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Preface

Statistical methodologies for product quality control, acceptance sampling plans, and product reliability are essential technologies that ensure product quality to reduce both consumer and producer risks. Numerous novel statistical technologies to improve and to evaluate product quality had been developed by many scholars in the past decades. After we edited the book *Statistical Modeling for Degradation Data* (2017; Springer, Singapore), we have seen a great need to bring together experts engaged in statistical process quality control, acceptance sampling plan, and reliability testing and designs to present and discuss important issues of recent advances in product quality technologies and related applications. For this reason, we edit this book *Statistical Quality Technologies: Theory and Practice* that focuses on statistical aspects of product quality technology development.

In this book, we aim to provide theories as well as applications of statistical techniques for manufacturing quality. This book provides a venue for the timely dissemination of research on the statistical methodologies of quality improvement and assessment and to promote further research and collaborative work in this area. The authors in each chapter have made both the theoretical results and the novel statistical quality technologies publicly available, thus making it possible for readers to readily apply these new methodologies in different areas of applications and research. We believe that the topics covered in the book are timely and have high potential to impact and influence in statistics, engineering, and manufacturing.

Outline of This Book Volume

This book volume brings together 16 chapters that are categorized as follows: Statistical Process Control (Part I), Acceptance Sampling Plans (Part II), and Reliability Testing and Designs (Part III). All the chapters have undergone a thorough review process.

Part I of this book includes six papers focusing on both theoretical and applied research in statistical process control. Chapter 1 provides an overview of some statistical process control methodologies. Qiu introduces some recent studies on nonparametric statistical process control, control charts for monitoring dynamic processes, and spatio-temporal process monitoring. In Chap. 2, Leiva, Marchant, Ruggeri, and Saulo introduce statistical quality control and reliability tools based on the Birnbaum-Saunders distribution and its generalizations, which are suitable for the situations where the distribution of product quality characteristic is asymmetric. Some possible research related to big data and business intelligence is also discussed. In Chap. 3, Koppel and Chang propose a system-wise process monitoring framework called the statistical system monitoring (SSM) for a production process equipped with thousands of process parameters and hundreds of product characteristics. The properties of the proposed SSM are studied via simulation and practical guidelines are provided. In Chap. 4, Abujiya and Lee present several location and dispersion cumulative sum (CUSUM) control charts based on the ranked set sampling (RSS) techniques. The proposed CUSUM charts are shown to be more effective compared to the standard CUSUM charts based on random sampling. In Chap. 5, Chiang, Ng, Tsai, Lio, and Chen provide a review on statistical process control for simple linear profile with independent or autocorrelated observations. Some recent developments of statistical process control on a simple linear profile model are discussed. In Chap. 6, Potgieter provides a review of some existing CUSUM procedures for monitoring location and concentration changes in circular processes. A new sequential changepoint procedure for detecting the changes in location and/or scale is proposed and the properties and performance are studied.

Part II comprises four chapters that emphasis on the statistical techniques related to acceptance sampling plans. In Chap. 7, Aslam, Rao, and Albassam present a generalized multiple dependent state sampling (GMDSS) plan for a time truncated life test to monitor product quality. Acceptable quality level and limiting quality level are used to determine the plan parameters. In Chap. 8, Prajapati, Mitra, and Kundu develop a decision theoretic sampling plan (DSP), which is an acceptance sampling plan based on Type-I and Type-I hybrid censoring via Bayes' decision theory approach with a suitable loss function. An algorithm for obtaining the optimal DSP is provided. In Chap. 9, Chiang, Ng, Tsai, Lio, and Chen provide a general structure of an economical design of acceptance sampling plan with warranty using truncated life test via Bayesian framework to tackle possible lot-to-lot variation of products. A unified algorithm to reach an optimal sample size and acceptance number for the sampling plan is established to minimize the respective expected total costs. In Chap. 10, Kumar investigates the optimal acceptance sampling plans that minimize the total expected testing cost subject to given upper bounds for the producer and consumer risks based on Type-II censored partially accelerated life test. Numerical results for the linear model and Arrhenius model are provided.

Part III includes six chapters that concentrate on reliability testing and designs. Chapter 11 deals with traditional accelerate life plan based on the c-optimality for minimizing the variance of percentile lifetime. In this chapter, Lu, Lee, and Hong propose a sequential design strategy for life tests based on the dual objectives to resolve the unknown model parameters to improve the accuracy of predicted lifetime. In Chap. 12, Wang, Jiang, and Wang deal with the stress-strength models for reliability design of systems when both the stress and the strength variables follow the proportional hazards family or the proportional reverse hazards family. Statistical inferential methods based on the proposed model are developed. In Chap. 13, Shen, Shen, and Xu consider a Wiener-based degradation model with logistic distributed measurement errors. Efficient algorithm is provided for the estimation of parameters. In Chap. 14, Pan and Seo present a generalized linear model approach to obtain the optimal accelerated life test planning based on the proportional hazard model. The proposed approach is shown to be flexible for any failure time distribution. In Chap. 15, Ouyang, Park, Byun, and Leeds provide the background behind a dual response surface methodology that incorporates a robust design. They propose different estimation methodologies for remedying the difficulties associated with data contamination and model departure. This section concludes with Chap. 16 that deals reliability modeling with manufacturing processes of modern ultra-large-scale integrated circuits. Bae, Yuan, and Kuo discuss some latest development in modeling the non-homogeneous distributed spatial defect counts.

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