CHAPTER 1

INTRODUCTION

Meeting customers' availability expectations for an individual product is best achieved through a process of continuous improvement, as shown in Figure 1.1. The heart of the process is an architecture-based, mathematical availability model that captures the complex relationships between hardware and software failures and the system's failure detection, isolation, and recovery mechanisms to predict unplanned, product-attributable downtime (covered in Chapter 5). In the architecture or high-level design phase of a product release, parameters for the model are roughly estimated based on planned features, producing an initial availability estimate to assess the feasibility of meeting the release's availability requirements (covered in Chapter 8). In the system test phase, updated modeling parameters (such as hardware failure rate calculations, software failure rate estimations from lab data, and measured system parameters) can be used in the model to produce a revised availability estimate for the product (covered in Chapter 7). After the product is deployed in commercial service, outage data can be analyzed to calculate actual rate of outage-inducing software and hardware failures, outage durations, and so on; these actual values can be used to better calibrate modeling parameters and the model itself (covered in Chapter 6). If there is a gap between the actual field availability and the product's requirements, then a roadmap of availability-improving features can be constructed, and the availability prediction for the next release is produced by revising modeling parameters (and the model itself, if significant architectural changes are made) to verify feasibility of meeting the next release's availability requirements with the planned feature set, thus closing the loop (covered in Chapter 10).

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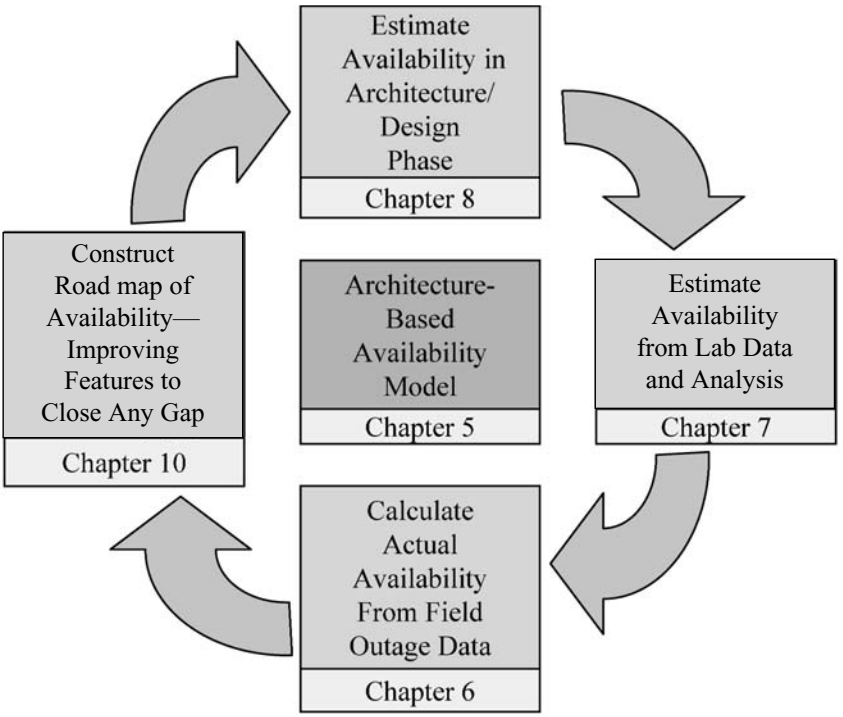

Figure 1.1. Managing system availability.

The body of this book is organized as follows:

- **Chapter 2, System Availability,** explains the classical, service providers' and TL 9000 views of availability.
- **Chapter 3, Conceptual Availability Model,** explains the relationship between service-impacting failure rates, outage durations and availability.
- **Chapter 4, Why Availability Varies between Customers,** explains why the same product with identical failure rates can be perceived to have different availability by different customers.
- **Chapter 5, Modeling Availability,** explains how mathematical models of system availability are constructed; an example is given.
- **Chapter 6, Estimating Parameters from Field Data,** explains how system availability and reliability parameters can be estimated from field outage data.
- **Chapter 7, Estimating Input Parameters from Lab Data,** explains how modeling input parameters can be estimated from

lab data to support an improved availability estimate before a product is deployed to customers (or before field outage data is available).

- **Chapter 8, Estimating Input Parameters in Architecture/Design Stage,** explains how modeling input parameters can be estimated early in a product's development, before software is written or hardware schematics are complete. Good modeling at this stage enables one to verify the feasibility of meeting availability requirements with a particular architecture and high-level design.
- **Chapter 9, Prediction Accuracy,** discusses how much field data is enough to validate predictions and how accurate availability predictions should be.
- **Chapter 10, Connecting the Dots,** discusses how to integrate practical software reliability and system availability modeling into a product's development lifecycle to meet the market's availability expectations.
- **Chapter 11, Summary,** summarizes the key concepts presented in this book, and the practical ways those concepts may be leveraged in the design and analysis of real systems.
- **Appendix A, Sample Reliability Report Outline,** gives an outline for a typical written reliability report. This explains the information that should be included in a reliability report and provides examples.
- **Appendix B, Reliability and Availability Theory**
- **Appendix C, Software Reliability Growth Models**
- **Appendix D, Abbreviations**
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