportunities. However, centralized measures seldom provided enough information to improve service quality. Improving performance required measures which supplied particular information for specific projects. Although informants stated that both centralized and independent measures were useful, we observed that centralized measures had greater impact on data collection and data use within the bank.

Centralized Measures: Measurement and tracking in Bank H centered around eight indexed values reported daily to the CEO and the Quality Council. The exact composition and format of the indices are considered proprietary information by Bank H but we can state that indices covered areas such as profitability, asset quality (loan security), management performance, employee satisfaction, customer satisfaction, and service process performance.

The indices were weighted aggregates of several indicators with some indicators being, in turn, indices of other measures. The number of indicators per index ranged from 1 to 22 and the time between measurement ranged from one day to one year. Our analysis of the indices led us to the identification of three types of measures. The groups differed with respect to types of measure, number of indicators, frequency of measurement, locus of measurement, and managerial level interested in the index. These are described next.

1. <u>Performance Indices</u>: Performance indices included profitability, asset quality (security), and management performance. These indices had only one or two indicators

each and comparatively longer time intervals between measurement -- a month or a year. Performance indicators were measured by employees at high levels within the organization and results were not widely disseminated. The information they conveyed was of most interest to upper management.

2. Outcome Indices: Outcome indices included employee satisfaction and customer satisfaction. These indices were composed of four or five indicators measured at different time intervals. For example, customer satisfaction was comprised of four indicators measured annually (customer needs survey, mystery shopper survey), quarterly (closed account surveys), and daily (quality dimension surveys). Indicators for these indices were measured by support departments (Human Resources in the case of employee satisfaction, and Marketing in the case of customer satisfaction). Outcome information was made available to staff but its dissemination and implications were not stressed. Outcome indices were used by upper and middle management in tactical planning.

3. Output Indices: Output and process performance were measured in a single index, the service process index (SPI). This index contained 22 indicators which were measured daily throughout the organization. Data were collected on team or departmental performance rather than on individual performance. The SPI contained information of particular interest to unit managers and division heads.

The analysis of indices shows that different data were being collected and used at different levels within the organization. We believe that the differences reflected the different responsibilities, functions, and planning terms of the levels. The differences can be seen in two indices of particular interest to this research: The Customer Satisfaction Index (CSI) and the Service Process Index (SPI).

The CSI was designed to measure the "voice of the customer" (1992 Quality Month, Bank H). It provided information on how well the bank was meeting or exceeding customer expectations. CSI indicators were of the type described as outcome measures, that is, measures of the overall impact of the bank's service on customers. These outcome measures were used primarily by upper and middle management in tactical planning.

The SPI was designed to measure "processes viewed to have the greatest impact on external customers" (1992 Quality Month, Bank H). The SPI was of particular interest in this research because of its impact on data collection throughout the bank. Employees measured daily those indicators which were applicable to their unit. SPI indicators were exclusively internal measures, that is, they used the bank's own standards not those of paying customers. The majority were of the type described as output measures, that is, they measured attributes of the delivered service, (wait time in lines, timely mailings, telephone response rate, and accuracy of address changes are examples). A few were of the type described as process measures, that is, they measured variables of the work process (Automatic Teller Machine (ATM) up-time, computer system availability, and staff knowledge are examples). These output and process measures were used primarily by unit managers and staff. In their more aggregated form they were used by division heads. In discussing SPI indicators, a division head commented:

> Some information is very valuable at an individual or branch level. When this information gets synthesized at a very high level it tells me where we need to change the process. It gives me a sense of where we are and, if we are contemplating changes, it gives a before and after view. The information can be used as justification for installing new equipment or systems.
>
> -- SVP retail banking, Bank H

By examining these two indices we see again that outcome measures and aggregations of output measures were used at the tactical level while detailed output and process measures were used at the operational level.

Use of indices forced aggregation of otherwise unlike data. For example, the SPI aggregated subjective scores (physical appearance of facilities and written communications), counts (accuracy of new account set ups), and timeliness measures in minutes (wait time in teller lines) or days (time to loan approvals). The need to aggregate such unlike data led to the collection of attribute data. Attribute data is easier to aggregate because it consists of counts and values based on counts. Bank H's indicators were frequently reported as percentages of times targets were met, for example, percentage of telephone calls answered within 15 seconds. No collection of variables data was observed in any of the areas studied. Variables data represent exact numerical values measured along a continuum and have potential to provide more information than attribute data. For example, attribute data may tell management that the target time for telephone answering was met 80% of the time, but it gives no indication of how far from target the other 20% were. Variables data would give more information by defining the average time taken to answer phone calls and the standard deviation of that time. This information gives a better picture of what is happening. It is also easier to detect small changes in performance with variables data. Managers reported making little or no use of some of the attribute data they collected.

In summary, we can state that the use of centralized indices influenced measurement throughout Bank H. Different data were used by employees at different levels within the bank. Measures of overall performance were used by upper management in strategic planning. Outcome and some output measures were used in tactical planning. Output and process measures were used at the operational level. We also observed that indices necessitated data aggregation, often of unlike data. This led to loss of information not only from the loss of detail inherent in summation, but also by forcing collection of attribute rather than variables data.

Work unit measures: In addition to collecting data for inclusion in the SPI, work units collected independent data for their own use. These measures were developed and used by quality improvement teams working on specific quality improvement projects. Data were collected and analyzed to determine baseline performance levels, to identify problem causes, and to ascertain results of intervention. Measures were process or output measures rather than outcome measures. Most quality improvement projects related to improving performance on an SPI indicator, for example, wait time in the new accounts area. Thus centralized indicators were being used to identify quality improvement opportunities and work unit measures were being used in the quality improvement process.

Opinions about measurement within Bank H varied. Management at Bank H liked to think that employees were getting into the habit of measuring -- that employees were developing measures and using data to monitor and improve service quality. By contrast, most employees felt that measurement was a "top down," management-driven task. They expressed dissatisfaction with what they saw as lack of feedback on the use made of the data they "sent up" to upper management. Most branch managers displayed graphs comparing performance of branches on selected SPI indicators but outside the retail division (branches), comparisons were often not possible as no comparable work units existed within the bank. Employees in these other areas often commented that the data collection was a "waste of time."

From our observation it was clear that non-managerial staff had limited information on the outcome measures obtained by the Marketing Department. This would be our major criticism of the quality initiative at Bank H. Failure to communicate to all employees the results of market research into customer satisfaction was a serious omission. Staff need to know which attributes of service delivery customers consider important and how customers perceive the bank's performance on those attributes. This omission contrasted sharply with Bank N's practice of wide dissemination of customer satisfaction information.

4.3.2 Data Collection and Data Use at Bank N

Centralized measures were used at Bank N for developing service standards, setting targets, and evaluating unit performance relative to other units. Some independent data were collected at the work unit level and used in training and motivational meetings. Although both centralized and independent measures were used effectively, the major culture change at the bank was achieved through dissemination of information from the centralized measures.

Centralized Measures: Measurement and tracking in Bank N centered around 15 critical service factors (*CSFs*) identified from independent market research in the bank's market base. Two large customer surveys were conducted. These were one shot surveys separated by a seven month interval. The first survey established baseline performance levels; the second replicated the first to determine the extent and direction of any change in customer ratings. However, management found the collection of data at single points in time unsatisfactory. Collection costs were high and data availability was infrequent. More importantly, data were subject to bias from economic and political factors beyond the control of employees. Consequently, the one shot surveys were replaced by an ongoing survey. The ongoing survey involved more frequent (weekly) monitoring with heavily reduced sample sizes. In addition to monitoring the bank's performance on the *CSFs,* researchers had begun to look beyond the factors to explore customers' opinions of how the bank demonstrates (or fails to demonstrate) each of the *CSFs*. For example, the bank sought to learn from customers what actions or behaviors made the customer "feel important" or made the branch "feel comfortable and welcoming."

The *CSFs* measured customers' general impressions of the bank's service rather than results of specific transactions, that is, they were outcome rather than output measures. The *CSF*s were consistent with Parasuraman et al's (1985) dimensions of service quality. For example, in the Parasuraman et al. study, reliability was consistently ranked highest by employees and customers. The findings at Bank N supported this, with the three highest rated factors being those related to error reduction or correction:

> Very few mistakes are made;
> Staff accept responsibility when mistakes are made;
> Mistakes are quickly fixed up. -- *CSFs*, Bank N

However, researchers at Bank N found that empathy ("Staff make you feel important") correlated most highly with overall rating of the bank's service quality.

Work unit measures: Bank N emphasized centralized rather than work unit measurement. Some measurement strategies for intermittently monitoring branch or team performance were specified in branch Service Action Plans. These included engaging customers as mystery shoppers, holding customer focus-group interviews, and distributing comment forms. Branches also surveyed the competition by sending their own staff to "shop" at other banks and businesses. Data from these sources provided stimulus for discussion, training, and motivation in weekly staff meetings. Measures at the work unit level included outcome, output, and process measures. Process measurement and control charts were most common in the operations area, that is, in back office transaction processing.

4.3.3 A Comparison

Both banks used a combination of centralized and independent measures though in different ways. In Bank H, centralized measures were determined from independent research in another market -- the U.S. mainland. In Bank N this determination was made from independent research in the bank's own market base. In both banks the existence of centralized measures was seen as desirable in providing comparative data for managers. Independent work unit measures were developed within both banks and used for motivation, training, and decision making by teams engaged in quality improvement projects.

Bank H's centralized measurement was implemented by a top-down mandate and a bottom-up data collection and aggregation system. That is, upper management determined what was to be measured and employees throughout the organization did the collection and recording. Data became increasingly aggregated as it was "fed up" the system to the Quality Council. In Bank N centralized measurement was also an upper management initiative. However, in Bank N responsibility for data collection and information dissemination remained at a regional level.

In both banks we observed patterns of differences in the types of measures (performance, outcome, output, process), the types of data (attribute, variables), the levels of aggregation (detailed, summarized), and frequency of measurement. The different patterns were related to the different levels of quality planning and implementation. These are discussed next.

4.4 LEVELS OF QUALITY PLANNING AND QUALITY MEASURES

From our research we identified three cascading levels of quality planning and implementation. We label the levels with common management terms: strategic, tactical, and operational. Our research showed the decisions made at each level differed and, consequently, the focus and nature of measures also differed. The differential relevance of measures was described by one informant as follows:

> What you will find is that the operational folk do not have the same view as the strategic planners. The measures which are relevant at the strategic level are not as relevant to the operational level workers. Sometimes it is, but [operational workers] tend to think more bottom-up, more individual-type things. You have to get operational measures very small, easily measured -- you have to measure pieces of the process. -- Manager, HMO

Planning at three levels is consistent with ISO 9000 but it is not commonly reported in the literature. We find this omission surprising because multiple levels of quality planning and implementation were common across all the organizations we studied. We believe that an understanding of the three levels can help an organization to objectively link strategies, tactics, and procedures to results.

Data needs and quality improvement processes at each level are described in chapters 5 - 7. For the sake of clarity we here define the levels, summarize the differences (Table 4.1), and show the interrelationship among levels.

Table 4.1
Quality Plans, Tasks, and Measures by Planning Levels

		STRATEGIC	TACTICAL	OPERATIONAL
PLANS	*Group Responsible*	Upper and Middle Management		Middle Management and Staff
	Planning Term	Long [3-5 years]	Medium [1-3 years]	Short [up to 1 year]
	Formal Plans	Vision; Mission; Stratetic, Business,and Quality Plans	Tactical Plan, Service Brief	Operational Plans, Service Action Plans
TASK	*Responsibility*	Vertical Alignment	Horizontal Alignment	Unit Optimization
	Object Focus	Organization/Environment, Product	Process	Activity
	Means	Enabling Strategies	Tactics to achieve strategic goals	Process management
MEASURES	*Stakeholder Focus*	Owners	Paying Customers/ Employees	Next Operation
	Measures	Performance (Results)/ Outcome	Outcome/ Output	Output/ Process
	Frequency	Monthly, Annual	Weekly, Quarterly	Hourly, Daily
	Aggregation	Global [aggregated]	Cluster [some aggregation]	Individual [non-aggregated]
	# Indicators	3 -7	8-15	3-5 per activity

Strategic level: We found strategic quality planning was the responsibility of upper management, though input was often sought from other managers and details were often handled by a steering committee. For example, the Quality Council at Bank H functioned as a steering committee. Strategic quality plans included the organization's vision, mission, financial goals, quality goals, and key strategies. Plans at this level covered terms of three to five years.

Our informants saw the strategic responsibility as a vertical responsibility, that is, a responsibility for obtaining a common focus throughout the organization. Vertical alignment can be achieved by linking corporate strategies with individual departmental priorities, a practice often referred to as policy deployment (Akao, 1991; King, 1989). Strategic planners focused on the organization and its environment with the aim of developing strategies to enable workers to achieve organizational goals. The organizational restructuring and cultural reengineering at Bank N were examples of successful enabling strategies.

A major strategic goal in all organizations we studied was the obtaining of a satisfactory return on investment for owners. Consequently, the principal measures of interest were performance measures such as profit, cycle times, and productivity of capital and other resources. Global outcome measures (customer satisfaction and employee satisfaction) were of interest as indicators of performance in areas which impacted financial performance. Senior managers preferred a few global values (indices, CSFs) reflecting performance in vital areas. Data at this level were highly aggregated.

Tactical level: From field data we saw that tactical quality planning was a joint venture between upper and middle management, with some input from others. For example, tactical planning at Bank H was carried out by the Quality Council (upper management) in conjunction with the Center for Quality Service (middle management) and division heads. Tactical plans covered one to three year periods. Service briefs were also prepared at this level. Service briefs are sets of requirements and procedures which define specific services to meet customer needs.

Our informants saw the tactical responsibility as a horizontal responsibility, that is, a responsibility for effective functioning across divisional and departmental lines. Tactical planners were responsible to strategic planners for achievement of strategic goals. They focused on processes with the aim of simultaneously reducing costs and increasing customer satisfaction.

Tactics were designed to increase customer and employee retention rates in order to achieve strategic goals. Consequently, the principal measures of interest at this level were outcome measures (customer satisfaction, employee satisfaction) and output measures (for example, responsiveness, reliability, empathy). Tactical data were less aggregated than strategic data, generally showing summations for divisions, functional areas, or even work units.

Operational level: We found operational quality planning was the responsibility of middle managers and staff in associated work areas. For example, branch managers in both banks prepared operational plans. Plans covered periods up to one year and related to process or sub-process improvement. Operational level service quality plans were referred to as Service Action Plans.

Our informants saw the operational responsibility as one of unit optimization, that is, units worked toward efficiency and effectiveness in meeting strategic objectives. Operational level workers were responsible for process management including management of the customer interface. They focused on activities within processes with the aim of improving the quality of service delivery.

We found the major focus at the operational level was the "next operation" (Bhote, 1991). The next operation could be an internal or external customer depending upon the nature of the task. The principal measures of interest at the operational level were detailed output or process measures. We believe a case could be made for increased use of outcome measures, though outcome data might be collected at higher levels within the organization and results passed down to operational workers.

Figure 4.1 presents our view of the functional relationship between the levels. The diagram is a composite of our observations in all the service organizations studied. As the Figure shows, direction and delegation flowed down from strategic planners (upper management, steering committee), to tactical planners (upper and middle management), and finally to operational managers (work unit managers and staff).

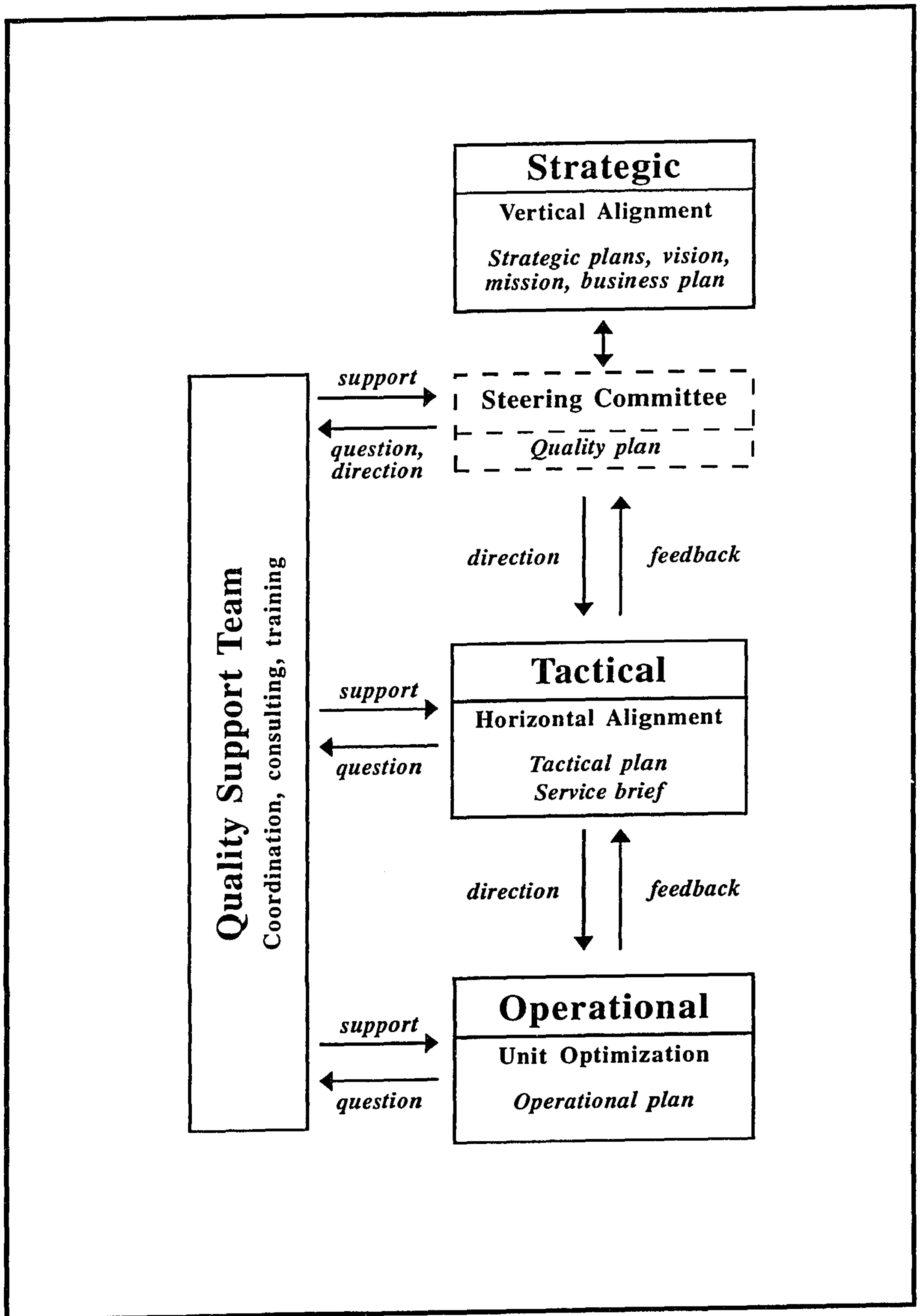


Figure 4.1: Service Quality Improvement at Three Levels

Performance results and needs were communicated back up the hierarchy for use in future planning. In some organizations, performance information from higher levels was also disseminated down to lower levels. We saw this in the sharing of financial information and dissemination of Critical Success Factors (*CSF*) results at Bank N. The hotel and HMO used in the validation study were also well along the path to open communication and fuller sharing of information with employees.

In our figure, as in the organizations we studied, coordination within and between levels and implementation support is provided by a quality support team under the direction of the steering committee. In Bank H the quality support team was formalized as the Center for Quality Service; in Bank N, quality support was provided by teams of specialists in regional offices.

The composition and structure of councils, committees, or teams responsible for the various levels differed across firms, reflecting differences in service industries, in organizational cultures, and in management attitudes. For example, we found that in some firms strategic planning was the exclusive domain of the CEO and a few senior managers. In other firms, middle management input to strategic planning was significant. Similarly, tactical planning and implementation in some firms was the responsibility of senior managers but in more open organizations the input of middle managers or all employees was included. The extent to which functions merged varied. During the validation phase of this research, we found some managers who viewed the strategic and tactical functions as one level in their organizations. But even in these organizations the three task levels could be identified though responsibilities merge.

In summary, we found quality was an organization-wide responsibility but the nature of the responsibility and the tasks required differed across levels of responsibility. Task differences led to differences in the type of measures used. Despite these differences we were able to develop a generic model of data needs for identification of quality improvement opportunities. Before elaborating on our model at each level (Chapters 5 - 7) we present our generic model.

4.5 A GENERIC DATA NEEDS MODEL

Modeling is the art of abstraction, the preparation of simplified versions of reality to make complex systems more readily understandable (Gaas, 1989). In preparing our generic model we were aware of the need for sufficient abstraction to allow applicability of our model across levels and across industries, while retaining enough detail for it to be useful. Our model is a synthesis of our observations in the banks, our general understanding of the quality improvement process, and feedback from the validation study. The generic model (Figure 4.2) presents a process to identify quality improvement opportunities, highlighting primary data collection points. It stops short at identifying quality improvement opportunities and does not suggest how improvement should be achieved. Quality improvement processes differ at each level and we leave a treatment of these to subsequent chapters.

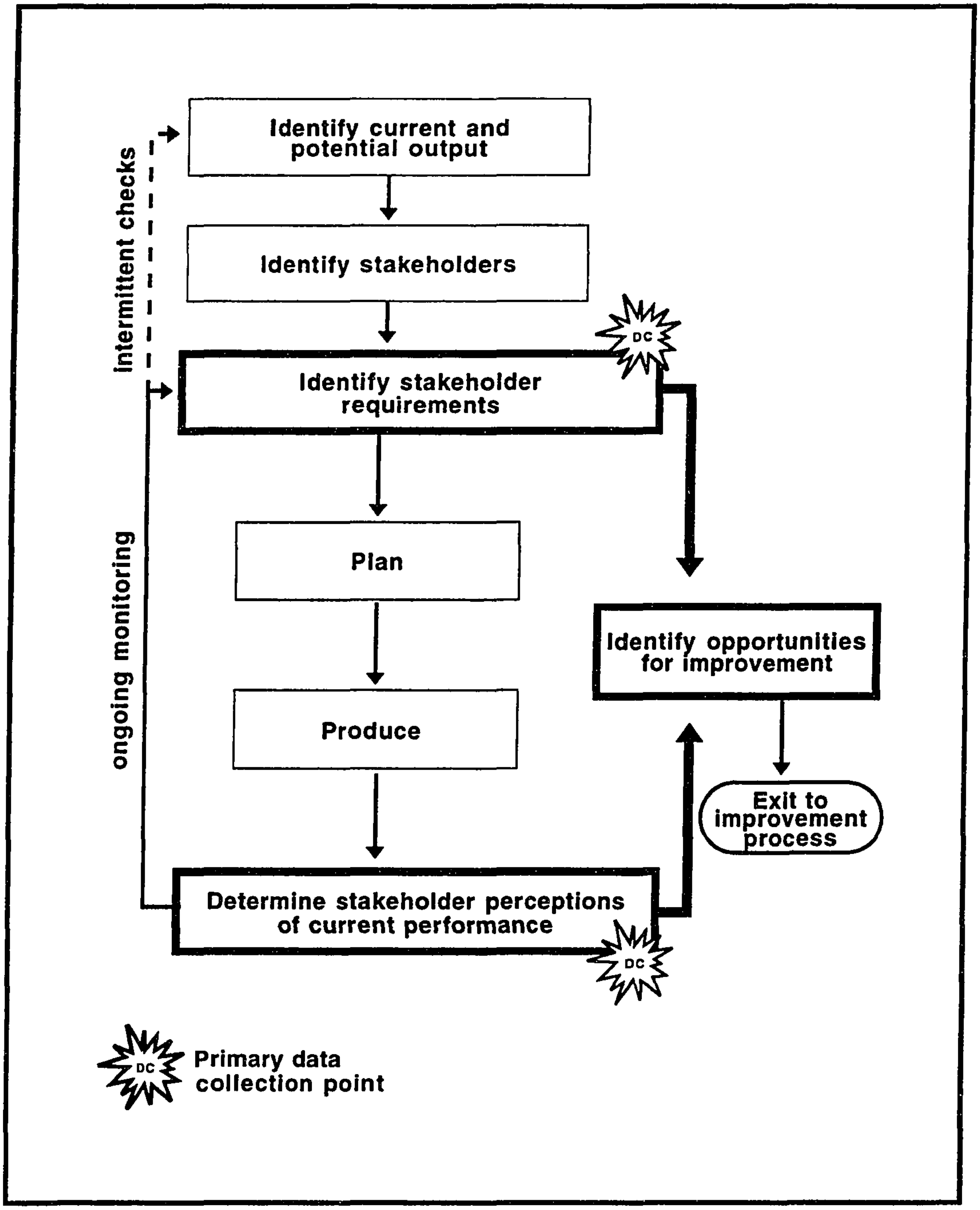


Figure 4.2: Data Needs to Identify Quality Improvement Opportunities

The focus of our model is on the primary data collection points; the identification of stakeholder requirements and the determination of stakeholder perceptions of performance. We find in the literature and from our research that these tasks are difficult for service providers. Yet they are critical. If we accept the current common wisdom that quality is "meeting or exceeding customer expectations," then identifying expectations (or requirements) and monitoring the extent to which they are met is crucial. Unmet requirements represent quality improvement opportunities. While these steps are important, they are not the only steps, nor even the first steps. Let us backtrack for a moment.

The first step in our model is the identification of current and potential output. Our investigation showed that in service firms, the output of interest may be a product (bundle of service options), but it will more often be service delivery. The interpretation of this step differed at each level. At the strategic level, the focus was often on potential output rather than current output. Senior executives told us that it was not sufficient for strategic planners to determine what customers (or potential customers) currently needed or expected. It was the role of strategic planners to anticipate future needs including products and services which customers might not be able to envisage (COO, car dealership). We found the focus at the tactical level was more commonly on the customer's current expectations and at the operational level, the focus was on subprocess output. Whatever the level, the first step should be to identify output -- output of the organization, output of a specific process, or output of a sub-process.

Once output has been defined, the second step is to identify all stakeholders. ISO 9001 defines a stakeholder as any individual or group with an interest in the performance of the organization or process (ISO, 1992). Stakeholders identified by informants in our research included stockholders (profit), customers (products, services), employees (continuity of employment, healthy work environment), and community (environmental issues, safety issues, fair practices). Regulatory bodies can also be viewed as stakeholders, though some informants considered regulators to be an "indirect voice of the customers" (VP, Center for Quality Service). The primary customers and stakeholders differed at each level. Some differences across industries may also be expected. It is important that for any given level, in any organization, all stakeholder be identified.

Once stakeholders are identified, the next step is to identify their requirements. This is a major data collection point. The complexity of the collection task differs. For example, our informants agreed that an important expectation of owners was a reasonable return on investment. This is a simple expectation to identify and to monitor; in most organizations return on assets (ROA) is routinely calculated. By contrast, determining and monitoring the needs of external customers is complex. We found the principal means of identifying the needs of external customers were focus-group interviews, surveys (phone and mail), customer comment cards, and complaints.

Determining and monitoring needs of internal customers was facilitated by frequent and open communication between employees, including communications across functional boundaries.

The first three steps -- identification of output, identification of stakeholders, and identification of stakeholder needs -- generally form the basis of an organization's mission statement. They outline an organization's reason for being by stating what the organization does, for whom it is done, and to what standard it is done (Davis & Olson, 1985; O'Brien, 1990).

With output, customers, and customer needs identified, it is possible to plan intelligently for service delivery and to deliver the service. In our generic model we show planning and production as black boxes because the nature of these activities differs at each level. However, at all levels there is a need to translate stakeholder requirements to measurable attributes and to set standards for these attributes. The next major data collection point is reached after a service is delivered. At this point stakeholder perceptions of performance are measured. As noted earlier, we found that measures differed according to level (Table 4.1). Several of the organizations in our study were not effectively measuring customer perceptions of service delivery. Where measures were taken, they were not always related to identified needs or expectations of customers. Clearly this was a problem area for practitioners.

The final step of this section of our model is the comparison of stakeholder requirements with perceptions of performance leading to the identification of quality improvement opportunities. The quality improvement process seeks to reduce the difference by moving performance closer to requirements as diagrammed in Figure 4.3.

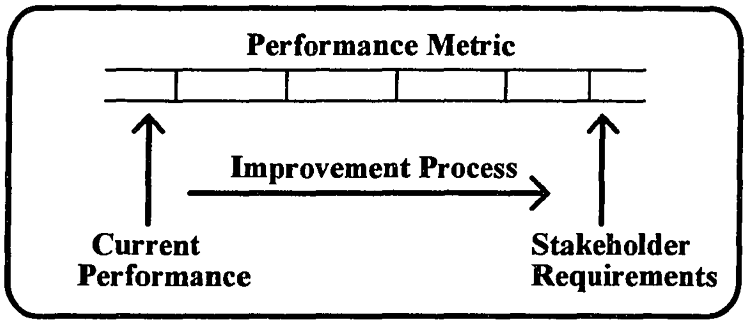


Figure 4.3: Quality Improvement Process: Aligning Performance with Stakeholder Requireme

The process our model describes is not a one-shot process. Customer expectations change, usually becoming more stringent. New products and lifestyle changes create new needs, improved performance of a firm or its competitors create higher expectations, and greater access to information creates more discerning customers. To continue to deliver quality service it is necessary to constantly monitor stakeholder requirements and to adjust standards accordingly. Planners should also intermittently check that their output and key stakeholders are unchanged. Output and market bases can and do change.

We found that many quality improvement teams, particularly at the operational level, began with the step "Identify quality improvement opportunities." In these cases staff selected areas in which they believed improvement was necessary. Either no data were collected on customer expectations and perceptions or these data were not used to identify and prioritize quality improvement opportunities. In some cases available data were not appropriate because they did not reflect attributes of importance to customers. Our model suggests a simple yet effective procedure for identifying quality improvement opportunities and focuses attention on the two major data needs:

1. the need to identify customer expectations, and
2. the need to measure customer perceptions of performance

When a team focuses on these two areas, relevant rather than convenient measures are developed, issues of importance to customers are addressed, and quality improves.

The focus on customer relevant measures may seem self-evident. However, like many self-evident truths, the obvious is not always followed in practice. Our model focuses attention on customers. It reminds practitioners that customer needs are paramount and that data must be relevant to customer needs and expectations. Use of our model could help effect a culture change -- a change to a culture which promotes service quality through customer focus. As one manager put it, "it will help us to get all employees 'singing from the same hymn book'" (EVP Human Resources & Service Quality). Our model also draws attention to the need to be proactive rather than merely reactive.

Our generic model is elaborated at each of the three levels in the following chapters. In these chapters we will present the differences we observed across the levels -- differences in stakeholders, in stakeholder requirements, in planning and production, and in measurement and goal setting.

CHAPTER 5

DATA NEEDS MODEL: STRATEGIC LEVEL

Strategic quality planning and policy making is an upper management task which involves setting directions, determining objectives, and developing strategies to achieve objectives. Plans cover relatively long time periods allowing for fundamental changes to be made. For example

- a bank may plan to restructure its organization to meet the differing needs of market niches
- an HMO may plan the introduction of new products (contract options) to retain existing customers and attract new customers
- a luxury hotel chain may plan a diversification into quality budget-priced accommodation in specified locations.

Data are used in all stages of setting directions, developing objectives, and selecting strategies. In this chapter we present our strategic level data needs model. Data for model development were collected from interviews, documents, observation, and group meetings in two banks. Model development and subsequent validation procedures were detailed in Chapter 3. Our model is presented in two sections "Data Needs to Identify Quality Improvement Opportunities at the Strategic Level" (Section 5.1) and "Quality Improvement Checklist at the Strategic Level" (Section 5.2). These two sections form a single model and are presented separately only for sake of clarity.

5.1 DATA NEEDS TO IDENTIFY QUALITY IMPROVEMENT OPPORTUNITIES AT THE STRATEGIC LEVEL

Our model of data needs to identify quality improvement opportunities at the strategic level is given in Figure 5.1. This section was validated through structured interviews and a survey of service providers (Section 3.5). Our discussion includes insights from both the field study and the more broadly based validation interviews. Table 5.1 lists the informants who were selectively sampled for validation interviews. The table is extracted from Table 3.2 and reproduced here to assist the reader as these people will be referred to throughout this chapter.

Table 5.1
Strategic Validation Interviews*

Organization	Informant
Bank	SVP, Human Resources & Quality
Consultancy	Senior Partner
Car Dealership	COO
HMO	Manager, Quality Support Services
Hotel	Quality Leader

Abbreviations:
SVP = Senior Vice President
COO = Chief Operating Officer
HMO = Health Management Organization

* Extracted from Table 3.2

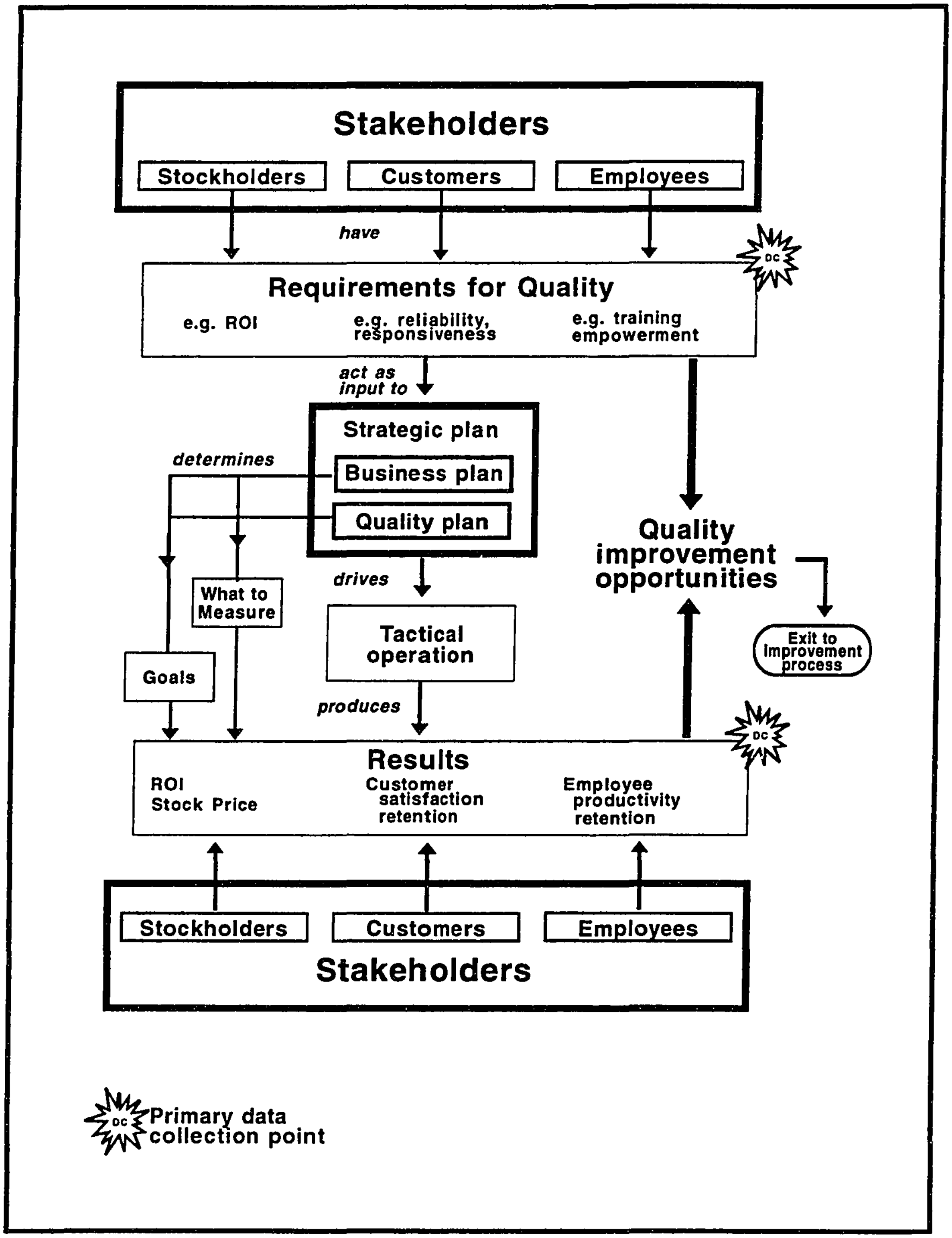


Figure 5.1: Data Needs to Identify Quality Improvement Opportunities at the Strategic Level

The basic premise of our strategic model is that quality improvement opportunities arise from discrepancies between stakeholder requirements and the organization's current performance in meeting them. This premise arose from consistent responses from informants in pilot and field interviews. To validate this premise we asked informants in the validation phase what defined quality in service production. They agreed that quality is produced when customer requirements are met. As one informant stated:

> [Quality is] understanding what customers want, changing our processes to remove that which is not value added, and developing performance measures so we can track how well we are doing.
>
> -- Manager, HMO

Our field data suggested that identifying strategic quality improvement opportunities requires a firm to:

- identify stakeholders,
- determine stakeholder requirements,
- develop strategic plans based on stakeholder requirements
- use strategic plans to drive tactical operations,
- use strategic plans to determine measures, and
- compare results with stakeholder requirements.

This is the flow of our model shown in Figure 5.1. Readers familiar with the literature on quality may be surprised by our model's emphasis on results. During the 1980's quality leaders and writers typically recommended a customer focus and disdained any direct focus on financial performance (Deming, 1985; Greig, 1993a; Omdahl, 1992; Strozier, 1991b). The belief was that if one assured customer satisfaction, results would follow. However, senior executives in our study clearly stated that quality was a means ***not*** an end, and that the strategic focus should be on the end -- overall performance. The call to measure overall performance and to link quality initiatives to results is becoming increasingly common. For example, the 1995 Malcolm Baldrige award criteria contain an increased emphasis on results compared to earlier versions (U.S. Department of Commerce, 1995). We do not disagree with the philosophy of customer focus. We simply report that from our interviews with senior executives at the strategic level the focus was on results. Customer focus was considered a tactical function. As such, we highlight customer focus in our tactical level model. In this chapter we address the issue of strategic level requirements.

5.1.1 Stakeholders at the Strategic Level

Service providers in our study consistently identified three significant stakeholders at the strategic level. These were **stockholders**, **customers**, and **employees**. Among these, the stockholders' need for a return on their investment was seen as the driving force. As one executive commented:

> Stockholders require a reasonable return on investment -- this is in the mission statement. Profitability is essential to business -- it is not a dirty word. It is a not a ***right*** of a company to make a profit, it is ***essential*** to make profit in order to survive.
>
> -- COO, car dealership

He remarked that all three stakeholders were important but that customers were like the headlights on the car showing the way and profit was the end result (Figure 5.2).

Figure 5.2: Informants Conception of Relationship Among Major Strategic Stakeholders.

Other groups considered for inclusion as stakeholders at this level included suppliers, regulators, and society (or community-at-large).

Suppliers were recognized as stakeholders by one informant in the validation phase. She commented:

> In order for them to supply us the right kinds of supplies and services to meet our customers' needs, they require from us adequate information, support, advance notice, and timing. -- Senior partner, consultancy

The Malcolm Baldrige award criteria also calls for basic information on the principal requirements of key suppliers (U.S. Department of Commerce, 1995). However, few of our informants considered suppliers to be among the "vital few" stakeholders and hence we have not included them in our model.

Regulators were considered stakeholders by some senior managers in the initial field study. Consequently we included them in our preliminary model. However, their inclusion as major stakeholders was not validated by other service providers. For example one informant commented:

> [Regulators] are not stakeholders. As a strategic effort our stakeholders are customers, employees, and our shareholders. We have to meet regulations but these are sometimes barriers because they can be

> contrary to our quality needs ... This is more a tactical issue, not a strategic issue. -- SVP, bank

Because the inclusion of regulators as strategic stakeholders was not consistently supported by informants in the validation phase, they were removed from our strategic model.

Society was recognized as a stakeholder by one informant in the validation phase (Senior partner, consultancy). This informant, formerly employed at a high level within a major bank, referred to the need to "give something back to the community," to "build the future for the workforce," and to "make sure we run a reputable organization." She believed social responsibility was particularly important in Hawaii where "there is a strong sense of community." We believe a case could be made for society's inclusion in a quality improvement model. As ISO 9000 notes, "The requirements of society are becoming more stringent worldwide" (ISO, 1992, p.80). However, society was not considered a significant stakeholder by most informants, consequently it was not included in our model.

Our model includes the three stakeholders consistently identified by informants as the "vital few": stockholders, customers, and employees. However, differences did occur across industries. For example, the HMO in our study recognized members, employers, and employees as stakeholders. Members were considered owners because the HMO was a not-for-profit health-care provider. But these "owners" consumed services and were not interested in profit or return on investment. Employers were HMO customers because they purchased contracts on behalf of their workers. But these "customers" did not use the HMO's services. Consequently their needs differed from those of customers in other organizations. As a further example, consider the case of military units. These units do not have owners, yet survey respondents in military organizations responded to questions about owners (Section 5.1.7). Perhaps they considered the Government or Central Command to stand in lieu of owners. But these owners would not seek a profit. Because differences occur across industries, it is important for each organization to identify all significant stakeholders in their own operation.

5.1.2 Stakeholder Needs at the Strategic Level

In our interviews we asked informants what they had identified as their stakeholders most important needs. Agreement was strong. The major strategic level stakeholders were owners and the major requirement was return on investment.

Although many customer and employee needs were identified, the concern at the strategic level was the more global consideration of customer and employee satisfaction and retention. For example, employee needs identified by senior managers included meaningful work, a good work environment, and a company employees could be proud of (Senior partner, consultancy); morale issues, removal of barriers, and training (SVP, bank); and opportunities for growth, teamwork, and recognition (Manager, HMO). The aim of these was to decrease absenteeism, increase employee productivity, and increase employee retention -- all with the objective of improving financial performance. Similarly, meeting customer expectations was aimed at increasing customer satisfaction, hence customer retention, and hence market share and profitability. Definition and monitoring of customer expectations was considered a tactical issue. As one informant noted:

> Customer retention is more important than satisfaction. The question becomes "**How do we do it?**" Meet needs and wants, exceed their expectations and also anticipate. And make sure that what they perceive as value is met every time they come into the store.
>
> -- COO, car dealership

"**How do we do it**" is a tactical issue. However, meeting customer expectations becomes a strategic issue when upper management needs to restructure the organization to meet the different needs of different market segments. This was the case in Bank N where the bank was restructured to facilitate provision of differential services to corporate, business, and individual customers. In general the most commonly reported strategic interest was employee and customer retention as drivers of improved performance.

5.1.3 Inputs to Strategic Planning

Strategic plans set a direction for an organization. According to our informants this requires listening to stakeholders. One informant described strategic planning as listening to three voices:

- Where we want to be (organization, employees)
- What the customers are saying they want, and
- Balancing these by the realities in which the firm operates (regulators, stockholders)

-- Senior partner, consultancy

Planning involves the creation of not one but several plans. The plans of most interest to this research were the business plan (financial goals) and the quality plan (quality goals). Not surprisingly, our observations showed that stakeholder's need for a return on investment drove the business plan, while customer and employee needs drove the quality plan. However, these two plans are, or should be, linked. The organization in our study with the most advanced quality system combined quality and productivity planning in one document. This was an organization (hotel) which had recently won the coveted Malcolm Baldrige National Quality Award for service industries.

5.1.4 Strategic Plans Drive Tactical Operation

The goals of strategic plans are achieved through the tactics and operations at other levels within the organization. As one informant commented:

> "Doing it" is the tactical interpretation of the high level strategy.

She went on to explain

> Most of our supporting strategies were developed through what we call our business plan. [We send this] out to managers and ask "What do you have to do to enable this to happen? How does that translate into detail plans." -- Manager, HMO

Each of our informants reported similar strategy deployment. One informant talked of senior line people taking the plans "down to their people" both to inform "what we need to achieve" and to ask "how can we achieve it?" (SVP, bank). Another described a more direct approach in which Corporate Headquarters told division heads what goals and emphasis they should have. Division heads then prepared their own action plans (COO, car dealership). These descriptions validated our model's depiction of strategic plans as drivers of tactical planning and operations.

5.1.5 Strategic Plans Determine Measures and Goals

Stakeholder needs embodied in strategic plans were used to set goals and determine quality and productivity measures. So close is this linkage that several informants defined a strategic plan as "the creation of a few key goals" (COO, car dealership; Senior partner, consultancy; SVP, bank). We were told that strategic plans and the measures taken "should dovetail very closely" (Senior partner, consultancy). These comments we took as validation of our assertion that strategic plans determine goals and measures.

5.1.6 Strategic Measures

Data from our interviews confirmed the common wisdom that "quality is judged by customers." At the strategic level, informants considered that quality of overall performance was judged by stockholders. They reported no direct measures of stockholder satisfaction with performance, instead they used stock price as an indicator of satisfaction. A rising price reflected increased demand for shares and suggested stockholder satisfaction with company performance. A drop in price suggested dissatisfaction. Senior executives in our study were interested in other measures of overall performance such as market share, resource productivity, and cycle time but only as means to sustaining a satisfactory profit.

Our analysis of indices and CSFs in the banks showed that at the strategic level, management desired a few measures of overall customer satisfaction and customer retention. Informants told us that only if satisfaction or retention rates failed to meet desired levels did they seek more detailed information. Similarly a few key indicators of employee satisfaction and retention sufficed at the strategic level: staff turnover, absenteeism, and overall workforce productivity.

Strategic level indicators were global measures. Most of the information came from data collected at other levels or data already residing in a firm's database, for example, ROA and staff turnover were routinely calculated and customer and employee satisfaction scores were summations of tactical level data.

5.1.7 The Importance of Links in the Strategic Model

To determine the strengths of major links in the validated model, we surveyed a sample of large service organizations (Section 3.5). Thirty-six surveys were mailed and twenty returned, giving a response rate of 57%. Table 5.2 summarizes the survey mailing and responses at the strategic level.

Figure 5.3 shows the links or sections of our model being tested by each question in the survey (Appendix N). The survey used graphic rating scales with five scale positions anchored at the endpoints by polar adjective pairs. Apart from the endpoints, scale positions were unmarked. In our analysis we scored responses on a range of 1-5 with "important" or "strong measurement" as high (5) and "unimportant" or "weak measurement" as low (1). Table 5.3 summarizes results at the strategic level.

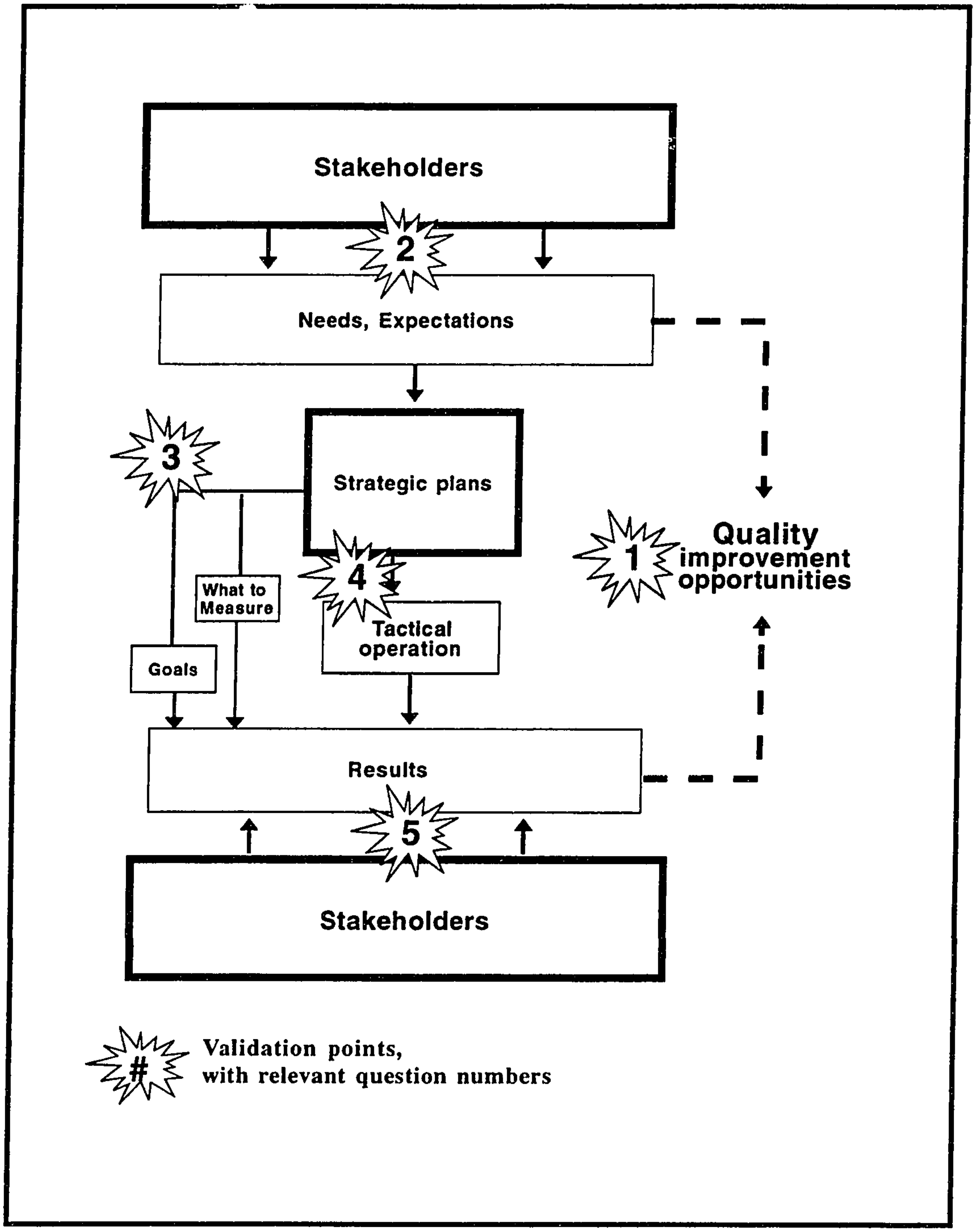


Figure 5.3: Model Linkages Validated by Survey: Strategic Level

Table 5.2
Packages Mailed and Responses Received:
Strategic Level

Organization Type	Packages Mailed	Responses Received
Military	7	5
Hospital/HMO	15	7
Hotel	2	1
Other	12	7
Total	36	20
Response Rate		**57%**

* Extracted from Table 3.3

Matching service outcomes to customer needs or expectations was rated "important" by all respondents (Question 1). This gives strong support for the basic premise of our strategic model, that is, that quality improvement opportunities arise from discrepancies between stakeholder requirements and an organization's current performance in meeting them. We also found support for the finding that stockholders, paying customers, and employees are the principal strategic level stakeholders (Question 2). Support was particularly strong for the importance of paying customers (range 4 - 5).

An interesting result was the relatively high importance accorded to controlling bodies (regulators) and community-at-large. We had included these in our preliminary model but removed them after informants in the validation phase failed to confirm them

Table 5.3
Survey Results: Strategic Level

	Mean	Max.	Min.
1. To provide service quality, how important is it to match service outcomes to customer needs or expectations?	5	5	5
(5 = Important; 1 = Unimportant)			
2. In developing a strategic plan, how important are the needs or expectations of:			
Stockholders (owners)	4.5	5	1
Employees	4.4	5	2
Paying customers	4.8	5	4
Controlling bodies	3.9	5	2
Community at large	3.8	5	2
(5 = Important; 1 = Unimportant)			
3. How important is the strategic plan in determining:			
Quality goals	4.7	5	2
Quality indicators	4.6	5	2
Productivity goals	4.2	5	3
Productivity indicators	4.1	5	3
4. How important is the strategic plan in determining:			
Tactical plan and tactical operation	4.7	5	4
(5 = Important; 1 = Unimportant)			
5. To what extent does your organization currently measure outcomes related to the needs of:			
Stockholders (owners)	3.3	5	1
Employees	3.0	5	1
Paying customers	3.7	5	1
Controlling bodies	3.3	5	1
Community at large	2.6	4	1
(5 = Strong; 1 = Weak)			

as being among the "vital few" stakeholders. Measurement of performance in meeting regulators' requirements was particularly high (Question 5). Mean levels of measurement for regulator requirements were equal to stockholder measures and higher than employee measures.

