

Preface

This book is organized into three parts. Part I, *Healthcare Information Technology*, outlines the motivation for writing the book, the background for the discussions, and the foundation upon which the subsequent parts of the book are based, and establishes the context for descriptions of the included conformance, interoperability, and testing concepts. Chapter 1, *Introduction*, gives an overview of the concepts, the targeted issues, and how the concepts are interrelated. This chapter describes a complete conformance testing process lifecycle from the development of standards to the certification of products. Chapter 2, *Architecture*, describes common architectures for distributed healthcare systems. The remaining concepts of the book are discussed against the backdrop of this context. Chapter 3, *Healthcare Data Exchange Landscape*, provides an overview of the Standards Development Organizations (SDO) and Standards Profiling Enforcement Organizations (PEO). In general, SDOs create the standards and PEOs apply the standards to address various workflows. Chapter 4, *Healthcare Data Exchange Standards*, provides a survey of the most relevant standards in use for healthcare data exchange today, while giving the reader a perspective on the standards-related technologies that are available along with the means to compare and contrast them at a high level. To explain the various data exchange concepts, case studies using specific standards are presented extensively throughout this book. Although any standard could have been used in the case studies, the HL7 v2.x standard is used for the most part since it is the most widely deployed standard, and the authors have extensive experience with it.

Part II, *Conformance*, focuses on the definition and explanation of conformance concepts and techniques for unambiguously specifying requirements, including applying the concepts of profiling. In the opinion of the authors, the lack of quality standard specifications is the biggest impediment to achieving interoperability among healthcare information systems. We encourage all standards developers to employ the concepts presented in Part II. Chapter 5, *Conformance Constructs*, provides a detailed explanation of conformance concepts that are applicable in a standard-agnostic manner to most standard specifications. This explanation sets the foundation for much of the discussion in later chapters, and the reader's

understanding of the information provided in this chapter is essential. Chapter 6, *Principles of Specifying Conformance*, describes how specifications should state requirements (conformance) in a general sense. This discussion includes the necessary conformance components and what they mean. A list of principles is given with explicit examples. Chapter 7, *Principles of Effective Profiling*, introduces the concept of profiling and how to use profiles effectively for managing standard specifications and for developing implementations. Chapter 8, *Profile Relationships*, gives an in-depth analysis of how profiles relate to each other in multiple dimensions (e.g., profile hierarchy and sender/receiver perspectives). A set of rules for creating and determining profile compliance and compatibility is given. Chapter 9, *Tools for Conformance Profiling*, provides a survey of the tools that help in effective application of the profiling mechanisms.

Part III, *Testing and Tools*, focuses on the concepts and techniques of conformance and interoperability testing. Principles of testing are discussed along with application of those principles via testing models, frameworks, architecture, tools, and testing programs. Parts I and II laid the foundation for a clear understanding of what conformance means, why it is necessary, and its benefits. Given that information as the background, how does anyone verify that implementers and users are applying the concepts appropriately in practice? *Testing and Tools* examines this topic by exploring the process, strategy, assessment, and instantiation of conformance and interoperability testing. A foundational chapter, Chap. 10, *Testing Models*, begins this part of the book by defining, in an abstract manner, the various testing models and describing the types of testing that can be performed within the models. Chapter 11, *Principles of Conformance Testing*, explains how to conduct conformance testing, including the creation and execution of test plans. Various types of conformance testing are examined. Chapter 12, *Conformity Assessment*, presents the assessment tables and interpretation of conformance for the conformance constructs presented in Chap. 5. The assessments provide the requirements for building validation tools to evaluate conformance. Through use of concrete examples, Chap. 13, *Testing Architectures*, provides a realization of the concepts and methodologies described in Chaps. 10 and 11. This realization includes a description of a testing infrastructure, testing framework, and an interoperability test bed. Case studies are provided to emphasize the utility of the modular approach. Chapter 14 builds upon this theme by providing a sampling of test tools created from the ideas (framework) explained in Chap. 13. Finally, Chap. 15 describes how testing programs operate and how they utilize the testing tools. An overview is given of the most prevalent testing and certification programs, such as the IHE Connect-a-thon and the ONC Health IT Certification Program that supports the CMS EHR Meaningful Use Programs.

Finally, Appendix, *Additional Healthcare Data Exchange Standards*, provides additional background information about some of the data exchange standards that are in use worldwide.

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Copy-Editor

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Dedication

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