SENSORY EVALUATION IN QUALITY CONTROL

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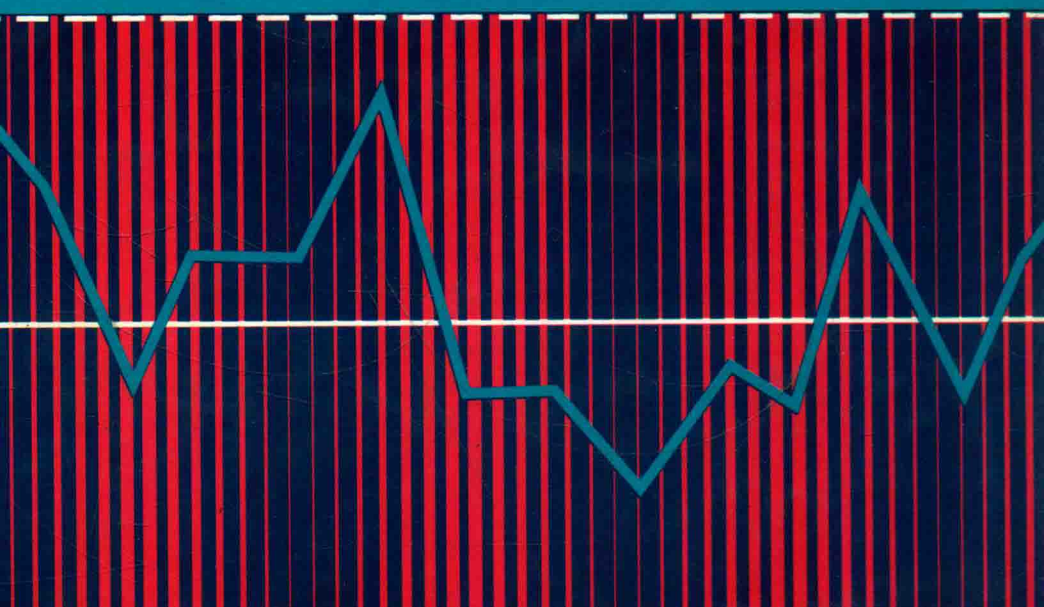

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Sensory Evaluation in Quality Control

To Michael, Frank, and Cathy

Preface

This book addresses an important, but so far neglected, topic: the application of sensory evaluation to quality control. Although several articles have been published that have discussed concepts of quality control/sensory evaluation (QC/sensory) programs, *Sensory Evaluation in Quality Control* is the first publication that addresses this topic in a comprehensive and practical way. This book is comprehensive, in that it presents the sensory and statistical information that is needed to design and implement several types of QC/sensory programs at the plant level. The book is practical, in that it provides a step-by-step description of the complete process to implement such programs, and it illustrates this process through real examples encountered by various consumer products companies (e.g., foods, personal care products, paper products). With this practical information, sensory and quality professionals can design and implement sound QC/sensory programs at the plant level.

This book was developed to provide the sensory and quality professional with an overview and guide to apply, in a production facility, the unique techniques that are used to measure sensory responses. Therefore, the book is intended for QC and/or R&D personnel (e.g., sensory managers and analysts, and quality professionals) in charge of implementing an in-plant program, as well as for the plant management and plant technical personnel (sensory coordinator and quality professionals) who are ultimately responsible for the routine operation of the established program. Technical personnel can use this book as a guide and benefit mainly from the in-depth description of the sensory and statistical information. QC, R&D, and plant management can use it to assess the benefits of a sensory program at the plant level, the various alternative techniques that exist, the advantages and limitations of each, and the resources and costs needed to implement any of the QC/sensory programs discussed.

This book is organized into four main parts. Chapter 1 is an overview of quality control programs, of the test methods in a QC operation (instrumental and sensory), and of the common sensory techniques that are published in the sensory literature and used in industry, with a discussion of the advantages and disadvantages of each. Chapter 2 is a discussion of the preliminary phases in the program implementation, such as the planning phase and the assessment of resources and needs. Chapters 3 to 6 present the in-depth description of four different QC/sensory programs: comprehensive descriptive, quality ratings, "in/out," and difference from control methods. Finally, the appendices contain statistical background information on the procedures, for summarizing and analyzing QC/sensory data.

Each program (chapters 3 to 6) is covered in four basic sections: 1) an abstract, 2) a description of the program in operation, 3) the steps and procedures for implementing and operating the program, and 4) other versions of the program. The abstract contains a brief summary of the method and describes the main characteristics of the method, as well as its uses, advantages, and disadvantages. The section on operation of the program describes the way the program functions. It shows the type of data collected, the type of sensory specification used, and the comparison of the collected data and the specifications for product decisions. This section allows the reader to become familiar with the methodology and principles of the program. The section on implementation of the program provides detailed information on each step recommended for developing and implementing such a program. This section is intended to provide the reader with information needed to implement that QC/sensory program. Finally, the section on other versions of the program presents modified programs of the main method. In many situations, due to limitations on resources or philosophical differences, professionals might opt to consider implementing modified or shorter versions instead of the complete program discussed in each chapter.

Each method has unique characteristics and approaches that are discussed in their corresponding chapter. There are, however, many common components and tests among all methods. These common elements are discussed in detail only in the first method presented—the comprehensive descriptive approach (Chapter 3). The other chapters (4-6) make frequent reference to the common program aspects discussed in Chapter 3.

Our special appreciation is extended to Barbara Pirmann and Andrea Senatore, for preparing and proofing this manuscript. We wish to also thank Clare Dus, for her assistance in the literature review, and Linda Brands, for her help in preparing several tables and figures of the book.