Responses to questions 2 and 5 reveal a mismatch between what respondents considered important (Question 2) and what was currently being measured (Question 5). Our survey questions did not allow us to investigate the reason for the differences in identified stakeholders or the importance of measures. Does stakeholder importance vary across service sectors, across organization sizes, or across ownership types? Are there differences between what practitioners think ***should*** be done and what actually ***is*** done? Examination of these differences would make interesting future research.

The survey validated our model's assertion that the strategic plan determined goals and measures (Question 3). The higher mean ratings given to the importance of strategic plans in determining quality goals compared to determining productivity goals was a surprising result. In all the organizations we studied in the field, procedures for the deployment of productivity goals were strongly established. Procedures for deployment of quality goals were less well developed. We have no data to explain the difference. However, it seems possible that there is a difference between what practitioners think should be done (survey) and what is actually done (field study). Further research would be needed to elucidate this issue.

5.1.8 Summary

Several conclusions can be drawn from our analysis of the measures used in banks and responses from informants in interviews. These data showed that strategic measures tended to be highly aggregated measures of overall performance. The primary result of interest was profit and its translation to return on investment for owners. Customer and employee satisfaction and retention were reported to be of interest but primarily as means to achieving improved results. The focus on results is consistent with a needs-based or problem-based use of data. Senior executives are accountable to owners for the overall financial performance of the organization, consequently they need data on results and areas which drive results.

Upper management used the information in the measures they received to recognize quality improvement opportunities. Where results were beneath acceptable levels, senior executives needed to reconsider the direction, plans, structures, and resources in the organization.

Identifying which areas need attention may require collection of additional data. The second section of our model provides a checklist of important drivers of quality at the strategic level. These are described next.

5.2 QUALITY IMPROVEMENT AT THE STRATEGIC LEVEL

The exit point of the first half of our model followed the identification of quality improvement opportunities. The second half of our model, described in this section, deals with strategic quality improvement. To improve quality at the strategic level, management must develop and implement strategies which enable employees to achieve desired goals. From our observations in the field sites and our examination of the literature we prepared a checklist of enabling strategies. These were validated by a panel of experts (Section 3.5.2). Experts were asked what, in their opinion, must top management do at the strategic level to enable a TQM system in an organization. Validation involved the mapping by experts of their brainstormed ideas to categories in our previously prepared checklist (Appendix T). We mapped ideas to a category only if at least two of the three experts mapped a particular idea to that category. Analysis of the mapping and of the accompanying discussion was designed to detect omissions, redundancies, and ambiguities. The validated strategies are presented in Figure 5.4 and discussed next.

5.2.1 Shared Vision

An organizational vision sets the direction for the future of the entire organization. It creates a focus for customer satisfaction and planning (Rieley, 1993/94). Vision requires lateral thinking in defining an organization's output. For example, innovations in distance banking (Telephone Bill Payment Service, Electronic Funds Transfer at Point of Sale) have shifted the major function (output) of banking from bookkeeping to information handling. With function redefined, future product developments can include improved information supply to customers, for example, analysis on bank statements, electronic bank statements, cash flow statements, or investment analysis for customers from bank mainframe data (Hunt, 1993).

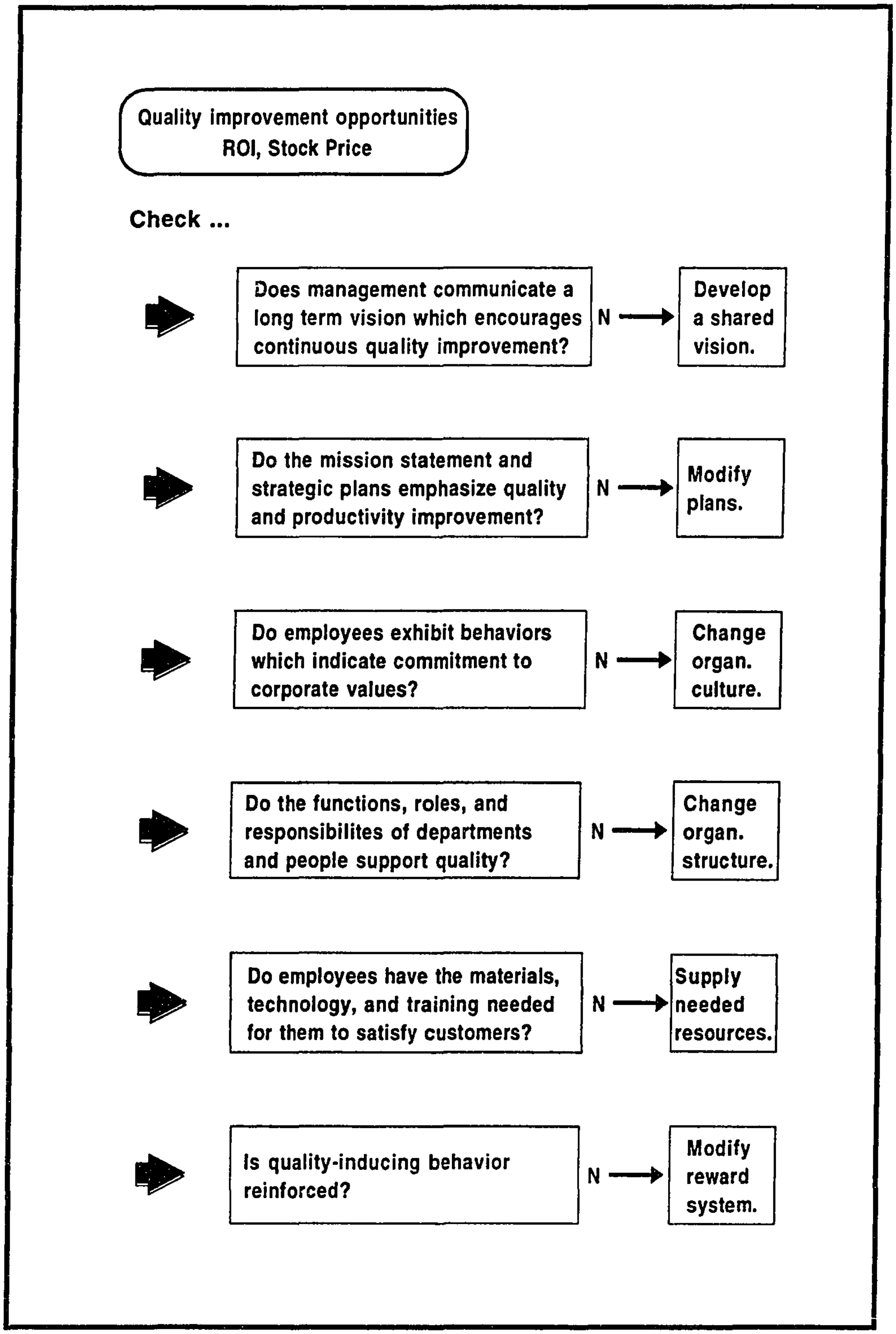


Figure 5.4: Quality Improvement Checklist at the Strategic Level

The importance of developing an organizational vision was discussed by several of our informants (SVP, bank; Manager, HMO; COO, car dealership). The panel of experts validated the inclusion of vision as an enabling strategy by mapping to the category the following ideas:

1. Establish congregational vision and mission
2. Create values, vision, and mission for organization
3. Establish credible commitment to quality improvement
4. Articulate a credible reason for undergoing such a major change
5. Determine the extent of change being contemplated
6. Widely communicate goals
7. Communicate vision/mission throughout organization, inclusive of external customers and suppliers

Ideas 1 - 2 directly state the need to create a vision while ideas 3 - 5 contain some required elements of that vision. Ideas 6 - 7 deal with communicating the vision -- the creation of a shared vision. The term "shared vision" used in our model was problematic for some experts who considered it similar to "organizational culture." They resolved the problem by agreeing that shared vision was a future-oriented aspiration while organizational culture represented the existing reality. In follow-up interviews all experts agreed that vision and culture were separate strategies.

5.2.2 Quality-focused Mission Statements and Strategic Plans

All organizations we visited had mission statements and strategic plans. Mission statements were short, setting out why the company was in business and including identification of output, customers, and customers needs. Strategic plans outlined the vital few goals on which the organization would focus in the medium to long term;

goals related to financial, productivity, and quality objectives. The panel of experts validated the inclusion of developing quality-focused plans as enabling strategies by mapping to the category the following ideas:

1. Establish congregational vision and mission
2. Create values, vision, and mission for organization
3. Identify customers and implement means to hear the customers
4. Focus the organization on customers and competitors
5. Articulate a credible reason for undergoing such a major change
6. Determine the extent of change being contemplated
7. Establish link between quality plans and strategic goals
8. Widely communicate goals

Ideas 1 - 2 directly state the need to create mission statements while ideas 3 - 6 give an indication of the content or purpose of mission statements and strategic plans. Ideas 7 - 8 deal with promulgating the mission. When presented to the panel of experts this category contained the terms "mission statement" and "business plan." From the discussion of the experts it was decided to change the term "business plan" to the more inclusive "strategic plans." Inclusion of strategic plans was problematic for one expert who considered that such plans contained elements of all the other categories, that is, he saw overlap of this category with others. However, we observed that there was little overlap in the mapping of ideas between this and the following categories. Furthermore, informants in the field considered these plans important. For these reasons we retained the strategy in the checklist.

5.2.3 Quality-focused Organizational Culture

We define organizational culture as a shared set of beliefs that controls the behavior of people in the organization. A senior executive stressed the strategic advantage of a quality culture as follows:

> Quality culture in an organization is an indirect attack on competitors because a competitor is not going to know what is happening -- it's not on your shelves, it's your people and what's in their heads.... [Quality culture] is the hidden competitive edge you will have over your competitors. -- COO, car dealership

Another informant talked about the "cultural attitude component involved in rolling out the vision" (Manager, HMO). She gave as an example the need for a change in employee attitudes toward limited-coverage HMO policies -- policies wanted by HMO customers but considered inferior by medical staff.

The panel of experts validated the inclusion of organizational culture as an enabling strategy by mapping to the category the following ideas:

1. Make quality improvement a high profile, non-negotiable priority
2. Institutionalize organizational learning
3. Walk the talk
4. Be patient

In follow-up interviews, one expert spoke of the extreme difficulty in changing an organizational culture. We agree that changing an organizational culture is difficult. We do not believe that it cannot be done. We saw a good example of successful, planned culture change in Bank N.

5.2.4 Flexible and Appropriate Organizational Structure

We define organizational structure as the distribution of responsibility within a firm as defined by the roles, functions, and reporting relationships within and among divisions, departments, and people in the organization. A major target of organizational restructuring is to create organizations that are flexible and responsive. Flexible organizations can more readily adapt to new needs and opportunities (U.S. Department of Commerce, 1995). The existence of an appropriate and flexible organizational structure was one management performance indicator at Bank H:

> The organization's structure has been designed to reduce bureaucracy and promote customer satisfaction.
>
> -- Indicator of management performance, Bank H

An appropriate organizational structure encourages open communication and employee empowerment. The panel of experts considered communication an important and necessary part of almost every strategy. Consideration was given to inclusion of a separate strategy, "foster open communication," but experts did not agree that it was something different or extra.

Experts did not strongly map any ideas to this category. Although several ideas were mapped by individual experts, no single idea was mapped by more than one expert. However, the need for an appropriate organizational structure was so widely accepted in the field organizations and in the literature (ISO, 1992; U.S. Department of Commerce, 1995) that we retained it in our model. One expert suggested a descriptor change to "develop an appropriate organization," that is, omit the word "structure." He disliked the term "structure" which, to him, carried an inference of bureaucracy. We believe that structures can be of many types and the appropriate one for a quality service organization is a flexible, responsive, and non-bureaucratic structure.

5.2.5 Supplying Needed Resources

An organization's resources are its people, materials, technology, and other inputs which enable a task to be completed in a quality manner. The need to provide adequate resources to assure quality seems self-evident.

Employees are an important resource in any organization. By satisfying the needs of employees, an organization increases its capability for satisfying the needs of external customers. This is particularly important in high-contact service organizations (Berry, 1980). Employee needs include: education and training, job design, and incentives (U.S. Department of Commerce, 1995).

The panel of experts validated the inclusion of supplying needed resources as an enabling strategy by mapping to the category the following ideas:

1. Provide resources to allow the quality work to occur
2. Consider appropriate information technology to support the effort
3. Cascade training through all levels
4. Be trained and cascade the training
5. Hire consultants

5.2.6 Reward System which Reinforces Quality Behaviors

We define reward systems as the compensation, recognition, and other systems which reinforce and maintain patterns of behavior. Reward systems can maintain dysfunctional as well as functional behaviors. It is important that reward systems maintain those behaviors which support quality. The panel of experts did not map any ideas to this category but in discussion expressed the opinion that reward systems were important. One expert spoke of the role of the reward system in communicating goals to employees -- "we tell workers what behaviors we value by what we reward." Informants in the field considered appropriate reward and recognition systems critical. Because of the perceived importance of reward systems in the organizations we studied we retained this category in our model.

5.2.7 Summary

Interview data showed that at a strategic level senior managers were responsible for developing and implementing strategies to enable employees to achieve quality and productivity goals. From our informants we learnt that senior managers were responsible for providing the direction, structures, and resources for achieving and maintaining service quality. The second half of our model of data needs at the strategic level presented a checklist of areas for review when developing strategies for a quality-focused organization. The checklist was developed from our observations in the field and from our reading of the literature on quality and was subsequently validated by a panel of experts. Our checklist serves to remind senior managers of the key areas for which quality strategies must be developed: vision, strategic plans, organizational culture, organizational structure, resource provision, and reward systems.

5.3 CHAPTER SUMMARY

We developed a model of data needs for quality improvement at the strategic level based on data collected from interviews, documents, observation, and group meetings in two banks. The preliminary model was split into two sections for validation. The first, more descriptive section was validated via structured interviews and a survey of service providers; the second, more prescriptive section was validated by a panel of experts. The final model incorporated feedback from the validation process. The final model consists of two stages, (a) steps to identify quality improvement opportunities, and (b) a checklist of areas in which strategies for improvement should be developed.

At the strategic level of the organizations we visited, data were used to set directions, develop objectives, and select strategies. Strategic level managers favored receipt of a few global (aggregated) measures from key performance areas. Measures of overall performance, particularly financial performance, were considered most important. This results focus is consistent with senior executives' accountability to owners for overall company performance. Outcome measures of customer and employee satisfaction were of interest as drivers of financial performance. Where the aggregated measures did not show a satisfactory level of performance, strategic level managers sought more detailed information. This detailed information was supplied from data collected at the tactical level.

The results-driven orientation of strategic managers was an interesting finding from our field research. The literature on quality emphasizes and encourages a focus on external customers and either overlooks or denigrates a focus on financial performance. However, our informants were in agreement, the major stakeholders at the strategic level are owners and their expectation was strong financial performance. Meeting the expectations of external customers and employees was seen as a means to achieving improved financial performance rather than an end in itself. Furthermore, our interview data showed that what was important was customer retention not merely customer satisfaction. A focus on external customers, their expectations, and their satisfaction was considered to be more a tactical issue than a strategic issue.

Our model of data needs at the strategic level outlines the context in which continuous quality improvement can occur. However, it cannot stand alone and must be integrally linked to the tactical and operational components of the model. Strategic plans set organizational directions and goals; tactical plans and actions are designed to achieve them. The tactical component of our model is discussed in the next chapter.

CHAPTER 6

DATA NEEDS MODEL: TACTICAL LEVEL

Tactical actions are the means by which strategic goals are realized. At the tactical level management takes a macro view of organizational processes, that is, they look at the entire process with the objective of clarifying responsibilities and interrelationships. Their task is one of horizontal alignment of functional departments. For example:

- a bank may redesign the lending process from customer inquiry to issuance of funds in order to speed the process
- an HMO may run focus-group interviews to determine the critical success factors in health care provision and to establish an organization-wide measurement system
- a hotel may install new technology designed to speed check-in and check-out procedures while simultaneously collecting important customer information

Data are used in all phases of process redesign from identifying opportunities for improvement to documenting the results of the intervention. In this chapter we present our tactical level data needs model. Data for model development were collected from interviews, documents, observation, and group meetings in two banks. Model development and subsequent validation procedures were detailed in Chapter 3. The final model is presented here in two sections "Data Needs to Identify Quality Improvement Opportunities at the Tactical Level" (Section 6.1) and "Quality Improvement Process at the Tactical Level" (Section 6.2). These two sections form a single model but are presented in two sections for sake of clarity.

6.1 DATA NEEDS MODEL TO IDENTIFY QUALITY IMPROVEMENT OPPORTUNITIES AT THE TACTICAL LEVEL

The first half of our tactical level model, data needs to identify quality improvement opportunities, is given in Figure 6.1. This section was validated through structured interviews and a survey of service providers (Section 3.5). This discussion includes insights from both the field study and the more broadly based validation interviews. Table 6.1 lists the informants who were selectively sampled for validation interviews. The table is extracted from Table 3.2 and reproduced here to assist the reader as these people will be referred to throughout this chapter.

Table 6.1
Tactical Validation Interviews

Organization	Informant
Bank	SVP Human Resources & Quality
Consultancy	President, in charge of training
Car Dealership	VP Quality Assurance & Marketing
Car Dealership	Total Quality Advisor
HMO	Quality Support Services Manager
Hotel	Quality Leader

Abbreviations:
VP = Vice President
SVP = Senior Vice President
HMO = Health Management Organization

* Extracted from Table 3.2

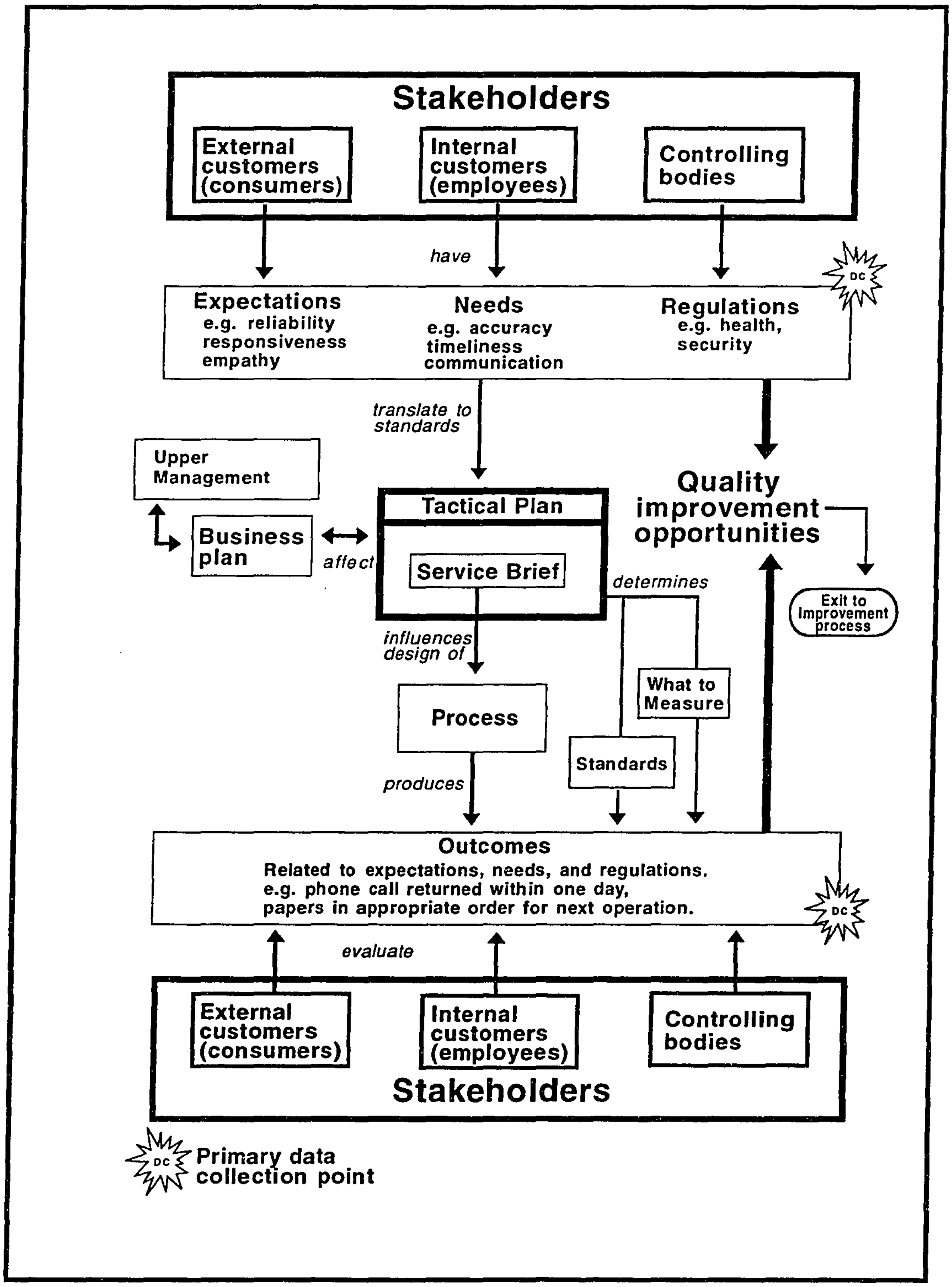


Figure 6.1: Data Needs to Identify Quality Improvement Opportunities at the Tactical level

The basic premise of our tactical model is that quality improvement opportunities arise from discrepancies between stakeholder needs or expectations and the organization's performance in meeting them. To validate this premise we specifically asked informants working at the tactical level what defined quality in service production. They agreed that quality is produced when customer perceptions of service outcomes match their expectations. As one informant stated:

> [Quality is] how our customers perceive the services that we provide. It is all based on our customers' expectations and if we can know or determine their expectations then we will be able, in their eyes, to deliver high quality service. Because if we say "this is high quality service" and it is not what the customers say is high quality service then we are misaligned. Always go back to what the customer expects, and needs, and wants.
>
> -- VP Quality Assurance & Marketing, car dealership

From field data collected in the banks it was clear that identifying tactical quality improvement opportunities required a firm to:

1. identify stakeholders,
2. determine stakeholder needs and expectations,
3. develop tactical plans based on stakeholder needs and strategic plans
4. design processes based upon tactical plans,
5. develop standards and measures based upon tactical plans, and
6. compare outcomes with stakeholder requirements.

We arranged these steps into the flow chart shown in Figure 6.1 and discuss it in the following sections.

6.1.1 Stakeholders at the Tactical Level

Service providers in our study consistently identified two significant stakeholders at the tactical level: **external customers** (consumers or paying customers) and **internal customers** (employees). Also mentioned by several informants were **controlling bodies** (regulators or society). Among these three stakeholders, the satisfaction of external customers was seen as the driving force. As one informant commented:

> The customer is critical ... that is why we are in business
>
> -- Total Quality Adviser, car dealership

According to our informants, to satisfy external customers it is necessary to first meet the needs of internal customers. Informants told us that trained employees who enjoyed a good working environment were better able to provide for external customers. A Manager in the HMO gave an example of the impact of employer (external customers) needs on clinic managers (internal customer). She explained:

> [Employees] become more important at the tactical level. For example, the clinic manager does not meet with the employer representative -- that person is not a direct customer of hers. However, for us to be able to develop more flexible benefits to employers -- to develop products which [employers] might find attractive -- may require the clinic manager to send her folk to get some training [or] to develop systems to administer new products -- new papers, new [computer] screens. Thus external customer requirements translate to internal customer requirements.
>
> -- Quality Support Services Manager, HMO

Controlling bodies (regulators) were included as stakeholders in the preliminary draft of our strategic level model but were removed when senior executives failed to validate their inclusion at that level. In strategic level interviews, senior executives told us that meeting regulations was "more a tactical issue" (SVP Human Resources & Quality, bank). However, their inclusion in a tactical level model was not strongly supported by data from tactical level interviews. As one informant noted:

> In our business most of the things the controlling bodies want our customers would want too, other than some environmental things. That is part of being a good community member. They are not a particularly important influence ... if we have met our customer needs, by and large, we have met the controlling bodies needs.
>
> -- Total Quality Adviser, car dealership

So, controlling bodies as stakeholders were excluded; managers accepted the need to meet regulations but some managers were not convinced that they were a significant influence. Because of the uncertainty, we included a question relating to the needs of controlling bodies when we later surveyed service providers by mail (Section 6.1.7). Surprisingly, survey respondents at the tactical level rated the importance of meeting the needs of controlling bodies almost as highly as they rated meeting the needs of paying customers and employees. Furthermore, reported actual measurement of outcomes related to controlling bodies was higher on average than measurement of outcomes related to either paying customers or employees. The survey results convinced us that it was prudent to include controlling bodies in our tactical level model; prudent because inclusion of a possibly less-than-significant stakeholder was potentially less harmful than exclusion of a possibly significant stakeholder.

6.1.2 Stakeholder Needs at the Tactical Level

Identification of stakeholder needs and expectations is a major data collection point in our model. Our field research suggested that identifying stakeholder needs was particularly important at the tactical level because information obtained at this level was fed up to the strategic level and down to the operational level. Tactical level employees had the skills, resources, and authority to conduct or arrange focus-group interviews and in-depth surveys. This centralization of data collection seemed appropriate to us. It is more efficient to determine stakeholder needs at a macro level for those situations where needs are universal across an organization. Determination of needs at the operational level could result in duplication, inconsistencies, and greater error. The expectations, needs, and requirements of external customers, internal customers, and controlling bodies are discussed next.

External customers: We asked informants in the two banks what they considered to be the most important needs of their external customers. Most often they quoted a selection of indicators from the centralized performance measures in their bank, that is, from the SPI indicators at Bank H or the *CSFs* at Bank N. We were not surprised by this because the literature on quality suggests that management communicates what they consider important by what they measure (Callaghan, 1992; Lawton, 1991; Trogdon, 1988). Our informants merely passed on to us what they had learned was important. Thus, our understanding of external customer needs in the banks is based upon what was measured. An analysis of the banks' service quality measures is given in Section 6.1.6.

In interviews, Bank H informants most often gave examples of customer needs related to responsiveness and reliability. For example, they commonly mentioned wait times in lines, loan approval times, telephone response rates (responsiveness), and the need to avoid or recover from errors (reliability). Responsiveness and reliability were also the dimensions stressed in training for new employees (Providing Quality Service Workshop, April 1993). Empathy and assurance factors were also mentioned by Bank H informants but with less emphasis than that accorded to reliability and responsiveness. We suspect this resulted from Bank H's strong focus on process and output measurement as it is easier to measure outputs related to responsiveness or reliability than it is to measure outputs related to empathy and assurance. Empathy and assurance are more easily measured as outcome measures, that is, by surveying customers. Bank N informants also commonly identified responsiveness and reliability factors, for example one informant stated:

> Errors are quite important. We have done a few surveys and avoiding errors is important -- and admitting errors, apologizing for them, and making sure they are fixed up quickly.
>
> -- Personal Banker, Bank N

In contrast to Bank H, Bank N strongly emphasized empathy and assurance factors. This was evident in the training given to operational level staff in the weekly meetings and in the competency profiles for every position in the bank. The importance of good product knowledge, an aspect of assurance, was usually stressed by personal bankers in interviews. For example, one personal banker defined quality as "meeting their financial needs by giving them the right products to meet their needs." Empathy with customers was also frequently mentioned by front line staff. For example, tellers spoke of "putting ourselves in the customer shoes" or "thinking about what they want and how they like to be treated." The emphasis on empathy and assurance was part of the structured culture change at Bank N.

In both banks tangible factors such as the appearance of buildings, brochures, and staff were also mentioned but in neither bank were they emphasized. Not surprisingly, tangible factors were most often mentioned by front-line staff. The lack of emphasis on tangible factors is consistent with the findings of Parasuraman et al. (1985). We wonder if tangible factors are one of those dimensions for which customers hold a threshold minimum requirement (Sasser, Olsen, and Wyckoff, 1978). That is, customers expect the bank to achieve at least a threshold condition on tangible factors but, once reached, service quality is judged on the basis of other factors. Since all banks were meeting the threshold on tangible factors, they did not provide a service quality competitive advantage. From our interviews and our analysis of measures developed in the banks we concluded that four dimensions were important: reliability, responsiveness, empathy, and assurance.

We also asked informants in the validation interviews what they had identified as the most important needs of external customers. Responses varied. For example, in the HMO and car dealership access was considered important but this was not a major factor at the bank or hotel. For the banks error avoidance and correction were important but these were less important in the other industries. Thus, our research supported Karwan and Rosen's (1988) finding that the importance of service quality dimensions differs across service industries.

Because the relative importance of outcomes and outputs will differ across industries, each organization must determine from its own stakeholders what attributes are important. One informant, a relatively new hire within her organization, told us that at the time of the study her organization simply did not know its stakeholder needs. She commented:

> We don't have that at this time but we are going to ask our customers.

She went on to explain:

> We were measuring wait time but I had to ask,
> "Well, did our customers say wait time was important?"
> At that time we set a goal of seven minutes, and I had to ask,
> "Well, where did you get the seven minutes?"
> "Well, that's the national standard."
> "Well, what do <u>our</u> customers say?"
> So, everything we do must be based on what is important to the customer... After you work for a while in an industry you think you know what the customer wants but the only way to know is to ask them. We truly want to be customer-driven.
>
> -- SVP Human Resources & Quality, bank

Her insistence that "the only way to know is to ask them" was typical of responses from other informants. We cannot say with certainty that *A*, *B*, or *C* are important needs but we can say with conviction that each organization must ask its own customers what they consider important.

The most common methods used by firms in our study to "ask customers what they want" were focus-group interviews (to identify the vital few needs), telephone surveys (to validate selected needs and to detect changes in their relative importance), and intelligent analysis of common queries and complaints. Focus-group interviews and telephone surveys are proactive, whereas complaint/query analysis is reactive. According to our informants, it is essential that organizations be proactive and not merely reactive. We were also told that proactive approaches should include both current and potential customers. As one informant commented, "A lot can be learnt from those who are not already our customers" (Regional manger, Bank N).

Centralization of queries and complaints services with advanced computer technology and access by 0-800 numbers was increasingly common. For example, the recently established Customer Satisfaction Center at Bank H invested heavily in computer hardware and software to automate data collection. This was considered to be cost-effective. As one informant commented:

> Centers like [the Customer Satisfaction Center] are the wave of the future because they run the interface for you at a very marginal cost.
> -- Research Officer, Customer Satisfaction Center, Bank H

Defining customer needs and expectations may involve identifying market segments and differential needs across segments. For example, in discussing a bank's program to upgrade facilities on a limited budget, a regional manager noted:

> [Branches] servicing higher socio-economic groups are considered to be priority for facility upgrades because these people tend to have higher expectations. Poor [facilities] in these areas create a wider gap.-- Regional Manager, Bank N

This policy is consistent with the gap model (Zeithaml et al., 1990) in which quality is achieved by closing the gap between customer expectations and their perceptions of service delivery.

In summary, we found that four dimensions of service quality were important to external customers in our firms -- reliability, responsiveness, empathy, and assurance. However, the relative importance of dimensions and components of dimensions varied across industries. Therefore, it is important for each organization to determine the needs of its own customers. Focus-group interviews, surveys, and analysis of complaints can be used to determine general customer needs and the specific needs of particular market segments.

Internal Customers: Our interview question to informants regarding the needs of internal customers drew a variety of responses. We were told that employees needed a good working environment, trust in one another both within and between departments, training in technical skills and organizational culture, empowerment (VP Quality Assurance & Marketing, car dealership), meaningful work, a good work environment, a company to be proud of (Senior Partner, consultancy), flexibility in their work, to be valued (Quality Support Services Manager, HMO), and morale issues (SVP

Human Resources & Quality, bank). Tactics believed by our bank informant to lead to improved morale included:

- listening to employees
- keeping employees informed
- including employees in decision making
- communicating the company's philosophy to employees
- supplying the necessary tools and environment
- empowering employees

-- SVP Human Resources & Quality, bank

This informant told us that empowerment of employees was very important because, she said, if employees were given the necessary tools and the environment and they were informed about what was required of them, they would perform well. This strong belief in empowerment was supported by other informants in the study.

In reviewing interview data it seemed that managers often discussed the needs of operational level workers and overlooked the needs of middle managers. This bias was also evident in the literature on quality. However, meeting the needs of middle managers is important. As one informant stated:

> We also need to address the issue of middle managers' needs. So many times quality efforts are aimed at the bottom and at the top and that is where they fail. If the top people were seeing the bottom people every day, that would be fine, but they are not. [By ignoring the needs of middle managers] we have totally cut out the delivery system. **Our delivery system to our employees is our middle managers.**
>
> -- SVP Human Resources & Quality, bank (emphasis added)

So, meeting the needs of all employees is important to achievement of service quality. In the organizations we studied, employee needs were determined by employee surveys. Understanding these needs was assisted by development of open communication systems within the organization.

Controlling bodies: We gathered less information on the needs of controlling bodies than on the needs of external and internal customers. This was because most informants in the validation interviews considered the needs of controlling bodies to be less important or subsumed by the needs of external customers. We were told that regulations differed across areas of the bank (SVP Human Resources & Quality, bank) and we also found they differed across industries. For example, asset security to assure financial stability was important in the banks while environmental and safety issues were important in the car dealership. Organizations must meet the requirements of controlling bodies. These requirements are usually laid out clearly in regulations and identification is not a major data collection task.

6.1.3 Inputs to Tactical Planning

Analysis of interview data told us that **stakeholder needs and strategic plans** were important inputs to tactical plans. For example, in the hotel, tactical plans (technical plans and action plans) were developed from strategic objectives relating to owners, guests, and employees. Our informant commented:

> The objectives of the strategic plan drive the technical plans and the action plans. Each division head takes a number of goals from the strategic plan relating to owners/guests/employees and develops action plans to meet the objectives identified. For example, strategic goal, owner satisfaction: technical goal, increase the transient rate.-- Quality Leader, hotel

In this hotel, tactical managers developed plans to meet stakeholder goals set at the strategic level. The close relationship between planning at the two levels was further emphasized by an informant in the car dealership:

> It all works together so that it is hard to break it out. [Managers in charge of individual dealerships] look at the technical issues and marry them to the strategic plan to make sure that everything is going in the same direction -- training, how things are being done ...
>
> -- Total Quality Adviser, car dealership

Comments by informants led us to include competitors' performance as an input to tactical planning in the preliminary model. For example, an executive at Bank H reported finding a mismatch between the bank's standard for wait time in teller lines and the performance standards in competing banks. This was seen as cause for concern though the standard was not immediately changed. Another bank informant commented:

> If your competitor is providing better service -- more timely responses -- you need to take a look at your process and see what you need to do to exceed the service they are providing to their customers.
>
> -- VP Customer Satisfaction Center, Bank H

However, this consideration of competitors' performance was not consistently supported by interviewees in our validation study. One organization viewed "competitors" as partners. The Quality Manager at the hotel told us:

> [We] like to see other hotels as partners, for example, if we have a problem in the linen area (losing linen), we will contact the neighboring hotel to see if they have a similar problem, the level of their problem, and how they solved it. We will then respond to requests for help from partner hotels.
>
> -- Quality Leader, hotel

So, the influence of competitors on tactical planning was uncertain. Because of the uncertainty, we included a question on the impact of competitor's performance on tactical plans when we later surveyed service providers by mail (Section 6.1.7). The mean rating for importance of competitors performance was well below the ratings given to other inputs and, consequently, we removed competitors performance from our model. The importance of benchmarking against best-in-class, whether or not a competitor, is retained in the second section of our model, quality improvement process.

In summary, the main inputs to tactical planning as reported to us by informants were stakeholder needs and strategic goals or plans.

6.1.4 Tactical Plans Drive Process Design

Tactical plans in the banks dealt primarily with aspects of process design and process improvement. We saw this in the documents we examined (Service Action Plans and Service Briefs) and consistently heard it in the interviews. As one informant commented:

> Process is very important at this level. It is the focus of the tactical quality plans. -- VP Center for Quality Service, Bank H

Bank employees had recognized both product and service (process) as components of service quality (Section 4.2). For this reason we included both process and product design as components of tactical plans in our preliminary model. We did this even though our informants had told us that "the only thing which can differentiate banks is service" (Personal Banker, Bank N). Informants in validation interviews unanimously confirmed that process design was an important component of tactical plans. However, the inclusion of product design at the tactical level was not supported by the validation study. Most informants concurred that "product design is really more a strategic issue" (President, consultancy). The inability to gain a sustainable competitive advantage through product design was commonly mentioned.

6.1.5 Tactical Plans Determine Quality Measures and Quality Standards

The tactical plans which we examined contained references to tactical measures and quality standards. These measures and quality standards were based upon stakeholder needs and strategic plans, for example, at Bank N, service standards were based upon *CSFs* as determined by external customers and regulations as set by controlling bodies. The impact of strategic plans upon tactical plans and key measures was discussed by one informant as follows:

> Tactical Plans are built within divisions to reflect the areas of focus in the strategic quality plan. These tactical plans outline the objectives, tasks, and key measures within the division needed in order to achieve the strategic objectives.
>
> -- VP Center for Quality Service, Bank H

The objective of customer-driven measurement was considered important but it was not always attained. One informant, a relatively new hire within her organization, told us what she found when she joined the bank. She commented:

> The plans ***should have been*** driving the measurement. However, there had been a lot of measurement for measurements' sake. Standards were set on what ***we*** thought the customer wanted rather than through the use of focus groups, interviews, or other means of asking the customer.
>
> -- SVP Human Resources & Quality, bank

We considered that these comments and observations validated our assertion that stakeholder needs and strategic plans were significant inputs to tactical planning. Furthermore, we considered that the comments validated our assertion that the tactical plans determined quality measures and service standards.

6.1.6 Tactical Measures

Our field research showed that tactical level service quality measures had a strong impact on quality initiatives throughout an organization. As previously noted, in choosing measures management sends a message to employees about what they consider important. We saw this in the banks when employees responded to questions about customer needs by citing measures determined at the tactical level. We also found that tactical measures directly influenced measurement at other levels. For example, in Bank H centralized measures (tactical measures) were used by quality improvement teams in branches to identify operational level quality improvement opportunities. In some organizations tactical measures were the only measures of some factors. For example, the hotel in our study had just one set of measures collected at the tactical level. Our informant told us:

> One set of measures is taken for all levels of planning. The full set of measures is available to employees at all levels and managers usually take highlights back to their units.
>
> -- Quality Leader, hotel

The importance of tactical measures was highlighted by informants' responses to the question "How do you know you are achieving quality?" They responded:

By measuring performance.
-- SVP Human Resources & Quality, bank
By measuring how we are doing.
-- Quality Support Services Manager, HMO
Through measurement and reporting of quality indicators
-- President, consultancy
Our measurements tell us. -- Quality Leader, hotel

To understand which measures in the banks were considered important we mapped them to the dimensions of service quality identified by Parasuraman et al. (1985). The percentages which mapped to each dimension are given in Table 6.2.

Table 6.2
Relationship of Bank Service Quality Measures to Service Quality Dimensions[1]

Quality Dimensions	Bank H SPI %	Bank N *CSFs* %
Reliability	21.7	13.3
Responsiveness	65.9	26.7
Assurance	3.1	26.7
Empathy	3.1	26.7
Tangibles	6.2	6.6
	100.0	100.0

[1] Parasuraman et al. (1985)

Our analysis shows some intriguing inconsistencies between what was measured and both the findings of Parasuraman et al. (1985) and the comments of bank informants during interviews. For example, the weak measurement of reliability factors in both banks is inconsistent with Parasuraman et al's finding that among the five dimensions reliability was the most important to customers. It is also inconsistent with informants' frequently expressed opinion that reliability was an important customer need. Both banks also had weak measurement of tangible factors. This is consistent with Parasuraman et al's finding that tangible factors are the least important to customers.

As Table 6.2 shows, Bank H had strong measurement of responsiveness factors and very weak measurement of assurance and empathy factors. The high weighting given to responsiveness factors was consistent with the opinion expressed by the VP Center for Quality Service that responsiveness was the most important service quality dimension (Providing Quality Service Workshop, April 1993). However, the weak measurement of empathy factors at Bank H was inconsistent with the informant's opinion that empathy was very important in Hawaii -- more important than in other States (EVP Human Resources & Service Quality, Bank H; VP Customer Satisfaction Center, Bank H). Thus, what was being emphasized in measurement at Bank H did not always match what employees told us were important to customer expectations. Bank N had a more balanced set of measures with equal measurement of responsiveness, assurance, and empathy factors.

In comparing the measures at the two banks we recall that Bank H's indicators were developed from staff opinions while Bank N's indicators were identified from focus-group interviews and surveys of the bank's customers. It is impossible to make strong statements about measurement from the measures of just two banks. However, if we accept that quality is what customers says it is, we are more inclined to believe any implications of Bank N's measurement pattern because Bank N's measurement was customer-driven while Bank H's was staff-driven.

During validation interviews informants emphasized the need for selection and use of customer-driven measures. For example, one informant commented:

> We are very much into measuring what the customers consider to be critical factors, and we'll be glad to measure those processes only if customers have identified them as important factors.
>
> -- SVP Human Resources & Quality, bank

Inclusion of an HMO in our validation study raised the interesting question of who judges service quality in professional services. The standard response is that customers judge quality. However, in many professional services customers do not have the knowledge or skill to make meaningful judgments on some aspects of service quality. For example, in health care, customers are able to judge the quality of service delivery in terms of responsiveness (wait times), access (ability to make appointments), and staff interactions (friendliness, courtesy, and communication); however, few customers can judge the quality of the medical advice they receive. For this reason, quality of care at the HMO was evaluated by other means such as evaluation by medical peers, length of hospital stays, and number of readmissions (Quality Support Services Manager, HMO). We expect that similar indirect measures of service quality would be required in other specialized professional services, for example, legal advice, accountancy, or dentistry.

It is generally agreed that to measure performance at the tactical level it is necessary to survey customers. At the tactical level, surveys may include:

1. Customer satisfaction surveys covering customer perceptions over a broad range of service activities, and
2. Market segment surveys covering perceptions of customers in particular market segments.

Customer satisfaction surveys in the organizations we studied were most often weekly, monthly, or quarterly telephone interviews with randomly selected customers and non-customers in the organization's market. By including non-customers, organizations were able to gain data on competitors' performance as well as their own. Bank N's experience was that small, weekly surveys were better than large one-shot surveys (Regional Manager, Bank N). Ongoing surveys provided more up-to-date information, reduced bias from confounding environmental factors, and reduced costs. A potential problem exists as more firms become customer-focused and begin to conduct telephone surveys. We received anecdotal evidence from friends and associates that telephone surveys were an intrusion of privacy, an annoyance, and increasingly rejected. Under these conditions, respondents are less likely to be cooperative and bias will result.

Market segment surveys are customer satisfaction surveys aimed at particular market segments, for example, business clients of a bank or conference attendees at a hotel. In our study these surveys were most often one-shot surveys.

Data may also be collected from targeted customer satisfaction surveys and comment cards but in our study these were more common at the operational level. Targeted customer satisfaction surveys were directed at randomly selected users of specific services such as users of a particular HMO clinic or callers to a complaint service. Comment cards were used to gain an immediate reaction from consumers of services. These cards are commonly seen in places where customers interfaces with service organizations, for example, on restaurant tables, in hotel rooms, and at teller stations. In our study performance data were also collected from complaints, but data from this source was known to be subject to bias and was not used to make inferences about overall performance.

6.1.7 The Importance of Links in the Tactical Model

To determine the strengths of major links in the validated model, we surveyed a sample of large service organizations (Section 3.5). Thirty-six surveys were mailed and twenty-two returned, giving a response rate of 61%. Table 6.3 summarizes the survey mailing and responses at the tactical level.

Table 6.3
Packages Mailed and Responses Received:
Tactical Level

Organization Type	Packages Mailed	Responses Received
Military	7	5
Hospital/HMO	15	9
Hotel	2	1
Other	12	7
Total	36	22
Response Rate		**61%**

* Extracted from Table 3.3

Figure 6.2 shows the links or sections of our model being tested by each question in the survey (Appendix O). The survey used graphic rating scales with five scale positions anchored at the endpoints by polar adjective pairs. In our analysis we scored responses on a range of 1-5 with "important" or "strong measurement" as high (5) and "unimportant" or "weak measurement" as low (1). Table 6.4 summarizes results at the strategic level.

In our survey matching service outcomes to customer needs or expectations was rated highly by all respondents (Question 1). This supported the basic premise of our tactical model, that is, that quality improvement opportunities arise from discrepancies between stakeholder requirements and their perceptions of service outcomes.

We also found support for the finding that paying customers, employees, and controlling bodies are important tactical level stakeholders (Question 2). The importance rating accorded to controlling bodies was higher than we had anticipated given their equivocal support in the validation interviews. Measurement of performance in meeting requirements of controlling bodies (Question 5) was particularly strong; higher than measurement of outcomes related to either paying customers or employees (Question 5). We took these survey results to indicate that controlling bodies should be included as tactical level stakeholders in our model.

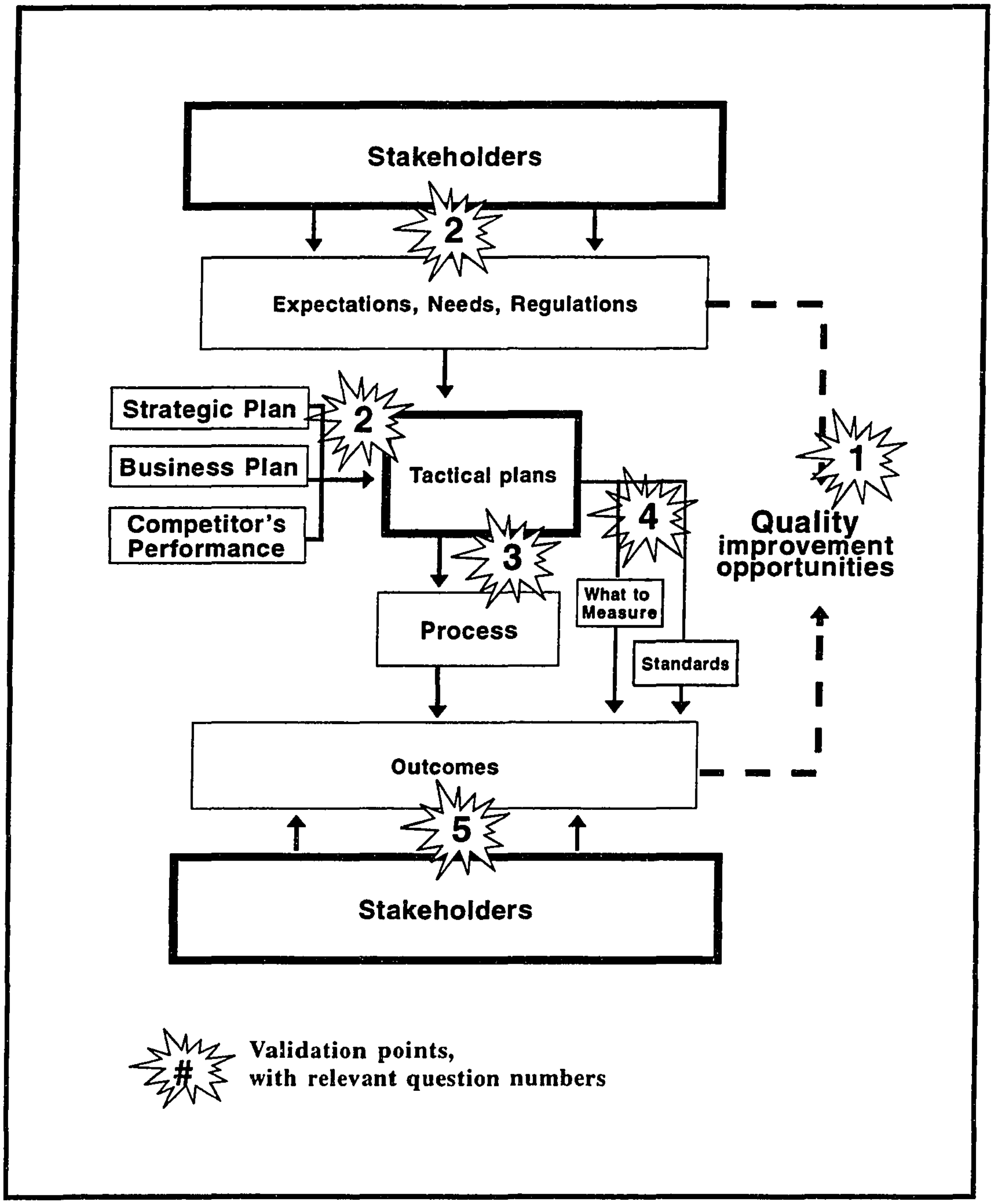


Figure 6.2: Model Linkages Validated by Survey: Tactical Level

Table 6.4
Survey Results: Tactical Level

	Mean	Max.	Min.
1. To provide service quality, how important is it to match service outcomes to customer needs or expectations?	4.7	5	4
(5 = Important; 1 = Unimportant)			
2 In developing a tactical plan, how important are:			
Needs of paying customers	4.5	5	3
Needs of employees	4.5	5	4
Needs of controlling bodies	4.3	5	3
Strategic plan	4.3	5	3
Business plan	4.4	5	3
Competitors performance	3.5	5	1
(5 = Important; 1 = Unimportant)			
3 How important is the tactical quality plan in influencing:			
Product design	4.1	5	2
Process design	4.4	5	2
4 How important is the tactical plan in determining:			
Quality standards	4.4	5	3
Quality indicators	4.4	5	3
Productivity standards	4.2	5	2
Productivity indicators	4.2	5	2
(5 = Important; 1 = Unimportant)			
5 To what extent does your organization currently measure outcomes at the tactical level related to the needs of:			
Paying customers	3.1	5	1
Employees	2.7	5	1
Controlling bodies	3.4	5	1
(5 = Strong; 1 = Weak)			

Responses to questions 2 and 5 reveal a mismatch between what respondents considered important (Question 2) and what was currently being measured (Question 5). Our survey questions did not allow us to investigate the reason for the differences

The survey also validated our model's assertion that strategic plans, particularly business plans, were important inputs to tactical level planning (Question 2). However, it did not support the inclusion of competitors' performance as important input to tactical planning.

The survey validated our model's assertion that the tactical plan was important in influencing process design (Question 3). A surprising result was the relatively high rating given to the importance of the tactical quality plan in influencing product design (mean rating 4.4). Product design had been included in our preliminary model but its inclusion at the tactical level was not supported in validation interviews and it was removed. Despite the survey's moderate support for product design as a tactical level function we elected to follow the wisdom of the field experts we had personally interviewed. These experts had considered product design more a strategic issue. Product design was not reinstated in our tactical level model.

The survey provided support for our model's claim that tactical plans were important in determining standards and indicators (Question 4). At this level, as at the strategic level, the survey showed higher mean ratings given to the importance of plans in determining quality goals compared to determining productivity. The difference at the tactical level was less than at the strategic level but it was still surprising given our observations in the banks.

