

## Book Review

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# Book: Internal Quality Control in Laboratory

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## Abstract

Quality control plays a crucial role in various domains, including production, services, and testing. The principles and techniques of quality control can be applied not only to product manufacturing but also to the service sector. One significant area where quality control is vital is in the testing and assessment of standard conformity. In particular, quality control in laboratories holds immense importance. In this review, we will provide an overview and discuss a recently published book titled: "Internal quality control in laboratory". The review will focus on the book's content, its application in different areas, and the innovative aspects it presents. The book itself is concise and comprehensive, offering a self-contained resource. It introduces key concepts from statistical quality control, eliminating the need for readers to refer to prerequisite textbooks. The book's strengths lie in its clarity, simplicity, and brevity, making it accessible for understanding quality control concepts and applying them within a laboratory setting. Additionally, the book includes numerous illustrative numerical examples, which further enhances its usefulness. The book targets quality control personnel in conformity assessment laboratories. However, it is also useful for general audiences with engineering and statistics background. The book covers basic needs of the targeted audience and deemed to be a good starting point for a quality control profession.

**Keywords** Management System, Internal Quality Control, Laboratory, ISO/IEC 17025

## 1. Introduction

Quality control is an important subject in production, service and test areas. Techniques of quality control are applicable to service sector as well as product manufacturing. An important service which is subject to quality control, is the testing and standard conformity assessment. Quality control in laboratories is of utmost importance. International standards in the field of laboratory management (e.g., ISO/IEC 17025) require a quality control scheme to ensure continuous improvement of the laboratory services. The laboratories must hold accreditation in order to be deemed technically competent and ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories is the main standard used by testing and calibration laboratories.

Any test or calibration laboratory shall have a procedure for monitoring the validity of results. The resulting data shall be recorded in such a way that trends are detectable and, where practicable, statistical techniques shall be applied to review the results. This monitoring shall be planned and reviewed and then referring to both internal quality control and proficiency testing, data from monitoring activities shall be analyzed, used to control and, if applicable, improve the laboratory's activities. If the results of the analysis of data from monitoring activities are found to be outside pre-defined criteria, appropriate action shall be taken to prevent incorrect results from being reported. The ultimate aim of a laboratory quality control program is to ensure that the test/ measurement results comply to established performance criteria including the

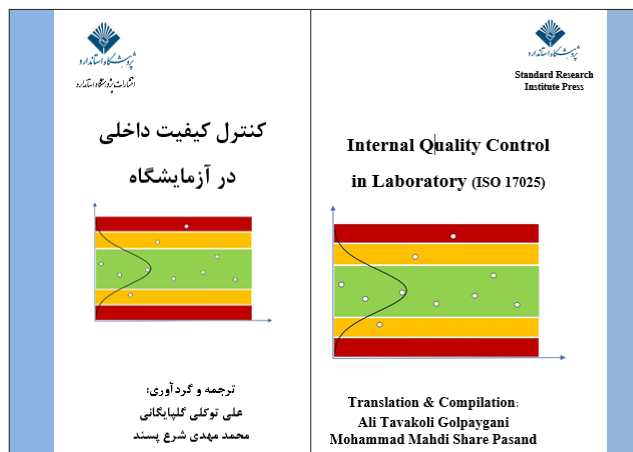


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reproducibility and repeatability of test results. The laboratory quality control program ensures that the results and measurements are reliable and have errors within the prespecified bounds.

This book review is dedicated to introduce and discuss the recently published book entitled as “Internal quality control in laboratory”.



### Book description

The bibliographical information of the book are as follows: Tavakoli Golpaygani, Ali and Mohammad Mahdi Share Pasand, Internal Quality Control in Laboratory, Standard Research Institute Press, Nov. 2023, Karaj, Iran.

The book is published in Persian. The publisher; Standards Research Institute press, publishes applied and theoretical books relevant to the fields of testing, quality control, standardization and conformity assessment. Authors have more than a decade experience in conformity assessment laboratories and have been collaborating in laboratory accreditation for ISO/IEC 17025 compliance [2].

The book contains 123 pages, 14 figures, 5 tables and more than 15 numerical examples discussing the derivation of statistical figures required for laboratory quality control in real world applications.