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1

Introduction

THE CONCEPT OF QUALITY

The Importance of Quality in American Industry

In today's very competitive and dynamic marketplace, thousands of new products and services are being offered to consumers on a regular basis. Consumers are faced with a variety of alternatives from which to choose and are forced to assess the product's factors (e.g., quality, cost), when making their product selection. Some consumers consider quality the most important factor while; for others it is cost or other parameters, such as availability, convenience, and so forth.

In the 1900s, there was little information on the link between quality and consumers' buying decisions. However, in the 1960s when the Japanese first began to sell their high-quality products in several U.S. markets with evident success, it was confirmed that consumers *do care for quality and buy quality* (Plsek 1987; Pedraja 1988). Other information supports the importance of quality in a product's success. For example, a variety of business surveys indicate that gains in market share and growth have been greater in companies that strive for excellent quality, than for those that produce low-quality products (Gallup Organization 1985).

Studies have shown that American consumers discriminate among quality products and prefer the highest and most reliable product option, such as the Japanese product counterparts (Schrock and Lefevre 1988; Penzias 1989). Garvin (1987) reports the results of a 1981 survey that found that nearly 50 percent of U.S. consumers believed that the quality of U.S. products had dropped in the previous five years. In addition, 25 percent of the consumers were "not at all" confident that U.S. industry can be depended on to deliver reliable products.

Schrock and Lefevre (1988) pose the question, "When will the United States learn?" and indicate that the United States has an outstanding ability to produce

complex and sophisticated products, but that this is insufficient. Efforts are needed for the country to regain its world leadership in quality. W. Edward Deming, who taught Japan about quality, states that, "We in America will have to be more protectionist or more competitive. The choice is very simple: if we are to become more competitive, then we have to begin with our quality" (Halberstam 1984).

In light of this scenario, American companies have committed to establishing programs for the development, maintenance and/or improvement of quality products. Companies know that the total cost of quality programs is outweighed by the benefits they produce. These benefits include savings, in terms of materials, effort, and time, as well as the enhanced business resulting from higher consumer acceptance and greater competitiveness.

Currently, many companies consider the pursuance and maintenance of quality an essential part of their operation. Experts consider that, without quality programs, companies are doomed to fail. Cullen and Hollingum (1987) believe that, in the future, there will be two types of companies: those that have implemented total quality and those that will be out of business. At the same time, these experts consider the Japanese quality perspective to be the model to follow for success. (Hayes 1981; Halberstam 1984; Cullen and Hollingum 1987; Schrock and Lefevre 1988; Penzias 1989).

The problem and the challenge are very complex. Within a company, the pursuit of quality must be the job and challenge of each employee, from top management to line workers. Educational and operational quality programs and the concepts of quality should be an essential component of the corporate culture. Many quality control books cover, in detail, endeavors that many American consumer products companies have undertaken: programs developed to establish and maintain their products' quality. This book adds a new tool to quality control programs that is critical for the consumer products industry: evaluating and controlling products, based on their sensory properties.

Definitions of Quality

Sinha and Willborn (1985) present a collection of definitions of quality (Table 1-1). Intrinsic in all these definitions is the concept that quality encompasses the characteristics of a product or service that are designed to meet certain needs under specified conditions. Although these are accurate definitions that are widely used and sometimes sufficient for discussing general concepts, there are additional aspects that need to be included, to better understand the total quality view. These concepts are:

- The consumer input in the definition of quality;
- The multidimensional nature of quality; and
- Quality consistency.

Table 1-1. General definition of quality

Definition	Source
"The totality of features and characteristics of a product or service that bear on its ability to satisfy given needs."	1, 4, 5
"Fitness for use."	2
"Conformance to requirements."	3
"The degree to which product characteristics conform to the requirements placed upon that product, including reliability, maintainability, and safety."	6
"The degree to which a product or service is fit for the specified use."	7

1. ANSI/ASQC Standard, "Quality System Terminology," A3-1978, prepared jointly by the American National Standards Institute (ANSI) and American Society for Quality Control (ASQC).
2. Juran, J. M., editor-in-chief, *Quality Control Handbook*, 3rd. ed., McGraw Hill Book Company, New York, 1974.
3. Crosby, P.B., *Quality Is Free*. McGraw Hill Book Company, New York, 1979.
4. DIN-53350. of Deutsches Institute fuer Normung Teil 11, Beuth-Verlag, Berlin.
5. EOQC, "Glossary of Terms Used in Quality Control," 5th ed., 1981, published by the European Organization for Quality Control.
6. QS-Norm Draft of Swiss Standard Association, 1981.
7. Seghezzi, H.D., "What is Quality Conformance With Requirements or Fitness for the Intended Use," *EOQC Journal* 4, 1981, p.3.

Source: Sinha and Willborn 1985.

The Consumer Input in the Definition of Quality

McNutt (1988) emphasizes the importance of defining quality in terms of consumer perceptions. He points out that the definition and assessment of a product's quality might be different for industry's management and the consumer. Garvin (1987) cites a survey that shows that 65 percent of business executives thought consumers could readily name a good quality brand in a big-ticket product category. When asked, only 16 percent of consumers could name such a brand for small appliances and only 23 percent could give a name for large appliances.

If the generic definitions of quality imply the satisfaction of needs, it should be made clear that it is the person *whose needs are being satisfied* who determines quality—that is, the consumer. Thus:

- The consumer's input is required to determine the product's quality parameters.
- It is the consumer's perception that underlies his or her assessment of quality.
- The consumer's perception of quality cannot be predicted.
- A complete study is required, to fully understand consumer perceptions.