Overall, the survey validated the main features of our model as developed in the banks and validated in subsequent interviews with other service providers. However, the survey did provide data which led us to make some changes. With the support of survey data we restored controlling bodies as stakeholders in our model and removed competitors' performance as a major influence on tactical planning. Data in our validation interviews had not given us a clear or consistent indication of the extent of influence of either of these two groups.

6.1.8 Summary

The primary outcomes of interest to tactical managers related to customer and employee satisfaction and retention. Outputs related to meeting regulations of controlling bodies were also important in as much as they set minimum standards which had to be met. Tactical planners used the information in the measures obtained to identify quality improvement opportunities. Where performance was below standard, managers recognized a need to make changes to service delivery processes. These changes most frequently involved process simplification and realignment of functional departments. The second section of our model presents a simple yet effective data-driven process to implement quality improvement at the tactical level. This is described next.

6.2 QUALITY IMPROVEMENT AT THE TACTICAL LEVEL

The first half of our model (Figure 6.1) presented the data needs to identify quality improvement opportunities at the tactical level; the first step in the quality improvement process. The second half of our model (Figure 6.3), described in this section, deals with the remaining steps; those relating to redesigning processes until quality standards are met or exceeded. To achieve this improvement, teams must gain an understanding of the firm's own processes and performance as well as the processes and performance of other best-in-class firms.

Our model was developed from our understanding of the quality improvement process in manufacturing industries, our field research in the two banks, and validation interviews with other service providers. This section of our model was validated by a panel of experts (Section 3.5.2). Experts brainstormed on the question "What activities or tasks must be completed at the tactical or operational level to achieve quality improvement?" They then individually mapped the group's brainstormed ideas to categories which we had previously derived from our preliminary model (Appendix T). We considered ideas mapped to a category if at least two of the three experts mapped an idea to that category. Analysis of the mapping and of the accompanying discussion was designed to detect omissions, redundancies, and ambiguities. The validated quality improvement process is given in Figure 6.3 and discussed next.

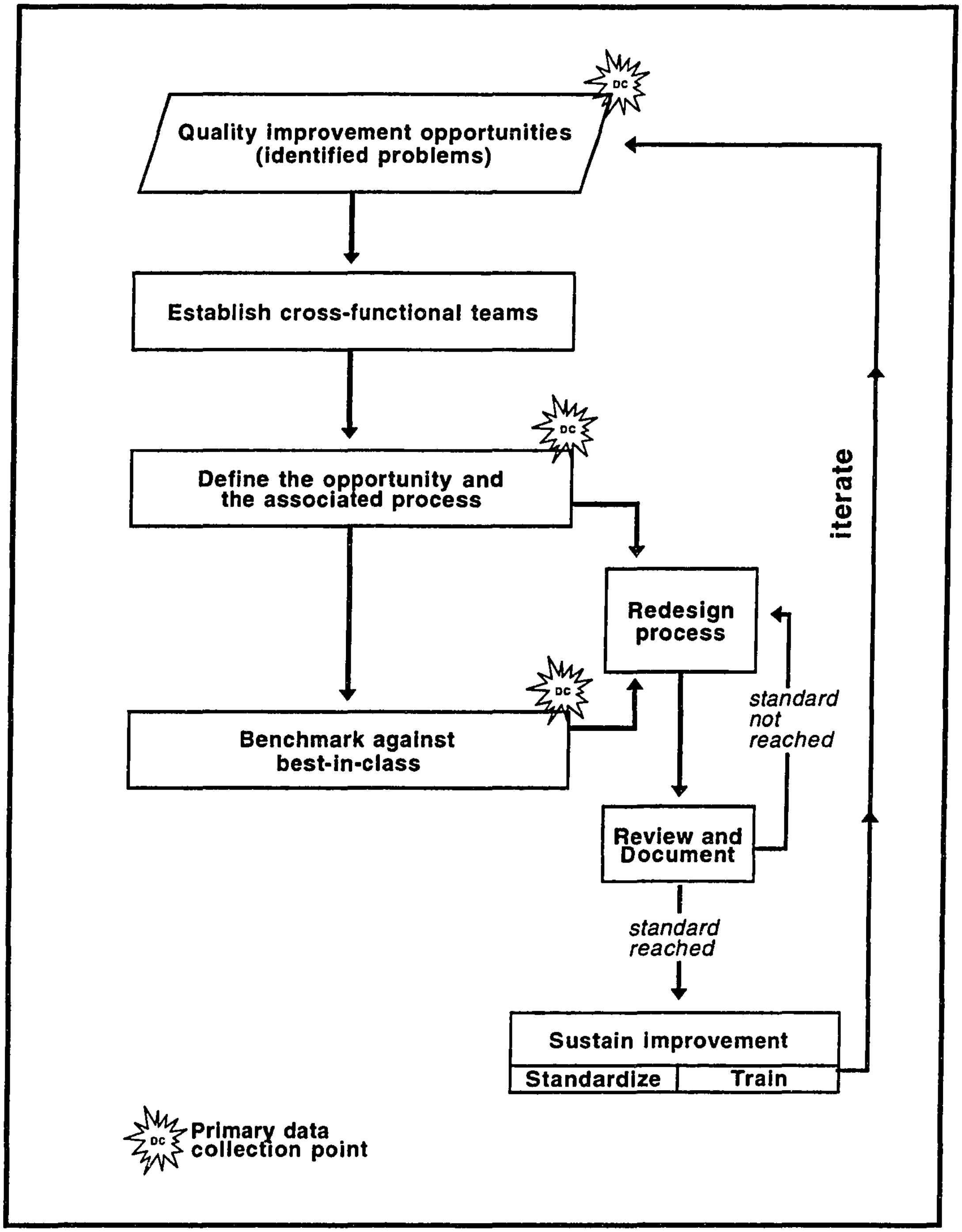


Figure 6.3: Quality Improvement Process at the Tactical Level

6.2.1 Quality Improvement Opportunities

The second section of our model assumes that quality improvement opportunities have already been identified. However, in asking experts to brainstorm on activities in the quality improvement process, we expected them to include activities relating to the first step, "identify quality improvement opportunities" which was detailed in Figure 6.1. For this reason we included this task among the categories given to experts.

The panel of experts validated the inclusion of the step "Identify quality improvement opportunities" by mapping to the category the following ideas:

1. Set objectives based on customers' needs and wants.
2. Identify the customers and learn their needs and wants.
3. Gathering information.

We considered that these ideas added further support to our modeling of the data needs to identify quality improvement opportunities as shown in Figure 6.1.

6.2.2 Establish Cross-functional Teams

The need to establish quality improvement teams was indicated by expert's creation of the following ideas (activities):

1. Forming teams around processes.
2. Establish cross-functional teams around main processes.
3. Team building and enabling of teams.
4. Identification of team and ancillary members.

Experts could not map these ideas to any of the categories in our model suggesting that another step was needed in our model.

Our failure to include the establishment of teams in our preliminary model was not through lack of belief in their importance. Everything that we had seen in the organizations we studied and in the quality literature suggested that quality improvement was a team effort. For example, at Bank H four types of teams were established: task teams (specific projects), functional teams (areas), cross-functional teams (horizontal alignment), and lead teams (upper management). Cross-functional teams operated at the tactical level. We also learnt that cross-functional teams were widely used in the HMO and the hotel in our validation study. Why then did we not include them in our preliminary model? Somehow, we had considered the establishment of teams both obvious and outside the actual problem-solving process we were trying to model. We assumed that the teams would be established before the process began and that "everyone would know this." On reflection, we see that their omission was an error. The step of establishing cross-functional teams was added to our model.

6.2.3 Define the Opportunity and the Associated Process

The literature on systems analysis tells us that the first step in a systematic problem solving process is the definition of the problem or opportunity and its environment. Hence, the first task of a quality improvement team and the next step in our model is the definition of the identified opportunity and the definition of the associated process.

The panel of experts validated the inclusion of a step "define the associated process" by mapping to the category the following ideas:

1. Identifying processes and subprocesses.
2. Definition of processes.
3. Develop measures of process effectiveness.

In our preliminary model we had included problem definition as a separate category. However, our panel of experts did not generate any activities which they could map to this category. In follow-up interviews it became clear that they considered problem definition an obvious and necessary step, but perhaps not as large a task as the others represented in our model. Remembering that our model was an abstraction, a simplification of reality, we merged the step "Define the opportunity" with the step that had followed it "Define the associated process."

6.2.4 Benchmark Against Best-in-Class

Benchmarking is a standard procedure in quality improvement. It can be used at all levels of an organization but it is particularly common at the tactical level. In benchmarking a company measures its performance against that of the best-in-class companies, determines how those companies achieved their performance levels, and uses the information to improve its own performance (Quality Glossary, 1992). Information on competitors' performance was used in all the organizations we studied, but formal benchmarking was less common. Some benchmarking was used by Bank N, the hotel, and the HMO in our study.

The panel of experts validated the inclusion of the step "Benchmark against best-in-class" by mapping to the category the following ideas:

1. Benchmarking best practices.
2. Benchmark core processes against competitors.
3. Develop measures of process effectiveness.

6.2.5 Redesign Process

Process redesign is the basis of quality improvement at the tactical level. An example of a simple yet effective process redesign was seen at Bank N where changes to the personal loan processing system resulted in large reductions in loan approval times. The redesign involved simplification of application procedures, development of quantifiable acceptance criteria, minimized and streamlined credit checks, and changes to job descriptions giving higher sign-off levels to branch staff. The changes enabled the bank to give instant lending decisions in many cases and a 24 hour guarantee on the remainder. In addition to improved responsiveness the standardized procedure resulted in improved quality of lending for the bank (Hub Manager, Bank N).

The panel of experts mapped to the category "Redesign Process" the following ideas:

1. Identify improvement outcomes relative to desired organizational results.
2. Plan implementation of improvement.
3. Improve supplier relationships.
4. Communicate scope, purpose, and duration of quality improvement.
5. Empower workers to manage their work.
6. Analyze improvement methods.

As can be seen by the variety of ideas mapped to this category, redesigning the process is a major step in itself, worthy of specialized attention. However, a detailed study of process redesign is not the focus of this dissertation (Section 1.4).

6.2.6 Review and Document

Our acceptance of a systems approach to quality improvement led us to include a post-implementation review step in our model. The purpose of this step is to determine if implemented changes resulted in improved performance and to check for any unintended effects on other processes. If the changes have been successful, the team should document its work, present reports to all employees with a stake in the process, and consider possibilities for replications of all or part of the changes in other areas of the organization. A post-implementation review was part of the quality improvement process used by teams at Bank H.

The panel of experts validated the inclusion of the step "Review and Document" by mapping to the category the following idea:

1. Document results in the form of data and a story -- create History.

This single idea falls a little short of a full review as we envision it. However, our systems approach to problem solving and our observations in Bank H convince us that a full review of an implementation is required.

6.2.7 Sustain Improvement

The final step in our model includes activities aimed at sustaining the improvement. These commonly include standardization of new procedures, changes to job descriptions, changes to competency profiles, and staff training. All of these activities were used to sustain improvement in Bank N following major changes to organizational process.

The panel of experts mapped to this category the following ideas:

1. Institutionalize the learning process of the department.
2. Institutionalize the communication process for the department.

We do not contend that the mapping of these ideas to this category validates the step as we define it. The ideas seem to us to belong to a different, broader category of enabling strategies. They are, if you will, departmental strategies. The brainstorming session did not elicit any activities which might fit our definition of sustaining improvement. However, when shown our model in follow-up interviews, all experts concurred with the inclusion of the category. Consequently, the final step was retained.

6.2.8 Summary

Data from field research showed that service quality improvement at the tactical level involved cross-functional teams in redesigning processes to meet service quality standards based upon customer expectations. The quality improvement process presented in our model was developed from our observations in the field and from our reading of the literature on quality. We refined the model in response to feedback from a panel of experts. Overall, we considered that the comments and ideas generated by the experts validated our model. However, experts were unable to map some of their ideas to our model. We considered the unmapped ideas to be broad enabling strategies rather than steps in an iterative improvement process. The unmapped ideas were:

Divisional Level

- Reaching consensus on the department's vision and mission
- Aligning the department's work with the overall organization's work

Organizational Level

- Defining the values of the organizational entity
- Develop vertical alignment of efforts within company
- Empower workers to manage their work
- Train employees in tools related to their quality improvement responsibility

We believe that the ideas listed under organizational level are strategic level enabling strategies. Indeed, all of these ideas were included in some form among the brainstormed ideas at that level.

A few activities were considered by the experts to "belong everywhere":

- gathering information
- measurement of performance
- initiate and update storyboard

(A storyboard is a means of communicating progress through visual (graphic) display of data)

We believe it is significant that all the activities which experts considered pervasive relate to data collection, data analysis, or using data for reporting. This is consistent with our modeling of a data-driven quality improvement process -- a process in which data are used in every step from identification of quality improvement opportunities to post-implementation review and documentation.

6.3 CHAPTER SUMMARY

We developed a model of data needs for quality improvement at the tactical level from field data collected in two banks. The preliminary model was validated in two sections. The first, more descriptive section was validated via structured interviews and a survey of service providers; the second, more prescriptive section was validated by a panel of experts. Feedback from the validation process was then used to refine the model. The final model presented in this chapter consists of two stages, (a) steps to identify quality improvement opportunities, and (b) an iterative quality improvement process.

At the tactical level of the organizations we visited, data were used in every step of the quality improvement process. Tactical level managers were interested in outcome and output measures related to customer and employee satisfaction. For example, they were interested in customer evaluations of responsiveness, reliability, assurance, and empathy as well as evaluations of overall satisfaction with the bank's service. Tactical data were less aggregated than strategic data but more aggregated than operational data. For example, tactical data generally summarized several indicators of a quality dimension, often across functional or regional areas. These data were collected on an ongoing basis, most often at weekly, monthly, or quarterly intervals though some annual surveys were also held.

In the organizations we studied, the identification of customer expectations and the monitoring of performance in meeting them were centralized at the tactical level. At this level employees had the skills, resources, and authority to conduct or arrange focus-group interviews and large surveys. Our analysis of field data identified four important dimensions of service quality: reliability, responsiveness, assurance, and empathy. This supports Parasuraman et al's (1985) finding in the mainland U.S. Our research also showed that service quality dimensions and components of dimensions differed across service industries, supporting Karwan and Rosen's (1988) finding. Since the importance of service attributes differs across industries, it is important for each organization to identify its own customers' expectations. In the organizations we visited, actual performance in meeting customer expectations was monitored primarily by telephone surveys of the entire market base or of market segments. Customer data from the operation level were also provided to tactical planners. These included data on customer expectations and performance evaluations provided by comment cards, mystery shoppers, and operators of the customer interface.

Our model at the tactical level describes a process to achieve breakthrough improvement at an organization- or site-wide process level. However, breakthrough improvements need to be consolidated and sustained through incremental improvements to processes and subprocesses. Incremental improvements arise from the actions of workers improving subprocesses within their work units. This is the operational component of our model which we describe in the next chapter.

CHAPTER 7
DATA NEEDS MODEL: OPERATIONAL LEVEL

The operational level of an organization is that level at which the organization's output is created and delivered -- customers are served, advice is given, transactions are processed, and complaints are handled. In operational planning, unit managers and workers take a micro view of processes, that is, they look at the details of subprocess design and operation. The focus is on activities over which the unit has control. Plans generally cover periods up to one year and include short term goals. For example,

- to reduce mean wait times in teller lines by having personal bankers assist tellers during peak periods
- to reduce the number of errors on purchase contracts by instituting self-checking procedures
- to reduce the number of abandoned incoming telephone calls by changing the manner in which calls are handled and referred.

Some process changes will be beyond the direct control of unit managers. For example, reducing mean customer wait times may require changes to staffing policies which are outside the unit managers authority. To bring about changes of this kind, unit managers need to work with senior managers who have wider powers. Such broad changes to organizational processes become tactical issues.

Data are used by quality improvement teams at the operational level to identify opportunities for improvement, to select and implement solutions, and to review the outcomes of improvement projects. In this chapter we present our operational level data needs model. Data for model development were collected from interviews, documents, observations, and group meetings in two banks. Model development and subsequent validation procedures were detailed in Chapter 3. For sake of clarity the model is presented here in two sections "Data Needs to Identify Quality Improvement Opportunities at the Operational Level" (Section 7.1) and "Quality Improvement Process at the Operational Level" (Section 7.2).

7.1 A DATA NEEDS MODEL TO IDENTIFY QUALITY IMPROVEMENT OPPORTUNITIES AT THE OPERATIONAL LEVEL

The first half of our operational level model, data needs to identify quality improvement opportunities, is given in Figure 7.1. This section was validated through structured interviews and a survey of service providers (Section 3.5). Table 7.1 lists the informants who were selectively sampled for validation interviews. This discussion includes insights from both the field study and the validation interviews.

Table 7.1
Operational Validation Interviews*

Organization	**Informant**
Bank	VP, Customer Satisfaction
Bank	VP, Branch Manager
Bank	Assistant VP, Branch Manager
Car Dealership	VP, Quality Assurance & Marketing
HMO	Clinic Manager

Abbreviations:
VP = Vice President
HMO = Health Management Organization

* Extracted from Table 3.2

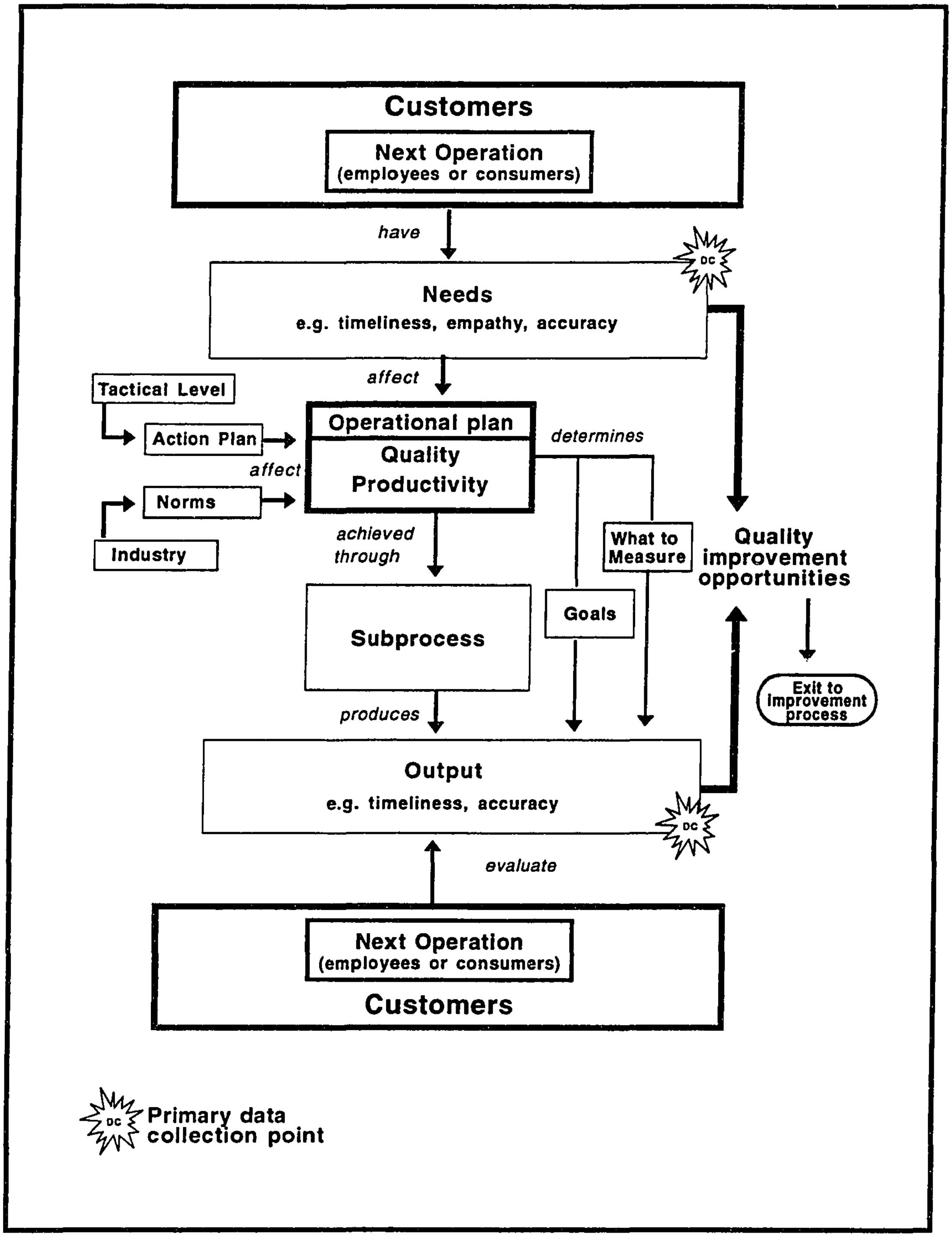


Figure 7.1: Data Needs to identify Quality Improvement Opportunities at the Operational Level

Informants at the operational level validated the basic premise of our model, that is, that quality improvement opportunities arise from discrepancies between customer needs and the unit's performance in meeting them. "Quality," we were told, "is defined by what the customer expects" (Branch Manager, bank). At the unit (operational) level the customer is the next operation. This may be an external (paying) customer or an internal customer (employee).

Research data collected in the banks showed that identifying operational level quality improvement opportunities required unit managers and workers to:

1. identify the customers in the next operation,
2. determine their needs,
3. develop operational plans based on identified needs, tactical plans, and industry norms,
4. design internal processes to meet operational objectives,
5. develop unit goals and measures based on operational plans and their input, and
6. compare output with customer needs.

This is the flow we incorporated into our operational level model as shown in Figure 7.1 and discussed in the following sections.

7.1.1 Customers at the Operational Level

At the operational level, informants spoke of "customers" rather than "stakeholders." In most cases they were referring to external customers. The needs of other stakeholders -- owners, controlling bodies, and the community-at-large -- had an impact on this level but the influence was considered indirect, being passed down to unit workers in the form of productivity goals and tactical level action plans.

Operational level workers were not engaged in determining who these other stakeholders were or what their needs were. We also found that at this level employee needs were viewed differently from the perspective taken at the strategic and tactical levels. At higher levels, managers considered employees' general needs, for example, resources, training, and morale issues. At the operational level, employees were viewed as customers of unit output. Because of this difference in focus at the operational level, we used the term "customer" rather than "stakeholder" in our operational level model.

In the two banks, operational level workers recognized two types of customers: **external customers**, "those who walk in off the street," and **internal customers,** "others in the banks who use my service," (Teller, Bank N). In our interviews most informants cited external customers as their customer. This was not surprising since most of our operational level interviews were in branches where activities usually involved an external customer. Branch employees often saw themselves as internal customers of other workers or operations but had difficulty recognizing that they might have internal customers. One informant commented:

> [Our customers are] anyone qualified to open an account with the bank or take out a loan. Anyone who is interested in banking products or services.

When asked "And what about other employees?" she responded:

> At the branch level it is the external customer. But in the back office -- departments who support us -- it is us, the branch employees, who are their customers. They need to treat us with the same respect as we treat external customers.
>
> -- Teller, Bank N

The ratio of internal customers to external customers may be a function of the size of an organization and the complexity of the process (Bhote, 1991). For example, a loan approval process may have several internal links each with an internal customer (next operation), but a hairdresser operating in a small salon will have fewer recognized internal customers. Whatever the ratio, workers must identify and consider the needs of both internal and external customers in order to provide service quality.

7.1.2 Customer Needs at the Operational Level

Identification of stakeholder needs is a major data collection point in our generic model. However, our field research showed that identifying external customer needs was considered less important at the operational level because unit managers and workers obtained this information from data collected at the tactical level. Some data were collected from branch interviews with customers who opened or closed accounts and from the anecdotal evidence of those who managed the customer interface, for example, tellers, personal bankers. However, in general, external customer needs at the operational level were a subset of those identified at the tactical level (Chapter 6).

In the units we visited we saw little evidence of workers assessing the needs of their internal customers. Informants told us that the process should involve working closely in partnership with internal customers. Our observations in the field led us to conclude that workers in large service organizations need to be made more aware of their internal customers and of those customers' needs.

7.1.3 Inputs to Operational Planning

Data from our field study showed that customer needs, tactical level plans, and industry norms were important inputs to operational planning and functioning. With regard to the impact of external customer needs one informant commented:

> We have not directly surveyed (customers) from our department but the bank surveys customers and that information gets fed back to us
> -- Manager, Customer Satisfaction Center, Bank H

This manager also emphasized the use of industry norms in setting unit service targets. For example, she used the industry norm to set a target for mean time taken to answer incoming phone calls. The HMO and hotel also reported using industry norms for comparative purposes. But the strongest and most commonly mentioned input to operational planning and functioning were higher level plans (strategic and tactical plans). One informant gave the following account:

> We receive direction from our Quality Council on the overall direction of the quality effort. For example, the 85% standard on satisfaction, was decided at the Quality Council. Then each clinic gets a report showing their performance from quarter to quarter and in comparison with other regions. [Clinic managers] can look across [the graph] and see opportunities for improvement. Local clinics are expected, as their own accountable groups, to have goals, to look at the data, and to work on the things which they see are affecting their own local levels. So, while access is a regional goal -- we are all working on access -- each clinic is supposed to review their performance and identify problems to work on in their own setting. [Senior managers] don't tell them what to do. Access gets monitored through the regional surveys, but how clinics are going to improve "access" is their decision.
> -- Clinic Manager, HMO

Other informants reported similar deployment of goals and policy in their organizations. These comments we took as validation fo our model's depiction of customer needs, tactical plans, and industry norms as inputs to operational planning.

7.1.4 Operational Plans Influence Subprocesses

The bank operational plans we examined contained strategies and actions affecting quality and productivity of subprocesses under the control of the planning unit. For example, at Bank N hub operating plans included changes to subprocesses such as:

- revision of job profiles, for example, amendments to loan sign-off levels for branches,
- revision of criteria, for example, criteria for evaluating new entrants,
- establishment of special positions, for example, employment of an Asian migrant manager,
- revisions to forms in use, for example, changes to evaluation forms for use in training, and
- mandating of certain communication links, for example, the links between personal bankers and credit bureau divisions.

The power of operating units to change subprocesses was limited. Many aspects of internal processes were dictated by the requirements of organization-wide process and this sometimes affected the service provided by operating units. For example, bank employees found that the information they could give customers about their accounts was limited by the information available on the bank's computer system. When senior managers at Bank H elected to move from an on-line teller transaction processing system to a daily batch processing system, this had an impact on the service provided by branches. Wait times in teller lines were expected to be reduced but up-todateness of account information would also be reduced. So, in the firms we studied, the objectives of operational plans were achieved through unit subprocesses but unit managers were somewhat restricted in the changes which they could make.

7.1.5 Operational Plans and Projects Determine Measures and Goals

By operational level measures and goals we mean measures and goals which are determined at this level by unit managers and workers. These included measures and goals for specific quality improvement projects at Bank H and for training and motivation at Bank N. In both banks quality activities were detailed in operational plans. Where the measures and goals were not also detailed in the operational plan, the quality activities determined what measures and goals were needed. In these cases the influence of the operational plans was indirect but still present.

In Bank H, data for centralized measures were collected within work units on behalf of tactical level staff. These measures were not influenced by operational plans. Indeed the direction of influence was reversed. Centralized measures influenced the quality culture in units and also the selection of quality projects. In validation interviews informants commonly mentioned centralized measures when speaking of operational level measurement. For example, we were told:

> Indicators are set and measured by the Quality Council; the operational level is responsible for the "how." But clinics can and do measure other things.
>
> -- Clinic Manager, HMO

In many cases goals were set by senior executives and delegated downward (Bank H, Bank N, car dealership, HMO). Speaking of productivity goals, a branch manager commented:

> Upper management set goals which branches delegate to individuals. These goals come from the branch's past performance and from the area (branch market characteristics).
>
> -- Branch Manager, bank

We considered that the validation interviews confirmed our model's assertion that operational plans determined quality measures and goals.

7.1.6 Operational Measures

Our analysis of the banks' quality measures showed that data collected at the operational level related to process or output measures rather than outcome measures and that these were strongly focused on specific problems. For example, at Bank H operational units used output and process information collated at the tactical level to identify opportunities for improvement. Other, project specific data were then collected by quality improvement teams within the unit and used to set goals, identify problem causes, select countermeasures, or present results.

Failure to collect outcome data suggests an assumption by teams that improving outputs will automatically lead to improved outcomes (customer satisfaction). However, outcomes will improve only if the relevant outputs are selected. Selecting relevant outputs was not always as easy as it seemed, even to front-line workers who "knew" what customers wanted, as one informant found:

> We cannot correlate phone access with satisfaction. We found that phone statistics were really awful but people were really satisfied. We

> figured that phone satisfaction incorporates a large scale so if [customers] had to wait on the phone but had a good experience at the clinic or got their appointment they were satisfied. So we need to look at both outcome (satisfaction) and output (actual performance).
>
> -- Clinic Manager, HMO

Outcome measures at the operational level my be collected from:

1. Targeted Customer Satisfaction Surveys covering customer perceptions of specific services, and
2. Customer comment cards.

Targeted customer satisfaction surveys are telephone or printed surveys of randomly selected users of targeted services. The banks used these surveys primarily to monitor telephone answering services such as the telephone bill payment service and the customer satisfaction center (complaints and queries) but they can be used for monitoring other services. For example, some car dealerships (branches) used targeted customer satisfaction surveys to call customers after purchase or service visits to thank customers for their patronage and to provide an opportunity to listen to how customers had experienced the interaction. The HMO also used targeted customer satisfaction surveys to monitor customer satisfaction with specific service facilities within clinics, for example, users of the dermatology clinic or users of parking facilities.

Comment cards are a particular form of targeted survey containing a few (1-5) brief questions. Cards may be handed to all or to randomly selected customers in specific areas or they may simply be displayed so that interested customers can take and complete them. For example, teller stations in both banks ordinarily had comment cards on display for customer use. For limited periods, tellers were asked to hand cards to all customers and to encourage completion. Comment cards are used in many service industries -- hotels, restaurants, HMOs, and others.

Even where data or information are handed down to unit managers from other levels, unit managers and workers play a role in determining what data they need. From our field data it was clear that in many organizations the problem was frequently one of selection. This problem was highlighted by an informant in the HMO. She told us:

> We have the information systems technology to provide measures at any crosscut or level required -- geographic, by clinic, by age level. Our quality group is working with the various operational level folk to see how the information can be made meaningful to them. How can they make it something they really own themselves.
>
> -- Quality Support Services Manager, HMO

In summary, data collected and used at the operational level were most often output or process data. We believe that greater use could be made of outcome data at this level. This outcome data may be collected in the unit or, more likely, fed down to the unit from higher levels in the organization.

7.1.7 The Importance of Links in the Operational Model

To determine the strengths of major links in the operational model, we surveyed a sample of large service organizations (Section 3.5). Thirty-six surveys were mailed and twenty-two returned, giving a response rate of 61%. Table 7.2 summarizes the survey mailing and responses at the operational level.

Figure 7.2 shows the links or sections of our model being tested by each question in the survey (Appendix P). The survey used graphic rating scales with five

Table 7.2
Packages Mailed and Responses Received:
Operational Level

Organization Type	Packages Mailed	Responses Received
Military	7	5
Hospital/HMO	15	10
Hotel	2	1
Other	12	6
Total	36	22
Response Rate		**61%**

* Extracted from Table 3.3

scale positions anchored at the endpoints by polar adjective pairs. In our analysis we scored responses on a range of 1-5 with "important" or "strong measurement" as high (5) and "unimportant" or "weak measurement" as low (1). Table 7.3 summarizes results at the strategic level.

Matching service outcomes to customer needs or expectations was rated highly by all respondents in our survey (Question 1). This added further support to the basic premise of our model that quality improvement opportunities arise from discrepancies between customer needs and customer perceptions of service delivery. The survey also supported our finding that customers needs, employee needs, and tactical plans are important inputs to operational planning (Question 2). However, at this level, as at the tactical level, we found a mismatch between what respondents considered important

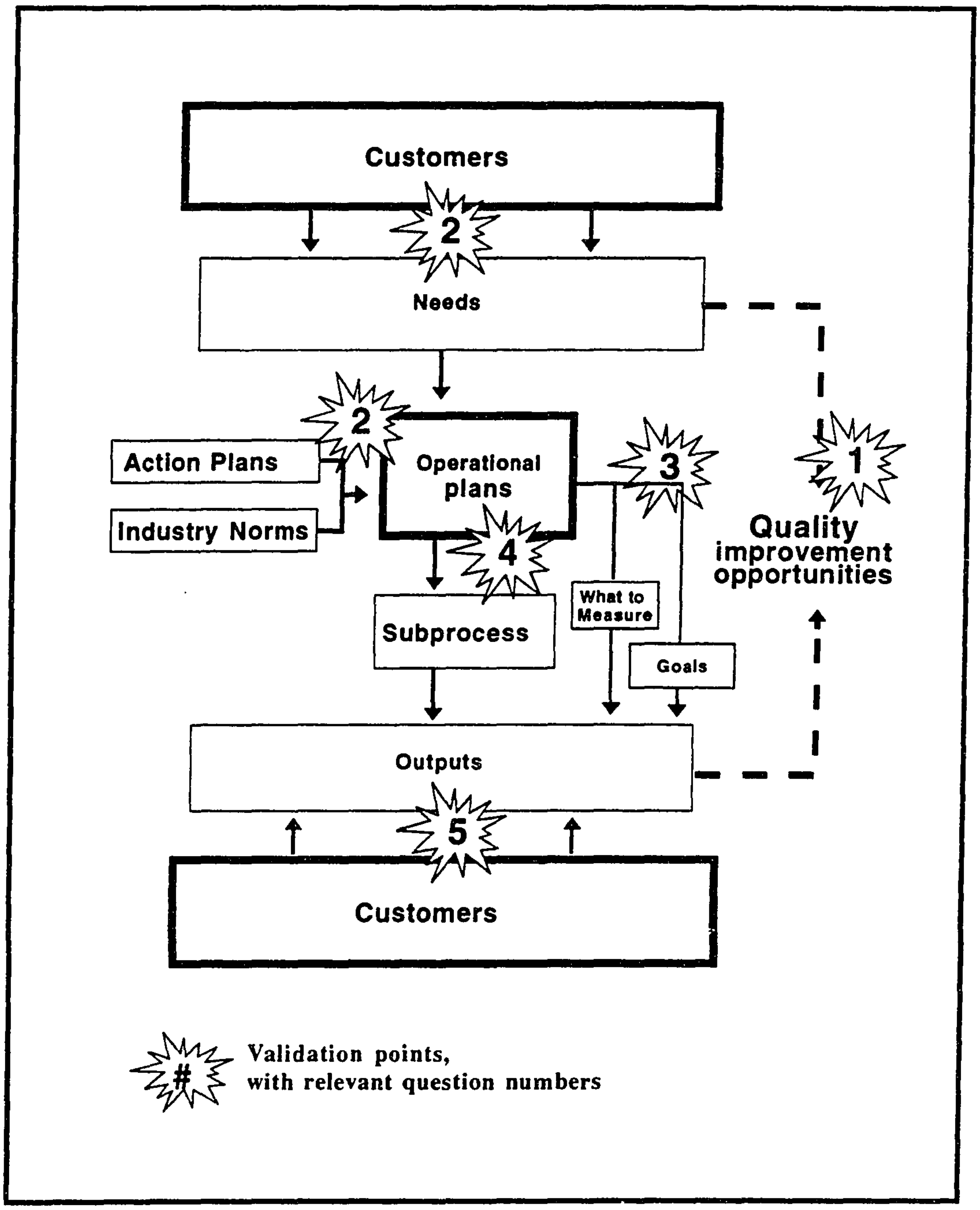


Figure 7.2: Model Linkages Validated by Survey: Operational Level

Table 7.3
Survey Results: Operational Level

	Mean	Max.	Min.
1. To provide service quality, how important is it to match service outcomes to customer needs or expectations? (5 = Important; 1 = Unimportant)	4.9	5	4
2 In developing an operational plan, how important are:			
Needs of paying customers	4.7	5	2
Needs of employees	4.5	5	3
Tactical plan (5 = Important; 1 = Unimportant)	4.5	5	3
3 How important is the operational plan in determining:			
Quality standards	4.4	5	1
Quality indicators	4.2	5	1
Productivity standards	3.8	5	1
Productivity indicators (5 = Important; 1 = Unimportant)	4.0	5	1
4 How important is the operational plan in influencing the design of subprocesses?	4.2	5	1
5 To what extent does your organization currently measure outcomes at the operational level related to the needs of:			
Paying customers	3.1	5	1
Employees (5 = Strong; 1 = Weak)	2.8	5	1

(Question 2) and what they were measuring (Question 5). Needs of paying customers and employees were considered important but were not measured strongly.

The survey validated our model's assertion that operational plans influence subprocess design (Question 3) as well as quality and productivity indicators and standards (Question 4). At the operational level, as at the strategic and tactical levels, the survey showed higher mean ratings given to the importance of plans in determining quality standards and indicators compared to determining productivity standards and indicators.

7.1.8 Summary

We defined the operational level as the level at which an organizations output is created and delivered. At this level unit managers and workers are responsible for process management and improvement. In the banks we saw data and information from the tactical level being used for motivation, training, and the identification of quality improvement opportunities. Other, independent data were collected and used to implement and monitor specific quality improvement projects. This unit-specific data was most often process or output data. The second section of our model sets out a quality improvement process which can be used at the operational level. This is described next.

7.2 QUALITY IMPROVEMENT AT THE OPERATIONAL LEVEL

The first half of our model (Figure 7.1) presented the data needs to identify quality improvement opportunities at the operational level, the first step in the quality improvement process. The second half of our model (Figure 7.3), described in this section, deals with the remaining steps from defining the opportunity, associated process, and problem causes, through selection and implementation of solutions to a successful conclusion as evidenced by a post-implementation review.

Our model was developed from our research in two banks, our understanding of systematic problem solving, and our reading of the literature on service quality. The second section of our model, discussed here, was validated by a panel of experts (Section 3.5.2). Experts brainstormed on the question "What activities or tasks must be completed at the tactical or operational level to achieve quality improvement?" They then individually mapped the group's brainstormed ideas to categories which we had previously derived from our preliminary model (Appendix T). We considered ideas mapped to a category if at least two of the three experts mapped an idea to that category. Analysis of the mapping and of the accompanying discussion was designed to detect omissions, redundancies, and ambiguities. The validated quality improvement process is shown in Figure 7.3 and discussed next.

Our model of the quality improvement process at the operational level is similar to the model at the tactical level. The major differences between the two levels lie in the scope of changes implemented, the subject of improvement, and the focus of

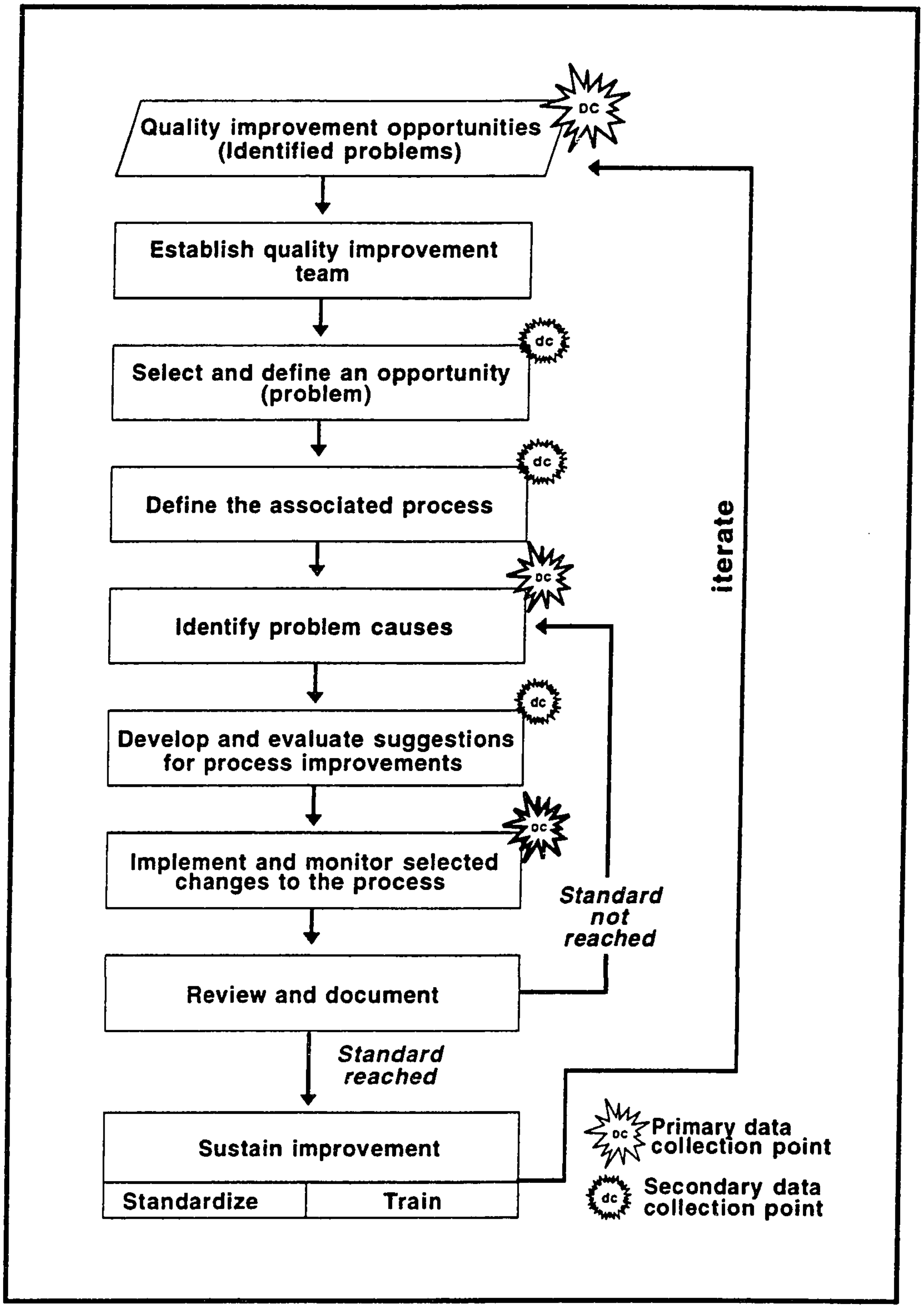


Figure 7.3: Quality Improvement Process at the Operational Level

comparisons. At the tactical level broad changes were made to organization- or site-wide processes with benchmarks taken against best-in-class firms. By contrast, operational level changes may be small but significant changes to unit subprocesses with comparisons made against other units within the organization and only rarely against other firms.

7.2.1 Quality Improvement Opportunities

The second section of our model assumes that quality improvement opportunities have already been identified (Figure 7.1). However, we included "identification of quality improvement opportunities" as a category for our panel of experts because we expected them to generate activities related to this initial step. Our expectations were met. The experts mapped to this step the following ideas:

1. Set objectives based on customers' needs and wants.
2. Identify customers and learn their needs and wants.
3. Gathering information.

We considered that these ideas added further support to our model of the data needs to identify quality improvement opportunities as shown in Figure 7.1.

7.2.2 Establish Quality Improvement Teams

The need to add a step in the model relating to establishing quality improvement teams was suggested by our panel of experts. In brainstorming they created the following ideas:

1. Forming teams around processes.
2. Team building and enabling of teams.
3. Identification of team and ancillary members.

As previously noted (Section 6.2.2) experts were unable to map these ideas to any of the categories proposed in our model suggesting that a step had been omitted. On reflection, we recognized that the omission was an error and added "Establish quality improvement team" to our model.

The question remained of where to include the new step in our operational model. Did team selection come before or after problem selection? We believe the answer differs depending upon the nature of the opportunity and the level of implementation. Our informant in the HMO told us that at the tactical level senior managers selected the opportunities to be worked on and then selected the best people to be in the team. This approach is common in the recently popularized "process reengineering." The result is a management selected cross-functional team. One of our experts was particularly critical of this approach. Referring to a field study in which he had been involved he told us:

> [Employees] told us that their teams were a complete disaster so long as management chose the issues that the teams were going to deal with, chose the members of the teams, and chose the leaders. [Employees] said that that just killed the whole team process. When [management] stopped doing that, when they allowed people to decide what teams they wanted to be on, when teams decided for themselves what issues they would work on, when they chose their own leaders, [team problem-solving] took off like crazy.
>
> -- panel expert

Another expert lent support to this by expressing the opinion that defining an opportunity or problem was a team responsibility. Consequently we included team establishment before problem selection and definition in the operational level model.

7.2.3 Select and Define an Opportunity

The first task of an operational level quality improvement team is the selection and definition of a quality improvement project (experts). For example, at Bank H quality improvement teams selected projects to improve performance in "problem" areas identified by customers (comment cards) or by measurement (centralized process and output measures). Short problem definitions were written and goals were set. For example, one branch undertook a project to "reduce customer wait times in the new account area" with a goal of "95% of customers being served within five minutes."

Our experts did not generate any ideas which they considered belonged to this category. However, the inclusion of this step in the quality improvement process at Bank H was consistent with systematic problem solving as outlined in any standard text on systems analysis. In follow-up interviews, experts agreed that problem definition was necessary. We decided to retain the step in our model.

7.2.4 Define the Process Associated with the Problem

All output (good or service) is produced by a process. To improve output, teams must understand the associated process. We know from the TQM literature that flowcharting processes is standard practice in quality improvement projects in manufacturing industries. We believe it is just as necessary in improving service quality. At an operational level, the "associated process" will usually be a subprocess.

The panel of experts validated the inclusion of the step "Define the associated process" by mapping to the category the following ideas:

1. Identifying processes and subprocesses.
2. Definition of processes.
3. Develop measures of process effectiveness.

7.2.5 Identify Problem Causes

Analysis of a problem to determine root causes is another standard procedure in the TQM approach to quality improvement. Frequently cause-and-effect diagrams are used for this purpose. These diagrams show the relationships among a variety of potential causes and the problem. We contend, and our model shows, that solutions can only be reached when the underlying problem causes are known.

The panel of experts mapped to this category the following idea:

1. Identify source(s) of quality gaps or defects.

Although only one idea was mapped to this category, that idea clearly indicates the need to identify problem causes. In follow-up interviews, experts agreed that this was a necessary step.

7.2.6 Develop and Evaluate Suggestions for Process Improvements

The next step in our model is the development and selection of countermeasures (potential solutions). Teams which have followed the steps in our model will have available data on the associated process and problem causes. These data should be used to help determine appropriate countermeasures. In some cases the appropriate countermeasures will be obvious from the problem causes identified. In other cases, team members may brainstorm ideas for countermeasures.

The panel of experts mapped to this category the following ideas:

1. Brainstorm improvements
2. Analyze improvement methods
3. Choose improvement method
4. Plan implementation of improvement
5. Improve supplier relationships
6. Communicate scope, purpose, and duration of quality improvement

We believe that the first four ideas validate the necessity of this step. Idea 5, improve supplier relationships, we consider to be a specific countermeasure applicable if supplier relationships is an identified problem cause. Supplier relationships are probably more important to manufacturing firms than to service firms.

Idea 6, communicate scope, purpose, and duration of quality improvement, is a task which "has to be done somewhere" (consensus of experts). However, our experts could not agree on where that place should be. We believe that it is best done up-front. Quality improvement teams at the operational level should get projects approved by the quality support team early in the improvement process. This will ensure that the project fits with organizational goals, priorities, and future directions. It will also enable teams to be put in touch with other teams working on similar projects.

7.2.7 Implement and Monitor Selected Changes to the Process

The next step in our model is the implementation and monitoring of the selected change. Experts mapped to the category "Implement and monitor selected changes" the following ideas:

1. Plan implementation of improvement.
2. Identify improvement outcomes relative to desired organizational results
3. Empower workers to manage their work.
4. Communicate scope, purpose, and duration of quality improvement.
5. Analyze improvement methods.
6. Improve supplier relationships.

We observe that only two of these ideas, those which we numbered 2 and 3, are exclusive to this category. The other four ideas were also included in the previous step, suggesting that these two steps might be combined. However, we believe that the selection of potential solutions is different from the actual implementation. First, different data will be used in each step. In the development of potential solutions, teams will use the data gathered while defining the process and identifying problem causes. They will also use "soft" data in the form of team members' knowledge of the system and their ideas about what might work. In the implementation phase, process and output data will be collected and graphed to monitor the effect of the change.

In addition to differences in data needs for these two steps we recognize differences in the duration of the steps. The development and evaluation of solutions is a one-shot task for any single iteration of the quality improvement process but monitoring performance will become an ongoing task. For these reasons we retained the two actions as separate steps.

7.2.8 Review and Document

The penultimate step in our model is a post-implementation review. In a post-implementation review a team checks for intended and unintended effects of the completed intervention. When a change is successful, the team should document its work, present a report, and consider possibilities for replications in other areas of the organization. If the change did not yield sufficient improvement, that is, the measures of interest did not reach predetermined goals, the team returns to the problem identification stage and repeats the previous three steps. Post-implementation reviews are a very important part of our quality improvement model. From such reviews learning occurs, both from the review process itself and from the sharing of knowledge with others.

The panel of experts validated the inclusion of the step "Review and Document" by mapping to the category the following idea:

1. Document results in the form of data and a story -- create History.

7.2.9 Sustain Improvement

The final step in our model is sustaining improvement. This includes standardization of new procedures and staff training. The panel of experts mapped to this category the following ideas:

1. Institutionalize the learning process of the department.
2. Institutionalize the communication process for the department.
3. Train employees in quality improvement tools

We do not contend that these ideas validate the step as we define it. The experts did not generate any ideas (activities) which we considered fitted our definition of sustaining improvement. However, when shown our model in follow-up interviews, all experts agreed that there was a need to actively sustain improvement, consequently, the step was retained.

7.2.10 Summary

Service quality improvement at the operational level involves teams of workers selecting and solving quality improvement opportunities. Our model at the tactical and operational levels are similar but the scope and focus of improvement are different. Operational quality improvement differs from tactical improvement in two important respects. First, operational quality improvement takes a micro view of organizational process, that is, it considers the detail inherent in subprocesses. By contrast the tactical level takes a macro view of organization- or site-wide processes. Consequently, operational level improvement tends to be incremental whereas tactical level interventions more frequently lead to breakthrough improvement. Second, operational quality improvement has a more internal focus using data which compares performance against internal standards or against other organizational units. By contrast, tactical level service quality improvement most often involves data and benchmarking against other firms. Despite these differences the quality improvement processes at the two levels are similar.

7.3 A COMPARISON ACROSS LEVELS

Chapters five through seven presented our detailed analysis of the generic model (Figure 4.2) at the three levels identified in our field research: strategic (Chapter 5), tactical (Chapter 6), and operational (Chapter 7). At each level we identified differences in the output focus, stakeholders identified, stakeholder requirements, plans, production focus, and perceptions measured. These differences are summarized in Table 7.4 and discussed next.

Output focus moved from a focus on potential output at the strategic level to current output at the operational level with both being important at the tactical level. The strong focus on potential as opposed to current output at the strategic level formed part of senior managements responsibility for providing vision for the organization.

Stakeholder requirements at the strategic level were assumed to be achievement of results in the form of return on assets or return on investment. This assumption was common across all organizations in our research. At the tactical level, market research was considered necessary to determine a limited number of critical success factors. These critical success factors tended to be broad indicators of customer satisfaction. At the operational level, specific needs of individual customers or customer groups are required. In the organizations we studied determination of customer needs at the operational level was seldom or poorly done.

