

Preface

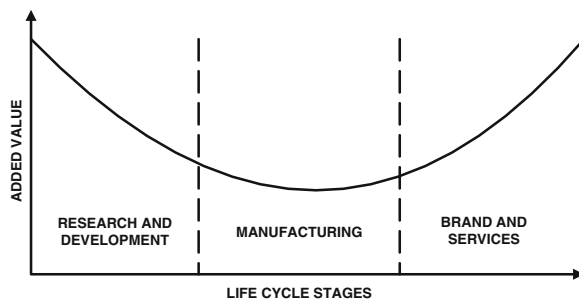
Manufacturing businesses need to develop new products and improve current products to better meet consumer needs in order to survive and grow in a fierce competitive environment. Customers have expectations regarding product performance over time. Product quality and reliability are crucial competence factors and hence the major concerns of manufacturing industries. To achieve world-class quality, the manufacturer of a product must satisfy customer needs using various models, tools, and techniques to help manage reliability and quality for new and current products.

The life cycle of a product refers to several stages from its conception, through design and manufacture, to service and disposal. Each stage can add value to the product and the magnitude is characterized by a well-known smile curve shown in Fig. 1. As can be seen from the figure, the efforts made in the pre-manufacturing and post-manufacturing stages can result in greater value than the value resulting from the efforts made in the manufacturing stage. This implies that manufacturing businesses not only emphasize on the manufacturing stage of the product life cycle but also need to get into the pre-manufacturing (design and development) and post-manufacturing (post-sale support). In order to do this, engineers need to be educated on product reliability and quality.

The education on quality and reliability engineering becomes essential to train product engineers. This book is written as an introductory textbook for senior undergraduate and postgraduate students in various engineering and management programs and can be used as a reference book for researchers and engineers in related fields. It provides readers with a primary training in quality and reliability engineering in the real industrial context.

This book focuses on concepts, models, tools, and techniques of quality and reliability in the context of product life cycle. These can be used for deciding the reliability for new product, ensuring certain level of quality of the product, assessing the quality and reliability of current products being manufactured, and improving the reliability and quality of the product.

The book comprises 17 chapters organized into four parts and some extra materials. The first part consists of six chapters and aims to provide basic concepts

Fig. 1 Smile curve

and background materials such as product life cycle, basic concepts of quality and reliability, common distribution models in quality and reliability, basic statistical methods for data analysis and modeling and, models and methods for modeling failure point processes.

The second part consists of five chapters and deals with major quality and reliability problems in product design and development phase. The covered topics include design for X, design for quality, design for reliability, and reliability tests and data analysis.

The third part consists of four chapters and deals with quality and reliability problems in product manufacturing phase. The covered topics include product quality variations, quality control at input, statistical process control, and quality control at output.

The fourth part consists of two chapters and deals with product warranty and maintenance.

The extra materials consist of three appendices and deal with some important theories and tools, including multi-criteria decision making analysis techniques, principal component analysis, and Microsoft Excel, with which a number of real-world examples in this book can be computed and solved. Exercises for each chapter are also included in extra materials.

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Jiang, R.

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