### Significance of the subject

Quality control in laboratories is a very essential concern. Chemical and biological laboratories are playing vital roles in the society. For example, a physician may prescribe a certain dose of a drug based on a report on the patient's blood test from a diagnostic laboratory. The laboratory result should be reliable and precise. A laboratory willing to attain reliable (repeatable and reproducible) results and maintain a high status with regard to customer satisfaction, will need to implement and monitor an effective internal quality control program to regularly check its test and measurement procedures. For a quality manager working at such a laboratory, it is crucial to under-

stand and effectively practice the concepts and methods of internal quality control described in this book.

### Readership

“Internal Quality Control in Laboratory” is easy to follow. Nevertheless, some parts of the 4th chapter, may be challenging for those readers not familiar with statistical quality control techniques. The target audience of the book are those laboratory experts who are mostly focused on technical aspects of their works but need to have a good practical skill to do quality control and statistical calculations for their own. An expert quality personnel or a well-educated mathematician/ engineer in the field of statistical quality control may find the book too simple. These readers, however, may find chapters two and three insightful. Laboratory managers will also find the contents useful since they need to understand these concepts before scheduling their programs.

### Coverage and comprehensiveness

“Internal Quality Control in Laboratory” covered many aspects and issues required by a quality personnel working or aiming to work at a conformity assessment laboratory. However, this book should be considered a handy starting point which emphasizes on the basics and gives simple treatments for most of daily problems in laboratory quality control. However, this book is not a comprehensive nor an elaborate treatment of the subject. For more details on the mathematical methods, advanced subjects and recent findings, the reader should consult many existing text books including [4], [5] and [6].

### Structure and organization

The book is brief and self-contained. Some concepts from statistical quality control are introduced so the reader does not need to refer to any pre-requisite text books. In the following, the main contents of each chapter is given: The first chapter is dedicated to terms and definitions. Though most of the definitions are drawn from international standards vocabulary, some definitions are rephrased to better convey the meaning of each term and facilitate its understanding for readers.

The second chapter discusses quality control, control charts (x-charts and r-charts), within-laboratory reproducibility, repeatability, measurement uncertainty, bias and different control samples. Methods and recommendations to derive target and alarm control limits are discussed as well. Important guidelines are then given to plan a quality control system and perform daily/ routine as well as long-term evaluations of the gathered data.

The third chapter deals with the proficiency testing technique. The proficiency testing is the mostly accepted

method of inter-laboratory evaluation [3]. Although proficiency testing is an inter-laboratory activity to evaluate and grade participating laboratories as per ISO/IEC 17065, it can also be used by the quality personnel to examine and re-define internal quality control programs. Therefore, this book also introduced and briefly discussed the most important statistical methods used in proficiency testing. This chapter tries to equip the reader with the essential elements of a comprehensive internal quality control program.

The fourth chapter discusses in detail, statistical methods and formulae frequently used in data evaluation for internal quality control. Outlier detection, conformity (similarity) evaluation (for two sets of measurements), estimation of pooled mean and variance, estimation of the mean and variance of each data set and variance conformity tests are discussed with numerical examples. In this chapter, important statistical tests including Students' T, Fishers', Cochran's and David's are briefly introduced and used in application-oriented examples.

The book contains six appendices. The first appendix is a useful complete example of a quality control test. Other appendices provide data tables of important probability density functions and statistical tests. Appendices 2 and 3 give Fishers' test upper limits for 95% and 99% confidence intervals, respectively. Appendices 4 and 5 contain Chi-square and Students' T distribution probabilities. Appendix 6 contains confidence intervals for different sample volumes and coverage factors of a Gaussian distribution.

### Novelty and Innovation

The strength points of the book are its clarity, simplicity and brevity. It has made it simple to understand quality control concepts and utilized them in a laboratory. The book contains several illustrative numerical examples which is also an advantage.

### Conclusion

In this book review, a recently published book titled: "Internal Quality Control in Laboratory" is introduced and reviewed. Content, chapters, practicality and innovative aspects of the book are briefly discussed. The book provides a concise and comprehensive resource that covers the book's content, application areas, and innovative aspects. With its strengths lying in clarity, simplicity, and brevity, the book effectively aids in understanding quality control concepts and their practical implementation within laboratory environments.

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#### Ethics approval and consent to participate

Not applicable.

#### Consent for publication

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#### Competing interests

The authors declare that they have no competing interests.

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