Determining stakeholder requirements is a major data collection point in our generic model of data collection needs. With respect to external customer

Table 7.4
A Comparison Across Levels

DIMENSION	*STRATEGIC*	*TACTICAL*	*OPERATIONAL*
Output	Potential (and current)	Current (and potential)	Current (of unit)
Stakeholders	Owners	Paying Customers Employees	Next Operation
Requirements *Expectations to determine*	Results	Critical Success Factors	Specific Needs
Means of determining	Assumed	Market Research, e.g., surveys, focus groups	Meetings with individual customers or groups
Plan	Strategic Plans Business Plans	Tactical Plans Service Briefs	Operational Plans Service Action Plans
Produce	Product Design	Process Design	Process Management
Perceptions *Performance Measure*	Overall Performance	Outcomes Outputs	Outputs Process
Aggregation	Global	Cluster	Non-aggregated
How	Internal Database, Tactical Data Summary	Market Research, Associate Surveys.	Personal Communication, Targeted Customer Surveys
Frequency	Monthly, Annual	Ongoing, Quarterly	Hourly, Daily, Weekly

requirements, most data collection occurs at the tactical level with information being fed up to the strategic level and down to the operational level. Information is fed up to the strategic level so that strategic planners can use the information in planning and in allocating resources. Information fed down to the operational level informs "those who do the job" about customer needs and expectations. Such information can be used for motivation and for training.

Plans differed across the levels with lower levels specifying in greater detail the requirements of higher level plans. Upper management set the general direction for the organization in the preparation of strategic and business plans. The tactics and resources to achieve these were then set out in organization-wide and division-wide tactical plans. Also determined at the tactical level were service briefs, that is, detailed specifications of service quality requirements for specific products and processes. The final level of specification was contained in operational level plans plans. These included both planning for productivity (operational plans) and for quality (service action plans).

Production focus varied from product design at the strategic level, to process design at the tactical level, to process management at the operational level. "Product" in service organizations refers to the bundles of service options offered to customers as a group, for example, loan types.

Determining performance in meeting **stakeholder perceptions** is the second major data collection point in our generic model of data collection needs. Data collection differed with respect to the performance measure, the level of aggregation, how data was collected, and the frequency of collection.

At the strategic level the primary measure of interest was overall performance with a secondary interest in measures of employee and customer satisfaction as the means to achieving overall performance. These measures were taken infrequently, most often quarterly or annually but sometimes monthly. Information was most often obtained from data already existing within the organization, for example, from summaries of transaction data (ROA) or from aggregates of data collected at the tactical and operational levels (customer and employee retention).

At the tactical level the focus was on outcome measures with some interest in output measures as drivers of outcomes. Where possible, measures were collected on an ongoing basis with monthly or quarterly reporting. Data were obtained from market surveys in the case of external customers and from associate surveys in the case of employees. Most data on performance in meeting the requirements of external customers is collected at the tactical level. At this level expert advice was obtained in the design of data collection strategies or the task was outsourced to a professional research company.

At the operational level the focus was on output measures and on process measures as the drivers of outputs. Data were collected regularly, most often daily or weekly but sometimes more frequently. Data at this level were specific and detailed. Feedback on performance was sometimes obtained from targeted customer surveys but was more often obtained formally or informally from personal communications with groups of customers in the next operation.

7.4 CHAPTER SUMMARY

This chapter presented our model of data needs for quality improvement at the operational level. The model was developed from field data collected in two banks and validated in two sections as for the tactical model (Section 6.3). The final model consists of two stages, (a) steps to identify quality improvement opportunities, and (b) an iterative quality improvement process.

In the organizations we studied, quality improvement teams at the operational level used data for process management and improvement. These teams were interested in output and process measures relevant to selected quality improvement projects. We saw that operational data were detailed, lacking the aggregation observed at higher levels in the organization. These data were collected frequently, most often daily, twice daily, or hourly. Selection of quality improvement projects and collection of data were strongly influenced by the goal setting and measurement directives of higher levels.

Operational level workers spoke about "customers" rather than "stakeholders," almost exclusively referring to external rather than internal customers. We believe that this emphasis on external customers is due to the inseparability of external customers from the service process (Section 2.1).

In our field research we observed that the knowledge, skills, abilities, and resources available at the tactical level were often not available at the operational level. Yet the operational level is where an organization's output is created and delivered. It is, in the words of Carlzon (1987), where one finds the "moments of truth"; the instances where the customer interfaces with the organization. In the banks we saw a need to provide assistance to teams in their determination of data needs and data use at every step of the quality improvement process. Senior managers in one bank told us that computerized support at this level would be an invaluable training and support resource. In addition to articulating the data needs model, this study develops a demonstration prototype for such a system. In the next chapter we describe out developmentof a computerized support system.

CHAPTER 8

DATQUAL: AN EXPERT SUPPORT SYSTEM

Flattening organizations is a fact of modern corporate life. As organizational hierarchies are flattened, responsibilities and decision making are pushed down the organization. Employees within operational units are required to solve problems and make decisions which previously were the domain of managers. Frequently, these employees lack the knowledge, skills, and resources to perform their new role. This can lead to inconsistencies and poor performance. Knowledge and skills can be gained from training, but training is normally available in blocks and not on an ad hoc basis. Teams need an expert they can call upon whenever they need support. However, it is difficult, if not impossible, to have an expert available on an as-needed basis. Our solution to this problem is to provide workers with a computerized expert -- an ESS to guide them through the data-driven quality improvement process.

In this chapter we first describe ESSs as a decision support tool (Section 8.1). We then present the logical model which drives our ESS, (Section 8.2), and describe our implementation approach (Section 8.3). The features and functioning of our application, DATQUAL, are demonstrated through the presentation of a sample user session (Section 8.4). We conclude the chapter with a discussion of proposed future developments for DATQUAL (Section 8.5)

8.1 DATQUAL AS AN EXPERT SUPPORT SYSTEM

Among the alternatives for computer-based support, an ESS seemed most appropriate for our problem domain. Expert Support Systems help users by structuring a complex problem solving task (Silverman, 1987). Expert Support Systems are not Decision Support Systems (DSS), that is, they do make recommendations or rank decision alternatives. Nor are they Expert Systems (ES), that is, they do not reach conclusions and make recommendations to users. The emphasis in "expert support systems" is on the *support*: they support decision making but do not make decisions. Our problem domain called for support in a complex series of decisions over an extended time period. Consequently, an ESS was the alternative of choice. Expert Support Systems and their relationship to DSS and ES are described more fully in Appendix B.

The prototype developed in this research uses procedural cueing to guide teams through a data-driven quality improvement process. Procedural cueing is a technique in which the user is guided toward a decision by being conducted through a series of steps and sub-steps. Silverman (1987) notes that procedural cueing:

> Reminds the user of all the steps; suggests steps overlooked; provides step advice when requested; cues the user on the latest and most recent techniques and organizational changes. -- Silverman (1987), p.80

One way to understand procedural cueing is through an analogy of training someone to make the Italian dish, lasagne. A lasagne expert (or ESS) might tell a user to make and lay down three layers: a pasta layer, a tomato/meat layer, and a cheese layer. If the user has a lot of experience in preparing Italian cuisine, this might be enough information for him or her to complete the task. However, a novice user, will want to know "How do I make the pasta layer?" " ... the tomato/meat layer," or "... the cheese layer." Our expert (or ESS) would need to decompose these steps to smaller steps for the novice. Some sub-steps may need to be further decomposed or explained. This questioning is analogous to selecting a step in DATQUAL. Users are initially provided with the major steps. Where they do not know how to complete a particular step, they select that step and the step is decomposed to a series of smaller steps. Information or advice is provided at every step and sub-step.

We see several benefits arising from the use of our system. DATQUAL simplifies a very complex process by providing a logical sequencing of steps. For novices this acts as a performance aid and provides training. DATQUAL acts as a performance aid by informing users of questions which must be asked and answered at each step of the process. On-the-job, context-based training is supplied in each DATQUAL consultation. The order in which steps are presented and the fact that selected steps and substeps remain visible on the screen, help users to form a mental model of the quality improvement process. Thus they can internalize the knowledge embedded in the system and become more effective members of quality improvement teams. For experts, DATQUAL helps assure that no important steps are omitted. DATQUAL tutorials also provide a language by which quality improvement can be understood and through which actions can be communicated. Above all, DATQUAL sells an idea -- the idea that quality improvement is a data-driven process.

A necessary precondition of system implementation was construction of a logical model. The descriptive model (Chapter 7) presented a macro model of data needs for service quality improvement. Implementation required a logical model which detailed steps and sub-steps, thereby structuring the problem domain. The logical model underlying DATQUAL is described next.

8.2 DATQUAL, LOGICAL MODEL

The logical model which underlies DATQUAL was derived from the operational level model presented in Chapter Seven. In particular, the initial prototype presented in this dissertation is based on the model of "Data Needs to Identify Quality Improvement Opportunities at the Operational Level" (Figure 7.1). Since future developments are planned, we refer to this prototype as "DATQUAL 1.0."

Derivation of the logical model for DATQUAL 1.0 was a stepwise process. First we extracted the major steps from the descriptive model then we defined the steps and sub-steps in more detail. Figure 8.1 shows the major steps of DATQUAL 1.0 mapped to the descriptive model (Figure 7.1). These major steps are: identifying output and customers, identifying customer expectations, determining what to measure, setting standards, measuring performance, and identifying quality improvement opportunities.

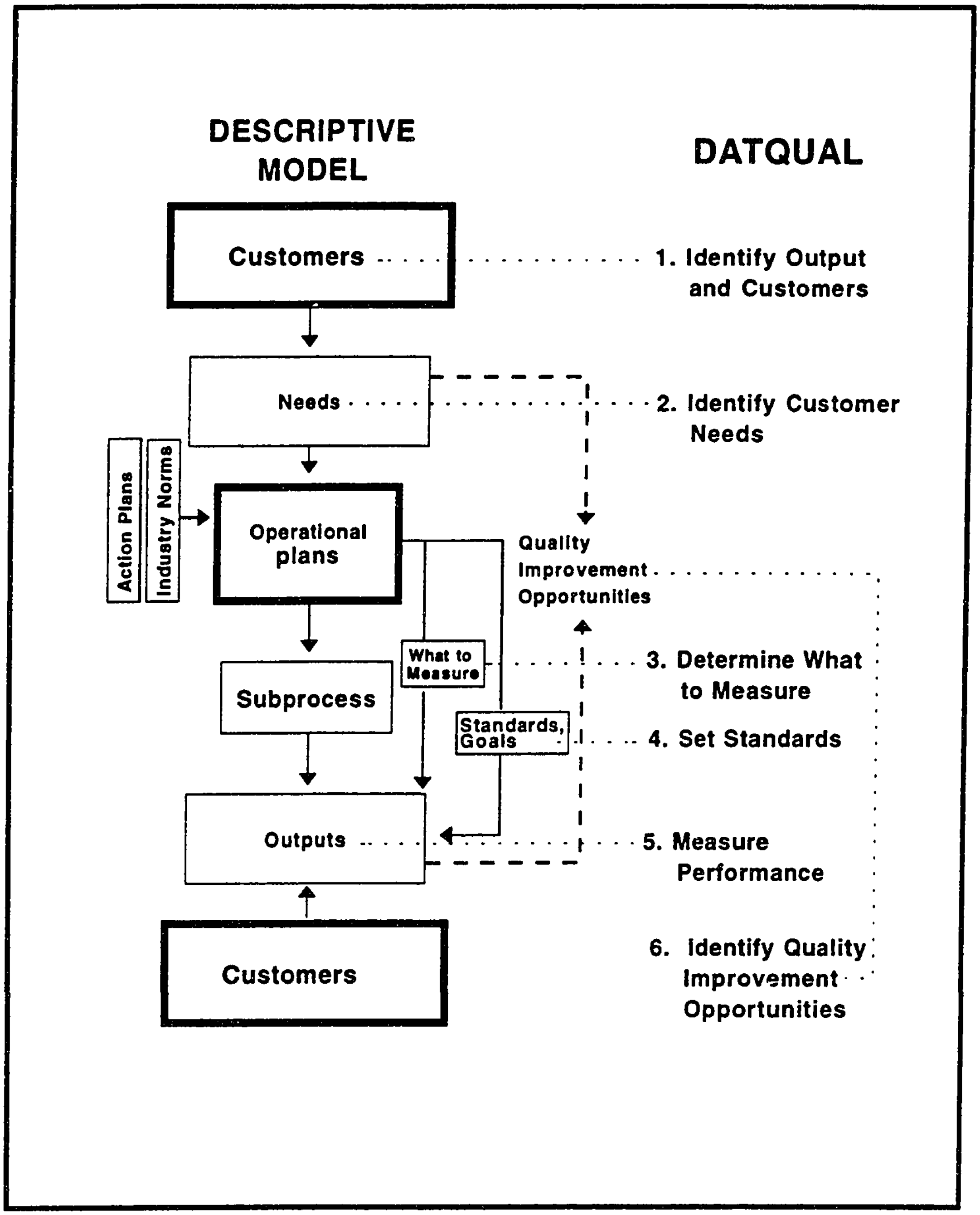


Figure 8.1: Major Steps of DATQUAL 1.0 Logical Model Mapped to Model of Data Needs to Identify Quality Improvement Opportunities at the Operational Level (Figure 7.1)

Two components of the descriptive model do not appear as major steps in the logical model. These are operational plans and subprocesses. The validated descriptive model showed ***operational plans*** as input in determining what to measure and in setting standards. However, preparation of operational plans is a separate activity outside the task domain of interest. The impact of these plans on measures and standards is addressed in system tutorials which detail the steps "Determine what to measure" and "Set standards." The second component of the descriptive model omitted from the logical model is ***subprocesses***. Processes and subprocesses are the means by which service output is achieved. As such, they are the target of quality improvement initiatives. However, the task domain of the initial prototype is identification of quality improvement opportunities and that relies on output and outcome data rather than process data. Hence subprocesses are omitted from the underlying logical model of the DATQUAL 1.0.

Steps two and three of our stepwise process to derive a logical model involved specifying in greater detail the substeps of each major step. Step detail came from our synthesis of a variety of informational sources: the literature on manufacturing quality, best practices observed in the field banks, insights gained from the validation process including both interviews with field experts and our panel of experts, and comments from non-participant practitioners, for example, conversations with practitioners on the internet. Among these, the major source of detail was the expertise provided by experts in the field and validation studies. The model is based primarily upon information provided by these experts, what worked for them and what did not.

Figure 8.2 presents the logical model for DATQUAL 1.0. The six major steps of the logical model are shown in the vertical column at the left.

1. Identify Output and Customers
2. Identify Customer Expectations
3. Determine What to Measure
4. Set Standards
5. Measure Performance
6. Identify Opportunities

The reader will recall that these steps were extracted from the descriptive model of data needs to identify quality improvement opportunities at the operational level as shown in Figure 8.1. To the right are the substeps or options offered in each step. In both Figures 8.2 and 8.3, a solid box represents a step or option a user can select, a circled "T" indicates availability of a tutorial, and a broken line box shows topics covered within a tutorial. For example, Figure 8.2 shows at Step 2, Identify Customer Needs, a user can select external customers, internal customers, or planning data collection. Each of these has a tutorial attached (circled "T"). The contents of the broken line box attached to the internal customers' box shows that major topics m this tutorial are: questions to ask and ranking issues. We will now discuss each major step.

Step 1, Identifying Output and Customers: The first step in our generic model was identification of current and potential output (Figure 4.2). Our research showed that at the operational level the focus was on current output of sub-processes (Section 4.5). Once output is defined, the next step is identifying customers of that

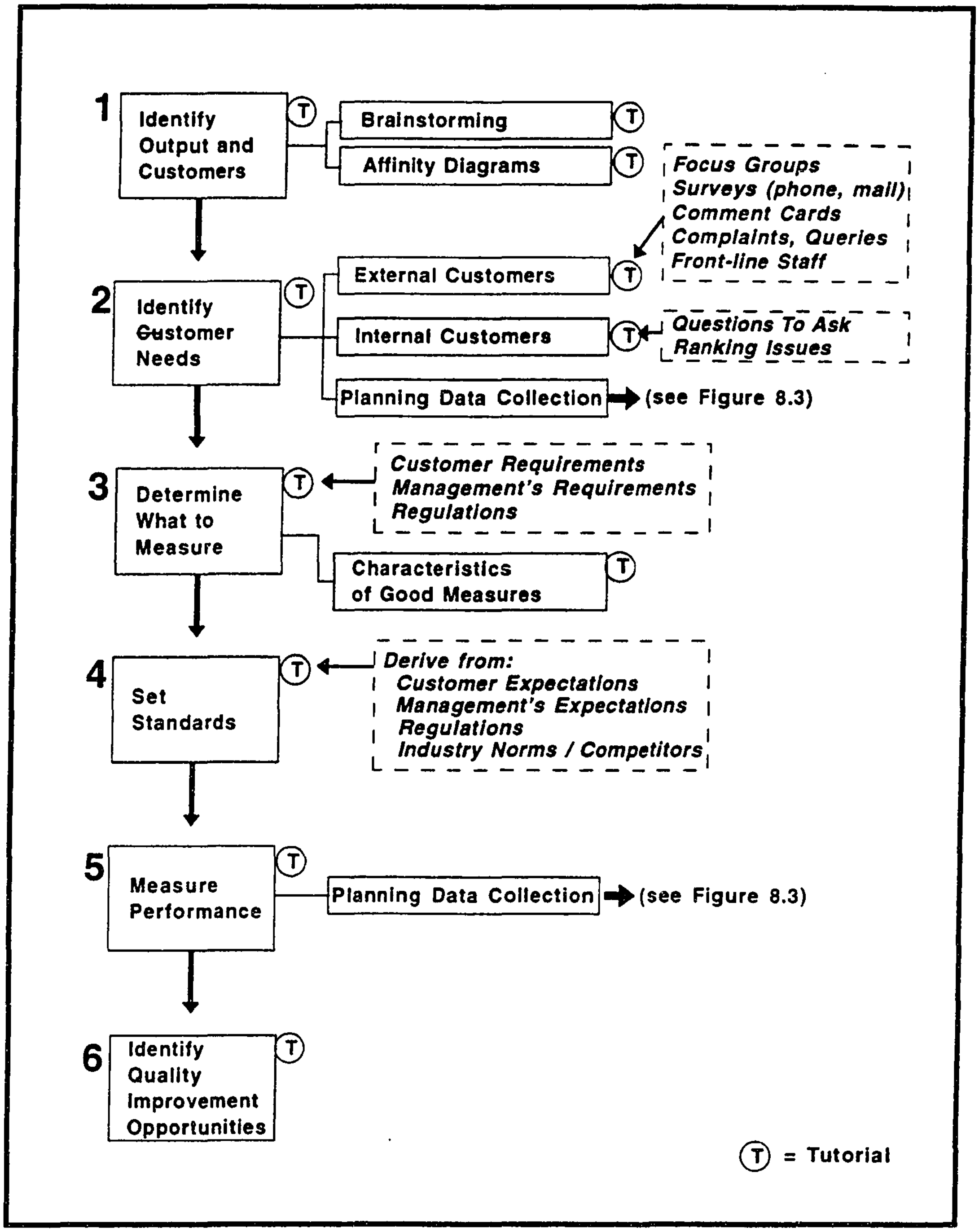


Figure 8.2: Logical Model, DATQUAL 1.0

output (Figures 4.2 and 7.1). These two steps of the descriptive model were combined in the logical model. Essentially in this step teams are asked to determine:

1. What do you produce?
2. For whom do you produce it?

The identification of all outputs is not as simple as might be expected. Many operational level quality improvement teams in the organizations we visited omitted this step. Our logical model suggests teams may wish to use brainstorming and affinity diagrams to help identify and classify the outputs of the unit or sub-process. Brainstorming is an effective way for teams to generate a list of ideas quickly, in this case unit outputs, and affinity diagrams can then be used to classify or group these outputs. The tutorials describe the techniques, their uses, and advantages as discussed in standard texts on quality (Brassand, 1989; Burr, 1993; ISO, 1992; King, 1989). Once output is known, customers of that output are more readily identified by the team.

Step 2, Identify Customer Needs: Following identification of output and customers, the descriptive model called for teams to determine customer needs (Figure 7.1). This becomes the second step of the logical model. Our field experts agreed operational workers must consider the needs of both external and internal customers (consumers or employees) in the next operation (Section 7.1.2). However, this was often not done or was poorly done. In this step of the logical model, teams are advised to answer two basic questions:

1. What service attributes do customers consider important, and
2. What level of performance do they expect on these attributes.

From interviews we learned that identification of needs of external customers often involved the use of focus groups, surveys (phone and mail), comment cards, complaint and query analysis, and listening to the insights of front-line staff. The tutorial on external customers describes each of these procedures, as well as suggesting advantages and hints for each. We drew the detail for our tutorial from a review of selected classic texts in the area (Churchill, 1987; Harrington, 1991; Ishikawa, 1982; ISO, 1992). The techniques in this step can be difficult and teams are advised to seek help from their quality support group as and when needed. Providing in-depth computerized support for the running of focus groups or designing of surveys would be a major task. Each could be the subject of an individual ESS.

To identify the needs of internal customers, operational level teams are advised to meet regularly with their customers. We suggest teams ask their customers:

1. What does our department deliver to you?
2. What are its important attributes (timeliness, completeness, etc.)?
3. How important is the attribute to you (1-10 scale)?

This line of questioning was derived from an internet communication with a practicing consultant (Craig Smith, quality listserve group). This consultant informed us that he had successfully used these questions when working with clients. Question one confirms the team's description of output and its customer (Step 1) and questions two and three determine the relevant attributes and their importance.

Identification of customer needs is a major data collection point. Consequently, from this step of the logical model we provide access to a module on planning data collection. Planning data collection is detailed in Figure 8.3 and discussed later.

Step 3, Determine What to Measure: In this step teams select measures. From interviews with field experts we learned that in selecting measures teams need to consider customer requirements, managerial requirements, and industry regulations. Ideally these would be embodied in the unit's operational plan (Figure 7.1) though this was not always done or the influences were not evident. In our logical model customer expectations are identified in the previous step (Step 2). Managerial expectations are set out in tactical plans, business plans, and service briefs, and regulations are set out in various publications (see Figure 7.1). Many writers in the literature on quality restrict consideration to the requirements of customers, but our informants agreed that the needs of management and the meeting of regulations were also important. In a quality-focused organization, management and customer needs will be complimentary and both will exceed the requirements of regulations.

In addition to providing information on the determinants of measures, advice is given on the characteristics of good measures. These characteristics were synthesized from the literature on quality (see, for example, Case & Bigelow, 1992).

Step 4, Set Standards: The setting of goals or standards for measures is the next important step following the decision of what to measure. Not surprisingly, data for setting standards come from the same sources that determine what to measure:

customer expectations, management expectations, and regulations. In addition, some data can be obtained from industry norms. In the logical model we show these four sources of standards as topics in the tutorial at this step.

Step 5, Measure Performance: The penultimate step in our descriptive and logical models is measuring output, for example, timeliness and accuracy. In reaching the fifth step teams will have already identified what to measure, and what standards to impose. At this point the team sets about measuring actual performance. This is the second major data collection point in the models. Once again, teams are directed to the major sub-step on planning data collection as shown in Figure 8.3 and discussed later.

Step 6, Identify Quality Improvement Opportunities: The final step in the process to identify quality improvement opportunities is the listing of opportunities (Figure 7.1). Most of the work is done. Our DATQUAL tutorial at this level simply reminds users of the steps they have completed and asks them to list all areas in which the measures of actual performance (Step 5) do not meet standards (Step 4). Since the standards in Step 4 are strongly influenced by customer expectations this amounts to identifying the areas in which the unit's performance is not meeting or exceeding customer expectations.

As might be expected, planning data collection is a major activity in any data-driven approach to problem solving. In DATQUAL 1.0 the two steps which most require expertise in data collection are Step 2, Identifying Customer Needs, and Step 5, Measuring Performance. The logical model for DATQUAL 1.0 (Figure 8.2) shows that from these steps a user should be able to access a sub-step or module on planning data collection. Because this sub-step is quite detailed it is diagrammed separately in Figure 8.3. The structure of the data collection sub-step is based on a data definition process used in Boeing's Fabrication Division and reported by Munoz & Nielsen (1991). Boeing's data definition process was developed for monitoring output and process performance rather than for collecting outcome data from external customers. Output and process measures were also the main focus of operational level quality improvement teams in the organizations we studied (Section 4.3). Since DATQUAL supports the quality improvement process at the operational level, the Boeing data definition process was considered relevant to our task domain. However, the basic structure of the process presented in the logical model could also be used for planning collection of outcome data. The detail we provide within the sub-step is our synthesis of a variety of sources including best practices in the field organizations, recommendations of ISO 9000, and recognized experts in the literature (Churchill, 1987; Harrington, 1991; Ishikawa, 1982).

The data definition process focuses on four aspects of data collection: scope of the study, parameters to measure, data analysis requirements, and data collection resources. These are shown in the left vertical column of Figure 8.3. DATQUAL 1.0 provides tutorials on each of these aspects and on graphing and sampling as shown in Figure 8.3 and described next.

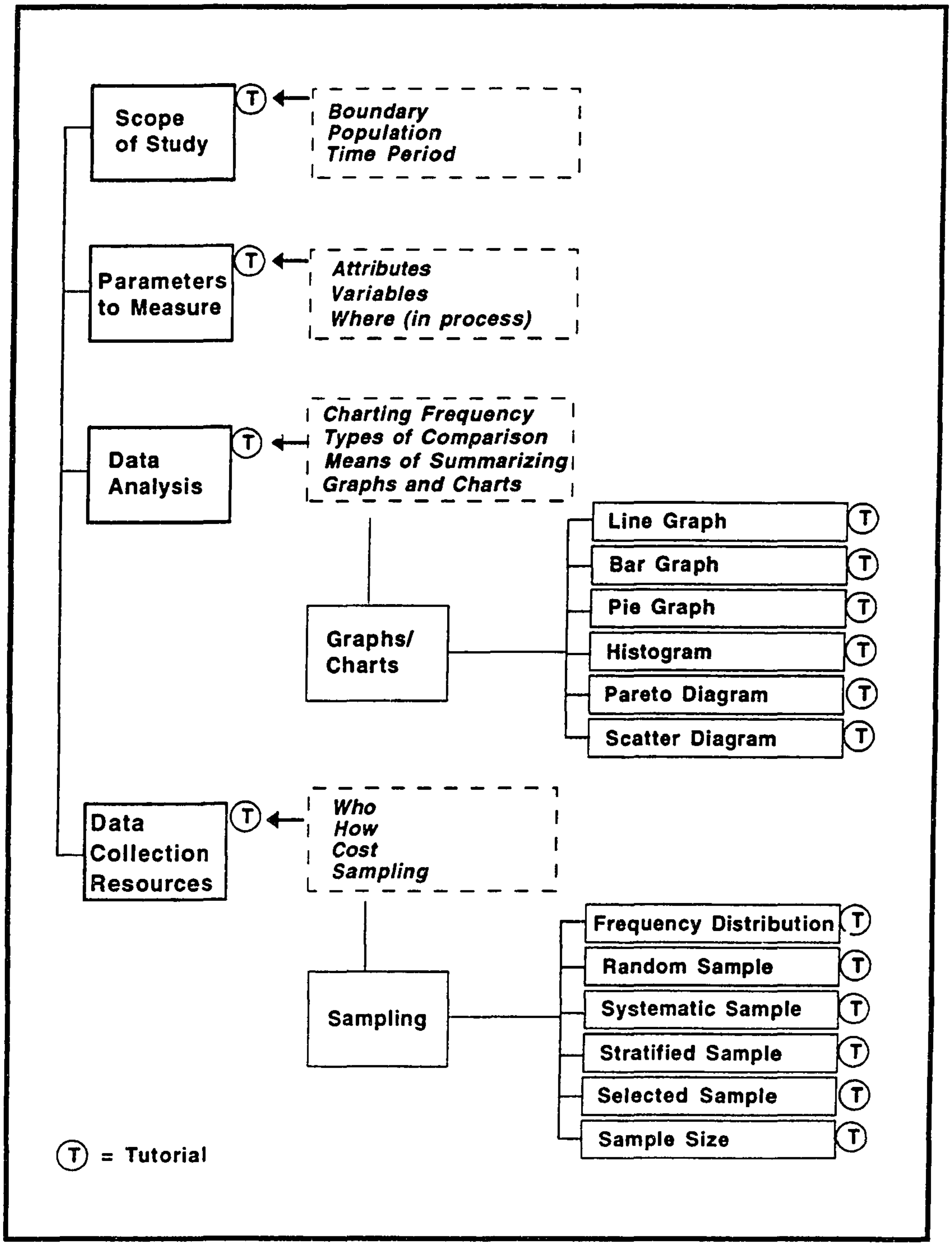


Figure 8.3: Logical Model, DATQUAL 1.0: Planning for Data Collection

Scope of Study: In this sub-step the team defines the limits of the study by defining the physical or process boundaries, the population of interest, and the time limit for the study. These are common considerations in setting boundaries for any experimental study. In the tutorial we wrote for DATQUAL we briefly define each term and give several examples to clarify each concept. For example, DATQUAL users are told to set boundaries for their study by selecting beginning and ending points within the process of interest. One of the examples given is the setting of boundaries for a study of a loan approval process: "The personal loan approval process, beginning with the arrival of the application forms at the loan center and ending with the transfer of files to Housing Loans Division." The concepts of population and setting time periods are similarly explained and clarified by presentation of examples.

Parameters to Measure: In this sub-step teams select the attributes and variables to be measured and stipulate where in the process they will be measured. In the banks we visited we found quality improvement teams collected almost exclusively attribute data, thereby excluding some of the rich information which can be obtained from variables data (Section 4.3.1). In the tutorial we wrote for DATQUAL we define attribute and variables data and give several examples of each. For example, DATQUAL users are told that attribute data consist of counts of items generally in situations where the answer is of the form yes/no or accept-reject. The difference between counting defective items (how many forms contain errors) and counting defects (how many errors) is explained. Examples of attribute data ("was the phone answered in time," "was the temperature within limits for this period," and "how many errors were there in the forms") were deliberately constructed to contrast with the examples presented later for variables data ("time taken to answer the phone," "temperature in the room," and "cost of correcting forms").

In this sub-step advice is also given on where in the process to collect data. In the DATQUAL tutorial we offer the common wisdom of measuring "as close as possible to the activity of interest," but also present specific recommendations extracted from the broad literature on manufacturing quality, for example, failpoints, critical activities, irrecoverable activities, cover-up activities, bottlenecks, costly activities, and process change-over points.

Data Analysis Requirements: In this sub-step, teams determine their data analysis needs with respect to charting frequency, types of comparisons to be made, means of summarizing data, and types of graphs and charts to use. These are important decisions because they will impact other decisions about the types of data to collect and the manner in which to collect it. In our DATQUAL tutorial we give several examples of comparisons that could be made, for example, comparisons over time (trend analysis), comparisons before and after interventions, comparisons by time periods such as time of day, comparisons by type (customer, query, transaction, form), comparisons by staff group, and comparisons by location. When discussing means of summarizing data we include discussion of standard statistical measures such as mean, median, range, variance, and standard deviation as well as measures such as percentages, cumulative frequencies, and control limits.

In this sub-step we recommend graphing or charting as a way to show relationships, patterns, or trends visually so that data can be more readily understood and interpreted. In the DATQUAL tutorial on graphing we discuss the general characteristics of good graphs (titles, labelled axes, use of legends, notes to charts, indication of desirable direction, and presentation of background information on data collection). We also present individual tutorials on charts commonly used in quality improvement: line graphs, bar graphs, histograms, pareto diagrams, and scatter diagrams. In DATQUAL the tutorial for each chart or graph gives a brief description of the chart including the situations for which it is useful, notes on how to construct the graph including a final list of check points, and a note on how to interpret the chart.

Data Collection Resources: In this sub-step teams define the resource requirements of their study in terms of people, equipment, money, and time. DATQUAL gives advice on determining who should collect data and how the data should be collected to assist ease and accuracy of data collection and subsequent analysis. In this step the issue of sampling is addressed. DATQUAL users can opt to read mini-tutorials on frequency distributions (including descriptions and examples of calculating mean, median, mode, and range, and the interpretation of a standard deviation). In addition users can opt to review any one of several sampling techniques commonly used in surveys including random samples, systematic samples, stratified samples, and selected samples. Detailed support on sampling is beyond the scope of the current computer implementation but is an area worthy of further research and development.

The logical model presented in Figures 8.2 and 8.3 provided a basic structure for DATQUAL 1.0 computer implementation. The next section describes that implementation.

8.3 DATQUAL IMPLEMENTATION

8.3.1 DATQUAL Implementation Environment

We considered the choice of implementation environment important. A poor choice could lead to problems in future developments if it was discovered that important functions could not be encoded. In our search, we required an expert system building tool which met the following requirements:

1. inexpensive
2. reliable
3. developer-friendly development interface
4. programming flexibility
5. good documentation
6. vendor support and maintenance
7. IBM PC platform for development and use
8. potential for run-only systems

The system chosen to meet these requirements was LEVEL5 OBJECT 3.0 supplied by Information Builders, Inc., New York, NY 10001-3782.

LEVEL5 OBJECT is a high-level development environment providing object-oriented programming, logic capabilities, and database access. Development in this environment is aided by the provision of graphical display builders, editors, and debugging tools. The underlying PRL code provides some flexibility and portability to other hardware platforms and operating systems. Compiled, run-only applications are available to run under Microsoft® Windows™. In short, the development environment appeared to meet our requirements for an initial prototype and for potential future developments.

In developing our prototype we experienced some problems with programming flexibility. In particular, we had difficulty transferring graphic files from other applications into LEVEL5 OBJECT. The environment accepts only bitmap files (*.bmp) which are not resolution independent. Consequently, we had difficulty transferring clear graphic images into pre-defined, pre-sized picture boxes. We considered this a major problem for the type of implementation we sought to develop. Many of the concepts and tools in DATQUAL are more readily conveyed by pictures. In addition, we found the restriction to simple text files (*.txt) in textboxes limiting. We would have liked the ability to read in word processed files with full text formatting and variable fonts in order to add variety and visual appeal to the textual displays. The inclusion of variable text into text files while technically possible is cumbersome and difficult. Use of variable text would have permitted more personalization of the tutorials. Because of these difficulties and the importance of graphics to our task domain we intend to investigate the feasibility of taking the basic DATQUAL structure to an interactive, multi-media environment for future research and development.

8.3.2 DATQUAL Implementation Method

We developed DATQUAL 1.0 as a network of objects. **Objects** are items within the application which have a unique identity, value, and behavior. Each **instance** of an object is defined by the general properties of the object class to which it belongs and by the attribute values declared for the specific instance. The primary objects in DATQUAL are windows, displays, and display items. **Windows** in DATQUAL have standard Microsoft® Windows™ appearance and functions. We created customized windows by declaring instances of a predefined object class with values for class attributes such as location and style. **Displays** are collections of display items which are output to windows in order to provide information to users. We created displays for DATQUAL by declaring specific instances of a predefined display class of objects. **Display items** commonly used in DATQUAL include textboxes, hyperregions, pictureboxes, and pushbuttons. We developed display items in DATQUAL using the environment's graphical developer interface.

The relationship among windows, displays, and display items can be seen by examining a typical DATQUAL user screen (Figure 8.4). The screen shown in Figure 8.4 has five windows: a narrow window across the top, three small windows down the left, and a large window at the right. Different instances of the display class of object are output to each window. For example, the narrow top window contains the display "title bar." This display includes four instances of the pushbutton class of objects. Each pushbutton has a method attached to perform a specific function as

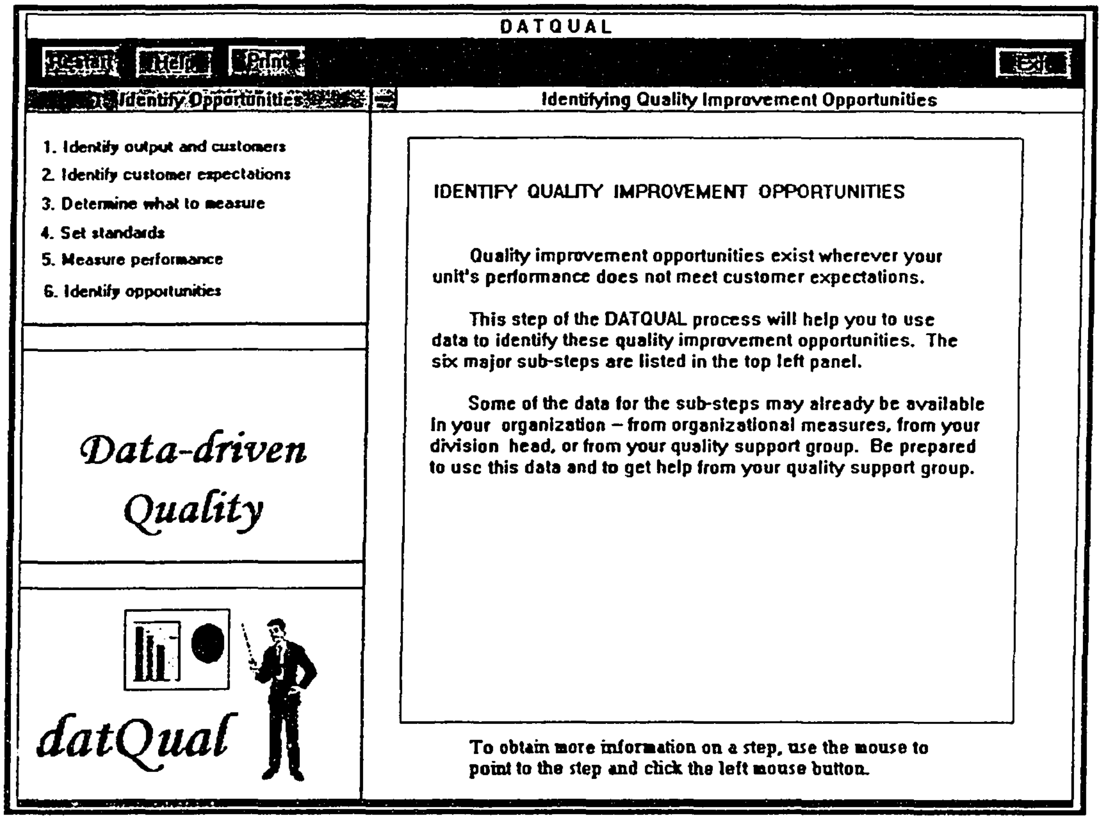


Figure 8.4: DATQUAL Typical Consultation Screen

indicated on the pushbutton label. The use and function of the buttons are described later in the sample session. As further examples, the upper left window contains the display "Level1" which includes 12 display items: six textboxes and six hyperregions (not visible) and the large right window contains the display "tutor1" with the text file "t1.txt" output to the main, framed text area.

Screen displays in DATQUAL are linked by **methods**. Methods are procedures for determining attribute values or reacting to them. We used "When Changed" methods to link DATQUAL displays. When a user makes a selection during run time a simple attribute (true/false) of an object is changed to TRUE, thereby invoking the method specified in its declaration. These methods cause the display output to selected windows to change.

DATQUAL 1.0 has 12 object classes, approximately 150 object instances, and 40 methods. In addition the application calls upon 85 external text file and 2 external bitmap files. Appendix U provides more detail and examples of the technical aspects of DATQUAL implementation. Appendix V provides a section of the 2000 line PRL code. The declarations presented in Appendix V define objects and methods used in the sample session presented later in this chapter (Section 8.4). However, before presenting the sample session, we will broadly outline our implementation approach.

8.3.3 DATQUAL Implementation Approach

In designing DATQUAL 1.0 we considered the needs of end-users. DATQUAL will have multiple users, many of whom will be entry-level employees with limited computer experience. Their system use will be intermittent. Unsophisticated, intermittent system users are likely to forget system functions between consultations. Consequently, a user-friendly interface was critical. We achieved user-friendly interfaces through simplicity, clarity, and consistency in screen displays and the delivery of an application which runs under Microsoft® Windows™.

DATQUAL operates somewhat like a hypertext implementation. Indeed, hyperregions underlying on-screen text provide the means of connecting and activating displays in DATQUAL. An important difference is that in our application we leave the previous steps and substeps displayed on the side of the screen (see Figure 8.4). Hypertext applications can cause novice users to become lost in a maze of screens. We wanted our users to retain a "sense of place" within a consultation session. By leaving step selections visible on the side of the screen we gave users a record of the step history, a sense of place within the application, and an ability to go back to previous steps or sub-steps easily. More importantly, concurrent display of step and substep breakdown would assist users in creating a mental model of the data-driven quality improvement process. This was one of our intended system objectives.

The resultant system structures our data-driven approach to continuous quality improvement. A demonstration of the functioning of the system is given in the sample session presented next.

8.4 A SAMPLE CONSULTATION SESSION

In this section we demonstrate some of the features of DATQUAL 1.0 through presentation of a sample session. The figures presented in this section show screens captured during an actual "consultation" with DATQUAL. In this demonstration, the developer (and writer) took the role of a new (or relatively new) user of DATQUAL.

To consult DATQUAL, the user first opens windows and LEVEL5 OBJECT, and then runs the DATQUAL application. The title display shown in Figure 8.5 fills the screen. The title screen welcomes the user to DATQUAL and informs the user that DATQUAL is "A structured guide to continuous improvement in service quality." The user has three choices represented by the three pushbutton on the top of the screen. The user can **continue** with the session to the next screen, find out more **about** DATQUAL, or **exit** the application.

Clicking on the about... pushbutton causes a smaller window to be superimposed on the title screen (Figure 8.6). The window contains a brief description of DATQUAL including a list of the six major steps. Clicking on the close pushbutton returns the user to the title display (Figure 8.5).

Clicking on the continue pushbutton at the top left of the title screen brings up the main selection display (Figure 8.7). Like the title display, this display is output to a full screen window. The exit pushbutton again appears in the upper right corner of the screen. In DATQUAL 1.0 the user is offered two alternatives at the main selection screen: selecting the steps at the right or selecting tools and techniques at the lower left. Selecting tools and techniques would display a list of the major tools and

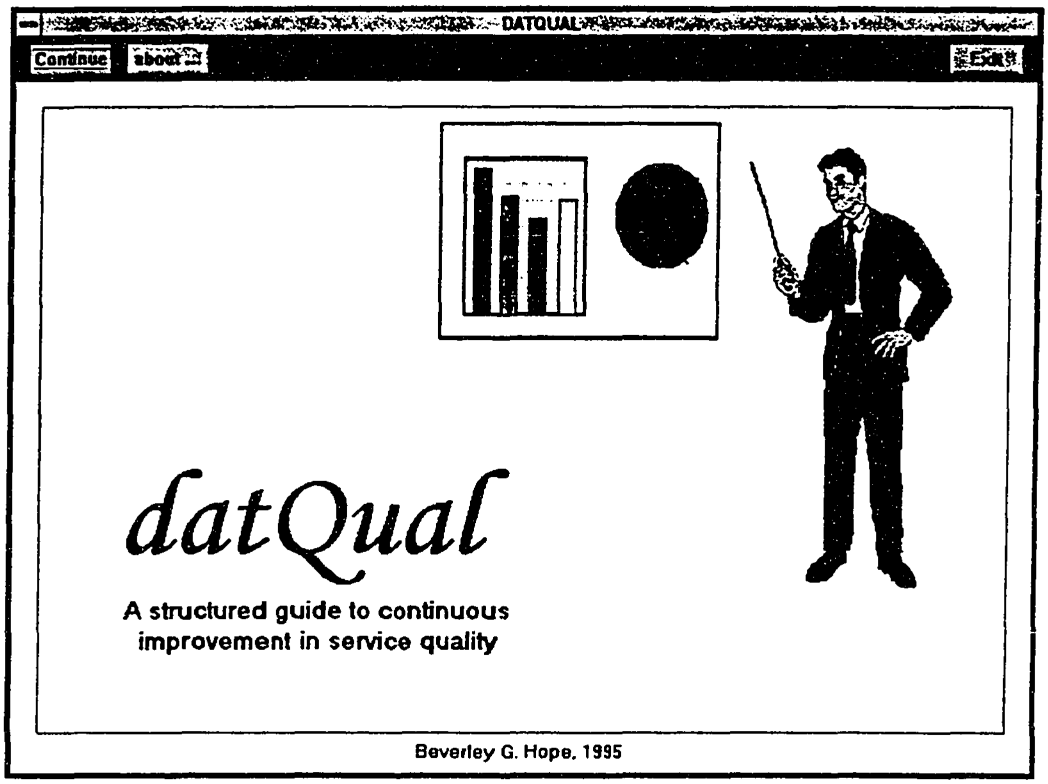


Figure 8.5: DATQUAL Title Screen

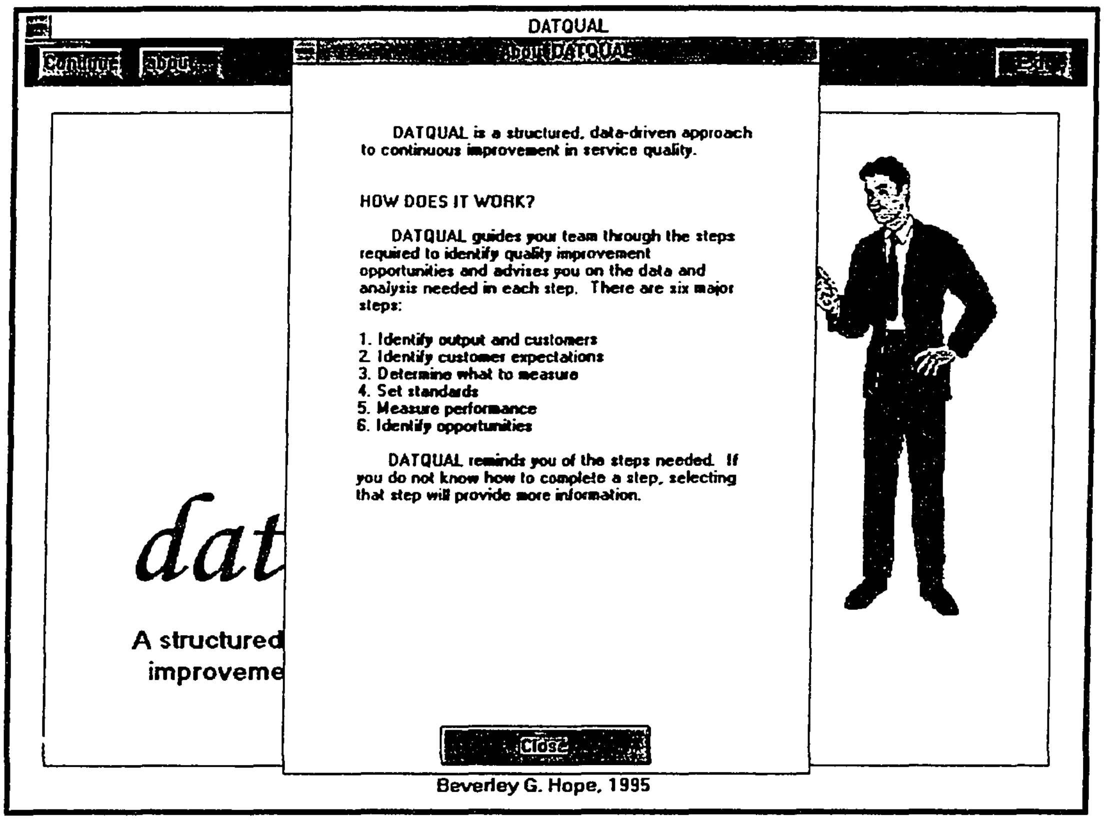


Figure 8.6: DATQUAL About DATQUAL Screen

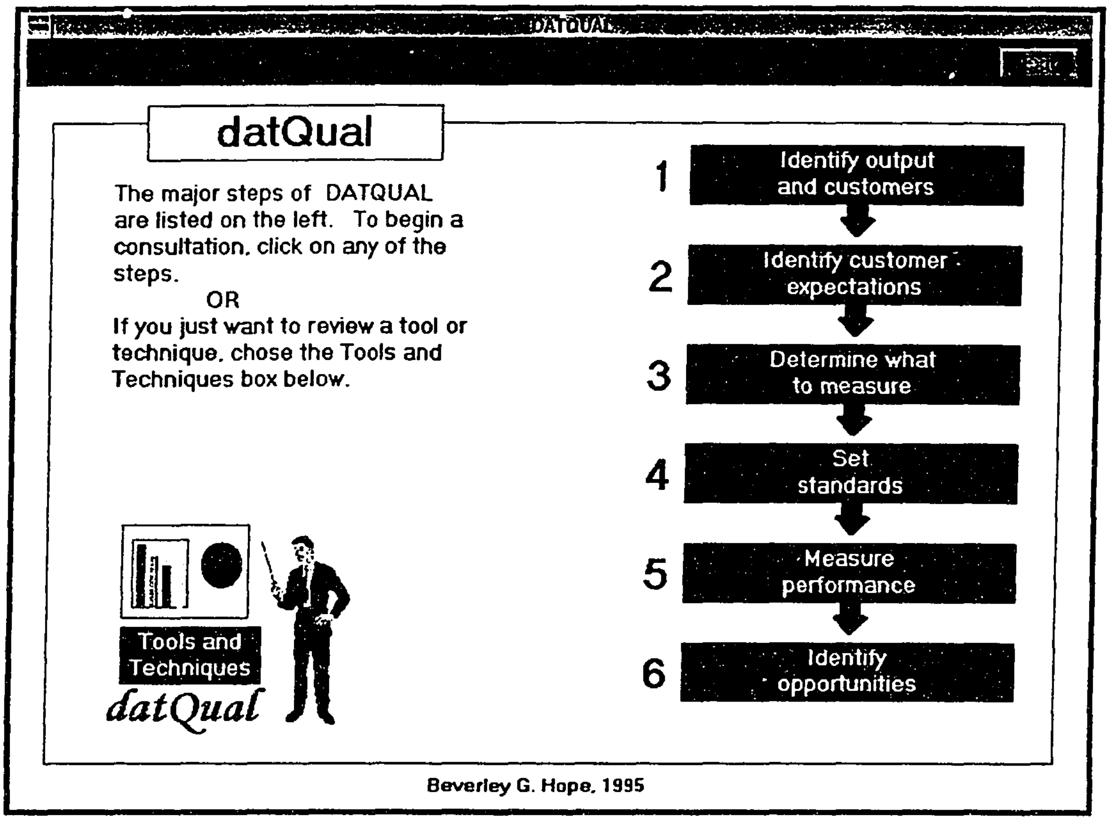


Figure 8.7: DATQUAL Main Selection Screen

techniques used in DATQUAL. If needed, the user could go to this screen to review a particular tool or technique. However, we remind users that they should first determine the information they need then choose the tool that will help them to generate and analyze the relevant data to provide that information. Focusing on tools rather than information needs had been a problem with some operational level quality improvement teams at Bank H (VP Center for Quality, Bank H).

For our demonstration, the user clicks on the steps hyperregion and the main consultation screen is displayed (Figure 8.8). This screen contains the five windows previously described (Section 8.3). The upper left window contains the six major steps:

1. Identify output and customers
2. Identify customer expectations
3. Determine what to measure
4. Set standards
5. Measure performance
6. Identify opportunities.

Text in the tutor window at the right provides a brief introduction to the process of identifying quality improvement opportunities and reminds users to be prepared to use data already existing within the organization. Instructions at the bottom of the tutor window, instruct users to select a step using the mouse. The two lower left windows contain graphics to fill some of the screen's white space. In applications for specific organizations, the organization's logo or quality motto might appear in these windows.

Four pushbuttons at the top of the screen allow the user to restart the application, obtain help, print the file in the tutor window, or exit the application.

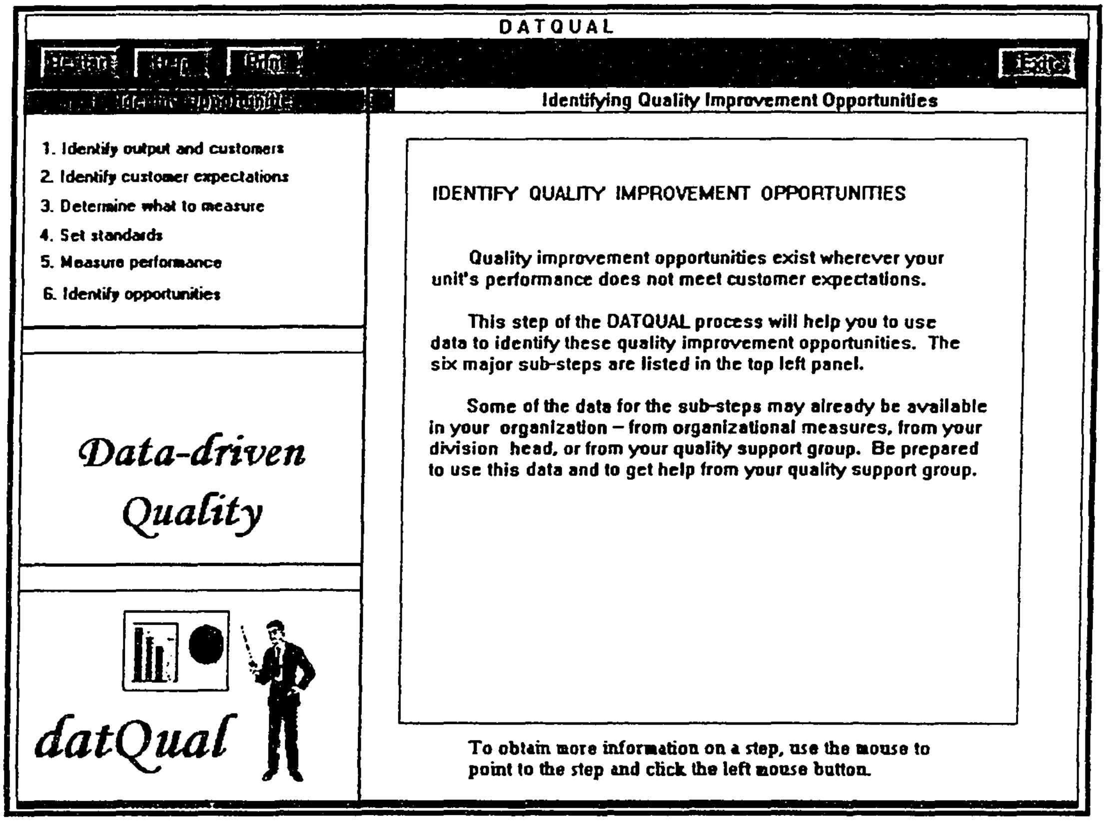


Figure 8.8: DATQUAL Main Consultation Screen

Selecting restart at any point during a consultation returns the user to the main selection display (Figure 8.7), selecting help brings up a help window (see Figure U.1 in Appendix U), and selecting print causes the current tutor file (large window at the right) to be printed. Selecting exit takes the user to the conclusion display presented at the end of our sample session (Figure 8.13).

Our user selects the second step in the top left window, identifying customer expectations. The tutorial window changes again, and the two lower left windows fill with options relevant to and discussed in the tutorial window (Figure 8.9). The user can scroll through the tutor window to read an overview of the step. In this overview, the user is informed that assessing customer expectations involves assessing two things:

1. Which things customers consider important in the service provided, and
2. What level of performance they expect.

We advise users that determining customer expectations can differ according to whether the customers under consideration are external customers or internal customers, and we direct users to the selections in the lower left window if more information is required. In this tutorial we also provide an overview of the four main steps in the planning data collection module (see Section 8.2) and direct users to the selections in the middle left panel.

For the purpose of our demonstration, the user first selects "Asking external customers" from the lower left window. The selection windows at the left remain unchanged but a new tutorial is presented in the tutor window at the right (Figure 8.10). By scrolling through this tutorial the user can read about the common

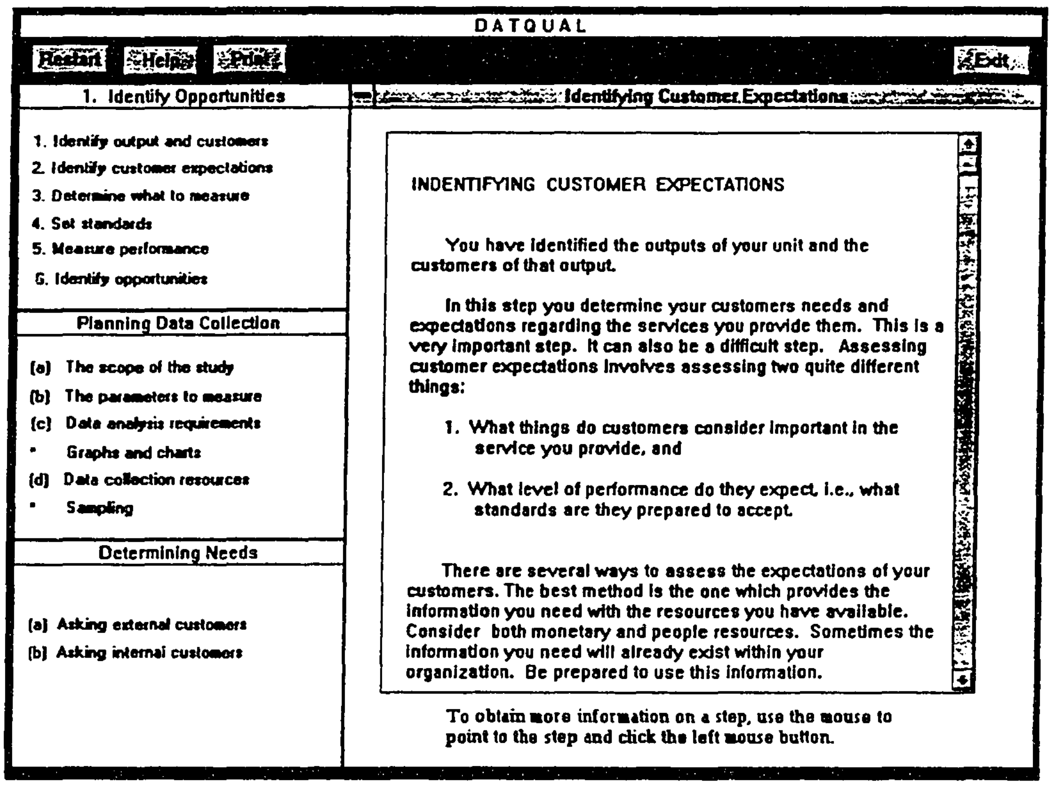


Figure 8.9: DATQUAL Identifying Customer Expectations Screen

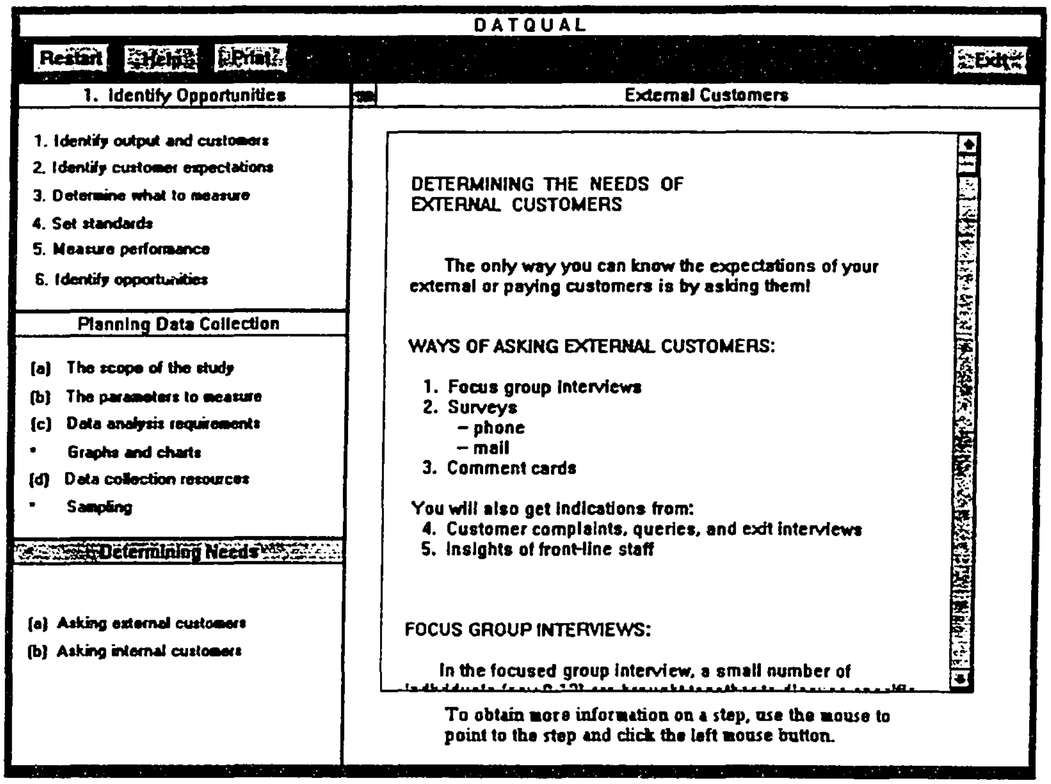


Figure 8.10: DATQUAL Asking External Customers Screen

methods used to *ask* external customers about their needs or expectations: focus groups, surveys, comment cards, analyzing complaints and queries, or listening to front-line staff. These were the methods used by the field organizations we studied.

For each method in this tutorial we provide a brief description of the procedure, examples of situations in which they might be used, and a note of some of the advantages of the method. For example we explain that in a focused group interview a small number of individuals (say 8-12) are brought together to discuss a specific issue. Each person's comments are considered in the group discussion so that everyone is exposed to the ideas of others. Among the uses of focus groups listed in the tutorial are: generating information to help in developing customer surveys, providing background information on issues, obtaining general impressions about services offered and how they are offered, and encouraging creativity about what could be offered. An advantage of focus group interviews is the snowballing effect as one individual's idea triggers a chain of responses from others. Focused group interviews under a trained moderator can encourage spontaneity and creativity. In our research, we found focus groups had been effectively used at Bank N in the early stages of its transformation to a quality focus. In Bank N's case, groups of customers were brought together at the branch level both to gain general impressions of the banks services and to help in developing questions for customer surveys.

Each of the other methods commonly used to determine the needs of external customers is similarly explained in the tutorial.

Alternately (or next), the user could chose to examine some aspect of planning data collection. The structure of this module was described earlier when we discussed the logical model (Section 8.2). The available selections are shown in the middle left window:

Planning the scope of the study,
Planning the parameters to measure,
Determining data analysis requirements,
- Reviewing graphs and charts (a part of data analysis),
Determining data collection resources, and
- Reviewing sampling (a part of resource determination).

For the purpose of our demonstration, our user selects "Graphs and charts." A new screen is presented (Figure 8.11). The tutor window at the right briefly introduces the topic of graphs as visual displays which help users to quickly see relationships, patterns, or trends in their data. The general characteristics of a good graph are enumerated, and users are directed toward the lower left panel for selection of a specific graph to review. In this lower window six chart types are offered for review: line graphs, bar graphs, pie graphs, histograms, pareto diagrams, and scatter diagrams. The user can always return to a previous step, but for demonstration purposes, our user selects the tutorial on Scatter Diagrams.

The tutorial shown in Figure 8.12 is presented. This tutorial describes a scatter diagram as a plot of points showing the relationship between two variables such as the number of months employed and the number of calls handled. The example of months employed and number of calls handled is used as the example in teaching users how to construct a scatter diagram from collecting data values, through labelling axes and

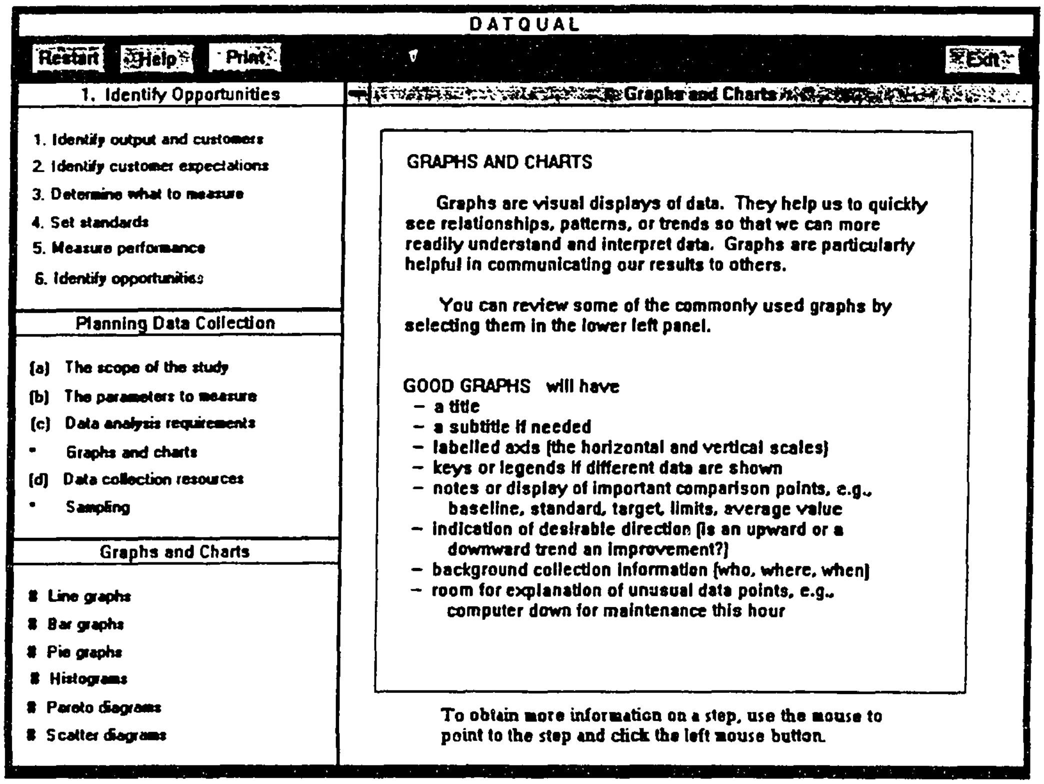


Figure 8.11: DATQUAL Graphs and Charts Screen

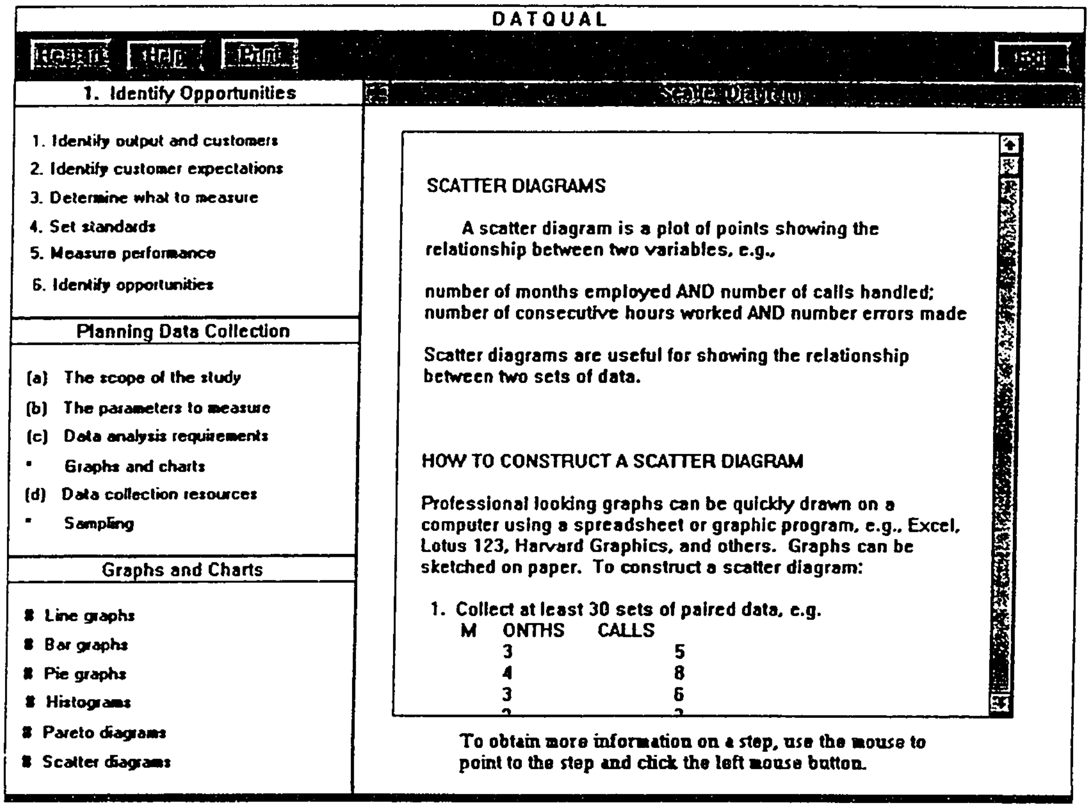


Figure 8.12: DATQUAL Scatter Diagram Screen

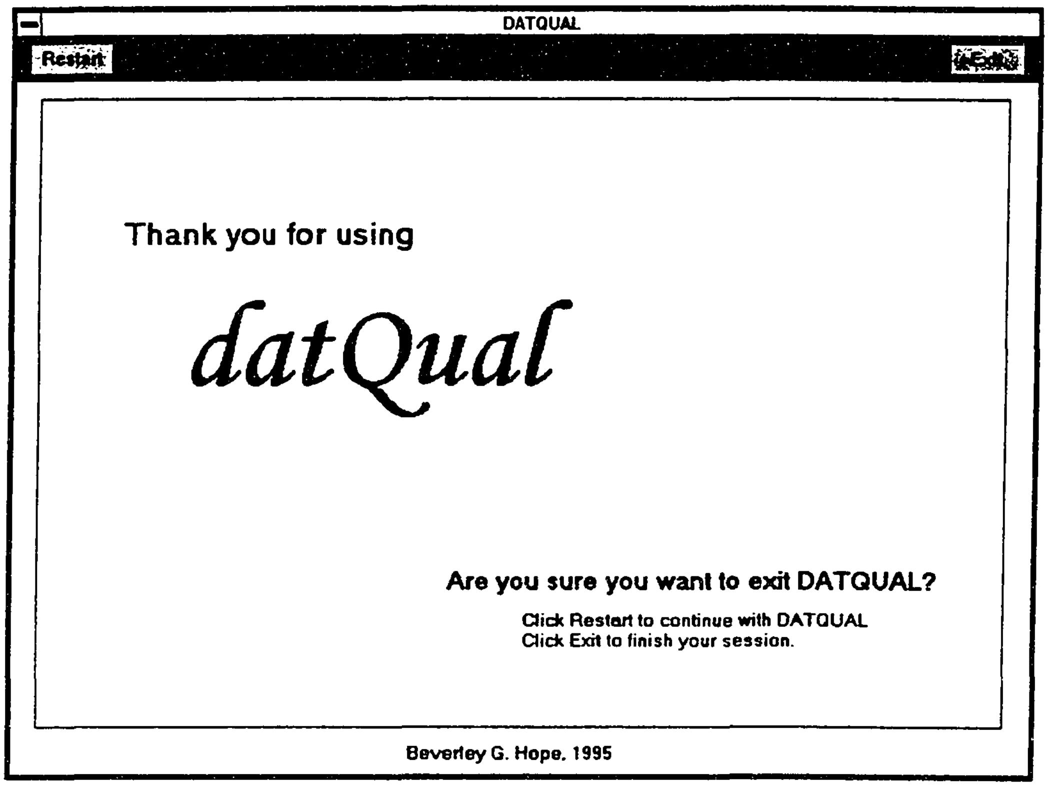


Figure 8.13: DATQUAL Conclusion Screen

plotting points. The visual interpretation of scatter diagrams to determine positive, negative, or no correlation is also discussed. Scatter diagrams can be a powerful tool for workers in objectively determining problem causes.

We will leave this sample session at this point. The user selects the exit pushbutton in the top right corner of the screen and the conclusion display is presented (Figure 8.13). The user is asked to confirm that he or she wishes to exit the session. Selecting exit from the conclusion display ends the session.

This sample session demonstrated the simplicity of operating DATQUAL. User selections made with the click of a mouse button allow users to move easily through the series of steps required to complete a specific task or subtask. Concurrent display of steps and sub-steps make it easier for users to understand the problem-solving process and to recall where they are within that process. This format also makes it easy for users to move back to earlier steps to make new selections. Pushbuttons at the top of the screen permit users to exit or restart the application, to obtain help, or to print the tutorial file at any time during a consultation. Simplicity, clarity, and consistency in screen displays add to the user-friendly nature of DATQUAL.

The purpose of DATQUAL 1.0 was to demonstrate how technology could be used to structure and support decision making in this problem domain. In the next section we outline some potential future developments for DATQUAL.

8.5 DATQUAL, FUTURE DEVELOPMENTS

The potential task domain for an ESS in service quality improvement is very broad. We defined a section of that domain for our demonstration prototype ESS. Additional breadth and depth of coverage will constitute future research and development.

8.5.1 Expanding the Breadth of DATQUAL 1.0

Adding breadth to DATQUAL 1.0 will involve expanding the task domain. DATQUAL 1.0 structured the task of determining data needs to identify service quality improvement opportunities at the operational level. Future development will extend the domain to include the steps required once opportunities have been identified. The reader will recall that the identification of quality improvement opportunities (Figure 7.1) was the first step in the broader quality improvement process (Figure 7.3). Thus the current research prototype, DATQUAL 1.0, will become one component of the broader domain of DATQUAL 2.0

A logical model extending DATQUAL to include the broader quality improvement process has been developed in outline, but full specification has yet to be attained. Figure 8.14 shows the five major steps we propose for DATQUAL 2.0 mapped to the descriptive model of the operational level quality improvement process (Figure 7.3). Our implementation approach, including the reuse of objects and extensive use of external files, means that upgrading DATQUAL in the current environment would require minimal new code. The major tasks would be detailing the

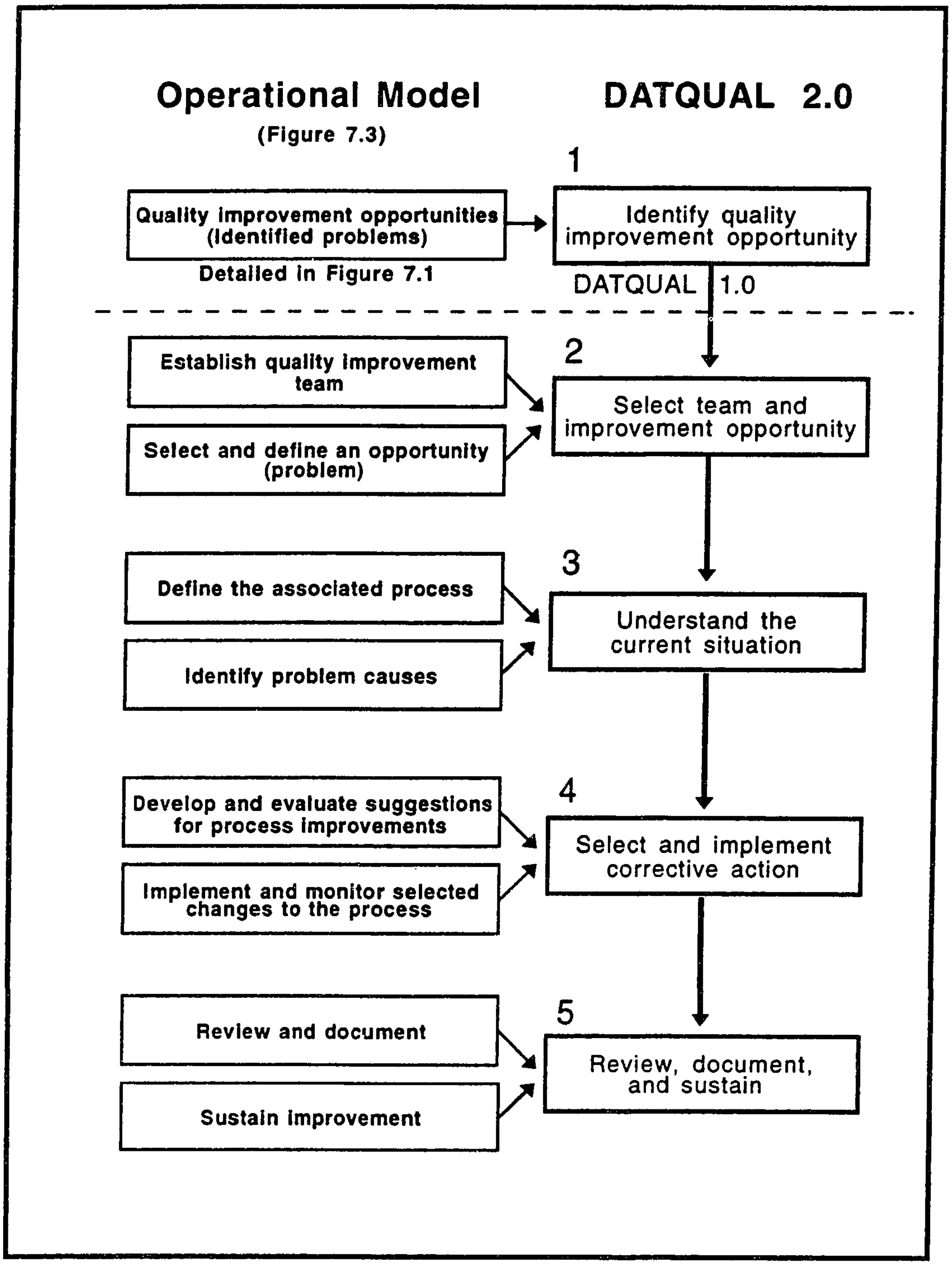


Figure 8.14: Major Steps of Proposed DATQUAL 2.0 Logical Model Mapped to Operational Level Quality Improvement Model

logical model and writing the additional tutorial and other text files. The basic structure of DATQUAL could remain unchanged. However, difficulties in implementing the initial prototype, particularly problems created by the restriction to bitmap files and inability to employ full font formatting, cause us to reconsider our choice of development environment. We now see strong potential for use of an interactive, multi-media environment.

In addition to increasing the breadth of coverage of DATQUAL, opportunities exist to add depth to tasks already included in DATQUAL 1.0. Some potential areas are discussed next.

8.5.2 Expanding the Depth of DATQUAL

The DATQUAL task domain offers many opportunities for extended depth of coverage. Potential gains could be achieved by inclusion of more expertise, more tutorial support, and automatic form generation. Additional **expertise** could include the provision of expert advice on determining sample sizes or expert advice on choosing the appropriate control chart to monitor performance. These topics, particularly that of determining sample size, are potentially complex. As such they might involve development of additional ES or ESSs. Additional **tutorial** material might be presented on topics identified by DATQUAL users. For example, we can see that additional tutorial material might be added in the complex area of designing and conducting surveys. This is another potentially large task which could amount to development of a separate ES or ESS. **Automatic form generation** could include the provision of expertise to determine and supply appropriate forms for data collection, recording control charts, registering teams, or any of the other activities in the quality improvement process which require relatively standardized forms. These are just some of the potential areas for further expansion. To decide which areas are most needed we would ask our customers, DATQUAL users.

Each potential addition to DATQUAL, whether the addition of breadth or depth, is a major task. As such, each addition represents another research and development opportunity.

8.6 CHAPTER SUMMARY

Modern organizations push responsibilities down the organizational hierarchy, requiring operational level workers to make decisions formerly made by management. This is particularly common in quality-focused organizations where it is assumed that the best people to make decisions and take action are "those who do the job." Employees at this level frequently lack the knowledge, skills, and resources to perform all of the tasks in the service quality improvement process. Our solution is to develop an ESS to guide operational level teams through a data-driven quality improvement process. This chapter presented a logical model and prototype ESS to demonstrate the use of procedural cueing to guide users through the quality improvement process. The system could provide workers with both a performance aid and context-based, on-the-job training.

To develop the ESS, we first translated our descriptive model developed from field data to a logical model. The logical model provided the detail and structure needed to drive the computer implementation. To expedite system development we used a high level expert system building tool, LEVEL5 OBJECT to develop an application which runs under Microsoft® Windows™.

Our application uses procedural cueing to guide users through a series of steps and substeps. DATQUAL operates in a hypertext-like manner with an important difference: in DATQUAL steps and substeps remain visible on the screen. The display of step and substep breakdown is designed to help users retain a sense of place within their consultation session and to help them form a mental model of the data-driven process.

DATQUAL 1.0 is a demonstration prototype system. The potential for increased breadth and depth of coverage is high. We see the limitations of the current implementation as opportunities for future research. Included among these opportunities is the potential for an interactive, multi-media implementation of the DATQUAL logical model.

CHAPTER 9

CONCLUSION AND REFLECTIONS

The aims of this research were to model the data needs for service quality improvement, and to encapsulate this knowledge in a computerized support system. The research included a field study using large, well-established banks (one in Hawaii, one in New Zealand) which are committed to quality improvement. The field research focused on three divisions or functions within the banks: retail banking, consumer lending, and customer satisfaction. Quality improvement and quality-related data needs were modelled at three levels corresponding to the three planning levels used in the banks -- strategic, tactical, and operational. The model was validated in a wider selection of service industries and by a panel of experts. The operational level model of data needs to identify quality improvement opportunities was expanded to create a logical model which served as a framework for development of an ESS in an object-oriented programming environment.

In this chapter we summarize and reflect on some of the findings of the research (Sections 9.1 - 9.3). We also appraise our achievement of anticipated research contributions (Section 9.4) and suggest areas for future research (Section 9.5).

9.1 QUALITY, DATA, AND THE FIELD BANKS

To develop a model of data needs we undertook a field study in two banks. Quality improvement systems in both banks were consistent with TQM philosophy. In particular, both banks were committed to long term business success through incremental quality improvement. At Bank H, incremental improvement was sought through the formation of quality improvement teams addressing improvement opportunities within units. At Bank N, incremental improvement was encouraged through motivational meetings and personal coaching based on goals and performance relative to position-specific competency profiles. Of the two banks, only Bank N had attained significant gains from breakthrough improvement. Organizational restructuring at Bank N had supported a shift to relationship banking. The restructuring centralized operations and rationalized support services, fundamentally changing the way the bank operated and significantly improving its performance.

The difference in approaches to incremental improvement in the two banks demonstrated a difference in emphasis. Bank H took a technocratic approach which emphasized process and process measurement while Bank N took a socio-technic approach which emphasized culture change. In TQM terms Bank H's approach highlighted an objective focus and Bank N's approach highlighted a customer focus. Despite the differences in emphasis, both banks collected and used data as an integral part of their quality improvement initiative.

Data were collected both centrally and independently in the work units. Centralized measures provided comparative data on unit functioning. These were used to identify quality improvement opportunities (Bank H) and to provide motivation and training (Bank N). Independent, work unit measures were used in the quality improvement process (Bank H) and for motivation and training (Bank N).

In interviews bank employees affirmed that service quality is an essential competitive strategy in increasingly deregulated markets. They told us products offered by banks were similar, making it difficult for banks to retain a competitive edge by offering superior products. However, superior service delivery could differentiate a bank from its competitors. The distinction between *products* (bundles of service options sold to customers) and *service* (the way employees assist customers) was an interesting finding of this research. Other writers have clearly stated that "banks sell services not things" (Shostack, 1977a,b). However, our informants found the *products/services* distinction useful. We found in the banks and the validations sites product design was a strategic function while service performance was the responsibility of all employees. Our model of data needs addresses *service* quality rather than *product* quality.

Informants generally defined service quality in terms similar to the commonly accepted definition of "meeting or exceeding customer expectations." Adopting this definition required quality-committed banks to (a) engage in market research to determine customer expectations, (b) establish service standards consistent with these expectations, and (c) measure performance to ensure standards were met. This is reflected in our model of data needs.

In terms of our model of data needs, Bank N began at the beginning. They had identified customers and customer expectations, and they had determined what to measure. At the time of our study, they were moving to the next step, establishing service standards. By contrast, Bank H emphasized performance measurement -- a step much later in our model. Bank N's approach lead to a feeling among staff that the bank was "on the right track." By contrast, staff at Bank H were often unclear of the purpose of the measures they were taking. Management at Bank H recognized that they had begun measurement too soon and were returning to the earlier stage of identifying customers and customer expectations. Thus our study showed that customer focus must precede data collection and our model reflects this focus.

9.2 DATA NEEDS AT THREE LEVELS

Our model of data needs for service quality improvement was developed from data collected in interviews, documents, observations, and group meetings in two banks. It was subsequently validated in a wider selection of service industries including interviews in a bank, a consulting firm, a car dealership, a hotel chain, and a health management organization (HMO). The model was validated in two sections. The first, more descriptive section was validated via structured interviews and a survey of service providers. The second, more prescriptive section was validated by a panel of experts. Feedback from the validation process was then used to refine the model.

We detailed the model at the three distinct but interdependent levels of measurement and tracking identified in our field research: strategic, tactical and operational. At a strategic level, senior managers used data to set directions, develop objectives, and select strategies for the organization. At a tactical level, senior and middle managers used data primarily to monitor performance in meeting expectations of external customers and to redesign organization-wide processes. At the operational level, quality improvement teams used data to identify opportunities for improvement, to select and implement solutions, and to review the results of their interventions in the system. Planning at three levels is consistent with ISO 9000 but it is not commonly reported in the literature. We find this omission surprising because multiple levels of quality planning and implementation were common across all the organizations we studied. An understanding of the three levels and the data needs at each level could help organizations objectively link strategies, tactics, and procedures to results.

Our research showed the primary stakeholders at each level differed. At the strategic level the primary stakeholders were owners and their primary need was an adequate return on investment. Satisfying and retaining paying customers and employees was viewed as an enabling strategy. At the tactical level the primary stakeholders were external customers. At this level managers had the skills, resources, and support needed to determine the expectations of customers and to monitor organizational performance in meeting them. Meeting the needs of internal customers in the service process chain was also important in process redesign at the tactical level. At the operational level the stakeholder focus was on the customer (internal or external) in the next operation. The identification of different stakeholder foci at each level is a new finding of our research. The finding offers opportunities for further research, for example, in determining how organizations respond to the sometimes conflicting needs of stakeholders or determining how the relative importance of different stakeholders varies across service industry types.

Differences in stakeholder foci and quality responsibilities at each level led to differences in data needs. We observed differences across levels in the types of measures (performance, outcome, output, process), the levels of aggregation (detailed, summarized), and frequency of measurement. In particular, we found that data were more highly aggregated at higher levels in the organization. Senior executives sought a few key indicators of organizational progress. By comparison, operational level workers sought detailed measures of output and process performance in order to control processes. We also observed that data collection and analysis was less frequent at higher levels of the organization. This reflects the longer planning term at the strategic level compared to the daily or hourly monitoring of operations required at the operational level. Thus data collection and analysis was closely linked to the use to be made of the data.

An interesting finding of our field research was the focus on results at the strategic level. This differs from the common injunction in the literature on quality to "focus on the customer not the results." However, our informants at the strategic level agreed, the major stakeholders at the strategic level are owners and their expectation was strong financial performance. Our informants saw customer satisfaction as a means to an end rather than an end in itself. Furthermore, our interview data with senior executives showed that what was important was not customer satisfaction but customer retention.

Our field data showed that data collection at the operational level was strongly influenced by goal setting and measurement directives of higher levels. Directed measurement influenced the selection of quality improvement projects and sent a message to employees about what management considered important. We saw this in the banks when operational level employees responded to questions about customer needs by citing measures determined at the tactical level.

An interesting finding of our research was the consistency between Bank N's *CSF*s and the service quality dimensions identified by Parasuraman, et al. (1985). In particular, Bank N's independent market research confirmed the Parasuraman, et al. finding that reliability was the most important service quality dimension for customers. Parasuraman et al's study was conducted entirely on the U.S. mainland: Bank N's *CSF*s were determined in New Zealand. Our discovery is the first suggestion we have seen that service quality dimensions might be constant across nationalities and cultures. Our observation was serendipitous rather than planned and we cannot infer too much from it. It does, however, suggest a potential area for future research: to what extent are the widely cited service quality dimensions determined by Parasuraman et al. consistent across different nations and cultures?

Karwan and Rosen (1988) found service quality dimensions and components of dimensions differed across service industries. Our validation study supported this. Since the importance of service attributes differs across industries, it is important for each organization to identify its own customers' expectations. Identifying customer expectations and monitoring performance in meeting them are major data collection points in our model.

Our model of data needs was presented in two stages: data needs to identify quality improvement opportunities, and the quality improvement process. Sufficient similarity existed across all levels to develop a generic model of the first stage but not the second. In particular, there was a strong difference between the quality improvement process at the strategic level on one hand, and the tactical and operational levels on the other. The basic premise of our model was that quality improvement opportunities arise from discrepancies between stakeholder requirements and the organization's performance in meeting them. From interviews and observations we learned that to identify these opportunities at any level it is necessary to:

1. identify current and potential output,
2. identify stakeholders,
3. identify stakeholder requirements,
4. determine stakeholder perceptions of current performance, and
5. compare requirements with performance to identify quality improvement opportunities.

Our descriptive model of data needs at three levels provides a way for researchers and practitioners to think about data needs for quality improvement. The model links data needs to the major steps in the quality improvement process thereby encouraging practitioners to collect data for specific purposes rather than merely to "collect data." This should help reduce the collection of irrelevant data.

The model advocates a proactive approach to improving service quality. It suggest a simple yet effective procedure for identifying quality improvement opportunities and implementing quality improvement projects. The model focuses on two major data needs: the need to identify customer expectations and the need to measure customer perceptions of performance. By focusing on these two areas, relevant rather than convenient measures are developed and issues of importance to customers are addressed. Our field research showed that quality improvement teams had difficulties in determining data needs. This was particularly true at the operational level where expert assistance was not available on an as-needed basis. Our solution to the problem at the operational level was the provision of expertise in the form of computerized support.

9.3 COMPUTERIZED SUPPORT

Harmon and King (1985) identify three approaches to instruction: education (supplying concepts), training (supplying task specific skills), and performance aids (supplying on-the-job support). In the organizations studied, education was supported, intermittent training was provided, and performance aids were occasionally used. Corporate-wide training at the start of a quality improvement initiative was common. However, our informants agreed that provision of ongoing training for new staff or updating skills of existing staff was more difficult to arrange. Our solution to this problem was the provision of computerized support as both a performance aid and a training tool.

The system we developed is an Expert Support System, that is, it uses knowledge from *experts* and employs expert system knowledge representations to *support* workers. An ESS seemed most appropriate for our problem domain which required us to structure a very complex problem solving task. DATQUAL, our application, structures the decision-making task by providing procedural knowledge in the form of a series of logically sequenced steps. The system does not provide factual or environmental knowledge on which to base decisions. Users must provide environmental knowledge and users must make the decisions.

The typical user of DATQUAL will be an unsophisticated, intermittent computer user at the operational level. Such users are likely to forget system features or functions between consultations. Consequently, user-friendliness was important. We achieved a user-friendly interface through simple, clear, consistent screen displays presented in standard Microsoft® Windows™. The concurrent display of windows for the various step, sub-step, and sub-sub-steps of a process remind users where they are within the web of decision making nodes. Without this concurrent display it would be easy for a user to get lost in the layers of the system and to experience difficultly in returning to a meaningful place from which to continue a consultation. Such difficulties with other systems were reported to us by novice computer users. In addition, concurrent display of steps and sub-steps should assist users in forming their own mental models of the process.

The structure imposed on the quality improvement process by DATQUAL will help ensure consistency throughout an organization. Embedding decisions about data collection and use within the quality improvement process aids in the collection and analysis of relevant and meaningful data. The data definition process captured in the sub-step on data collection and analysis leads teams toward the collection of statistically valid data. The result is a system which provides:

- decision making support
- formal and informal training
- access to expertise on an ad hoc basis
- consistency of practices throughout an organization

The prototype system demonstrates how technology can be used to structure and support decision making in this problem domain. The provision of expertise to unit-level workers will empower them to become effective agents in the quality improvement system of an organization.

9.4 RESEARCH CONTRIBUTIONS

The research realized the anticipated contributions (Chapter 1).

By synthesizing knowledge from field experts with knowledge in the literature on manufacturing quality, this research contributes toward an ***improved understanding of quality-related data needs in service industries***. The three-level model of service quality improvement provides a new way of conceptualizing data needs for service quality improvement. Fresh insights into the use of data in service organizations is provided by comparing stakeholder foci, measurement types, measurement frequency, and level of data aggregation at each of the three planning levels. In defining data use at three levels within an organization, this research adds to the body of knowledge in the area.

The logical model prepared as the basis of the computer implementation ***provides a strategy for determining quality-related data needs*** within the context of identifying quality improvement opportunities. The model provides a systematic approach to determining data needs. This not only adds to the body of knowledge in the area of quality improvement, it also provides a practical contribution to those engaged in service quality improvement.

The development of DATQUAL ***demonstrates a new application of computer technology to a TQM problem***. Many packages are available to assist in quality assurance or quality control, particularly in statistical process control or use of specific tools. However, the package developed in this research is unique in its use of procedural cueing to assist operational level quality improvement teams in using data to identify quality improvement opportunities.

In applying procedural cueing to a new task domain, this research ***provides further evidence of the efficacy of procedural cuing in ESS's***. Our implementation approach was inspired by an ESS for military procurement reported by Dillard et al. (1987). That system was developed using ZOG, an early, experimental frame-based environment. Screen displays were simple and a step history was not available. This research uses LEVEL5 OBJECT, a high level, object-oriented ES building tool. By taking advantage of the power of a modern, high-level development environment, the current research not only provides further evidence of the efficacy of procedural cuing, it also improves upon existing research systems.

The research project was well-received by management in the participating banks and by field experts in the validation study. The research served to ***strengthen the link between the university and the business community***. In addition to strengthening the specific link between the University of Hawaii and the Hawaiian bank, the practical contributions of the research serve to strengthen community perceptions of the relevance of university research in general.

In addition to the anticipated contributions of the research, the eventual provision of a fully-functional system will provide support and training for workers, enabling them to provide better quality service to customers.

9.5 RESEARCH LIMITATIONS

This research is just one step in the accumulation of knowledge in the area of service quality improvement. The limitations of this research provide opportunities for future research. Some limitations are described next.

Prototype system: The ESS developed in this dissertation project is a demonstration prototype. ***Future research and development*** will enhance and extend the system by extending the scope of the system and providing more capabilities. The scope of the system will be extended to provide support over the service quality improvement process in addition to the data needs to identify quality improvement opportunities. System capability could be developed to the stage where forms for data collection or reporting can be output from the program. Future research will also involve evaluation of the system. By evaluation we mean both validation and user assessment.

Issue specific: This research addresses only one of the problems encountered in implementing quality improvement systems. The dissertation research is intended to become the first step in a wider research program. The broader interest is in the ways in which information technology can be used to aid organizational transformation to a quality focus enabling them to meet the challenges of market globalization. ***Future research*** will identify and elucidate other obstacles to implementation of quality improvement systems and develop strategies to overcome these obstacles. For example research into the difficulties service organizations experience in blueprinting service delivery processes may be a fruitful area for future research. Another interesting and important area for future research is that of organizational restructuring and development to support service quality improvement systems.

Our next research step will be further development and assessment of the ESS. We also plan to carry out further investigation within the banking industry. An important variable in this extended research would be the investigation of the extent to which corporate or national cultures impact the type, extent, and level of quality improvement systems in banks. These extensions of the current research will be followed by investigations in other service industries such as health care and travel.

9.6 CHAPTER SUMMARY

A major aim of this research was to model the data needs for service quality improvement. We found that quality improvement initiatives and data needs in service organizations could be described at three levels --strategic, tactical, and operational. We found that stakeholder foci, measurement foci, frequency of measurement and analysis, and levels of data aggregation differed across levels.

A section of our descriptive model of data needs was expanded to create a logical model of a data-driven approach to identification of quality improvement opportunities at the operational level. The expertise in the model was made accessible to teams through its implementation in an ESS. The ESS acts as a performance aid and a tool for formal and informal training.

This research represents a significant step on the journey toward understanding and overcoming problems in improving service quality. It elucidates the data needs for service quality improvement and thereby adds to the body of knowledge in the area. In addition, it will lead to practical benefits in the provision of support and training for service providers in the field. Services play a dominant role in post-industrial economies. Any improvement in service quality benefits not only the firm and its customers but also, through improved national competitiveness, the economy of the nation.

APPENDIX A
TOTAL QUALITY MANAGEMENT

Total Quality Management (TQM) is a well-known and widely practiced system of quality improvement. The term "Total Quality Management" was initially used in 1985 by the Naval Air Systems Command to describe its approach to quality improvement (Quality Glossary, 1992). Since then it has been expanded, defined, and redefined but in essence it remains a management approach to long-term business success through continuous improvement. It consists of a basic philosophy, a set of generally accepted management principles, and a collection of tools for implementation as described next.

TQM Philosophy

The TQM philosophy is an amalgam of the writings and teachings of several quality pioneers: W. Edwards Deming, Joseph Juran, Kaoru Ishikawa, and others such as Philip Crosby, Armand Feigenbaum, and Genichi Taguchi. Excellent summaries of the views of these pioneers can be found in Marsh and Garvin (1986) and Wood (1989). Although different pioneers, followers, academics, and practitioners stress different elements of the philosophy the overriding tenet is always that of a customer focus. Other major tenets include: a strategic focus on quality, a process focus, total involvement, and an objective focus. The four basic tenets of quality are described next.

***Customer focus*:** Quality is judged by the customer. Thus quality improvement systems must focus on the customer and address those goods and services attributes which lead to customer satisfaction, loyalty, and preference. Organizations must not only meet basic customer requirements but also enhance offerings in a way that differentiates them from competitor's offerings (U.S. Department of Commerce, 1992). Too strong an emphasis on competition can be counter-productive. Yoshio Maruta, president of KAO Corporation of Japan, stated:

> Our company is not really interested in competition. Our main goal is to put ourselves in the consumers' shoes. We have to understand what their needs are. If we start worrying about competition, then we're not putting our customers first. -- Maruta, in Patterson (1991), p. 23

***Strategic focus*:** Customer-focused quality is a strategic concept in that it takes a long term view directed at customer retention and increased market share. A strategic focus is one which contributes toward attaining long term goals, significantly changes organizational performance, fundamentally changes the way an organization operates, and requires commitment from top management (McNurlin & Sprague, 1989). The long term focus on continuous improvement is what Deming (1986) refers to as "constancy of purpose." Although long term, it is not static. In today's rapidly changing market environments, strategy requires sensitivity to changing customer demands coupled with flexibility and rapidity of response. The importance of an ability to change and respond to change was highlighted by Doug Anderson, Director, Corporate Quality Services, 3M:

> Adopting quality as a positive business strategy requires a willingness to change, to create the environment for change, to provide training, to demonstrate support, and to reinforce progress. The quality process must be ongoing and neverending to keep up with the customer and market changes. Total quality leadership is hard work. Quality, the ability to respond to and manage change, will be the key ingredient separating the leaders from those who falter.
>
> -- Anderson (1990), p. 17

Process focus: Goods and services are provided by production processes which generally traverse functional department borders. Providing quality requires focusing on the entire process rather than on the departments. The more traditional departmental focus can cause process delays and other problems at the departmental borders. Process simplification involves reducing the number of steps in a process and the number of departmental border traversals.

Total involvement: Total involvement requires both committed leadership and worker empowerment. It is the task of management to lead rather than to supervise or control. The aim of leadership is to improve system performance by creating and maintaining a supportive system --resources, training, goals, measurement, feedback, and rewards. Leaders also provide the vision and policies needed to sustain continuous improvement in the organization. Management is responsible for empowering workers so that they can improve processes and achieve their potential. Worker empowerment requires knowledge, skills, and sufficient resources and time to perform the required tasks. A sense of ownership of processes, sub-processes, and tasks is needed. Kane notes:

> Each person must have a sense of ownership of the work activity he/she manages.... Adopt a participative style ... you can't be successful without it because continuous quality improvement is based on tapping the creativity of the people who understand the work best, who in turn are those closest to it. -- Kane (1988), p. 20

Objective focus: Assuring quality requires management based upon reliable information rather than on intuition or hunches. Data and subsequent analysis provide the information necessary to make decisions and take appropriate action. This is true at all levels of the organization from the production worker to the highest executive. In a TQM system, production workers collect and analyze data to monitor and control processes, to identify areas for improvement, and to determine cause-effect relationships. Executives use information extracted from data in their decision making processes. The importance of data to executives was stressed by Sullivan as follows:

> It is essential that senior executives lead with data rather than with intuition. Key indicators and benchmarks must be used to evaluate and improve the organization's structure and processes.
>
> -- Sullivan (1992), p. 25

TQM Principles

TQM principles are essentially guides for management. Many such principles can be extracted from the extensive literature on TQM and from the teachings of the quality pioneers. A useful classification of these can be obtained by utilizing the headings commonly used in cause-and-effect diagrams (see, for example, Ishikawa, 1982). A classification of some commonly accepted principles is given in Table A.1.

Table A.1
TQM Principles

WORKERS:	teamwork education and training safety reward systems
MACHINES:	preventative maintenance automation
MATERIALS:	single sourcing
METHODS:	process improvement defect prevention looking upstream standardization quality by design
MEASUREMENT:	disaggregation or stratification aggregation benchmarking

TQM Tools

The TQM tools are a series of techniques which are useful in the implementation of quality at the tactical and operational level. Among the most well-known of these are the *magnificent 7* (Figure A.1), most of which are described in Ishikawa's "Guide to Quality Control" (Ishikawa, 1982), an English translation of a text used to introduce quality techniques and practices to groups of Japanese workers. These groups were the beginning of the quality circle phenomenon. Other commonly used techniques not included in the *magnificent 7* are: brainstorming, nominal group techniques, interviews, surveys, force-field analysis, and stratification. A brief description of the *magnificent 7* follows.

***Flow chart*:** A diagrammatic representation of a sequence of steps or movement of goods or information. Flow charts are helpful in gaining an understanding of a system, process, or physical layout prior to intervention.

***Check sheet*:** A form to record the frequency, location, existence, or nature of some characteristic of an item. Check sheets facilitate ease and accuracy of data collection and subsequent analysis.

***Histogram*:** A bar graph of frequency of recorded values for an item highlighting the dispersion in data. Histograms may be used for such purposes as determining the relationship between production and specifications, or to observe changes in dispersion of attributes of goods or services.

***Cause-and-effect diagram*:** A diagram of possible causes of a particular event. Cause-and-effect diagrams have 4-6 branches coming off a central line giving them a fishbone appearance. Each branch may contain several sub-branches. They are useful in classifying, documenting, and understanding the causes of dispersion which affect quality.

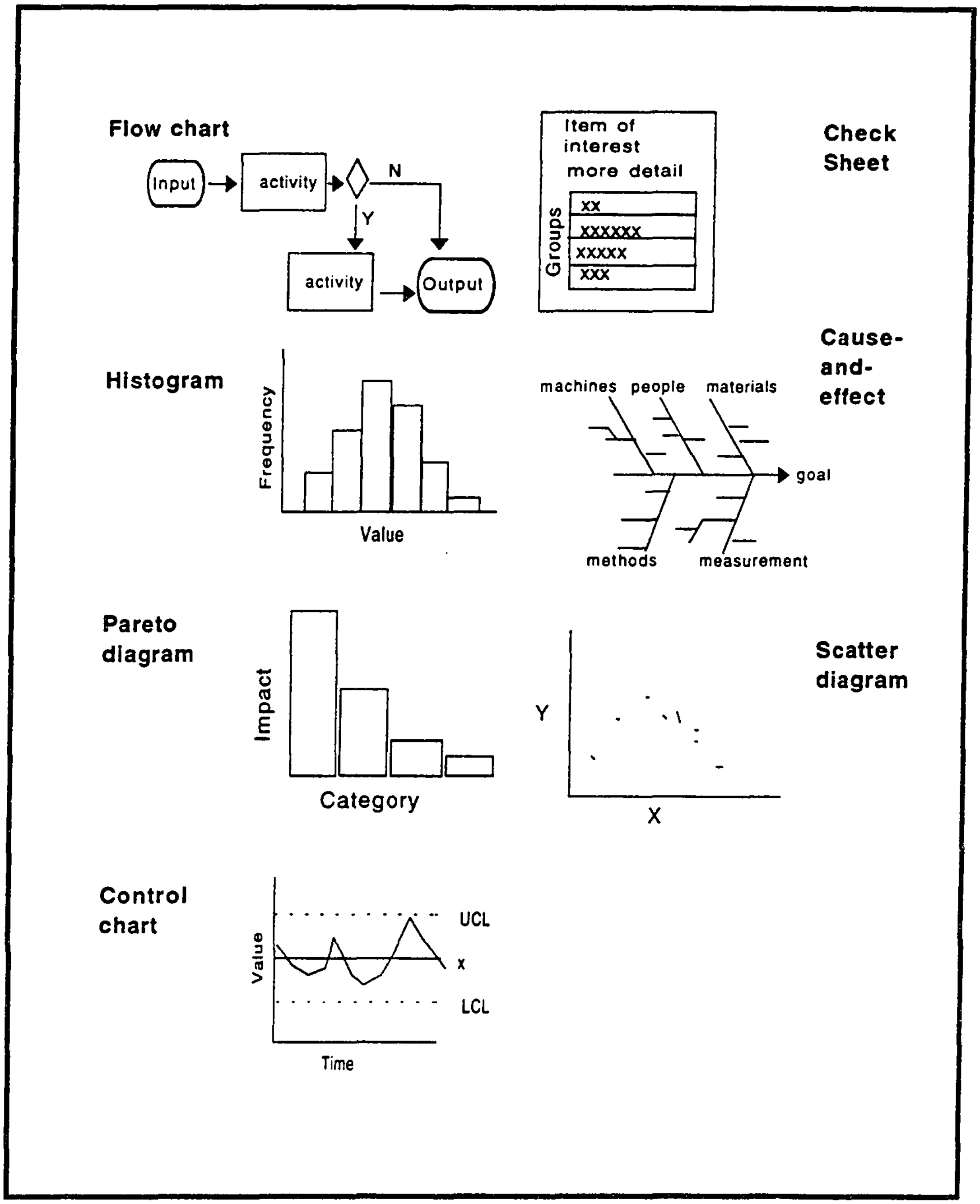


Figure A.1: The Magnificent Seven Tools of Total Quality Management

***Pareto diagram*:** A bar graph displaying frequencies of occurrence of problems in decreasing order. Pareto diagrams may be used to prioritize problems needing attention, or to focus attention on critical problems to gain management support for action. They may be used as a way of visually displaying the efficacy of changes made by comparing *before* and *after* diagrams.

***Scatter diagram*:** A graphical plot of the relationship between two variables. Scatter diagrams are useful in identifying the correlation, if any, between two sets of data.

***Control chart*:** A line graph over time, that is, a time series graph, with the addition of upper and lower control limits based on statistical calculations. Control charts are used to monitor processes and, by utilizing control limits and the theory of probability, to determine if a process is in control. An out of control process is demonstrated by a detectable pattern which signals corrective action is warranted.

The tools of TQM support the objective focus of the TQM philosophy. Indeed, the TQM philosophy and principles evolved from management practices in Japanese firms using statistical process control techniques and from the writings of the quality pioneers who advised these firms. A central issue in quality control is understanding variation.

Variation: Common Cause and Special Cause

An organization cannot consistently meet specifications or customer expectations if there is wide variation in output on any significant attribute. Output variation results from variation in inputs and processes and control of output variation is essential for the control of quality (Figure A.2). Thus measuring, monitoring and controlling processes at the operational level to minimize variation is essential to assuring quality products.

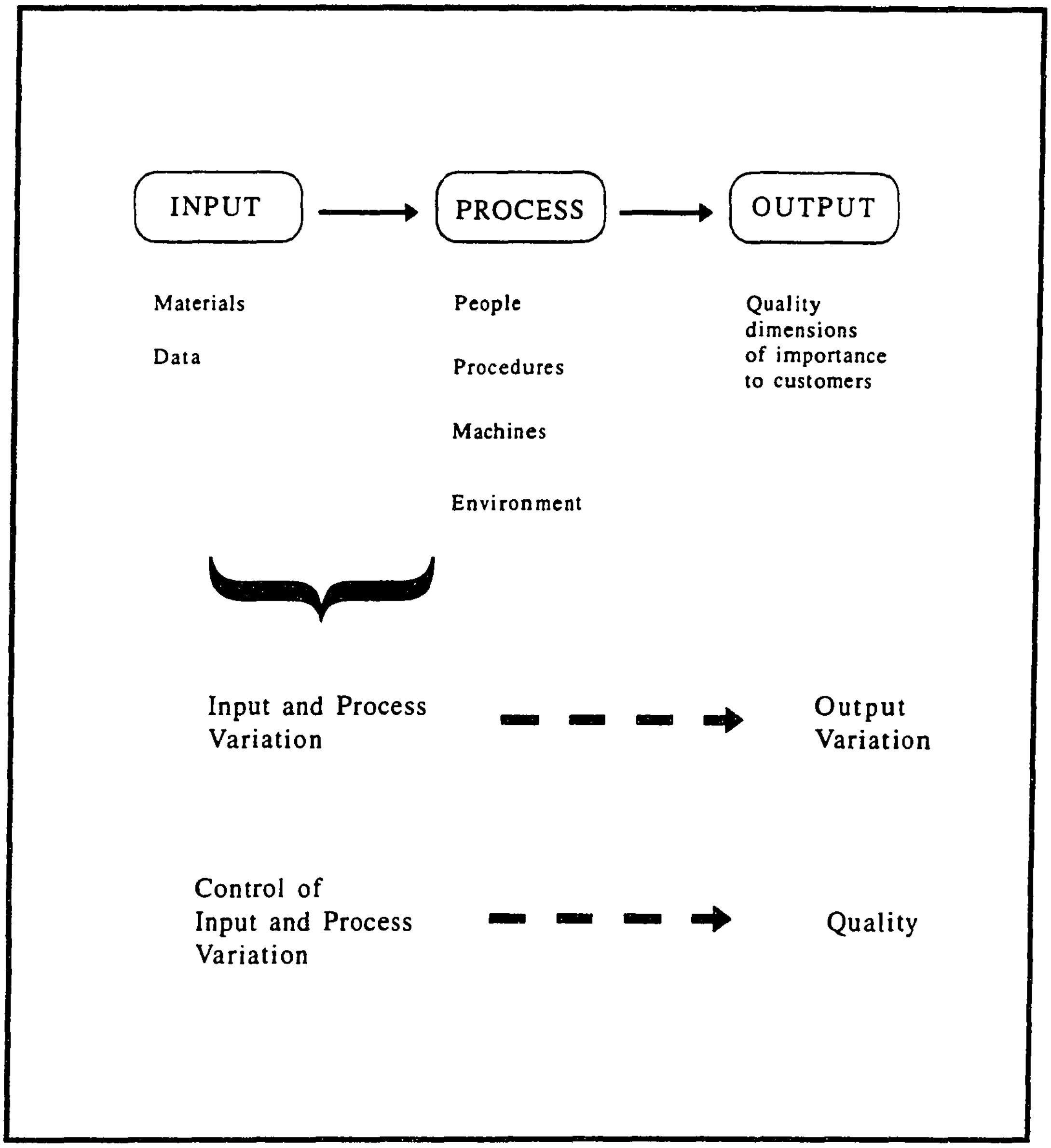


Figure A.2: Variation in Inputs and Processes Leads to Variation in Output

Some process variation is normal and should be expected (Gitlow & Hertz, 1983; Wheeler & Chambers, 1986). However, it is necessary to distinguish between two kinds of variation and their cause: normal variation (common cause) and abnormal variation (special cause). Common causes of normal variation are the fault of the system. They arise from the process and the way it is organized. Normal variation does not require worker intervention. Indeed, adjusting equipment or procedures may cause a stable process to go out of control. Because normal variation results from the system, workers are not responsible for it. The system belongs to management and reduction of normal variation is management responsibility. Special causes of abnormal variation are not part of the system. Abnormal variation is recognized as a pattern of variation that changes over time (Wheeler & Chambers, 1986). It is often localized, that is, specific to a particular person or machine. Abnormal variation requires worker intervention or training. Deming has variously estimated that 85-94% of variation is attributable to the system and only 6-15% attributable to individuals (Deming, 1975, 1986). He clearly assigns the blame for loss due to unwanted variation to management.

> Most of the trouble with faulty product, recalls, high cost of production and service, is chargeable to the system and hence to management. Efforts to improve the performance of workers will be a disappointment until the handicap of the system is reduced. -- Deming (1975), p. 1

The Quality Cycle

The Shewhart cycle, also known as the P-D-C-A or Deming cycle, is a commonly used procedure for achieving quality improvement. The method uses data and experimental methods (Deming, 1986). The model suggests an iteration of four improvement phases as follows:

Plan: Question the process capability, hypothesize improvements, and predict outcomes.

Do: Make experimental or pilot changes.

Check: Compare the experimental outcomes with current performance and with predictions.

Act: If the changes brought improvement, incorporate them into the process and standardize.

Using the Shewhart cycle requires valid and reliable measurement. Statistical sampling and computer processing simplifies the measurement task and makes it feasible to obtain needed information.

This appendix summarized the TQM approach to quality improvement. But TQM is more than statistical process control, more than a set of tools and principles, more even than a philosophical outlook. Full acceptance of TQM is a paradigm shift -- one which involves a change in corporate culture that enables organizational transformation to a more quality oriented, competitive way of doing business.

APPENDIX B
EXPERT SUPPORT SYSTEMS

Expert Support Systems (ESS) combine concepts from Decision Support Systems (DSS) and Expert Systems (ES) to provide intelligent support to decision makers. We agree with Silverman (1987) in viewing ESS as a logical development arising at the intersection of the rational and inferential decision making models. The rational model of decision making assumes perfect knowledge, implies one major decision, and employs primarily quantitative models to reach a solution through analysis. By contrast the inferential model of decision making recognizes ambiguity and complexity in knowledge, assumes an incremental decision making process, and employs primarily qualitative models to reach a solution through intuition or inference. Decision Support Systems, although not assuming perfect knowledge, lean more toward the rational model of decision making, employing quantitative models to provide their support. Expert Systems lean more toward the inferential model, employing inference to reach conclusions. Expert Support Systems are designed to support decision making somewhere between these two extremes, employing both analysis and inference (Figure B.1).

Expert Support Systems utilize ES knowledge representations, tools, and techniques but differ in functionality in that they require the user to do more of the work. The ESS structures a task and provides some of the knowledge required to perform it. The user also provides knowledge, usually in response to stimuli provided by the system, and the user makes the decision. Thus the emphasis in "expert support system" is on the *support*: it supports decision making but does not make decisions. Because ESS use ES concepts, an understanding of ESS requires an understanding of ES's.

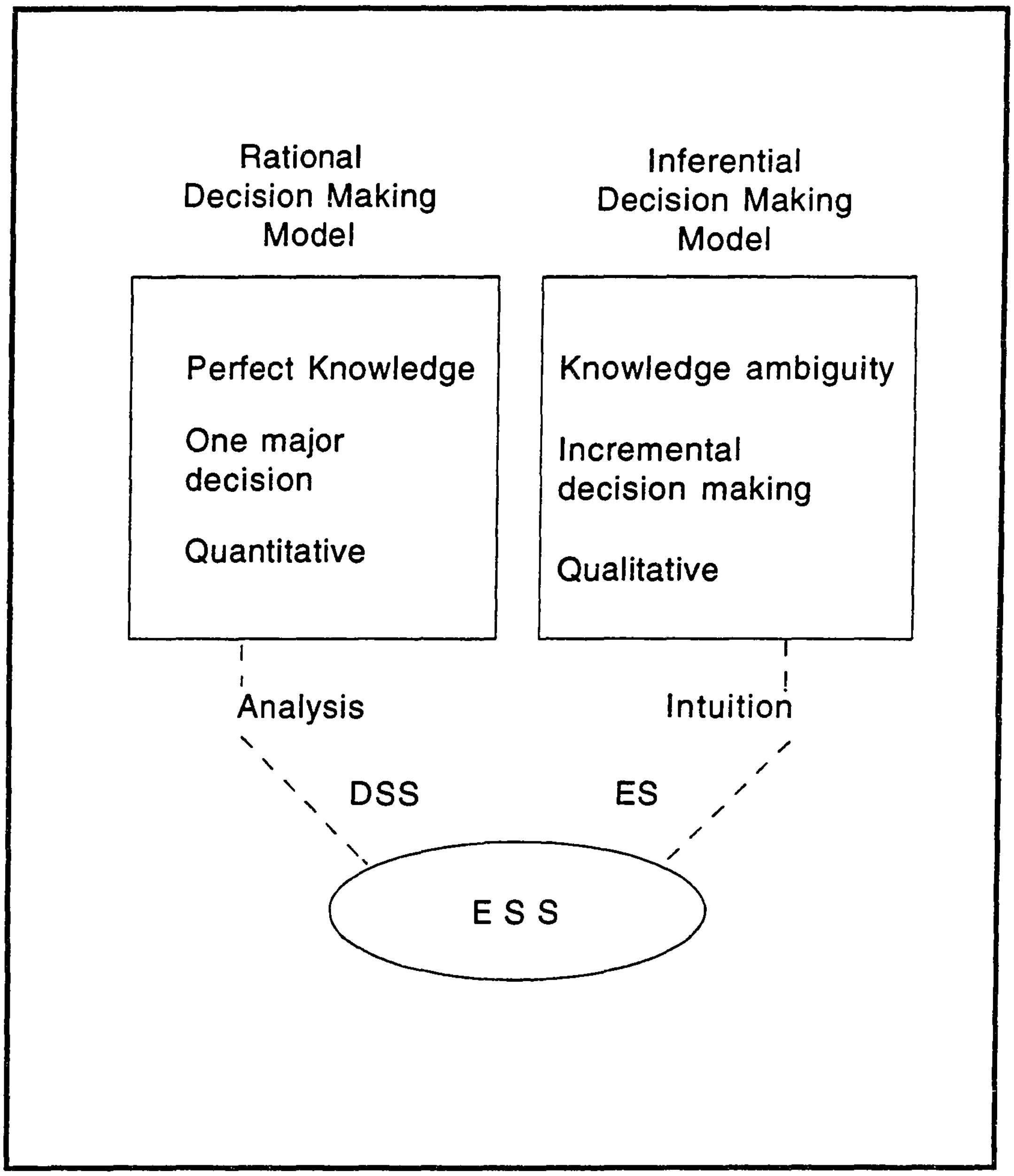


Figure B.1: Origins of the Expert Support System Decision Making Model

Expert Systems

Expert Systems are among the more practical applications arising from the field of artificial intelligence (AI). They differ from other AI research and development in that they focus on representing and using knowledge in specific task areas. They also differ in their emphasis on "real world" problems of scientific or commercial importance to people outside the field of AI (Buchanan & Smith, 1989). An excellent review of the computer science issues in ES can be found in Buchanan and Smith (1989).

Expert systems have been successfully used for many problems such as classification, design configuration, diagnosis, fault isolation, monitoring, planning, and scheduling (Harmon, Maus, & Morrissey, 1988; Shenoy, 1986). They make recommendations by seeking and using relevant information from their human users and from available knowledge bases. They can deal with incomplete or fuzzy data but can generate questions to elicit needed data. Upon request, they will offer explanations for the questions they ask or the recommendations they make. Buchanan and Smith (1989) define an ES as a computer program that:

> ***Reasons with domain-specific knowledge that is symbolic*** as well as numerical (this is what we mean by calling an expert system a knowledge-based system).
>
> ***Uses domain-specific methods that are heuristic*** (plausible) as well as following procedures that are algorithmic (certain).
>
> ***Performs well*** in its problem area.
>
> ***Explains*** or makes understandable both what it knows and the reasons for its answers.
>
> ***Retains flexibility.***
>
> -- Buchanan & Smith (1989), p. 151

The first two characteristics, symbolic reasoning and heuristics, classify ES's as AI. The last three define standards of performance. Many of these characteristics may be present in other systems, but when all of them are present together they describe the unique environment of an ES.

High performance in terms of conclusions reached is a goal of ES developers. However, it is not necessary for a system's performance to equal that of the best human experts in order for it to be a useful application (Buchanan & Smith, 1989; Davis, 1989; Luconi, Malone, & Scott-Morton, 1989; Turban, 1990). Advice from a good, not expert, system can be useful to a novice. Davis (1989) writes that ES's are:

> ... a commitment to a certain system architecture, explicitness of knowledge encoding, transparency, availability of explanations, and so forth. The `expert' part of the name is an aspiration, not a necessity, and much good will accrue from them even if we never had built one that was truly expert at its task. -- Davis (1989), p. 69

Because ES's are not necessarily *expert*, the broader term "knowledge-based systems" (KBS) is often preferred to the term "expert system."

A basic design concept of KBS's is the separation of domain knowledge (for example, sampling theory or process improvement) from the reasoning program. A typical KBS architecture consists of a knowledge base, inference engine, explanation facility, user interface, and developer interface (Figure B.2). The knowledge base is the repository of all the facts and relations in the problem domain. Facts and relations must be encoded in a declarative (non-procedural) form which permits other programs to reason with them. For example, knowledge may be stored in rules or frames. The inference engine is the control module which reasons with the knowledge base. It contains the logic and procedures to be applied to the knowledge base in order to reach a conclusion. The explanation facility provides support to users by defining terms used

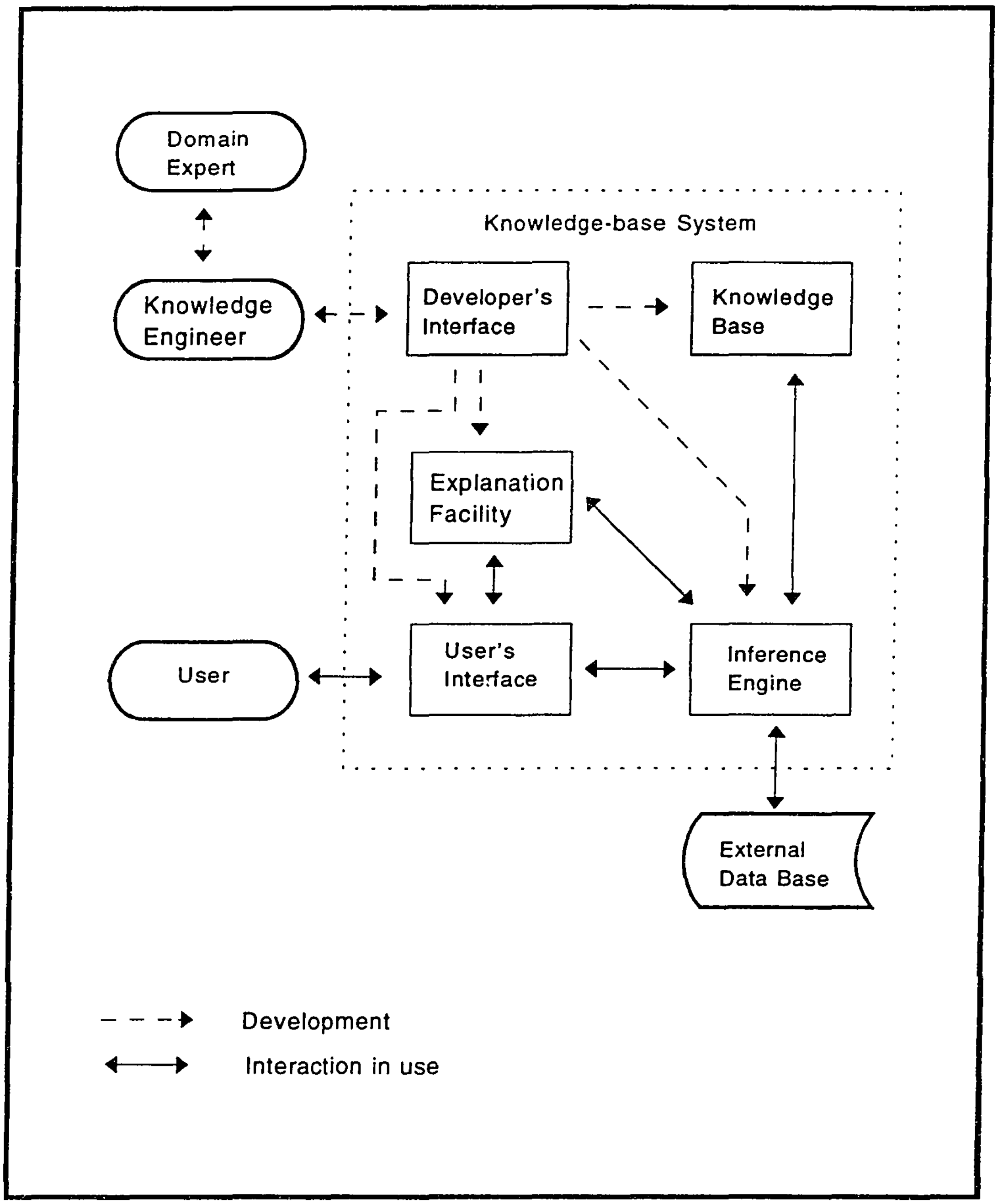


Figure B.2: Components of Knowledge-Based System (Based on a Model in Shenoy, 1986)

in system-user interactions, explaining why a question is being asked, or how a particular conclusion was reached. The user interface provides those elements necessary for the user to interact with the system, for example, screen designs and access to user options or help facilities. The developer interface is used by the programmer, or knowledge engineer, to develop and modify the components of the system. The Domain expert or experts supply knowledge about the problem domain to the knowledge engineer.

Knowledge Representation

A distinguishing characteristic of KBS's is their use of domain specific, declarative knowledge. Structuring this knowledge is an important design issue which extends beyond the broad issue of what to represent to specific issues of how to use data structures. Two common forms of knowledge representation are rules and objects.

Rules: The most common early representation was rules (Rauch-Hindin, 1986). Rules consist of IF ... THEN ... statements which express a logical relationship between facts contained in the IF statement (antecedent) and a conclusion contained in the THEN statement (conclusion). For example, in identifying the type of data to be collected, a simple rule might specify:

IF data are counts in categories
  OR data are proportions in categories
  OR data are counts per unit
THEN data are attribute data

Rules can be linked in a chain when the antecedents of one rule are also the conclusions of other rules. A chain of rules linked in this way enables the reaching of a conclusion or taking of an action. Rules are evaluated using either backward or forward chaining. In backward chaining, the system starts with the goals and works back to determine if facts can be found to support that goal. That is, the system works through the rules from consequences back to antecedents. In forward chaining, the system takes given facts and determines what conclusions can be reached or new facts established. After all new facts in a cycle are added, the process is iterated until no new facts can be added. Thus in forward chaining the system works through the rules from antecedents to conclusions.

The primitive action in a rule-based system is referred to as "firing a rule." In a forward chaining rule-based system, a rule is fired when the IF portion of a rule is found to be true, at which time some action is taken, for example, the existing set of facts may be modified. The firing of successive rules produces an inference chain which leads to a conclusion.

Rule-based systems are action-centered, that is, they focus on the inferential relations (Buchanan & Smith, 1989). Because of their inferential focus, rules are particularly suitable for heuristic knowledge. Advantages claimed for rule-based systems include: simplicity of understanding, ease and speed of coding, modularity, and adaptability (Argarwal & Tanniru, 1992; Hayes-Roth, 1985). However, large rule-based systems tend to lack structure and can become unwieldy and difficult to maintain (Hayes-Roth, 1985, Shenoy, 1986). They are also limited in the knowledge types which they can represent and the problems to which they can be applied.

Objects: Object-oriented systems attempt to model the way humans organize knowledge by clustering related knowledge and taking advantage of similarities in clusters. Object-oriented programming is based on two key concepts: data encapsulation and inheritance. Data encapsulation refers to the structuring of data in self-contained entities (objects) together with actions for data manipulation and provision for selective data access. Inheritance refers to the passing down of variable (attribute) data or functions from a parent (superclass) to offspring (subclass). An object is a data structure containing a knowledge cluster about a particular object or object class. Information is contained in *lot*. For example, a knowledge base of quality control teams might include objects for each team with slots for team name, team leader, location, meeting times, and current problems. In their initial conception, these data structures were referred to as frames (Minsky, 1975). Frame-based systems become object-oriented when the data structures contain both descriptive and procedural attributes, for example, facets or demons. A facet is some additional information such as a default value or comment. A demon triggers an associated program when a particular action occurs, for example, a value is added, deleted, changed, or needed.

The primitive action in object-oriented systems is termed "sending a message." When an action needs to be taken, a message is sent to the object that can perform that action. Message sending is analogous to a function call in conventional programming.

Object-oriented systems are object-centered, that is, they focus on facts. The paradigm is based on the assumption that intelligence arises from the application of large amounts of specific knowledge rather than from a few general inferences (Buchanan & Smith, 1989; Harmon, et al. 1988). Advantages claimed for object-oriented systems include: suitability to a wider variety of knowledge types leading to greater flexibility in use, better knowledge base structuring leading to easier management and maintainability, and easy reusability of code (Harmon & King, 1985; Prerau, 1990; Rauch-Hindin, 1986).

Hybrid systems combining objects or frames and rules have been shown to provide improved naturalness, efficiency, and flexibility (Fikes & Kehler, 1985, Minsky, 1991). Minsky (1991) observes:

> To solve all but the simplest problem we'll need to use several different representations. This is because each particular kind of data-structure has its own virtues and deficiencies, and none by itself can be adequate for all the different functions involved with what we call `common sense.'
> -- Minsky (1991), p. 394

The ESS developed in this research employs a frame-based structure with rules to connect frames and present information displays. The frame-based representation is particularly suited to structuring the procedural cueing the ESS employs.

APPENDIX C
THE FIELD STUDY AS A RESEARCH STRATEGY

In the rational model of research design, the problem precedes the choice of method, that is, the researcher should first consider the problem to be solved and then choose the best methodology to solve that problem (Martin, 1982). However, methodological decisions involve trade offs among competing alternatives, none of which may be optimal (Hackman, 1982; McGrath, 1982). Runkel and McGrath (1972) identify eight research strategies which can be distinguished by their use of obtrusive or unobtrusive methods, and their concern with universal behavior systems or particular behavior systems. These are shown in Figure C.1.

This research uses a field study. Field studies use unobtrusive operations of particular behavior systems in natural settings. In their more descriptive form, field studies are often referred to as case studies. A case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used. -- Yin (1984), p. 23

Field studies are suited to research problems which do not require researcher control over behavior and ask *how* or *why* questions about contemporary events (Yin, 1984). They can have particular value in applied areas where the research aims to provide practitioners with tools (Gummesson, 1991). By using a field study we were able to retain the contextual complexity of the implementation environment. The trade off was the gaining of realism at the expense of some precision and statistical generalizability.

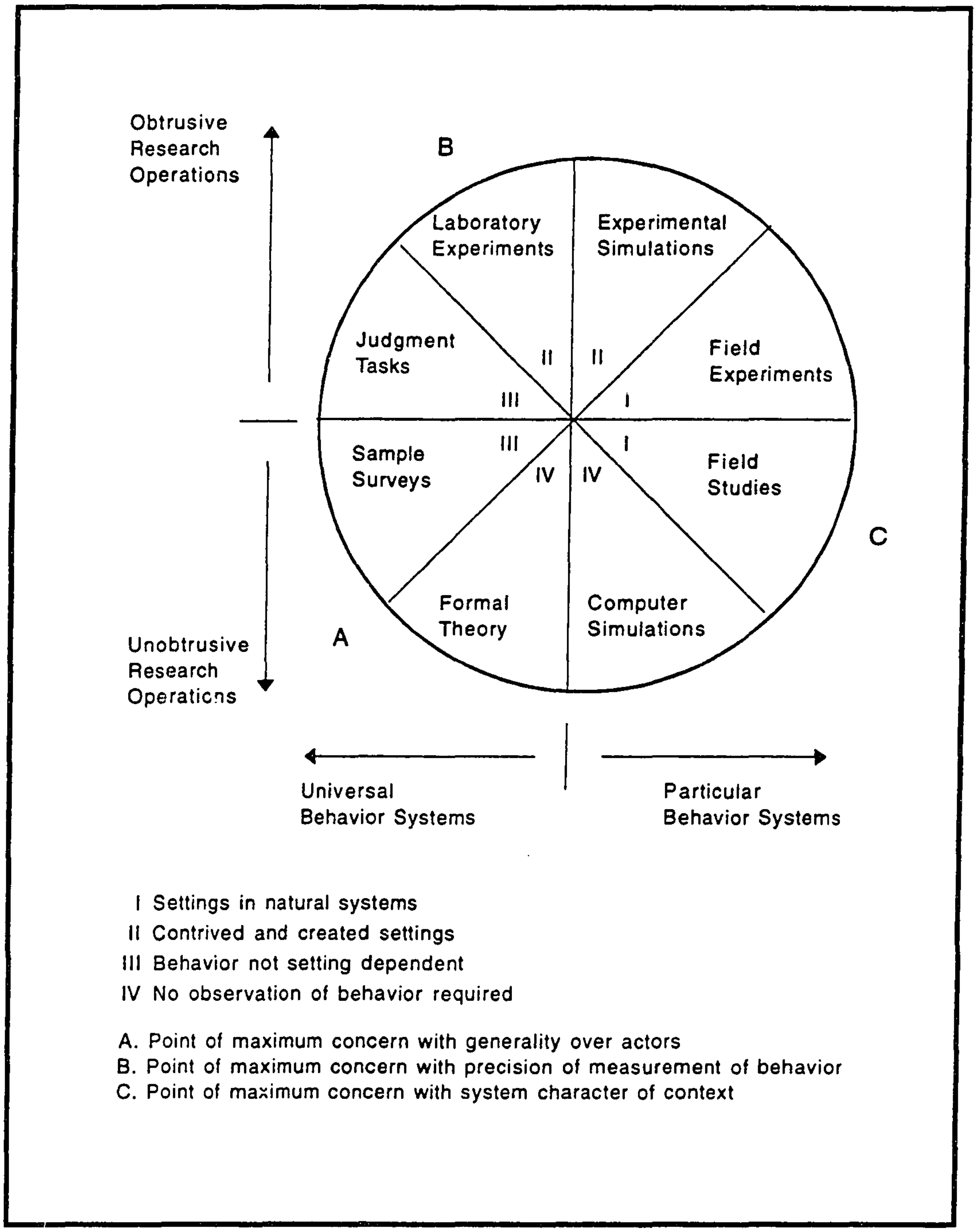


Figure C.1: Research Strategies (Source: Runkel and McGrath, 1972)

Field studies are difficult to do well (Middleton, 1985; Yin, 1984). In experimental studies a researcher must be concerned with the trade-off between internal and external validity. In field research credibility replaces internal validity and transferability replaces external validity.

Credibility: In experimental studies, internal validity refers to the extent to which changes in the dependent variable can be attributed to changes in the independent variable. That is, internal validity measures the degree of some hypothesized causal link. In an exploratory field study, such as the one undertaken in this dissertation, relationships are not hypothesized a priori. The objective is to explore the multiple realities which exist in the natural environment and establish relationships during the research process (Lincoln & Guba, 1985). Thus, the criterion of interest in the field study is credibility rather than internal validity.

Credibility is achieved by (a) conducting the field study in a manner such that the findings are considered credible by the audience of interest, and (b) demonstrating that the findings are considered credible by the informants --the constructors of the multiple realities (Lincoln & Guba, 1985). Conducting the field study in a credible manner requires ensuring adequate scope, depth, and variety of methods (Denzin cited in Lincoln & Guba, 1985). Adequate *scope* of an investigation is achieved by conducting the investigation for a length of time sufficiently long to gain an adequate understanding of the context of the problem. What is sufficiently long is a judgment call based on the size and complexity of the problem context. Investigation in this study continued to the point of redundancy, that is, to the point where minimal new information was emerging. Adequate ***depth*** is obtained by focusing in detail on the salient characteristics in the situation. In this investigation we concentrated on the service quality improvement process, particularly the process at the operational or work unit level, and on the associated data needs. The third technique for achieving credibility is the use of a ***variety of methods*** of inquiry such as multiple sources, methods, investigators, or theories. This research used multiple sources of evidence (informants) and multiple methods of inquiry (interviews, documentation, direct observation, group meetings). In addition, the model were shown to selected informants and revised where necessary. In this way we demonstrate that the model is considered credible by the constructors of the multiple realities in the field.

Transferability: In experimental studies, external validity refers to the extent to which causal relationships can be generalized across measures, settings, or times. Random sampling and randomized assignment of subjects to experimental conditions is used to foster external validity (Cook & Campbell, 1979). Still, generalizability relies upon a similarity of characteristics between the experimental group and the groups to which generalizations are being made. In field studies the term *tranferability* is often preferred. As with experimental studies, transferability of findings or models is an empirical issue depending on the degree of similarity between contexts. To be sure of transferability, it is necessary to know both the original context and the context of inference. Transferability cannot be made by an investigator who knows only the original context. Proof of transferability lies not with the original investigator but rather with the person seeking to make inference elsewhere. Lincoln & Guba (1985) note:

APPENDIX D
PILOT INTERVIEWS

Grand Tour and Prompting Questions

Tell about me

Background, student, dissertation research
Research interest

Tell me about you

Bank position, length of service
Experience, background

Tell me about quality at Bank ....

Is quality important at Bank ...? Why?
What are the consequences of bad quality?
How do you achieve quality?
How do you know you are achieving quality?
- Do you monitor your work? Tell me about it?
- Do you measure quality? How?

How do you know what your customers want?
Do you have problems in providing quality in your job? What?
How could the Bank Help you to achieve better quality?

Tell me about training in the bank

How do you know when training is needed?
What training is provided for experienced staff?

In what ways has banking changed since you began with the bank?

What was the most significant change in the bank in the last 12 months?
Has deregulation affected banking or what you do? How?
Describe a change in quality management in the last year.

How do you use computers in your work?

Do you use computers to help with quality and productivity? How?
In what ways might computers be used to help you more?

APPENDIX E
RESEARCH PROPOSAL PRESENTED TO BANK H

May 1993

A field study

to

CONSTRUCT A DATA NEEDS MODEL FOR DEVELOPING A COMPUTERIZED SUPPORT SYSTEM

Beverley G. Hope
Doctoral Candidate
Communication and Information Sciences
University of Hawaii at Manoa

Open Grants, East-West Center

in
conjunction
with

Rosemary H. Wild
Assistant Professor
Department of Decision Sciences
University of Hawaii at Manoa

Beverley G. Hope
EWC Box 1650
1777 East-West Road
Honolulu, HI, 96848

Phone: (808) 957-0065
Internet: bevhope@uhunix.uhcc.hawaii.edu
wild@uhccvx.uhcc.hawaii.edu

Rosemary H. Wild
Department of Decision Sciences
University of Hawaii
College of Business Administration
2404 Maile Way
Honolulu, HI 96822

Phone: (808) 956-7713
Internet:

Executive Summary

Quality is an essential competitive strategy for service organizations in competitive, deregulated markets. Achieving quality requires attending to both outcomes and processes and identifying the dimensions of quality important to customers. But service providers have found it difficult to transfer to service quality many of the quality assurance techniques widely accepted and used in manufacturing. One prevalent problem for service organizations is the determination of appropriate data to measure service quality and to monitor, control, and improve the service production process. Data collection plans are designs for the collection and analysis of data such that required information is obtained and inferences about the state of a product or process can be made with desired levels of confidence. Developing these plans requires special knowledge, skills, and abilities.

This proposal outlines a project designed to develop a model of data needs within service organizations and a strategy for collecting data that can be transformed into the information needed to improve service quality. To develop the model we seek to conduct a field study at Bank H incorporating interviews, observation, record analysis, and small group meetings. The model will serve as a framework for the development of a computerized support system to assist staff in understanding what data to collect and how to collect it most effectively. The support system is expected to both train and support staff and to provide expert assistance as needed.

The research and development project is designed to fulfill part of the requirements of the Ph.D. degree of the principal investigator at the University of Hawaii at Manoa.

STATEMENT OF PURPOSE

In 1981 Joseph Juran wrote:

> The West is in serious trouble with respect to product quality. A major reason is the immediate threat posed by the Japanese revolution in quality. .-- Juran (1981), p. 9

Since then many U.S. manufacturers have begun to improve their competitiveness. These manufactures have accepted the philosophy and principles of quality pioneers such as W. Edward Deming, Joseph Juran, Kaoru Ishikawa, and Genichi Taguchi and implemented quality improvement systems (QIS). However, service industries have been slow to follow. Quality control from its inception was applied to the characteristics of manufactured products and acquired a factory orientation which still prevails in much of the literature. Service firms find it difficult to transfer to service quality many of the techniques widely accepted and used in manufacturing. Thus, even where service providers adopt the philosophy and principles of quality improvement they frequently find its implementation difficult.

The purpose of our ongoing research is to identify obstacles to the implementation of QIS and to explore the ways in which technology can be used to overcome them. One prevalent problem for service industries is collecting the appropriate data to measure, monitor, and control service quality. The purpose of this research project is to facilitate the measurement task. We seek to develop a model of data needs within Bank H and a strategy for collecting data that can be transformed into the information needed to improve service quality. This model will serve as a framework for the development of a computerized support system to assist Bank H in understanding what data to collect and how to collect it most effectively in order to improve service quality.

SERVICE QUALITY

In banking, as in other service industries, quality is defined as "meeting or exceeding customer expectations." Achieving quality requires service providers to attend to both the outcome and the process of service delivery. While the goal of a QIS is to meet or exceed customer expectations, the process is the means of achieving that goal. In other words, focusing on the outcome ensures an organization is "doing the right thing," and focusing on the process ensures it is "done right."

These two elements of quality are captured in a conceptual model of service quality produced by a group of researches at Texas A&M University after conducting focus groups with providers and customers in four service industries: retail banking, credit cards, securities brokerage, and product repair and maintenance. The model, shown in Figure E.1, defines service quality as the degree and direction of the discrepancy

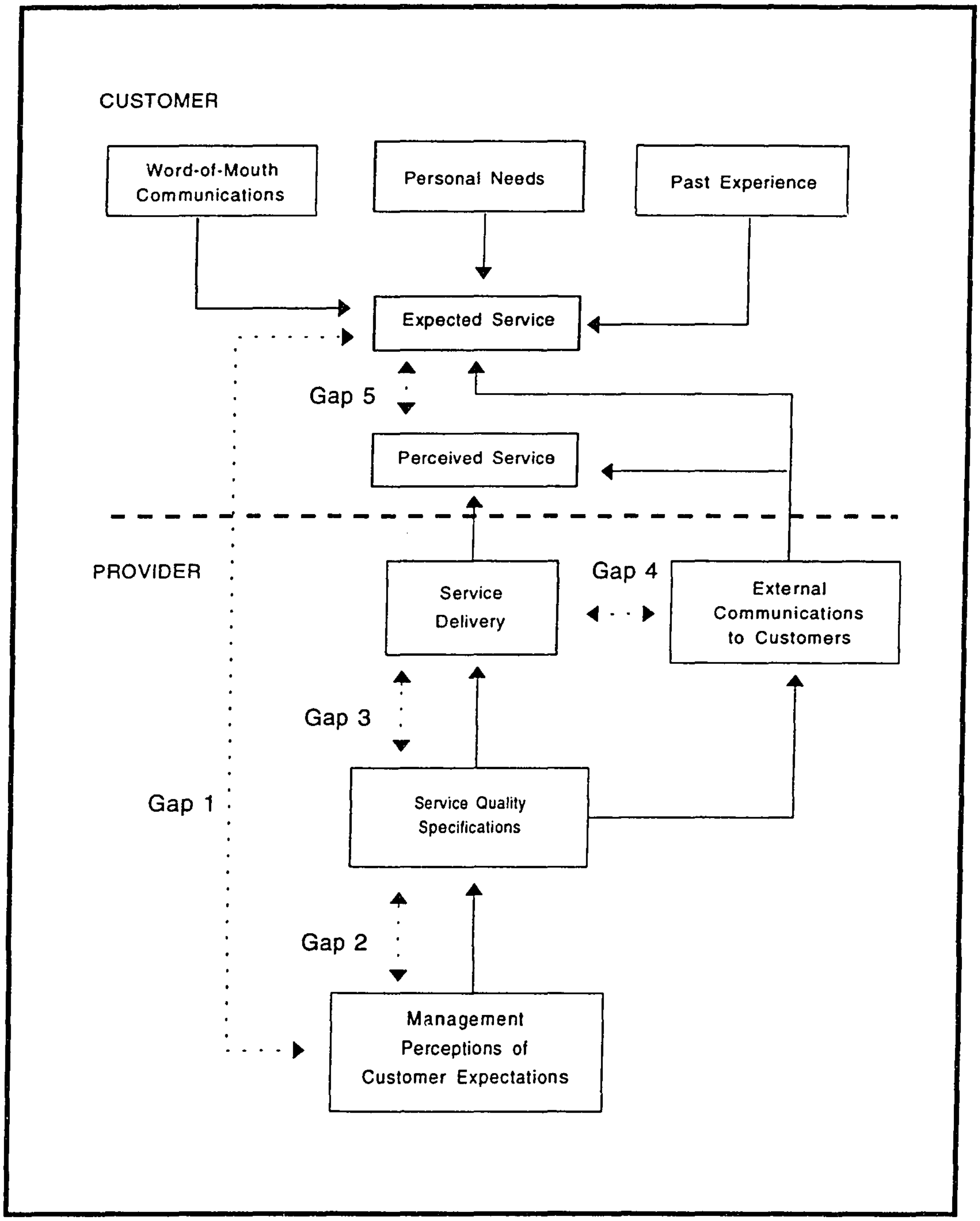


Figure E.1: The Gap Model of Service Quality (Source: Zeithaml, Parasuraman, & Berry, 1990, p. 46)

between expected service and perception of a delivered service (Gap 5 in Figure E.1). To close the quality gap service providers must close Gaps 1-4. Management must have an accurate perception of customer expectations (Gap 1), these expectations must be correctly translated into service quality specifications (Gap 2), and employees must produce services which meet these specifications (Gap 3). In addition, management must ensure that personnel do not promise more than can be delivered and that all that is promised in advertising, personal selling, and other communications with customers is delivered (Gap 4).

The group's research identified five dimensions of quality as shown in Table E.1. In another study, Ernst & Young reported five key service/product parameters that banks intend to emphasize in the future (Table E.2). In both studies reliability was rated the most important dimension or parameter. However, reliability is the only element common to both studies for although both include "responsiveness" the terms are defined differently in each study. The differences appear to arise because the banking study Ernst & Young) focused on products, whereas the Texas A&M study took a broader view.

Applying the Gap Model of service quality to Bank H's operations should enable greater understanding of the bank's service quality and its determinants. Comparisons of Bank H's measures of service quality with the parameters identified in the Ernst & Young study will show how Bank H stands in relation to efforts proposed by other banks.

DATA COLLECTION FOR QUALITY

Management by fact is a basic tenet of quality improvement. Data and subsequent analysis provide the information necessary to make decisions and take appropriate action at all levels of the organization from entry level to the highest executive. Associates collect and analyze data to monitor and control processes, to determine if incoming or outgoing batches meet specified acceptance levels, and to determine cause-effect relationships of changes in performance. Executives use information extracted from data to evaluate and improve the organization's structure and processes.

Managing by fact requires the selection of performance indicators, collection of relevant data, and analysis of that data to provide information for specific purposes (Malcolm Baldrige National Quality Award Guidelines, 1992). Data collection plans must ensure: accuracy in collection, timeliness in collection, ease of collection, and ease of subsequent analysis. To achieve these goals it is necessary to design collection procedures carefully. For example, care in the design of check sheets can greatly simplify the data collection task and result in more accurate data and data

Table E.1:
Five Dimensions of Service Quality

Reliability: ability to perform the promised service dependably and accurately.
Responsiveness: willingness to help customers and provide prompt service.
Assurance: knowledge and courtesy of employees and their ability to convey trust and confidence.
Empathy: caring Individualized attention a firm provides its customers.
Tangibles: appearance of physical facilities, equipment, personnel, communication materials.
--Zeithaml, et al. (1990)

Table E.2
Future Areas of Importance Identified by Banks

Reliability: maintaining faith in the integrity of retail products
Performance: adding more capabilities, features, and functions to products.
Convenience: making it easier for customers to obtain services, e.g., through self-service and phone service.
Responsiveness: designing product features and functions according to customer's needs.
Adaptability: tailoring products to meet individual requirements.
-- Ernst & Young (1992)

which are more readily transformed through analysis into useable information. It is also important to recognize that data collection is essentially a sampling exercise. It is neither necessary nor desirable to collect data on 100% of transactions or events. To do so would not only be wasteful and costly, it is likely to lead to greater error. Thus data collection plans must include consideration not only of what is measured but also the frequency of measurement, method of sampling, and quantity of data collected.

Data collection plans also include consideration of how data is to be translated into actionable information for management. This requires aggregation and analysis, which can be a difficult task. As Willem Mastenbroek, a quality consultant, points out:

> The main problem of information management is selection; that is how to condense the available information into a few figures that offer a true informational handle to management and employees. Ideally, each unit and organizational level should have a limited number of indicators that would periodically make visible the results obtained. Measuring results in this way provides a constant incentive for improving performance. It mobilizes energy: units know what they stand for.
>
> -- Mastenbroek (1991), p. 21

If data are not appropriately analyzed the result can be the reporting of "information" which correlates weakly or not at all with organizational success.

To develop data collection plans in such a way that inferences about the state of a process or product can be made with desired levels of confidence requires a sound knowledge of statistics. Often employees lack expertise in this domain and managers frequently receive inaccurate or inappropriate information. We propose to develop a model of data needs and to encapsulate the model in a computerized support system for those associates charged with the responsibility of implementing quality improvement projects.

RESEARCH PROJECT

Model Development

In order to develop the model of data needs we would work closely with the Quality Service team at Bank H. We would conduct in-depth interviews with staff at selected levels in the organization, observe bank processes, examine current data collection practices and records, and conduct meetings with staff, as described below.

Interviews: We seek to interview staff at selected levels in Bank H in order to determine the bank's requirements and to gain an understanding of existing and anticipated quality-related data needs. At the executive level, interviews would be designed to elicit knowledge on strategic information needs: What information do top executives feel they need? How does the information relate to the banks mission, business plan, or identified Critical Success Factors? How often do they want to see this information? What are their views on aggregation of data? How are current plans implemented, and what resources are employed? From recordings of these interviews we seek to gain insights into how quality and performance planning are integrated into overall business planning

At middle management and other levels, interviews would be designed to elicit knowledge on operational information needs. Again the interest would be in what information or data these people feel they need, why they feel they need it, how often they wish to see it, and how they would use it. From interviews at these levels we seek to gain insights into data needs of `those who do the job'.

At all employment levels we will be interested in respondents' views on the meaning of quality and how quality considerations impact their job functioning. Differing definitions of quality may result in different perceptions of data needs. We are interested in determining the consistency of definitions, beliefs, and commitment to quality throughout the organization. Another general area for exploration at all levels would be the current and potential roles of computer technology in assuring quality.

Observation: We seek to observe bank processes and data use practices to determine what is being done and how it is being done. We anticipate that these observations will make us more aware of the bank's functioning and create the insight needed to generate further questions.

Records: We seek to examine records of existing data collection and analysis to see what may be learnt from them and to determine how improvements might be made.

Group meetings: Finally we would like to meet with small groups of staff to provide feedback on preliminary findings and models and possibly to brainstorm for improvements and changes to existing practices.

This study at Bank H is designed to access multiple sources of evidence and to utilize the knowledge of bank experts in the development of the data needs model. The study should provide the information needed to:

1. model the existing data collection process in Bank H
2. model an improved data collection process,

3. develop a model of Bank H's data needs, and
4. develop procedures to assist managers and associates in determining their own data needs.

System development

System development will be incremental, using a commercial knowledge engineering tool. Initially a simple system will be developed and tested. After effecting desired changes the system will be expanded. This develop-test-enhance cycle will be iterated until an acceptable, complete system is obtained.

The function of the proposed system is two-fold:
1. to provide assistance and training through
   (a) guidance through a series of appropriate questions, and
   (b) tutorials on request, and
2. to provide expert advice.

For example, tutorials might be provided in various areas such as identifying the quality characteristics of a process or the questions to be answered in designing a data collection plan. Thus when the user reaches the "Data Collection Plan" frame he or she may select a tutorial for sample size, randomization, or some other element of this process. User-friendliness will be an overriding goal in system design. This extends to logical ordering, clear screen displays, menu or command driven interfaces, and good documentation.

Validation and assessment

As the system nears completion, selected staff will be trained in system use and the system will be validated and assessed. **Validation** refers to the process of determining the truth or accuracy of the model: **Assessment** to the measurement of user acceptance and satisfaction with the system.

Validation: In order to validate the model, the data needs model developed in Bank H will be tested in another bank. Ideally model validity should be assessed in a setting similar to, but not identical with, the development environment. Subject to availability of funding, the model developed at Bank H will be validated in Bank N. New Zealand provides an excellent location for validation because New Zealand banking institutions and the financial environment in which they operate differ from those in the U.S.. In general, New Zealand banks provide a more integrated banking service than their American counterparts and the New Zealand financial market is less regulated than the U.S. financial market. Indeed, the New Zealand financial market is amongst the most deregulated in the world and may provide a model for future deregulation in other nations. Because of these differences validation in New Zealand represents a particularly robust test. If funding is not available for travel to New Zealand, validation will need to be carried out in other branches of the Bank H. Such validation will provide a less robust test of the model and system.

Validation will take two forms: (1) determining the face validity of the model, and (2) determining the validity of the model as implemented in the system. Face validity will be obtained by presenting the model of data needs to individuals or groups in both banks, walking through the model, and obtaining feedback and acceptance from these experts. System validity will be measured by comparing results obtained by field personnel trained in using the system with results obtained by an expert.

System assessment: After completion of initial training sessions in the banks, user satisfaction will be assessed by means of a brief survey instrum·nt.

COMMENTARY

The project to develop a model of data needs at Bank H and to encapsulate that model in a computerized support system forms part of a broader research agenda designed to identify problems in implementing QIS in service industries and the ways in which computer technology can be used to overcome them.

The research and development project outlined in this proposal is intended to fulfill part of the requirements of the Ph.D. degree for the principal investigator. Thus the research will be monitored and assessed by a committee of five faculty lead by Assistant Professor Rosemary H. Wild, and a written dissertation will be submitted to Graduate Division at the University of Hawaii at Manoa.

Benefits to Bank H

We believe that the research will also benefit Bank H by increasing understanding of quality-related data needs in the bank and by enabling the design of efficient and effective data collection strategies. Benefits should arise both from the model development process and from the outcome -- the provision of a computerized support system for staff charged with the responsibility of implementing quality improvement projects.

SELECTED REFERENCES

Ernst & Young, and American Quality Foundation (1992). ***International Quality Study: Banking Industry Report***. Cleveland, OH: Ernst & Young.

Juran, J. M. (1981). Product quality -- a prescription for the West. Part I: Training and improvement programs. ***Management Review***, 70(6), 8-14.

Malcolm Baldrige National Quality Award (1992) ***1992 Award Criteria.*** Gaithersburg, MD: National Institute of Standards and Technology.

Mastenbroek, W. F. G. (1991). ***Managing for quality in the service sector.*** Oxford: B. Blackwell.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1990). ***Delivering quality service: Balancing customer perceptions and expectations***. New York: Free Press.

Researchers

Beverley Hope is a candidate for the degree of Doctor of Philosophy (Ph.D.) in Communication and Information Sciences at the University of Hawaii at Manoa. She is also a participant in the East-West Center's Education and Training program where she is currently in the third year of a four-year graduate degree scholarship. Beverley received a B.S. and M.B.A. from the University of Kansas. Her primary areas of study at the doctoral level have been quantitative methods, operations research (particularly quality improvement systems), and management information systems. She is currently interested in investigating the ways in which computer technology can be used to support service industries in the implementation of quality improvement systems. Other research interests include simulation modeling and analysis and process re-design.

Rosemary Wild is an assistant professor in the Department of Decision Sciences at the University of Hawaii. She came to the University of Hawaii from the University of Arizona in Tucson where she received a B.A. and M.A. in English, an M.S. in Systems and Industrial Engineering, and a Ph.D. in Management Information Systems. Rosemary's teaching and research interests include simulation modeling and analysis, knowledge-based simulation, business and industry process re-design, and quality improvement methods.

Dr. Wild has presented her work at many national and international conferences and has published in several journals including the *Communications of the ACM*, *Simulation*, and *The International Journal of Computing and Education*. She has received both the University of Hawaii College of Business Administration teaching excellence award and the prestigious Dennis Ching/First Interstate Bank teaching award. Rosemary has been closely involved with companies in Hawaii in their TQM implementation efforts and was a member of a task force which created a center for excellence in Hawaii called PRISE (Pacific Region Institute for Service Excellence). She currently serves on the PRISE Programs Committee.

APPENDIX F
SUMMARY PROPOSAL SENT TO DIVISION HEADS AT BANK H

A PROPOSAL FOR DEVELOPING A COMPUTERIZED SUPPORT SYSTEM FOR DESIGNING DATA COLLECTION PLANS

OVERVIEW

A prevalent problem for service firms is the determination of appropriate data to measure service quality and to monitor, control, and improve the service production process. Data collection plans are designs for the collection and analysis of data such that required information is obtained and inferences about the state of a product or process can be made with desired levels of confidence. These plans should ensure appropriateness, accuracy, timeliness, and ease of data collection, statistical correctness of sampling procedures, and ease of subsequent analysis.

PROPOSAL OBJECTIVES

To develop a strategy for determining data needs,
develop a strategy for collecting data,
encapsulate these in a computerized support system,
develop a model of Bank H's data needs in a selected area, and
develop a strategy for data collection in a selected area of Bank H

FIELD STUDY

To achieve these objectives I seek to conduct a field study in one division of Bank H incorporating interviews, observation, record analysis and small group meetings. The purpose, coverage, and estimated time requirements of these are summarized below:

Interviews with staff at selected levels:

Purpose: to determine requirements and to gain understanding of existing and anticipated quality-related needs of associates from entry to managerial level.

Coverage: nature of quality, quality-related problems and successes, information needs for ensuring quality, use and potential use of technology in assuring quality.

Time: 1-2 interviews at each level, duration approximately 30 minutes.

Observation of processes and data collection procedures:

Purpose: to gain awareness of the divisions functioning and to afford the insight required to be able to ask the right questions.

Coverage: unobtrusive observation and observation with participation and/or questioning where possible and beneficial.

Time: 1-2 half-days in various sections.

Scrutiny of data collection and analysis records:

Purpose: to model the existing data collection and analysis structure and to understand existing collection strategies.

Coverage: collection forms and equipment, sampling schedules (where, when, how much, by whom), data/indices generated, and levels of analysis and reporting.

Time: bank time: maybe 30 minutes. investigator's time: substantially more.

Small group meetings:

Purpose: groups of workers at the same level or performing the same job function may inspire ideas or suggestions in one another, thereby generating more insights collectively than can be obtained from individual interviews.

Coverage: current difficulties, improvements to existing data collection practices, feedback on preliminary findings and models, and training, testing and assessment of the computerized support system.

Time: 2-3 groups of, say 4-6 persons, meeting for about 45-60 minutes.

BENEFITS TO DIVISION

I believe the research will benefit the division by increasing understanding of quality-related data needs and by enabling the design of efficient and effective data collection strategies. Benefits should arise both from the model development process and from the provision of the computerized support system. At the conclusion of the study the division should have:

- a model of data needs within the division
- a strategy for collecting data
- a computerized support system for designing data collection plans

BENEFIT TO THE INVESTIGATOR

The project at Bank H forms part of a broader research agenda designed to identify problems in implementing quality improvement systems in service industries and the ways in which computer technology can be used to overcome them. The research and development project outlined in this proposal is intended to fulfill part of the requirements of the Ph.D. degree for the investigator.

Beverley G. Hope

Doctoral Candidate
Communication and Information Sciences
University of Hawaii at Manoa

Education & Training, East-West Center

EWC Box 1650
1777 East-West Road
Honolulu, HI, 96848

Phone: (808) 957-0065

APPENDIX G
STATEMENT OF REQUIREMENTS SUBMITTED TO BANK N

Quality Improvement in a Service Industry

RESEARCH REQUIREMENTS AT BANK N

Beverley G. Hope

Background

This research is conducted in partial fulfilment of the requirements of the degree of Doctor of Philosophy at the University of Hawaii at Manoa. The research objectives are:

to develop a model of the service quality improvement process,
to develop a model of data needs,
to develop an expert support system to assist and train managers and associates in using data to improve service quality.

Preliminary research has been conducted with Bank H, Hawaii under the sponsorship of the Vice President, Center for Quality. The research consisted of interviews with executive, division heads, and staff in three divisions:

Retail banking - Branch deposits/cheques
Consumer lending - personal loans, second mortgages
Customer satisfaction center - 24 hour phone-in service

The investigation involved interviews, examination of documents, observation, and small group meetings. Interviews took approximately 30 minutes each, group meetings slightly longer. The outcome has been an improved understanding on the part of the researcher of the nature of the U.S. banking industry and quality problems faced by banks. This knowledge, combined with knowledge in existing literature, has lead to the development of preliminary models as follows:

Model of the quality improvement process
Model of data needs by planning level
Strategy for determining data needs

Requirements at Bank N

The objectives of the research at Bank N are:

To validate the models developed at Bank H,
To gain an understanding of Bank N's operations as an example of a New Zealand Bank, and
To determine perceived data needs and quality indicators for quality improvement at Bank N.

To achieve this I would like to investigate two areas of retail banking, **consumer lending and deposit services**, and business lending. I would like to begin the research by interviewing branch managers at banks of different sizes, say, small, medium, and large. On advice and referral from these branch managers I would like to extend interviews to other branch staff, for example, retail bankers, consumer business managers, and tellers. Where possible I would like to look at bank documents relevant to quality issues and to observe branch banking in progress. Finally, at the hub level and/or with the group of branch managers I would like to discuss the research findings and models developed. The purpose of these meetings would be twofold:

to provide feedback for Bank N, and
to provide feedback and validation of the models developed.

It is not anticipated that this research will result in any cost to Bank N beyond the provision of staff time and provision of written material relevant to the study such as printed brochures or duplicated copies of quality related data records. The primary requirement of Bank N will be access to staff under the direction of branch managers.

APPENDIX H
INTERVIEW QUESTIONS: ORGANIZATIONAL/DIVISIONAL LEVEL
(Strategic/Tactical issues)

BIOGRAPHICAL:
Name ... Position ... Duties/Responsibilities ... Experience

BANK POSITION

***Mission*:** What is the bank's mission?
What strategic emphasis does the bank place on quality?

***Market*:** What is the bank's (division's) market?
Who are the bank's customers?
Does the bank use niche marketing?
Is future expansion planned? If so in what directions?

***Competition*:** What is the bank's competitors?
Do you monitor the competition?
What role does technology play in improving competitiveness?

QUALITY
Tell me about quality and quality improvement at Bank ...
What is quality? How do you define it?
What are the dimensions (characteristics) of service quality?
How do you know you have achieved quality?
What is the bank's greatest problem/difficulty in assuring quality?
What is the cost of assuring quality?

DATA FOR QUALITY
What information do you need or want to see in order to monitor quality? Why?
How is this data used?
How often do you want to see it?
How much detail do you want? (i.e. levels of aggregation)
Who decides what to measure and how to measure it?

TECHNOLOGY

How is technology used to assure or monitor quality?
In what ways do you think technology could help you to achieve service quality?

NEW PRODUCTS

Have new products changed in recent years? How? and Why?
How are new product ideas generated? (customer, dept, competition)
Who is involved in designing new products? (dept, mgmt levels, customer)
How does technology and quality affect the design of new products?

APPENDIX I
INTERVIEW QUESTIONS:
BRANCH/WORK GROUP LEVEL
(Tactical/Operational issues)

BIOGRAPHICAL:
Name ... Position ... Experience

TASK
What are your duties/responsibilities?
Who are your customers?

QUALITY
Tell me about quality and quality improvement in ....
What is quality? How do you define it?
What are the dimensions (characteristics) of service quality?
How do you know you have achieved quality?
What do you do to assure quality?
What has been .... greatest success in the last 12 months?

Quality Problems
What are the problems you face daily in providing service quality?
If you were president for a day and could make one decision to improve quality, what decision would you make?
How do you identify the causes of problems?

DATA FOR QUALITY

Current Practice
What data do you collect?
How do you determine:
- what data to collect?
- how much to collect?
- who should collect it? [who is making these decisions?]

How are data analyzed and reported?

Desired Practice

What data do you think should be collected?

(a) for you to monitor your own performance

(b) for management

How would you use this data?

How often do you want to see it?

How much detail do you want?

(averages : % target met : individual/group : ???)

TECHNOLOGY

How has technology affected banking and the way you do your job?

How do you see technology being used in the future?

How can technology help you to improve the quality of your work?

APPENDIX J
BANK POSITION TITLES

The positions within the retail banking structures of Bank N and Bank H are shown in Figure J.1. These are briefly described next.

Analyst: (Bank N) Person who supports Relationship Manager in Business Bank by performing analysis as required.

Associate: (Banks H & N) Bank employee. Although a general term, it is more commonly used to refer to non-managerial staff.

Branch Manager: (Banks H & N) Person responsible for branch activities. At Bank H, the Branch Manager has specific responsibility for branch sales but not direct responsibility for branch operations which are the responsibility of a Customer Service Manager. At Bank N, the Branch Manager has responsibility for both sales and operations.

Branch Operations Officer: (Bank H) See Head Teller.

Business Bank Manager: (Bank N) Senior manager responsible for a Business Bank (hub area). The Business Bank Manager works independently but in co-operation with the Hub Manager.

Consumer Business Manager: (Bank N) Senior manager in Consumer Bank Hub who has relationships with (responsibility for) a number of high-value small businesses. Approximately 80% of a Consumer Business Manager's time is spent on non-formula lending activities.

Consumer Loan Officer: (Bank H) Associate employed in consumer lending group to process and approve or reject consumer loan applications.

Customer Service Manager: (Bank H) Person responsible for branch operations, i.e., daily running of branch activities such as teller activities.

Customer Service Representative: (Bank H) Associate who handles telephone queries and complaints from customers (customer satisfaction center) or who handles telephone bill payment queries.

Financial Services Representative: (Bank H) Associate in branch who arranges for opening of new accounts and raising of small loans.

Head Teller: (Bank N) Associate responsible for oversight of teller operations in a branch. The Head Teller also operates a teller station when needed.

Hub Manager: (Bank N) Senior manager responsible for a family (sub-region) of Consumer Banks.

Market Manager: (Bank H) Branch Manager with additional responsibility for oversight of a group of branches (market).

Personal Banker: (Bank N) Experienced associate in branch who specializes in selling products (including new accounts) and arranging formula (rule-based) loans. Personal Bankers have relationships with (responsibility for) about 500-600 high-value customers.

Project Officer - Resource Analysis: (Bank H) Special position held by an associate in the customer satisfaction center. This person is responsible for collecting data and determining resource needs, for example, staff, computers.

Relationship Manager: (Bank N) High level associate in Business Bank who has relationships with (responsibility for) about 60 high-value, large organizations, for example, university. Relationship Managers work closely with management in client organizations to tailor bank products to meet specific client needs.

Regional Manager: (Bank N) Senior manager who oversees a particular regional function or support area, for example, Regional Manager - Sales Support.

Retail Banker: (Bank N) see Personal Banker

Retail Banking Manager: (Bank N) see Branch Manager.

Service Manager: (Bank H) Associate in charge of Customer Service Representatives in customer satisfaction center.

Teller: (Banks H & N) Branch associate who accepts deposits, pays out for withdrawals, and answers basic queries.

Vice President, Senior Vice President, Executive Vice President: (Bank H) Levels of seniority among upper management with Vice President being lowest and Executive Vice President being highest. Vice Presidents have specific functional or divisional responsibility, for example, Vice President - Center for Quality, Senior Vice President - Marketing.

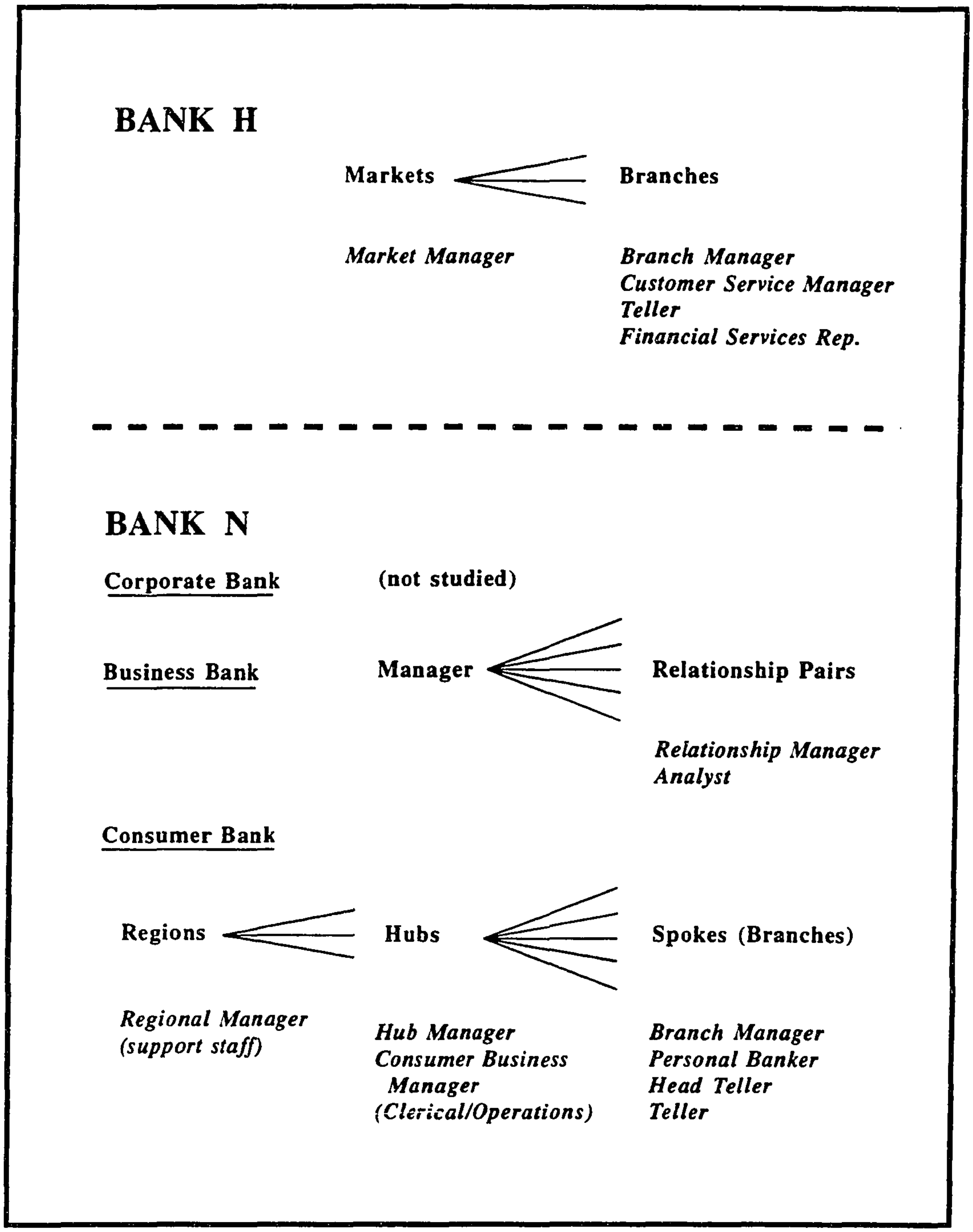


Figure J.1: Positions within the retail banking structures of Bank N and Bank H (Positions Shown in Italics)

APPENDIX K
STRUCTURED INTERVIEW: STRATEGIC LEVEL

As part of my doctoral studies at UH, I have been researching the data collection and measurement practices of service providers in their efforts to provide service quality. Today, I want to ask you some questions about quality planning and implementation **at the strategic level** in [org]. The purpose is to determine the accuracy and generality of a model developed in another organization -- a bank. I have some specific questions which relate to the models. After we finish these questions I would like to show you the models and discuss with you how you believe the models could be improved.

No confidential information about [org] will be disclosed in the research report, and no response today will be specifically linked to [org]. **At the conclusion of the interview I will give you the opportunity to decide if you want [organization's] contribution to the research to be acknowledged in the introduction to the research report.**

1 *To verify the link "Alignment produces Quality*
(Customer needs <---> Outcomes determined by customers)

a. What defines quality in service production?

Backup Q1. How does [organization] identify opportunities for improvement at the strategic level?

Backup Q2. Does [organization] take action to determine customer requirements, needs, or expectations? Why?

2 *To verify stakeholders at the strategic level.*
(Stockholders Employees)

b. In strategic planning, whose needs or expectations are you trying to satisfy?

....

....

....

....

....

Backup Q1. If not specifically mentioned ask about:
stockholders and employees

c. If you are specifically planning for quality is a different set of people considered?

3 *To verify sample requirements/needs of stakeholders*

d. What has [organization] identified as [stakeholder's] most important current needs?

....

....

....

....

4 ***To verify that outcomes in terms of stakeholder requirements are, or should be, evaluated.***
(Measure outcomes)
e. How does management know it is achieving quality?

f. What indicators does [org] monitor to track performance in meeting [stakeholder's] needs?

....

....

....

....

....

Backup Q1. If no indicator mentioned for specific stakeholder identified by organization **...**
And in relation to meeting [stakeholder's] needs, what do you measure?

5 *To verify relationship among the various levels of planning and the quality outcomes.*
(Needs $\Rightarrow$ Strategic $\Rightarrow$ Tactical $\Rightarrow$ Outcomes)

g. What plans do [organization] prepare at the strategic level?

Backup Q1. Does [organization] develop strategic plans which include planning for quality?

Backup Q2. And does [organization] develop business plans which is separate?

h. How are the goals and objectives of these plans achieved?

Backup Q1. Is planning carried out at other levels in the organization, i.e., levels other than strategic?

Backup Q2. How do these plans work together?

i. What effect do [identified plans] have on and measurement of quality outcomes?

6 *Approval for contribution to be acknowledged*

j. Do you want [organization's] contribution to the research to be acknowledged in the introduction to the research report?

APPENDIX L
STRUCTURED INTERVIEW: TACTICAL LEVEL

My name is Beverley Hope. As part of my doctoral studies at UH, I have been researching the data collection and measurement practices of service providers in their efforts to provide service quality. Today, I want to ask you some questions about quality planning and implementation at the tactical level in [organization]. The purpose is to determine the accuracy and generality of a model developed in another organization -- a bank. I have some specific questions which relate to the models. After we finish these questions I would like to show you the models and discuss with you how you believe the models could be improved.

No confidential information about [org] will be disclosed in the research report, and no response today will be specifically linked to [organization].

1 ***To verify the link "Alignment produces Quality***
(Customer needs <---> Outcomes determined by customers)

a. What defines quality in service production?

Backup Q1. How does [organization] identify opportunities for improvement at the strategic level?

Backup Q2. Does [organization] take action to determine customer requirements, needs, or expectations? Why?

2 *To verify stakeholders at the tactical level.*
(external customers, internal customers, controlling bodies)

b. In tactical planning, whose needs or expectations are you trying to satisfy?

....	....
....	....
....	....
....	....
....	....

Backup Q1. If not mentioned, ask specifically about:
external customers internal customers controlling bodies

Backup Q2. If you are specifically planning for quality is a different set of people considered?

3 *To verify sample requirements/needs of stakeholders*

c. What has [organization] identified as [stakeholder's] most important current needs?

....	....
....	....
....	....
....	....

Backup Q1. If no indicator mentioned for specific stakeholder identified by organization **...**
And in relation to meeting [stakeholder's] needs, what do you measure?

4 ***To verify that strategic plans, business plans, and competitor performances affect tactical planning.***

d. Do higher level plans affect planning for quality at this level? How?

Backup Q1. strategic plans?

Backup Q2. business plans?

e. Do you consider competitor performance when planning for quality at this level?

5 ***To verify that outcomes in terms of stakeholder requirements are, or should be, evaluated.***

(Measure outcomes)

f. How does management know it is achieving quality?

g. What indicators does [org] monitor to track performance in meeting stakeholder's needs?

....

....

....

....

....

Backup Q1. If no indicator mentioned for specific stakeholder identified by organization

And in relation to meeting [stakeholder's] needs, what do you measure?

6 ***To verify relationship among the various levels of planning and the quality outcomes.***
(Needs + Business Plan + Competitors → Tactical →Outcomes)

h. What plans does [organization] prepare at this level?

i. What are the main foci of the quality and productivity elements of these plans?
(product, process)

Backup Q1. Does planning consider product design, i.e., services offered?

Backup Q2. Does planning consider process design?

j. What is the relationship between plans at this level and measurement of quality outcomes?
(standards, what to measure)

APPENDIX M
STRUCTURED INTERVIEW: OPERATIONAL LEVEL

As part of my doctoral studies at UH, I have been researching the data collection and measurement practices of service providers in their efforts to provide service quality. Today, I want to ask you some questions about quality planning and implementation at the operational level in [org]. The purpose is to determine the accuracy and generality of a model developed in another organization -- a bank. I have some specific questions which relate to the models. After we finish these questions I would like to show you the models and discuss with you how you believe the models could be improved.

No confidential information about [org] will be disclosed in the research report, and no response today will be specifically linked to [org].

1 ***To verify the link "Alignment produces Quality":***
(Customer needs <---> Outcomes determined by customers)

a. What defines quality in service production?

Backup Q1. How does [org] identify opportunities for improvement at the operational or work-unit level?

Backup Q2. Do you take action to determine customer requirements, needs, or expectations at the [work unit] level? Why?

2 ***To verify stakeholders at the operational level.***
(consumers employees)

b. In planning for quality whose needs or requirements are you trying to satisfy?

....

....

....

....

....

Backup Q1. If not mentioned, ask specifically about:
consumers and employees

3 ***To verify sample requirements/needs of stakeholders***

c. What has [organization] identified as [stakeholder's] most important current needs?

....

....

....

....

....

4 ***To verify that plans at upper levels affect operational level quality planning and implementation.***

d. Does planning from other, higher levels affect planning for quality and productivity at this level. How?

5 ***To verify that outcomes in terms of stakeholder requirements are, or should be, evaluated.***
(Measure outcomes)

e. How do you know you are achieving quality?

f. What indicators do you monitor to track performance in meeting [stakeholder's] needs?

....	....
....	....
....	....
....	....

Backup Q1. If no indicator mentioned for specific stakeholder identified by organization ...
And in relation to [stakeholder's] needs, what do you measure?

6 ***To verify relationship among the various levels of planning and the quality outcomes.***

(customer needs – tactical plan ⇒ operational plan (Q+P) ⇒ subprocess ⇒ output)

g. What plans do you prepare at this level?

h. What are the main foci of these plans?

Backup Q1. Do you consider both quality and productivity?

i. I am going to ask about both Quality and Productivity measures. What determines what quality indicators you measure at this level?

j. What determines what productivity indicators you measure at this level?

Backup Q1. Does the operational plan influence what outcomes are measured at this level?

k. How do you determine goals and standards for indicators?

APPENDIX N
STRATEGIC LEVEL QUESTIONNAIRE

Strategic Level Planning for Quality

(Please circle the marker on the scale which best represents your opinion)

1. To provide service quality, how important is it to match service outcomes to customer needs or expectations?

Unimportant | | | | | Important

2 In developing a strategic plan, how important are the needs or expectations of:

(a) Stockholders? Unimportant | | | | | Important

(b) Employees? Unimportant | | | | | Important

(c) Paying customers? Unimportant | | | | | Important

(d) Regulatory bodies? Unimportant | | | | | Important

(e) Community at large? Unimportant | | | | | Important

3 How important is the strategic plan in determining:

(a) Quality goals? Unimportant | | | | | Important

(b) Productivity goals? Unimportant | | | | | Important

(c) Quality indicators chosen?

Unimportant | | | | | Important

(d) The productivity indicators chosen ?

Unimportant | | | | | Important

4 How important is the strategic plan in influencing tactical planning and operation? (Tactical plans may be referred to by other names such as *action plans, technical plans* or *service brief*)

Unimportant | | | | | Important

5 To what extent does your organization currently measure outcomes related to the needs of:

(a) Stockholders ? weak measurement | | | | | strong measurement

(b) Employees? weak measurement | | | | | strong measurement

(c) Paying customers? weak measurement | | | | | strong measurement

(d) Regulatory bodies? weak measurement | | | | | strong measurement

(e) Community at large? weak measurement | | | | | strong measurement

APPENDIX O
TACTICAL LEVEL QUESTIONNAIRE

Tactical Level Planning for Quality
(Please circle the marker on the scale which best represents your opinion)

1. To provide service quality, how important is it to match service outcomes to customer needs or expectations?

Unimportant |——|——|——|——| Important

2 In developing a tactical plan, how important:

(a) The needs of paying customers?

Unimportant |——|——|——|——| Important

(b) The needs of internal customers (employees)

Unimportant |——|——|——|——| Important

(c) The needs of controlling bodies (regulators)?

Unimportant |——|——|——|——| Important

(d) The strategic plan? Unimportant |——|——|——|——| Important

(e) The business plan? Unimportant |——|——|——|——| Important

(f) Competitors' performance?

Unimportant |——|——|——|——| Important

3 How important is the tactical quality plan in influencing:

(a) Product[1]design? Unimportant |——|——|——|——| Important

(b) Process design? Unimportant |——|——|——|——| Important

[1]We define "product" as a bundle of services *sold* as a package, e.g., a check account with particular features or options.

4 How important is the tactical plan in determining: (Tactical plans may be referred to by other names such as *action plans*, *technical plans* or *service brief*)

(a) Quality standards? Unimportant |——|——|——|——| Important

(b) Productivity standards?

Unimportant |——|——|——|——| Important

(c) The quality indicators chosen?

Unimportant |——|——|——|——| Important

(d) The productivity indicators chosen?

Unimportant |——|——|——|——| Important

5 To what extent does your organization currently measure outcomes at the tactical level related to the needs of:

(a) Paying customers? weak measurement |——|——|——|——| strong measurement

(b) Internal customers? weak measurement |——|——|——|——| strong measurement

(c) Controlling bodies? weak measurement |——|——|——|——| strong measurement

APPENDIX P
OPERATIONAL LEVEL QUESTIONNAIRE

Operational Level Planning for Quality
(Please circle the marker on the scale which best represents your opinion)

1. To provide service quality, how important is it to match service outcomes to customer needs or expectations?

Unimportant |—|—|—|—| Important

2 In developing an operational plan, how important are:

(a) The needs of paying customers?

Unimportant |—|—|—|—| Important

(b) The needs of internal customers (employees)?

Unimportant |—|—|—|—| Important

(c) The tactical plan? *(action plan, technical plan, service brief)*

Unimportant |—|—|—|—| Important

3 How important is the operational plan in determining:

(a) Quality standards? Unimportant |—|—|—|—| Important

(b) Productivity standards?

Unimportant |—|—|—|—| Important

(c) The quality indicators chosen?

Unimportant |—|—|—|—| Important

(d) The productivity indicators chosen?

Unimportant |—|—|—|—| Important

4 How important is the operational plan in influencing the design of subprocesses?

Unimportant |—|—|—|—| Important

5 To what extent does your organization currently measure outcomes at the operational level related to the needs of:

(a) Paying customers? weak measurement |—|—|—|—| strong measurement

(b) Internal customers (Employees)?

weak measurement |—|—|—|—| strong measurement

APPENDIX Q
LETTER OF TRANSMITTAL AND COVER SHEET

Beverley G. Hope
East-West Center
Box 1650, 1777 East-West Road **Phone: (808) 944-6403**
Honolulu HI 96848 **Fax (808) 944-7070 (attn. Glen)**
Email: bevhope@uhunix.uhcc.hawaii.edu

Date, 1994

Contact Person
Address

Person's name:

We are conducting research to learn more about service quality improvement. **We hope you will be able to help us in this study by distributing the enclosed survey in your organization.**

From our research in service firms we have developed models of service quality improvement and associated data needs. *[Organization]* is one of a few firms we have contacted to obtain data on the relative strengths of key links in these models. The more surveys we get back, the better will be our understanding of this important area. That is why your assistance in distributing the surveys is so greatly needed.

Three different surveys are enclosed. **The surveys should take about two minutes to complete. Please distribute the questionnaires to one person at each of the three levels of quality planning and implementation (a total of three people):**

strategic	(enabling strategies -- long term -- top management),
tactical	(process wide -- medium term -- top and upper management), and
operational	(work-unit level -- short term -- branch or area management).

Please have each person complete the relevant questionnaire and return it directly to me in the attached envelopes. Numbers on the forms are for statistical purposes only. No specific set of answers will be associated with any participating organization.

When the data from all participating organizations are analyzed, I will be happy to send you a summary of the research results. If you wish to receive the summary of the results or if you wish your firm to be acknowledged as a contributor to the research, please complete and return the response slip on the accompanying information sheet. If you have any questions please contact me by phone, fax, or email at the addresses above.

Your support of this research is important to us. Thank you for your cooperation.

Sincerely

Planning and Data Collection for Service Quality Improvement

The three levels of planning as defined in this study are:

1. **Strategic Level Planning for Quality**
   We define strategic planning as the long term planning for quality usually performed by upper management. These plans provide for the necessary structures and resources to enable members of the organization to achieve both breakthrough and continuous quality improvement.

   Please have a member of your strategic quality planning and implementation team complete this questionnaire.

2. **Tactical Level Planning for Quality**
   We define tactical planning as medium term planning for quality improvement usually performed by upper and middle management in consultation with other workers. At this level tactics are devised to meet strategic goals. Tactics may include the redesign of organization-wide processes.

   Please have this questionnaire completed by a member of your organization who is involved in tactical planning and implementation .

3. **Operational Level Planning for Quality**
   We define operational planning as the short to medium term plans prepared by work groups or branches. At this level quality improvement teams plan and implement projects to improve the subprocesses for which they are responsible.

   Please have a quality improvement team leader complete this questionnaire.

Please detach the section below and return it to me with one of the surveys or in a separate envelope.

☐ In your report, please acknowledge our firm as a contributor to the research.

☐ Please send a summary of the research results when complete.

Firm: ______________________________

Address: ______________________________

____

____

APPENDIX R
COVER SHEET ACCOMPANYING EACH QUESTIONNAIRE

Beverley G. Hope
East-West Center
Box 1650, 1777 East-West Road
Honolulu HI 96848
Phone: (808) 944-6403
Fax (808) 944-7070 (attn. Glen)
Email: bevhope@uhunix.uhcc.hawaii.edu

Date, 1994

Quality Leader:

Planning and Data Collection for Service Quality Improvement

We are conducting research to learn more about service quality improvement. **We hope you will be able to help us in this study by completing the enclosed survey.**

From our research in service firms we have developed models of service quality improvement and associated data needs. Your firm is one of a few firms we have contacted to obtain data on the relative strengths of some key links in these models. The more surveys we get back, the better will be our understanding of this important area. That is why your assistance in completing the surveys is so greatly needed.

Please read each question and give your opinion of the importance of the item in your quality planning and implementation. **The survey should take about two minutes to complete.**

Here is how to use the scales:

If you think that the item is important, circle the right-most marker:

Unimportant |——|——|——|——| Important

If you think that the item is somewhat important, circle the second-from-right marker:

Unimportant |——|——|——|——| Important

If you think that the item is neither particularly important nor unimportant, i.e., you have a neutral opinion about the item, circle the middle marker:

Unimportant |——|——|——|——| Important

and so on.

Numbers on the forms are for statistical purposes only. No specific answers or set of answers will be associated with any participating organization. **After you have answered all the questions, please return the survey in the enclosed postage-paid envelope.**

Thank you so much for your help.

Sincerely

APPENDIX S
FOLLOW UP LETTER TO NON-RESPONDENTS

EWC Box 1650
1777 East-West Road
Honolulu HI 96848

Phone: 944-6273
Fax: 944-7070 (attn. Glen)
Email: bevhope@uhunix.uhcc.hawaii.edu

Date, 1994

Contact Person,
Address

Person's Name:

A few weeks ago I sent brief questionnaires about service quality management to you and to quality managers in a few other firms. I have been pleased with the response and appreciate the time taken by individuals to distribute, to complete, and to return forms.

However, some surveys are still outstanding. The more surveys we get back, the better will be our understanding of service quality improvement and associated data needs. If you distributed the forms in your organization, my thanks. If you need additional questionnaires or further information please leave voice mail at 808-944-6273 or fax me at 808-944-7070 (attn. Glen). I appreciate your support of the research.

Sincerely

Beverley G. Hope
MBA *Kansas*, PhD (ABD) *Hawaii*

APPENDIX T
CATEGORIES PROVIDED TO EXPERTS

Quality Improvement at the Tactical and/or Operational Levels

"What activities or tasks must be completed at the tactical or operational level to achieve quality improvement?"

1. Identify opportunities for improvement
2. Select and define an opportunity (problem).
3. Benchmark against best in class.
4. Define the process associated with the problem.
5. Identify problem causes.
6. Develop and evaluate suggestions for improvements.
7. Implement and monitor selected changes (Redesign the process).
8. Sustain (Review, Standardize, Train).
9. Document.

Enabling strategies at the upper management level

"What must top management do at the strategic level to enable a total quality management system in an organization?"

1. Develop a shared vision.
2. Develop or modify the business mission and plan.
3. Develop an appropriate organizational culture.
4. Develop an appropriate organizational structure.
5. Supply needed resources.
6. Develop an appropriate reward system.

APPENDIX U
IMPLEMENTATION APPROACH FOR DATQUAL EXPERT SUPPORT SYSTEM

We developed DATQUAL as a network of objects, primarily windows, displays, and display items. **Objects** are items within the application which have a unique identity, value, and behavior. Each **object class** defines the general properties of a group of similar objects. For example, the pushbutton class defines common properties of all pushbuttons. **Attributes** describe important characteristics of the class. For example the pushbutton class has attributes for pen color, fill color, selected, label, attribute attachment, and display attachment. Values for attributes are stored in specific **instances** of object classes. For example, in DATQUAL the *bar help pb* is an instance of the *pushbutton* class of objects. This instance defines a pushbutton which appears at the top of most screen. We defined *bar help pb* as:

Example 1

```
INSTANCE bar help pb ISA pushbutton
  WITH label := "Help"
  WITH attribute attachment := show help1 OF show
  WITH location := 80,5,140,30
```

The first line declares *bar help pb* as an instance of the *pushbutton* object class. In this instance the pen color, fill color, and selected attributes assume the default values of black, grey, and FALSE, consequently they are not declared for this specific instance. The second line of the declaration causes the label "Help" to be written on the button. The last line defines the screen coordinates for the display of the button. The function of the attribute attachment is explained later.

Our development of DATQUAL consisted of three primary tasks: creating windows, creating displays, and connecting displays. The descriptions which follow use as their example aspects of the superimposed help window shown in Figure U.1

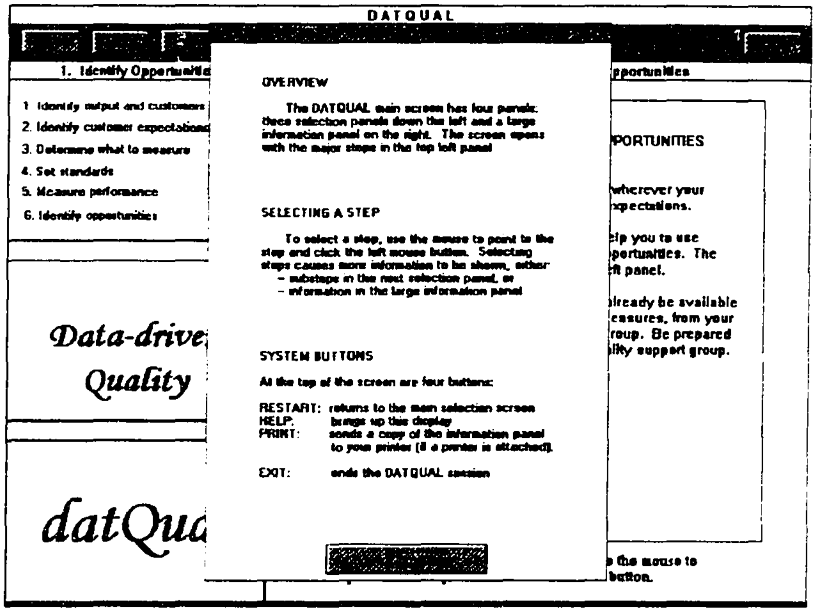


Figure U.1: DATQUAL Help Window

Creating Windows

DATQUAL Windows have standard Microsoft® Windows™ appearance and functions. Customized windows were created by declaring instances of a predefined object class with values for the class attributes: location, menus, style (moveable, sizeable, closebox, scrollable), title, visible, and output. DATQUAL has seven customized windows: a full screen window, a smaller "help" window, and five windows designed to be displayed simultaneously during most of a consultation session. For example, the declaration for the *help window* shown in Figure U.1 is:

Example 2

INSTANCE help window ISA window
WITH location := 200,18,600,575
WITH menus [1] := UNDETERMINED
WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable
WITH title := "About DATQUAL"
WITH visible := FALSE

The first line declares *Help About Window* as an instance of the window class of objects. The value of the location attribute fixes the screen coordinates for the window. The value UNDETERMINED for menus indicates that no menu items have been defined for this window. The values for the style attribute show that users will not be able to move or size the window (moveable CF FALSE, sizeable CF FALSE) but they will be able to close the window using a standard windows closebox. None of the windows we defined for DATQUAL are moveable or sizeable by users during run-time. The title to be displayed in the window's title bar is initialized to "About DATQUAL." This value will be changed during run time in response to different user selections, for example, in Figure U.1 the value has been changed to "DATQUAL Help."

In the *help window* declaration we initialized the visible attribute to FALSE and made no assignment to the output attribute. These values will be changed during run time. For example, when a user requests help by clicking the help button, the relevant **instance of the display class** will be assigned to the output attribute and the visible attribute will be changed to TRUE. This causes the relevant information to be displayed in a window which is superimposed on currently active windows.

Creating Displays

Displays provide information to users when they are output to a window. Each **instance of the display class** is a collection **display items** which comprise a particular display. Display items commonly used in DATQUAL include textboxes, hyperregions, pictureboxes, and pushbuttons. For example, the *help* display has just two items, a textbox instance and a pushbutton instance. The resultant PRL declaration is:

Example 3

```
INSTANCE help ISA display
 WITH wait := FALSE
 WITH delay changes := FALSE
 WITH items [1 ] := help tb
 WITH items [2 ] := help close pb
 WITH menus [1 ] := UNDETERMINED
```

The first line declares *help* as an instance of the display class of objects. The wait and delay changes attributes have no function in this instance, hence they are initialized to FALSE, and no menus are defined. Display item 1 is a textbox which will contain the text specified in the *help tb*. Display item 2 defines a pushbutton to close the window.

Help tb and *help close pb* are in turn instances of other object classes. For example, the *help tb* is an instance of the textbox class. Its declaration is given below:

Example 4

```
INSTANCE help tb ISA textbox
 WITH pen color := 0,0,128
 WITH justify IS left
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE,
      strikeout CF FALSE
 WITH font size := 8
 WITH frame := FALSE
 WITH filename := "C:\\L5O30\\DATQUAL\\H_ABOUT.TXT"
 WITH text := ""
 WITH location := 51,18,351,488
```

The first line declares *help tb* as an instance of the textbox system class. The pen color is set to blue (value := 0,0,128). Fill color (background) defaults to white and is not shown in the declaration. The values for justify, font, font style, and font size attributes cause the text to be left justified and printed in bold, 8 point, MS Sans Serif font. Filename is initialized to the specified text file. During runtime, the application will locate and import specified text files for display in the textbox. The location value positions the text at the specified coordinates within the window.

We created DATQUAL displays in LEVEL5 OBJECT's interactive graphical display editor. In this environment display items can be positioned or resized either by respecifying the location coordinates or by moving or resizing objects on the screen using a mouse. Displays are the primary informational object in our application.

Connecting displays

In DATQUAL methods are used to link displays. Methods are procedures for determining an attribute values (When Needed method) or reacting to changes in an attribute values (When Changed method). We used When Changed methods to link displays in DATQUAL. We did this by defining object classes with collections of simple (true/false) attributes each of which had a When Changed method specified within their declaration. When a user makes a selection during run time an attribute of one instance of this class is set to TRUE, thereby invoking the method specified in its declaration.

For example, the object class *show* has 7 simple attributes. One of these is the attribute *show help1* used to display a help screen to a user. This attribute of the *show* object class is attached to the *help pb* in its declaration (see Example 1). When a user clicks on a Help button during run-time, the value of this simple attribute changes to TRUE and the specified method is invoked. The PRL declaration for the *show help1* attribute is:

Example 5

```
WITH show help1 SIMPLE
  WHEN CHANGED
   BEGIN
    visible OF help window := FALSE
    title OF help window := "DATQUAL  help"
    filename OF help tb := "h_help1.txt"
    output OF help window := help
    visible OF help window := TRUE
   END
```

This declaration superimposes the *help window* in the center of the screen, and causes the window to display the text contained in the "h_help1.txt" file together with other items contained in the display instance *help display*.

Putting It All Together

A visual representation of the relationship among windows, displays, display items, and methods as used in DATQUAL is shown in Figure U.2. This representation uses the objects previously described.

1. ***We created instances of the window class***, defining each instance by designating values for each of the class attributes. In this example the instance *help* is created and defined.

2. ***We created instances of the display class***. Each instance contains a collection of display items. In this example the instance *help* instance is created. At run time the relevant displays are output to designated windows in response to user selections. In this example the *help* display is output to the *help window*.

3. ***We defined display items for each display***. Each display item is, itself, a separate object with associated attribute values. In this *help tb* and *help close pb* are

the display items which make up the *help* display. Most displays contain many more display items; for clarity we selected the simplest display for this demonstration.

4. ***We wrote methods to connect displays and methods*** in response to user selections. Pushbutton and hyperregion display items were attached to displays or attributes of other objects. In this example, the *help close pb* has the *close help* attribute of the *show* object class attached. During run-time, when the user clicks on the close pushbutton the method specified in this attribute's declaration is invoked.

This example shows just a small section of the DATQUAL network of objects -- windows, displays and display items linked by methods.

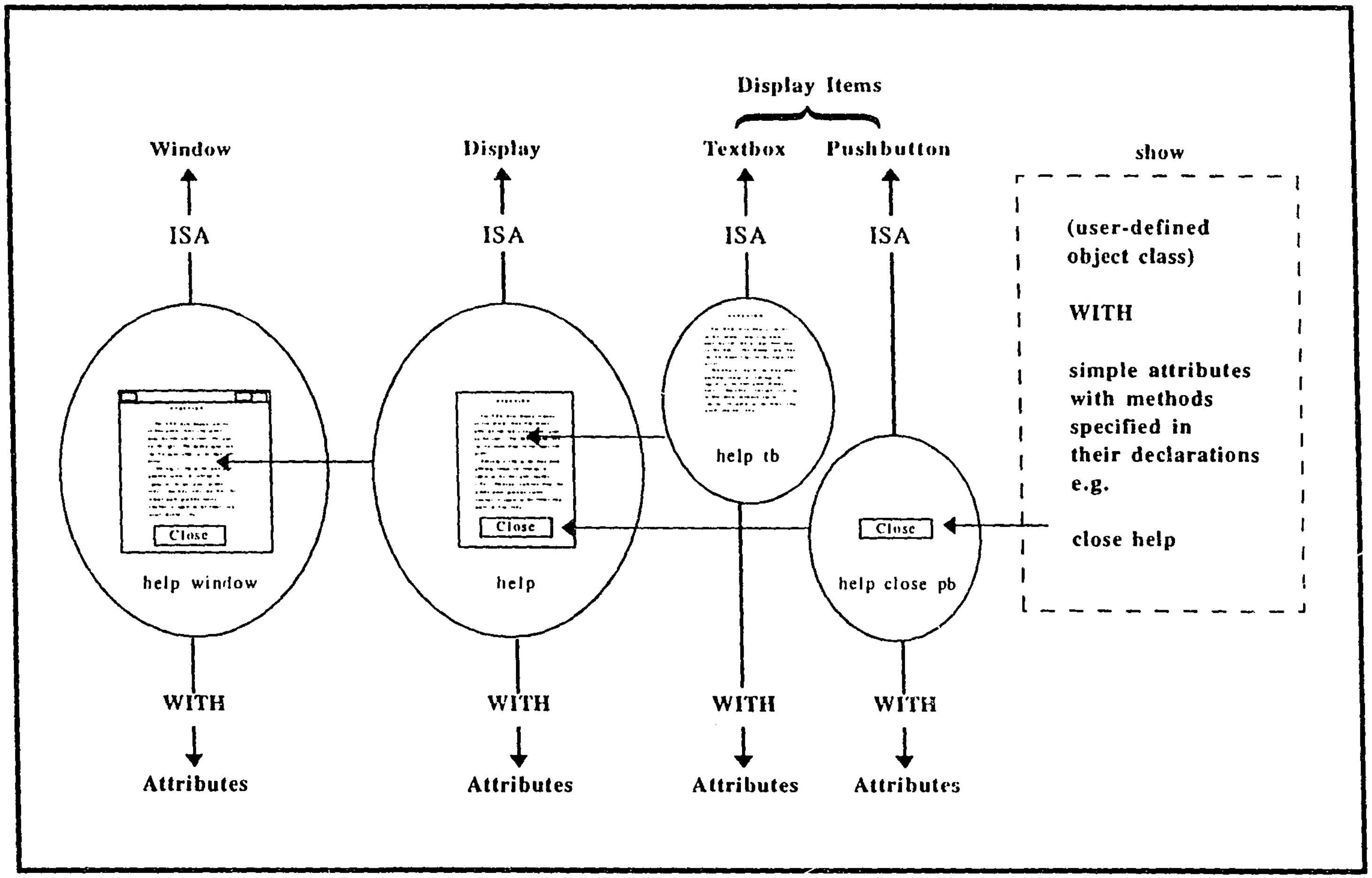


Figure U.2: Relationship Among Common DATQUAL objects

APPENDIX V
PRL DEFINITIONS OF OBJECTS AND INSTANCES USED IN THE SAMPLE SESSION

```
$VERSION30
$LOCATIONS ARE PIXELS

CLASS prinfile INHERITS add on
 WITH filename STRING
 WITH print SIMPLE

CLASS show
 WITH show about SIMPLE
  WHEN CHANGED
   BEGIN
    visible OF help window := FALSE
    title OF help window := "About DATQUAL"
    filename OF help tb := "h_about.txt"
    output OF help window := help
    visible OF help window := TRUE
   END
 WITH close help SIMPLE
  WHEN CHANGED
   BEGIN
    visible OF help window := FALSE
   END
 WITH show help1 SIMPLE
  WHEN CHANGED
   BEGIN
    visible OF help window := FALSE
    title OF help window := "DATQUAL  help"
    filename OF help tb := "h_help1.txt"
    output OF help window := help
    visible OF help window := TRUE
   END
 WITH restart from bar SIMPLE
  WHEN CHANGED
   BEGIN
    output OF main window := mains
    visible OF main window := TRUE
    visible OF bar window := FALSE
    visible OF level1 window := FALSE
    visible OF level2 window := FALSE
```

```
      visible OF level3 window := FALSE
      visible OF tutor window := FALSE
    END
  WITH exit from bar SIMPLE
   WHEN CHANGED
    BEGIN
      output OF main window := conclusion
      visible OF main window := TRUE
      visible OF bar window := FALSE
      visible OF level1 window := FALSE
      visible OF level2 window := FALSE
      visible OF level3 window := FALSE
      visible OF tutor window := FALSE
    END
  WITH no hyper SIMPLE
```

CLASS show dca

```
 WITH show dca3b SIMPLE
   WHEN CHANGED
    BEGIN
      output OF level3 window := level3
      output OF level2 window := level2
      title OF level3 window := "Graphs and Charts"
      output OF tutor window := tutor1
      title OF tutor window := "Graphs and Charts"
      filename OF tutor1 text1 := "tdca3b.txt"
      filename OF tutor1 text2 := "t_infl.txt"
      filename OF prinfile 1 := filename OF tutor1 text1
      filename OF level3 text1 := "s_dca3b1.txt"
      filename OF level3 text2 := "s_dca3b2.txt"
      filename OF level3 text3 := "s_dca3b3.txt"
      filename OF level3 text4 := "s_dca3b4.txt"
      filename OF level3 text5 := "s_dca3b5.txt"
      filename OF level3 text6 := "s_dca3b6.txt"
      attribute attachment OF level3 hyper1 := show dca3b1 OF show dca
      attribute attachment OF level3 hyper2 := show dca3b2 OF show dca
      attribute attachment OF level3 hyper3 := show dca3b3 OF show dca
      attribute attachment OF level3 hyper4 := show dca3b4 OF show dca
      attribute attachment OF level3 hyper5 := show dca3b5 OF show dca
      attribute attachment OF level3 hyper6 := show dca3b6 OF show dca
      visible OF level3 window := TRUE
      visible OF level2 window := TRUE
      visible OF level1 window := TRUE
```

```
      visible OF tutor window := TRUE
    END
  WITH show dca3b4 SIMPLE
   WHEN CHANGED
    BEGIN
      title OF tutor window := "Histograms"
      filename OF tutor1 text1 := "tdca3b4.txt"
      filename OF tutor1 text2 := "t_infl.txt"
      filename OF prinfile 1 := filename OF tutor1 text1
    END
```

CLASS show step1

```
 WITH show st 1 SIMPLE
  WHEN CHANGED
   BEGIN
     output OF main window := clean
     output OF bar window := menu bar
     output OF level3 window := level3 graphic
     output OF level2 window := level2 graphic
     title OF level3 window := " "
     title OF level2 window := " "
     output OF tutor window := tutor1
     title OF tutor window := "Identifying Quality Improvement Opportunities"
     filename OF tutor1 text1 := "t1.txt"
     filename OF tutor1 text2 := "t_infl.txt"
     filename OF prinfile 1 := filename OF tutor1 text1
     output OF level1 window := level1
     title OF level1 window := "1.  Identify Opportunities"
     filename OF level1 text1 := "s1_1.txt"
     filename OF level1 text2 := "s1_2.txt"
     filename OF level1 text3 := "s1_3.txt"
     filename OF level1 text4 := "s1_4.txt"
     filename OF level1 text5 := "s1_5.txt"
     filename OF level1 text6 := "s1_6.txt"
     attribute attachment OF level1 hyper1 := show st 1_1 OF show step1
     attribute attachment OF level1 hyper2 := show st 1_2 OF show step1
     attribute attachment OF level1 hyper3 := show st 1_3 OF show step1
     attribute attachment OF level1 hyper4 := show st 1_4 OF show step1
     attribute attachment OF level1 hyper5 := show st 1_5 OF show step1
     attribute attachment OF level1 hyper6 := show st 1_6 OF show step1
     visible OF bar window := TRUE
     visible OF level3 window := TRUE
     visible OF level2 window := TRUE
```

```
      visible OF level1 window := TRUE
      visible OF tutor window := TRUE
      visible OF main window := FALSE
    END
 WITH show st 1_1 SIMPLE
  WHEN CHANGED
    BEGIN
      output OF bar window := menu bar
      output OF level3 window := level3 graphic
      output OF level2 window := level2
      title OF level3 window := " "
      title OF level2 window := "Tools and Techniques "
      output OF tutor window := tutor1
      title OF tutor window := "Identifying Output and Customers of Output"
      filename OF tutor1 text1 := "t1_1.txt"
      filename OF tutor1 text2 := "t_infl.txt"
      filename OF prinfile 1 := filename OF tutor1 text1
      filename OF level2 text1 := "s_blank.txt"
      filename OF level2 text2 := "s_brains.txt"
      filename OF level2 text3 := "s_affini.txt"
      filename OF level2 text4 := "s_blank.txt"
      filename OF level2 text5 := "s_blank.txt"
      filename OF level2 text6 := "s_blank.txt"
      attribute attachment OF level2 hyper1 := no hyper OF show
      attribute attachment OF level2 hyper2 := show brainstorming OF show tools
      attribute attachment OF level2 hyper3 := show affinity OF show tools
      attribute attachment OF level2 hyper4 := no hyper OF show
      attribute attachment OF level2 hyper5 := no hyper OF show
      attribute attachment OF level2 hyper6 := no hyper OF show
      visible OF bar window := TRUE
      visible OF level3 window := TRUE
      visible OF level2 window := TRUE
      visible OF level1 window := TRUE
      visible OF tutor window := TRUE
    END
 WITH show st 1_2 SIMPLE
  WHEN CHANGED
    BEGIN
      output OF bar window := menu bar
      output OF level3 window := level3
      output OF level2 window := level2
      title OF level2 window := "Planning Data Collection "
      title OF level3 window := "Determining Needs"
```

```
      output OF tutor window := tutor1
      title OF tutor window := "Identifying Customer Expectations"
      filename OF tutor1 text1 := "t1_2.txt"
      filename OF tutor1 text2 := "t_infl.txt"
      filename OF prinfile 1 := filename OF tutor1 text1
      filename OF level3 text1 := "s_blank.txt"
      filename OF level3 text2 := "s1_2_a.txt"
      filename OF level3 text3 := "s1_2_b.txt"
      filename OF level3 text4 := "s_blank.txt"
      filename OF level3 text5 := "s_blank.txt"
      filename OF level3 text6 := "s_blank.txt"
      attribute attachment OF level3 hyper1 := no hyper OF show
      attribute attachment OF level3 hyper2 := show st 1_2_a OF show step1
      attribute attachment OF level3 hyper3 := show st 1_2_b OF show step1
      attribute attachment OF level3 hyper4 := no hyper OF show
      attribute attachment OF level3 hyper5 := no hyper OF show
      attribute attachment OF level3 hyper6 := no hyper OF show
      filename OF level2 text1 := "s_dca1.txt"
      filename OF level2 text2 := "s_dca2.txt"
      filename OF level2 text3 := "s_dca3.txt"
      filename OF level2 text4 := "s_dca3b.txt"
      filename OF level2 text5 := "s_dca4.txt"
      filename OF level2 text6 := "s_dca4b.txtt"
      attribute attachment OF level2 hyper1 := show dca1 OF show dca
      attribute attachment OF level2 hyper2 := show dca2 OF show dca
      attribute attachment OF level2 hyper3 := show dca3 OF show dca
      attribute attachment OF level2 hyper4 := show dca3b OF show dca
      attribute attachment OF level2 hyper5 := show dca4 OF show dca
      attribute attachment OF level2 hyper6 := show dca4b OF show dca
      visible OF bar window := TRUE
      visible OF level3 window := TRUE
      visible OF level2 window := TRUE
      visible OF level1 window := TRUE
      visible OF tutor window := TRUE
    END
WITH show st 1_2_a SIMPLE
  WHEN CHANGED
    BEGIN
      title OF tutor window := "Identifying Needs of External Customers"
      filename OF tutor1 text1 := "t1_2_a.txt"
      filename OF tutor1 text2 := "t_infl.txt"
      filename OF prinfile 1 := filename OF tutor1 text1
    END
```

INSTANCE prinfile 1 ISA prinfile

INSTANCE the application ISA application
WITH unknowns fail := TRUE
WITH threshold := 50
WITH title display := TD
WITH ignore breakpoints := FALSE
WITH reasoning on := FALSE
WITH numeric precision := 8

INSTANCE menu bar ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := bar colorbar tb
WITH items [2] := bar restart pb
WITH items [3] := bar help pb
WITH items [4] := bar print pb
WITH items [5] := bar exit pb
WITH menus [1] := UNDETERMINED

INSTANCE TD ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := TD colorbar tb
WITH items [2] := TD continue pb
WITH items [3] := TD about pb
WITH items [4] := TD frame tb
WITH items [5] := TD copyright tb
WITH items [6] := TD logo pic
WITH items [7] := TD datqual tb
WITH items [8] := TD descriptor tb
WITH items [9] := TD exit pb
WITH menus [1] := UNDETERMINED

INSTANCE conclusion ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := conclusion colorbar tb
WITH items [2] := conclusion frame tb
WITH items [3] := conclusion copyright tb
WITH items [4] := UNDETERMINED
WITH items [5] := conclusion text1 tb
WITH items [6] := conclusion datqual tb

WITH items [7] := conclusion text2 tb
WITH items [8] := conclusion exit pb
WITH items [9] := conclusion restart pb
WITH items [10] := conclusion text3 tb
WITH menus [1] := UNDETERMINED

INSTANCE mains ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := mains steps hr
WITH items [2] := mains tools hr
WITH items [3] := MS colorbar tb
WITH items [4] := ms exit pb
WITH items [5] := MS frame tb
WITH items [6] := MS copyright tb
WITH items [7] := mains instruct tb
WITH items [8] := MS tools tb
WITH items [9] := mains arrow1 pic
WITH items [10] := mains arrow2 pic
WITH items [11] := mains arrow3 pic
WITH items [12] := mains arrow4 pic
WITH items [13] := mains arrow5 pic
WITH items [14] := mains step1 tb
WITH items [15] := mains step2 tb
WITH items [16] := mains step3 tb
WITH items [17] := mains step4 tb
WITH items [18] := mains step5 tb
WITH items [19] := MS num1 tb
WITH items [20] := MS num2 tb
WITH items [21] := MS num3 tb
WITH items [22] := MS num4 tb
WITH items [23] := MS num5 tb
WITH items [24] := MS datqual tb
WITH items [25] := mains title tb
WITH items [26] := mains step6 tb
WITH items [27] := MS num6 tb
WITH menus [1] := UNDETERMINED

INSTANCE help ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := help tb

WITH items [2] := help close pb
WITH menus [1] := UNDETERMINED

INSTANCE level2 graphic ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := level2 graphic tb
WITH menus [1] := UNDETERMINED

INSTANCE level3 graphic ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := UNDETERMINED
WITH items [2] := level3 graphic tb
WITH menus [1] := UNDETERMINED

INSTANCE level3 ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := level3 hyper1
WITH items [2] := level3 hyper2
WITH items [3] := level3 hyper3
WITH items [4] := level3 hyper4
WITH items [5] := level3 hyper5
WITH items [6] := level3 hyper6
WITH items [7] := level3 text1
WITH items [8] := level3 text2
WITH items [9] := level3 text3
WITH items [10] := level3 text4
WITH items [11] := level3 text5
WITH items [12] := level3 text6
WITH menus [1] := UNDETERMINED

INSTANCE clean ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := UNDETERMINED
WITH menus [1] := UNDETERMINED

INSTANCE tutor1 ISA display
WITH wait := FALSE
WITH delay changes := FALSE
WITH items [1] := tutor1 frame tb

```
 WITH items [2 ] := tutor1 text1
 WITH items [3 ] := tutor1 text2
 WITH menus [1 ] := UNDETERMINED

INSTANCE level1 ISA display
 WITH wait := FALSE
 WITH delay changes := FALSE
 WITH items [1 ] := level1 hyper1
 WITH items [2 ] := level1 hyper2
 WITH items [3 ] := level1 hyper3
 WITH items [4 ] := level1 hyper4
 WITH items [5 ] := level1 hyper5
 WITH items [6 ] := level1 hyper6
 WITH items [7 ] := level1 text1
 WITH items [8 ] := level1 text3
 WITH items [9 ] := level1 text2
 WITH items [10 ] := level1 text4
 WITH items [11 ] := level1 text5
 WITH items [12 ] := level1 text6
 WITH menus [1 ] := UNDETERMINED

INSTANCE level2 ISA display
 WITH wait := FALSE
 WITH delay changes := FALSE
 WITH items [1 ] := level2 hyper1
 WITH items [2 ] := level2 hyper2
 WITH items [3 ] := level2 hyper3
 WITH items [4 ] := level2 hyper4
 WITH items [5 ] := level2 hyper5
 WITH items [6 ] := level2 hyper6
 WITH items [7 ] := level2 text1
 WITH items [8 ] := level2 text2
 WITH items [9 ] := level2 text3
 WITH items [10 ] := level2 text4
 WITH items [11 ] := level2 text5
 WITH items [12 ] := level2 text6
 WITH menus [1 ] := UNDETERMINED

INSTANCE level1 hyper1 ISA hyperregion
 WITH attribute attachment := show dca1 OF show dca
 WITH location := 10,17,250,32
```

```
INSTANCE level1 hyper2 ISA hyperregion
  WITH attribute attachment := show dca2 OF show dca
  WITH location := 10,39,250,54

INSTANCE level1 hyper3 ISA hyperregion
  WITH attribute attachment := show dca3 OF show dca
  WITH location := 10,61,250,76

INSTANCE level1 hyper4 ISA hyperregion
  WITH location := 10,83,250,98

INSTANCE level1 hyper5 ISA hyperregion
  WITH attribute attachment := show dca4 OF show dca
  WITH location := 10,105,250,120

INSTANCE level1 hyper6 ISA hyperregion
  WITH attribute attachment := show dca4b OF show dca
  WITH location := 10,127,250,142

INSTANCE level2 hyper1 ISA hyperregion
  WITH location := 10,17,250,32

INSTANCE level2 hyper2 ISA hyperregion
  WITH location := 10,39,250,54

INSTANCE level2 hyper3 ISA hyperregion
  WITH location := 10,61,250,76

INSTANCE level2 hyper4 ISA hyperregion
  WITH location := 10,83,250,98

INSTANCE level2 hyper5 ISA hyperregion
  WITH location := 10,105,250,120

INSTANCE level2 hyper6 ISA hyperregion
  WITH location := 10,127,250,142

INSTANCE level3 hyper1 ISA hyperregion
  WITH visible := FALSE
  WITH location := 10,17,250,32
```

INSTANCE level3 hyper2 ISA hyperregion
WITH visible := FALSE
WITH location := 10,39,250,54

INSTANCE level3 hyper3 ISA hyperregion
WITH visible := FALSE
WITH location := 10,61,250,76

INSTANCE level3 hyper4 ISA hyperregion
WITH visible := FALSE
WITH location := 10,83,250,98

INSTANCE level3 hyper5 ISA hyperregion
WITH visible := FALSE
WITH location := 10,105,250,120

INSTANCE level3 hyper6 ISA hyperregion
WITH visible := FALSE
WITH location := 10,127,250,142

INSTANCE mains steps hr ISA hyperregion
WITH attribute attachment := show st 1 OF show step1
WITH location := 470,80,750,500

INSTANCE mains tools hr ISA hyperregion
WITH attribute attachment := show tool & tech OF show tools
WITH location := 123,378,280,485

INSTANCE TD logo pic ISA picturebox
WITH clipped := FALSE
WITH filename := "C:\\L5O30\\DATQUAL\\LOGO.BMP"
WITH location := 330,65,760,440

INSTANCE mains arrow1 pic ISA picturebox
WITH clipped := FALSE
WITH filename := "C:\\L5O30\\DATQUAL\\ARROW1.BMP"
WITH location := 580,110,665,150

INSTANCE mains arrow2 pic ISA picturebox
WITH clipped := FALSE
WITH filename := "C:\\L5O30\\DATQUAL\\ARROW1.BMP"
WITH location := 580,185,665,225

```
INSTANCE mains arrow3 pic ISA picturebox
  WITH clipped := FALSE
  WITH filename := "C:\\L5O30\\DATQUAL\\ARROW1.BMP"
  WITH location := 580,260,665,300

INSTANCE mains arrow4 pic ISA picturebox
  WITH clipped := FALSE
  WITH filename := "C:\\L5O30\\DATQUAL\\ARROW1.BMP"
  WITH location := 580,335,665,375

INSTANCE mains arrow5 pic ISA picturebox
  WITH clipped := FALSE
  WITH filename := "C:\\L5O30\\DATQUAL\\ARROW1.BMP"
  WITH location := 580,410,665,450

INSTANCE bar restart pb ISA pushbutton
  WITH label := "Restart"
  WITH attribute attachment := restart from bar OF show
  WITH display attachment := mains
  WITH location := 10,4,70,29

INSTANCE bar help pb ISA pushbutton
  WITH label := "Help"
  WITH attribute attachment := show help1 OF show
  WITH location := 80,5,140,30

INSTANCE bar print pb ISA pushbutton
  WITH label := "Print"
  WITH attribute attachment := print OF prinfile 1
  WITH location := 150,4,210,29

INSTANCE bar exit pb ISA pushbutton
  WITH label := "Exit"
  WITH attribute attachment := exit from bar OF show
  WITH display attachment := conclusion
  WITH location := 730,5,790,30

INSTANCE TD continue pb ISA pushbutton
  WITH label := "Continue"
  WITH display attachment := mains
  WITH location := 10,5,75,30
```

INSTANCE TD about pb ISA pushbutton
WITH label := "about ..."
WITH attribute attachment := show about OF show
WITH location := 85,5,150,30

INSTANCE conclusion exit pb ISA pushbutton
WITH pen color := 0,0,0
WITH fill color := 192,192,192
WITH label := "Restart"
WITH display attachment := mains
WITH location := 10,5,75,30

INSTANCE conclusion restart pb ISA pushbutton
WITH pen color := 0,0,0
WITH fill color := 192,192,192
WITH label := "Exit"
WITH attribute attachment := exit OF application
WITH location := 730,5,790,30

INSTANCE ms exit pb ISA pushbutton
WITH label := "Exit"
WITH display attachment := conclusion
WITH location := 730,5,790,30

INSTANCE TD exit pb ISA pushbutton
WITH label := "Exit"
WITH display attachment := conclusion
WITH location := 730,5,790,30

INSTANCE help close pb ISA pushbutton
WITH label := "Close"
WITH attribute attachment := close help OF show
WITH location := 120,500,280,530

INSTANCE bar colorbar tb ISA textbox
WITH pen color := 0,0,0
WITH fill color := 0,0,0
WITH justify IS left
WITH font := "System"
WITH text := ""
WITH location := 0,0,800,35

INSTANCE TD colorbar tb ISA textbox
WITH pen color := 0,0,0
WITH fill color := 0,0,0
WITH justify IS left
WITH font := "System"
WITH text := ""
WITH location := 0,0,800,35

INSTANCE TD frame tb ISA textbox
WITH justify IS left
WITH font := "System"
WITH frame := TRUE
WITH text := ""
WITH location := 20,55,780,550

INSTANCE TD copyright tb ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 10
WITH text := "Beverley G. Hope, 1995"
WITH location := 310,555,490,580

INSTANCE TD datqual tb ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "Monotype Corsiva"
WITH font style IS bold, italic, underline CF FALSE, strikeout CF FALSE
WITH font size := 72
WITH text := "datQual"
WITH location := 81,319,401,441

INSTANCE TD descriptor tb ISA textbox
WITH pen color := 128,0,0
WITH fill color := 255,255,255
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 14

WITH text := "A structured guide to continuous improvement in service quality"
WITH location := 70,440,410,490

INSTANCE conclusion colorbar tb ISA textbox
WITH pen color := 0,0,0
WITH fill color := 0,0,0
WITH justify IS left
WITH font := "System"
WITH text := ""
WITH location := 0,0,800,35

INSTANCE conclusion frame tb ISA textbox
WITH justify IS left
WITH font := "System"
WITH frame := TRUE
WITH text := ""
WITH location := 19,49,779,544

INSTANCE conclusion copyright tb ISA textbox
WITH pen color := 0,0,128
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 10
WITH text := "Beverley G. Hope, 1995"
WITH location := 310,555,490,580

INSTANCE conclusion text1 tb ISA textbox
WITH pen color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 18
WITH text := "Thank you for using"
WITH location := 80,140,320,180

INSTANCE conclusion datqual tb ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "Monotype Corsiva"

WITH font style IS bold, italic, underline CF FALSE, strikeout CF FALSE
WITH font size := 72
WITH text := "datQual"
WITH location := 130,185,469,301

INSTANCE conclusion text2 tb ISA textbox
WITH pen color := 0,0,128
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 14
WITH text := "Are you sure you want to exit DATQUAL?"
WITH location := 340,415,740,450

INSTANCE conclusion text3 tb ISA textbox
WITH pen color := 0,0,128
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 10
WITH text := "Click Restart to continue with DATQUAL
Click Exit to finish your session."
WITH location := 400,450,690,490

INSTANCE MS colorbar tb ISA textbox
WITH pen color := 0,0,0
WITH fill color := 0,0,0
WITH justify IS left
WITH font := "System"
WITH text := ""
WITH location := 0,0,800,35

INSTANCE MS frame tb ISA textbox
WITH justify IS left
WITH font := "System"
WITH frame := TRUE
WITH text := ""
WITH location := 19,63,779,548

INSTANCE MS copyright tb ISA textbox
WITH pen color := 0,0,128

WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 10
WITH text := "Beverley G. Hope, 1995"
WITH location := 310,555,490,580

INSTANCE mains instruct tb ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12
WITH text := "The major steps of DATQUAL are listed on the left. To begin a consultation, click on any of the steps.
OR
If you just want to review a tool or technique, chose the Tools and Techniques box below."
WITH location := 65,105,345,270

INSTANCE MS tools tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12
WITH text := "Tools and
Techniques"
WITH location := 120,430,230,475

INSTANCE mains step1 tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12

WITH text := "Identify output
and customers"
WITH location := 500,80,750,125

INSTANCE mains step2 tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12
WITH text := "Identify customer
expectations"
WITH location := 500,155,750,200

INSTANCE mains step3 tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12
WITH text := "Determine what
to measure"
WITH location := 500,230,750,275

INSTANCE mains step4 tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0
WITH justify IS center
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 12
WITH text := "Set
standards"
WITH location := 500,305,750,350

INSTANCE mains step5 tb ISA textbox
WITH pen color := 255,255,255
WITH fill color := 128,0,0

```
 WITH justify IS center
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 12
 WITH text := "Measure
performance"
 WITH location := 500,380,750,425
```

INSTANCE help tb ISA textbox

```
 WITH pen color := 0,0,128
 WITH justify IS left
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 8
 WITH frame := FALSE
 WITH filename := "C:\\L5O30\\DATQUAL\\H_ABOUT.TXT"
 WITH text := ""
 WITH location := 51,18,351,488
```

INSTANCE level2 graphic tb ISA textbox

```
 WITH pen color := 0,0,128
 WITH justify IS center
 WITH font := "Monotype Corsiva"
 WITH font style IS bold, italic, underline CF FALSE, strikeout CF FALSE
 WITH font size := 28
 WITH text := "Data-driven
Quality"
 WITH location := 40,50,215,145
```

INSTANCE level3 graphic tb ISA textbox

```
 WITH pen color := 128,0,0
 WITH justify IS left
 WITH font := "Monotype Corsiva"
 WITH font style IS bold, italic, underline CF FALSE, strikeout CF FALSE
 WITH font size := 48
 WITH text := "datQual"
 WITH location := 30,40,235,125
```

INSTANCE tutor1 text1 ISA textbox

```
 WITH pen color := 0,0,0
 WITH justify IS left
```

```
 WITH font := "System"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 10
 WITH frame := FALSE
 WITH scroll := TRUE
 WITH horizontal scroll := FALSE
 WITH text := ""
 WITH location := 48,20,492,459

INSTANCE tutor1 text2 ISA textbox
 WITH pen color := 0,0,128
 WITH justify IS left
 WITH font := "MS Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 10
 WITH filename := "C:\\L5O30\\DATQUAL\\T_INF1.TXT"
 WITH text := ""
 WITH location := 80,470,460,510

INSTANCE level1 text1 ISA textbox
 WITH pen color := 128,0,0
 WITH justify IS left
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 8
 WITH text := ""
 WITH location := 11,18,251,33

INSTANCE level1 text3 ISA textbox
 WITH pen color := 128,0,0
 WITH justify IS left
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 8
 WITH text := ""
 WITH location := 10,61,250,76

INSTANCE level1 text2 ISA textbox
 WITH pen color := 128,0,0
```

WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,39,250,54

INSTANCE level1 text4 ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,83,250,98

INSTANCE level1 text5 ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 11,103,251,118

INSTANCE level1 text6 ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH frame := FALSE
WITH text := ""
WITH location := 13,127,253,142

INSTANCE level2 text1 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS left

WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,17,250,32

INSTANCE level2 text2 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,40,250,55

INSTANCE level2 text3 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 11,61,251,76

INSTANCE level2 text4 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,84,250,99

INSTANCE level2 text5 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255

WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,105,250,120

INSTANCE level2 text6 ISA textbox
WITH pen color := 0,0,128
WITH fill color := 255,255,255
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,127,250,142

INSTANCE level3 text1 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,17,250,32

INSTANCE level3 text2 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,39,250,54

INSTANCE level3 text3 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8

WITH text := ""
WITH location := 10,61,250,76

INSTANCE level3 text4 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 12,82,252,97

INSTANCE level3 text5 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,105,250,120

INSTANCE level3 text6 ISA textbox
WITH justify IS left
WITH font := "MS Sans Serif"
WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF FALSE
WITH font size := 8
WITH text := ""
WITH location := 10,127,250,142

INSTANCE MS datqual tb ISA textbox
WITH pen color := 128,0,0
WITH justify IS left
WITH font := "Monotype Corsiva"
WITH font style IS bold, italic, underline CF FALSE, strikeout CF FALSE
WITH font size := 28
WITH text := "datQual"
WITH location := 114,377,241,424

INSTANCE tutor1 frame tb ISA textbox
WITH justify IS left
WITH font := "System"
WITH frame := TRUE

```
 WITH text := ""
 WITH location := 28,19,493,461

INSTANCE mains title tb ISA textbox
 WITH pen color := 128,0,0
 WITH justify IS center
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 24
 WITH frame := TRUE
 WITH text := "datQual"
 WITH location := 90,50,315,92

INSTANCE mains step6 tb ISA textbox
 WITH pen color := 255,255,255
 WITH fill color := 128,0,0
 WITH justify IS center
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 12
 WITH text := "Identify
opportunities"
 WITH location := 500,455,750,500

INSTANCE mains num6 tb ISA textbox
 WITH pen color := 128,0,0
 WITH justify IS center
 WITH font := "MS Sans Serif"
 WITH font style IS bold, italic CF FALSE, underline CF FALSE, strikeout CF
FALSE
 WITH font size := 24
 WITH text := "6"
 WITH location := 470,460,490,495

INSTANCE main window ISA window
 WITH location := 48,48,798,528
 WITH full screen := TRUE
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable
 WITH title := "DATQUAL"
 WITH visible := TRUE
```

```
INSTANCE help window ISA window
 WITH location := 200,18,600,575
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable
 WITH title := "About DATQUAL"
 WITH visible := FALSE

INSTANCE bar window ISA window
 WITH location := 0,0,800,55
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable CF FALSE
 WITH title := "D A T Q U A L"
 WITH visible := FALSE

INSTANCE level1 window ISA window
 WITH location := 0,55,260,235
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable CF FALSE
 WITH title := "Identify Opportunities"
 WITH visible := FALSE

INSTANCE level2 window ISA window
 WITH location := 0,235,260,415
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable CF FALSE
 WITH title := ""
 WITH visible := FALSE

INSTANCE level3 window ISA window
 WITH location := 0,415,260,595
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable CF FALSE
 WITH title := "(Untitled)"
 WITH visible := FALSE

INSTANCE tutor window ISA window
 WITH location := 260,55,800,595
 WITH menus [1 ] := UNDETERMINED
 WITH style IS moveable CF FALSE, sizeable CF FALSE, closeable
 WITH title := "Notes"
 WITH visible := TRUE
END
```

REFERENCES

Agarwal, R., & Tanniru, M. (1992). A structured methodology for developing production systems. ***Decision Support Systems***, 8(1), 483-499.

Albrecht, K., & Zemke, R. (1985). ***Service America: Doing business in the new economy.*** Homewood, IL: Dow Jones-Irwin.

American Management Association (1991). ***Blueprints for service quality: The Federal Express approach.*** New York, NY: AMA Membership Publications.

Anderson, D. (1990). The role of senior management in total quality. In A. G. Tank (Ed.), ***Global perspectives on total quality*** (Report No. 958, p. 17). New York, NY: The Conference Board.

Akao, Y. (Ed.) (1991) ***Hoshin Kanri: Policy Deployment for Successful TQM.*** Cambridge, MA: Productivity Press.

Bateson, J. E. G. (1979). Why we need service marketing. In O. C. Ferrell, S. W. Brown, & C. W. Lamb (Eds.), ***Conceptual and Theoretical Developments in Marketing*** (pp. 131-146). Chicago, IL: American Marketing.

Berry, L. L. (1980). Services marketing is different. ***Business***, 30(3), 24-29.

Berry, T. H. (1991). ***Managing the total quality transformation.*** New York: McGraw-Hill.

Berry, L. L., Zeithaml, V. A., & Parasuraman, A. (1985). Quality counts in services too. ***Business Horizons***, 28(3), 44-53.

Bhote, K. R. (1991). ***Next operation as customer (NOAC): How to improve quality, cost, and cycle time in service operations.*** New York, NY: American Management Association.

Bitner, M. J., Booms, B. H., & Tetreault, M. S. (1990). The service encounter: Diagnosing favorable and unfavorable incidents. ***Journal of Marketing***, 54, 71-84.

Bojanic, D. C. (1991). Quality measurement in professional services firms. ***Journal of Professional Services Marketing***, 7(2), 27-36.

Bowen, D. E. & Cummings, T. G. (1990). Suppose we took services seriously. In D. E. Bowen, R. B. Chase, T. G. Cummings, & Associates, ***Service management effectiveness: Balancing strategy, organization and human resources, operations, and marketing***, (pp. 1-14) San Francisco, CA: Jossey-Bass Publishers.

Brown, S. W., Gummesson, E., Edvardsson, B., & Gustavsson, B. (Eds.) (1991). ***Service quality: multidisciplinary and multinational perspectives***. Lexington, MA: Lexington Books.

Buchanan, B. G., & Smith, R. G. (1989). Fundamentals of Expert Systems. In Barr, A., Cohen, P. R., & Feigenbaum, E. A., (Eds.), ***The handbook of artificial intelligence*** (pp. 149-192). Reading, MA: Addison-Wesley Publishing.

Budde, R., Kautz, K., Kuhlenkamp, K., & Zullighoven, H. (1992). What is prototyping? ***Information Technology and People***, 6(2-3), 85-95.

Budde, R., & Zullighoven, H. (1992). Prototyping revisited. ***Information Technology and People***, 6(2-3), 97-107.

Buzzell, R. D., & Gale, B. T. (1987). ***The PIMS principles: Linking strategy to performance***. New York, NY: The Free Press.

Buzzell, R. D., & Wiersema, F. D. (1981). Successful share-building strategies. ***Harvard Business Review***, 59(1), 135.

Callaghan, M. (1992). EIS and total quality. In C. Holtham (Ed.), ***Executive information systems and decision support systems*** (pp. 171-179). London, England: Chapman & Hall.

Campbell, D. T., & Stanley, J. L. (1966). ***Experimental and quasi-experimental designs for research***. Stokie, IL: Rand McNMally.

Carlzon, J. (1987). ***Moments of truth***. New York, NY: Ballinger.

Case, K. E., & Bigelow, J. S. (1992). Inside the baldrige award guidelines: Category 6: Quality and operational results. ***Quality Progress***, 25(11), 47-52.

Casey, C., Esparza, V. Graden, C. J., & Reep, P. J. (1993) Systematic Planning for data collection. ***Quality Progress***, 26(12), 55-59.

Center for Continuous Quality Improvement, The (1993). ***Strategic planning document***. Continuing Education and Business Outreach Division, Milwaukee Area Technical College.

Chase, R. B. (1978). Where does the customer fit in a service operation? ***Harvard Business Review***, 56(6), 137-142.

Chase, R. B., & Garvin, D. A. (1989). The service factory. ***Harvard Business Review***, 62, 61-69.

Chipello, C. J. (1988, March 21). Foreign rivals imperil U.S. firm's leadership in the service sector. ***Wall Street Journal***, pp. 1, 10.

Churchill, G. A., Jr. (1987). **Marketing research: Methodological foundations** (4th ed). Chicago, IL: The Dryden Press.

Clark, C. (1940). ***The conditions of economic progress.*** London, England: Macmillan.

Collier, D. A. (1983). Managing a service firm: A different management game. ***National Productivity Review***, 3(1), 36-45.

Cook, D. T., & Campbell, D. T., (1979). ***Quasi-experimental design: Design and anlaysis issues for field settings.*** Stokie, IL: Rand McNally.

Cox, E. P. (1980). The optimal number of response alternatives for a scale: A review. ***Journal of Marketing Research***, Vol XVII (November), 407-22.

Crosby, P. B. (1974). ***Quality without tears: the art of hassle-free management.*** New York, NY: McGraw-Hill.

Crosby, P. B. (1979). ***Quality is free.*** New York, NY: Mentor Books.

Davenport, T. H. (1993). ***Process innovation: Reengineering work through information technology.*** Boston, MA: Harvard Business School Press.

Davis, B. D., & Olson, M. H. (1985). ***Management information systems: conceptual foundations, structure, and development*** (2nd ed). New York, NY: McGraw-Hill Book Company.

Davis, R. (Ed.). (1989). Expert systems: How far can they go? (Part Two) ***AI Magazine.*** 10(2), 65-77.

Dearden, J. (1983). Will the computer change the job of top management? ***Sloan Management Review***, 25(1), 57-60.

Debate: Does the Baldrige Award Really Work? (1992). ***Harvard Business Review***, 70(1), 126-129, 132, 134, 136-141, 146-148.

Deming, W. E. (1975). On some statistical aids toward economic production. ***Interfaces***. 5(4), 1-15.

Deming, W. E. (1986). ***Out of the crisis***. Cambridge, MA: Massachusetts Institute of Technology.

Dillard, J. F., Ramakrishna, K., & Chandrasekaran, B. (1987). Knowledge-based decision support systems for military procurement. In B. G. Silverman (Ed.), ***Expert systems for business*** (pp. 120-139). Reading, MA: Addison-Wesley Publishing.

Donnelly, J. H., Jr, Berry, L. L., & Thompson, T. W. (1985). ***Marketing financial services: A strategic vision***. Homewood, IL: Dow Jones-Irwin.

Doyle, J. (1985). Expert systems and the "myth" of symbolic reasoning. ***IEEE Transactions on Software Engineering***, SE-11(11), 1386-1390.

Durand, I. G., Marquardt, D. W., Peach, R. W., & Pyle, J. C. (1993). Updating the ISO 9000 quality standards: responding to marketplace needs. ***Quality Progress***, 26(7), 23-28.

Ernst & Young, & American Quality Foundation. (1992). ***International quality study: Banking industry report***. Ernst & Young, 1600 Huntington Building, Cleveland, OH 44115.

Ezerman, G. C. (1991). Improving the quality of professional work: the ECOS model. In W. F. G. Mastenbroek (Ed.), ***Managing for quality in the service sector*** (pp. 110-121). Oxford, England: Basil Blackwell.

Falzon, J. J. (1988). Measuring the quality of services. In L. Schein & M. A. Berman (Eds.), ***Total quality performance: Highlights of a conference*** (Research Report Number 909, pp. 54-58). New York, NY: The Conference Board.

Fitzsimmons, J. A. (1990). Making continual improvement a competitive strategy for service firms. In S. W. Brown, E. Gummesson, B. Edvardsson, & B. Gustavsson (Eds.), ***Service quality: multidisciplinary and multinational perspectives*** (pp. 284-295). Lexington, MA: Lexington Books.

Forrester, J. (1973). Counterintuitive behavior of social systems. In D. L. Meadows & D. H. Meadows (Eds.), ***Toward global equilibrium: Collected papers*** (pp. 3-30). Cambridge, MA: Wright-Allen Press.

Fikes, R., & Kehler, T. (1985). The role of frame-based representation in reasoning. ***Communications of the ACM***, 28(9), 904-920.

Gaither, N. (1992). ***Production and operations management***. Fort Worth, TX: The Dryden Press.

Gass, S. I. (1989). Model world: A model is a model is a model is a model. ***Interfaces***, 19(3), 58-60.

Gevarter, W. B. (1987). The nature and evaluation of commercial expert system building tools. ***Computer***, May, 24-41.

Gray, J. L., & Harvey, T. W. (1992). ***Quality Value Banking***. New York, NY: John Wiley & Sons.

Greig, M. K. (1993a). Connecting the dots at Allstate. ***Competitive***, 2(4), 6-8.

Greig, M. K. (1993b). Leadership from the bottom. ***Competitive***, 2(4), 2-3.

Gitlow, H. S., & Hertz, P. T. (1983). Product defects and productivity. ***Harvard Business Review***, 83(5), 131-141.

Groonoos, C. (1983). Innovative marketing strategies and organization structures for service firms. In L. L. Berry, G. L. Shostack, & G. D. Upah (Eds.), ***Emerging perspectives on services marketing*** (pp. 9-21). Chicago, IL: American Marketing Association.

Groonoos, C. (1990). ***Service management and marketing: Managing the moments of truth in service competition***. Lexington, MA: Lexington Books.

Grubbs, M. R., & Reidenbach, R. E. (1989). ***Winning Banks: Managing Service Quality for Customer Satisfaction***. Rolling Meadows, IL: Bank Administration Institute.

Gummesson, E. (1991). ***Qualitative methods in management research*** (Rev. ed.). Newbury Park, CA: Sage Publications.

Hackman, J. R. (1982). Preface. In J. E. McGrath, J. Martin, & R. A. Kulka (Eds.), ***Judgment calls in research*** (pp. 7-9). Beverley Hills: Sage Publications.

Hammer, M., & Champy, J. (1993). ***Reengineering the corporation: A manifesto for business revolution***. New York, NY: Harper-Collins.

Harmon, P., & King, D. (1985). ***Expert systems, artificial intelligence in business***. New York. NY: McGraw Hill.

Harmon, P., Maus, R., & Morrissey, W. (1988). ***Expert System Tools and Applications***. New York, NY: John Wiley & Sons.

Harrington, H. J. (1991). ***Business Process Improvement: The Breakthrough Strategy for Total Quality, Productivity, and Competitiveness***. New York, NY: McGraw-Hill.

Hayes, R. H., & Abernathy, W. J. (1986). Managing our way to economic decline. ***Harvard Business Review***, 58(4), 67-77.

Hayes-Roth, F. (1985). Rule-based systems. ***Communications of the ACM***, 28(9), 921-932.

Haywood-Farmer, J., Alleyne, A., Duffus, B., & Downing, M. (1985). Controlling service quality. ***Business Quarterly***, (Winter), 62-67.

Haywood-Farmer, J., & Lyth, D. M. (1988). Management of services: A research agenda. ***Proceedings of the Decision Sciences Institute annual meeting***, (2)1261-1263.

Heskett, J. L. (1986). ***Managing in the service economy***. Boston, MA: Harvard Business School Press.

Heskett, J. L. (1987). Lessons in the service sector. ***Harvard Business Review***, 65(2), 118-126.

Heskett, J. L. (1990). Rethinking strategy for service management. In D. E. Bowen, R. B. Chase, T. G. Cummings, & Associates, ***Service management effectiveness: Balancing strategy, organization and human resources, operations, and marketing***, (pp. 17-40) San Francisco, CA: Jossey-Bass Publishers.

Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E, Jr., & Schlesinger, L. A. (1994). Putting the service-profit chain to work. ***Harvard Business Review***, 72(2), 164-174.

Heskett, J. L., Sasser, W. E., Jr., & Hart, C. W. L. (1990). ***Service breakthroughs: Changing the rules of the game***. New York, NY: The Free Press.

Hill, T. P. (1977). On goods and services. ***Review of Income and Wealth***, 23(12), 315-338.

Hodges J. S., & Dewar, J. A. (1992). ***Is it you or your model talking? A framework for model validation***. Santa Monica, CA: Rand.

Holusha, J. (1990, February 6). Talking Business with Juran of Juran Institute. ***New York Times***, OP-ED page.

Hostage, G. M. (1975). Quality control in a service business. ***Harvard Business Review***, 53(4), 98-113.

Hunt, D. (1993, March). Technology as change agent: How the change from banking to financial services will affect you. ***Hawaii Information Network and Technology Symposium***, Honolulu, HI, March 22-23.

Information Builders, Inc. (1993). ***LEVEL5 OBJECT reference guide***. New York, NY: Author.

Isaac, S., & Michael, W. B. (1981). ***Handbook in Research and Evaluation*** (2nd ed). San Diego, CA; EdiTs.

Ishikawa, K. (1982). ***Guide to quality control***. Tokyo, Japan: Asian Productivity Organization.

ISO (1992). ***ISO 9000 international standards for quality management***, (2nd ed.). Geneve, Switzerland: International Organization for Standardization.

Johnson, E. M., & Seymour, D. T. (1985). The impact of cross selling on the service encounter in retail banking. In J. A. Czepiel, M. R. Solomon, & C. E. Surprenant (Eds.), ***The service encounter: managing employee/customer interaction in service businesses*** (pp. 226-239). Lexington, MA: Lexington Books.

Judd, R. C. (1964). The case for redefining services. ***Journal of Marketing***, 28(1), 58-59.

Juran, J. M. (1981a). Product quality -- a prescription for the West. Part I: Training and improvement programs. ***Management Review***, 70(6), 8-14.

Juran, J. M. (1981b). Product quality -- a prescription for the West. Part II: Upper-management leadership and employee relations. ***Management Review***, 70(7), 57-63.

Juran, J. M. (1982). ***Juran on planning for quality***. New York, NY: Free Press.

Kalinosky, I. S. (1990). The total quality system -- going beyond ISO 9000. ***Quality Progress***, 23(6), 50-54.

Kane, E. J. (1988). Quality improvement at MSA. In L. Schein, & M. A. Berman, (Eds.), ***Total quality performance: Highlights of a conference*** (Research Report Number 909, pp. 18-20). New York, NY: The Conference Board.

Karwan, K. R., & Rosen, L. D. (1988). Quality measurement and operations strategy in service organizations. ***Proceedings of the Decision Sciences Institute annual meeting***, (2)1231-1233.

Kelly, T. (1993). A Decade of change: Quality Progress' tenth annual AQ/QC software directory. ***Quality Progress***, 26(3), 21-84.

Kerklaan, L.A.F.M. (1991). Diagnosis of quality in service: the quality scales in auditing customer-supplier relations. In W.F.G. Mastenbroek (Ed.), ***Managing for quality in the service sector*** (pp. 49-66). Oxford, England: Basil Blackwell.

King, B. (1989). ***Hoshin Planning The Developmental Approach.*** Methuen, MA, GOAL/QPC.

Klaus, P. G. (1985). Quality epiphenomenon: The conceptual understanding of quality in face-to-face service encounters. In J. A. Czepiel, M. R. Solomon, & C. E. Surprenant (Eds.), ***The service encounter: managing employee/customer interaction in service businesses*** (pp. 17-33). Lexington, MA: Lexington Books.

Koepp, S. (1987, February 2). Pul-eeze! Will somebody help me? ***TIME Magazine***, pp. 28-34.

Langevin, R. G. (1977). ***Quality control in the service industries***. New York, NY: AMACOM.

Latzko, W. J. (1986). ***Quality and productivity for bankers and financial managers***. New York, NY: Marcel Dekker Inc.

Lawton, R. L. (1991). Creating a customer-centered culture in service industries. ***Quality Progress***, 24(9), 69-72.

Levitt, T. (1972). Production line approach to service. ***Harvard Business Review***, 50(5), 41-52.

Light, L., & Tilsner, J. (Eds.). (1993, October 18). Up front: Betting to win on the Baldie winners. ***Business Week***, p. 8.

Lincoln, Y. & Guba, E. (1985). ***Naturalistic Inquiry***. Newbury Park, CA: Sage Publications.

Lovelock, C. H. (1983). Classifying services to gain strategic marketing insights. ***Journal of Marketing***, 47 (Summer), 9-20.

Luconi, F. L., Malone, T. W., & Scott Morton, M. S. (1986). Expert Systems: The next challenge for managers. ***Sloan Management Review***, Summer, 3-14.

Lyth, D. M., & Johnston, R. (1988). Incorporating quality considerations into the design of a customer processing service operation. ***Proceedings of the Decision Sciences Institute annual meeting***, (2)1267-1269.

Madsen, R. W., & Moeschberger, M. L. (1986). ***Statistical concepts with applications to business and economics***. Englewood Cliffs, NJ: Prentice-Hall.

Maister, D. H., & Lovelock, C. H. (1982). Managing facilitator services. ***Sloan Management Review***, 23(3), 19-33.

Marsh, A., & Garvin, D. A. (1986). A note on quality: The views of Deming, Juran and Crosby. ***Harvard Business School***, Report No. 9-687-011.

Marquardt, I. A. (1992). Inside the baldrige award guidelines: Category 3: Strategic quality planning. ***Quality Progress***, 25(8), 93-96.

Marszalek-Gaucher, E. (1990). ***Transforming health care organizations***. San Francisco, CA: Jossey-Bass.

Mastenbroek, W. F. G. (1991). ***Managing for quality in the service sector***. Oxford, England: Basil Blackwell.

Martin, J. (1982). A garbage can model of the research process. In J. E. McGrath, J. Martin, & R. A. Kulka (Eds.), ***Judgment calls in research*** (pp. 17-39). Beverley Hills: Sage Publications.

McCracken, G. (1988). ***The long interview***. Newbury Park, CA: Sage Publications.

McGrath, J. E. (1982). Dilemmatics: The study of research choices and dilemmas. In J. E. McGrath, J. Martin, & R. A. Kulka (Eds.), ***Judgment calls in research*** (pp. 69-102). Beverley Hills: Sage Publications.

McNurlin, B. and Sprague, R. H. (1989). *Information systems management in practice* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Mersha, T., Adlakha, V., & O'Brien, W. (1988). Consumer assessment of service quality. *Proceedings of the Decision Sciences Institute annual meeting*, (2)1242-1244.

Metzger, R. O. (1982). Banking in the 1980's: Productivity improvement on an exponential curve. *National Productivity Review*, 2(1), 22-28.

Middleton, J. (1985). Case Study. In J. Middleton & D. Wedemeyer (Eds.), *Methods of communication planning* (pp. 463-479). Paris, France: UNESCO.

Minsky, M. (1975). A framework for representing knowledge. In P. H. Winston (Ed.), *The psychology of computer vision* (pp. 212-277). New York, NY: McGraw-Hill.

Minsky, M. (1991). Society of mind: a response to four reviews. *Artificial Intelligence*, 48(3), 371-396.

Mongtomery, D. C. (1991). *Design and analysis of experiments* (3rd ed.). New York, NY: John Wiley & Sons.

Munoz, J., & Nielsen, C. (1991). SPC: What data should I collect? What charts should I use? *Quality Progress*, 24(1), 50-52.

O'Brien, J. A. (1990) *Management Information Systems: A Managerial End User Perspective.* Homewood, IL: Irwin.

Omdahl, T. (1992). Inside the baldrige award guidelines: Category 2: Information and analysis. *Quality Progress*, 25(7), 41-46.

Osgood, C. E., Suci, G. J., & Tannebaum, P. N. (1957). *The Measurement of Meaning*. Urbana, IL: University of Illinois Press.

Parasuraman, A., Zeithaml, V. A. & Berry, L. L. (1985). Conceptual model of service quality and its implications for future research. *Journal of Marketing*, 49(3), 41-50.

Patterson, T. D. (1991). Breaking the language barrier. *World*, 25(2), 22-25.

Porter, M. (1990). *Competitive Strategy*. New York, NY: The Free Press.

Prerau, D. S. (1990). ***Developing and managing expert systems: Proven techniques for business and industry***. Reading, MA: Addison-Wesley Publishing.

Quinn, J. B., & Gagnon, C. E. (1986). Will services follow manufacturing into decline? ***Harvard Business Review***, 64(6), 95-104.

Quality Glossary, The (1992). ***Quality Progress***, 25(2), 20-29.

Rabbit J. T., & Bergh, P. A. (1993). ***The ISO 9000 book: A global competitor's guide to compliance and certification.*** White Plains, NY: Quality Resources.

Rathmell, J. M. (1966). What is meant by services. ***Journal of Marketing***, 30(10), 32-36.

Rauch-Hindin, W. (1986). ***Artificial intelligence in business, science, and industry***. Englewood Cliffs, NJ: Prentice Hall.

Regan, W. J. (1963). The service revolution. ***Journal of Marketing***, 27(2), 57-63.

Rieley, J. B. (1993/94). The circular organization: How leadership can optimize organizational effectiveness. ***National Productivity Review,*** Winter, 11-19.

Richardson, L. (1984). ***Bankers in the selling role*** (2nd ed.). New York, NY: John Wiley & Sons.

Roach, S. S. (1991). Services under siege - the restructuring imperative. ***Harvard Business Review***, 69(5), 82-91.

Rosander, A. C. (1985). ***Applications of quality control in the service industries.*** New York, NY: Marcel Dekker.

Rosander, A. C. (1989). ***The quest for quality in service***. Milwaukee, WI: ASQC Quality Press.

Runkel, D. J., & McGrath, J. E. (1972). ***Research on human behavior: A systematic guide to method.*** New York, NY: Holt, Rinehart, & Winston.

Sasser, W. E., Olsen, R. P., & Wyckoff, D. D. (1978). ***Management of service operations***. Boston, MA: Allyn & Bacon.

Schlesinger, A., & Heskett, J. L. (1991). The service-driven service company. ***Harvard Business Review***, 69(5), 71-81.

Schmenner, R. W. (1986). How can service businesses survive and prosper? ***Sloan Management Review***, 27(3), 21-32.

Schnoll, L. (1993). One world, one standard. ***Quality Progress***, 26(4), 35-39.

Schoefler, S., Buzzell, R. D., & Heany, D. E. (1974). Impact of strategic planning on profit performance. ***Harvard Business Review***, 52(2), p. 137.

Schwartz, M. H. (1992). What do the words "product" and "service" really mean for management? ***Quality Progress***, 25(6), 35-39.

Shenoy, P. P. (1986). ***Some notes and comments on expert systems.*** Unpublished manuscript, University of Kansas, School of Business, Lawrence, KS.

Shostack, G. L. (1977a). Banks sell services -- not things. ***The Banker's Magazine***, 160 (Winter), 40-45.

Shostack, G. L. (1977b). Breaking free from product marketing. ***Journal of Marketing***, 41(2), 73-80.

Shostack, G. L. (1984). Designing services that deliver. ***Harvard Business Review***, 62(1), 133-139.

Shostack, G. L. (1987). Service positioning through structural change. ***Journal of Marketing***, 51, 34-43.

Silverman, B. G. (1987). Should a manager "hire" an expert system? In B. G. Silverman (Ed.), ***Expert systems for business*** (pp. 5-23). Reading, MA: Addison-Wesley Publishing.

Smith, A. (1977). ***The wealth of nations***. New York, NY: Dutton (originally published, 1776).

Strozier, R. M. (1991a). Behind the lines. ***World***, 25(2), 1.

Strozier, R. M. (1991b). Measuring up. ***World***, 25(2), 30, 32-34, 36-38.

Sullivan, R. L. (1992). Inside the baldrige award guidelines: Category 1: Leadership. ***Quality Progress***, 25(6), 25-28.

Sussman, M. L. (1991). Finding common ground. ***World***, 25(2), 6-9.

Takeuchi, H., & Quelch, J. A. (1983). Quality is more than making a good product. *Harvard Business Review*, 61(4), 139-145.

Tenner, A. R., & DeToro, I. J. (1992). ***Total quality management: Three steps to continuous improvement***. Reading, MA: Addison-Wesley Publishing.

Thomas, D. R. E. (1978). Strategy is different in service businesses. ***Harvard Business Review***, 56(4), 158-165.

Trogdon, E. N. (1988). Customer perspective as a competitive weapon. In L. Schein & M. A. Berman (Eds.), ***Total quality performance: Highlights of a conference.*** (Research Report Number 909, pp. 65-69). New York, NY: The Conference Board.

Turban, E. (1990). ***Decision support and expert systems*** (2nd ed.). New York, NY: Macmillan.

U.S. Bureau of the Census (1975). ***Historical statistics of the United States, colonial times to 1970, Bicentennial Edition*** **(Parts 1 & 2)**. Washington, DC: U.S. Government Printing Office.

U.S. Bureau of the Census (1992). ***Statistical abstract of the United States*** **(112th ed.)**. Washington, DC: U.S. Government Printing Office.

U.S. Department of Commerce (1995). ***Malcolm Baldrige National Quality Award: 1995 award criteria*** ASQC, PO Box 3005, Milwaukee, WI 53201-3005.

van der Hart, H. W. C. (1991). Marketing of product service: strategic, tactical and operational aspects. In W. F. G. Mastenbroek (Ed.), ***Managing for quality in the service sector*** (pp. 76-91). Oxford, England: Basil Blackwell.

Waterman, D. A. (1986). ***A guide to expert systems***. Reading, MA: Addison-Wesley Publishing.

Wheeler, D. J. & Chambers, D. S. (1986). ***Understanding statistical process control***. Knoxville, TN: Keith Press.

Wood, R. C. (1989). The prophets of quality. ***Quality Assurance New Zealand***, 15, 16-20.

Woods, W. A. (1986). Important issues in knowledge representation. ***Proceedings of the IEEE***, 74(10), 1322-1334.

Yin, R. K. (1984). ***Case study research: Design and methods. Applied social research methods series: Volume 5.*** Beverley Hills, CA: Sage Publications.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1985). Problems and strategies in services marketing. ***Journal of Marketing***, 49(2), 33-46.

Zeithaml, V. A., Parasuraman, A., & Berry, L. L. (1990). ***Delivering quality service: Balancing customer perceptions and expectations***. New York, NY: Free Press.