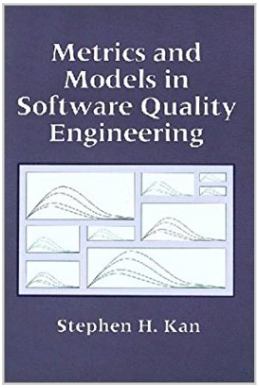

Metrics and Models in Software Quality Engineering

By Stephen H. Kan

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If you need to understand how to measure software quality and how to use measurements to improve your software development, you will want to have a copy of this book. Metrics and Models in Software Quality Engineering provides the information and teaches the skills you need to measure and improve the quality of the entire software development process from high-level to low-level design, as well as all phases of reliability. Joining action plans with actual project experiences, this book focuses on using - not just describing - metrics. It provides detailed coverage of essential issues and techniques, including software metrics, software reliability models, and models and analysis of program complexity. Metrics and Models in Software Quality Engineering goes even further, discussing such topics as in-process metrics, defect removal effectiveness, customer satisfaction, and more. Numerous real-life examples, many taken from the author's experience as the software quality focal point for IBM's Baldrige Award-winning AS/400, show you how to put the theories and techniques to work. The book also contains examples from such major computer companies as Hewlett-Packard, Motorola, and the NASA Software Engineering Laboratory. This excellent balance of theory, techniques, and examples makes for a highly-instructive and practical book on one of the most important topics in software development. "I've devoted considerable space to Kan's Metrics and Models in Software Quality Engineering because I believe it is an important book that bridges the worlds of industrial statistical process control and software engineering. The AS/400 software is a large, complex and very successful product for IBM. Kan provides insights into the methods IBM used to control the quality in this project which provide lessons that we would all do well to study." -Software Development "The concise and clear explanation of function point counting is a jewel. Metrics and Models in Software Quality Engineering If you are looking for just one book on metrics, this is a good choice." -The Northwest C++ Users Group newsletter 0201633396B04062001

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Editorial Review

From the Back Cover
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About the Author
Stephen H. Kan is Senior Technical Staff Member (STSM) and a technical manager in programming for IBM in Rochester, Minnesota. As process manager of the quality management process in product development for IBM's eServer iSeries software development, his responsibilities include quality goal setting, supplier quality requirements, quality plans, in-process metrics, field quality status, and quality and project assessments. Dr. Kan has been a faculty member of the Master of Science in Software Engineering program at the University of Minnesota since 1998. He is certified by the American Society for Quality as a Quality Engineer, a Reliability Engineer, and a Quality Manager, and by the Project Management Institute as a Project Management Professional. 0201633396AB08212002

Looking at software engineering from a historical perspective, the 1960s and earlier could be viewed as the functional era, the 1970s the schedule era, and the 1980s the cost era. In the 1960s we learned how to exploit information technology to meet institutional needs and began to link software with the daily operations of institutions. In the 1970s, as the industry was characterized by massive schedule delays and cost overruns, the focus was on planning and control of software projects. Phase-based life-cycle models were introduced and analysis, like the mythical man-month, emerged. In the 1980s hardware costs continued to decline. Information technology permeated every facet of our institutions and also became available to individuals. As competition in the industry became keen and low-cost applications became widely implemented, the importance of productivity in software development increased significantly. Various cost models in software engineering were developed and used. In the late 1980s, the importance of quality was also recognized.

The 1990s and beyond is certainly the quality era. With state-of-the-art technology now able to provide abundant functionality, customers demand high quality. Demand for quality is further intensified by the ever-increasing dependence on our society on software. Billing errors, large-scale disrupted telephone services, and even a missile failure during the Gulf War can all be traced to the issue of software quality. In this era, quality has been brought to the center of the software development process. From the standpoint of software vendors, quality is no longer an advantage factor in the marketplace; it has become a necessary condition if a company is to compete successfully.

Measurement plays a critical role in effective software development. It provides a scientific basis for software engineering to be a true engineering discipline. This book describes the metrics and models in software quality engineering: quality planning, process improvement and quality control, in-process quality management, product engineering (design and code complexity), reliability estimation and projection, and analysis of customer satisfaction data. Most measurement books take an encyclopedic approach in which every possible software measurement is included. This book confines its scope to the metrics and models on software quality. Areas such as cost estimation, productivity, staffing, and performance measurement, for which numerous publications exist, are not covered.

This book is intended for use by software project managers, software development managers, software engineers, software product assurance personnel, and students in software engineering and in management information systems. It provides practical guidelines and examples in the practice of quality engineering in software development. Although equations and formulas are involved, the focus is on the understanding and applications of the metrics and models (rather than mathematical derivations). Throughout the book, numerous real-life examples are used from the development of the IBM Application System/400 (AS/400) at IBM Rochester, Minnesota, and from other companies in the software industry. (IBM Rochester won the Malcolm Baldrige National Quality Award in 1990 and became ISO 9000 registered in 1992.) Chapter 12 details a case study of the AS/400 software quality management system and provides links with the AS/400 examples in previous chapters.

Chapter 1 discusses the definition of software quality and the total quality management framework. Chapter 2 reviews various development process models that are used in the software industry and discusses the process maturity framework and several quality standards. Chapter 3 examines the fundamentals in measurement theory, which are very important for the practice of software measurement. Chapter 4 presents the major software quality metrics associated with the software life-cycle phases, describes the metrics programs of several large software companies, and discusses software engineering data collection. Chapter 5 describes the application of the basic statistical tools for quality control, known as Ishikawa's seven basic tools, in software development. Chapter 6 examines the central concept of defect removal effectiveness, its measurements, and its role in quality planning.Chapters 7 through 10 cover the three categories of software quality engineering models, each of which is intended for a separate purpose: (1) the reliability models for quality assessment and projection (Chapter 7 on the Rayleigh model and Chapter 8 on the exponential distribution and the reliability growth models), (2) the quality management models for managing quality during the development process (Chapter 9), and (3) the complexity metrics and models that can be used by software engineers for quality improvement in their design and implementation (Chapter 10).

Chapter 11 discusses the measurement and analysis of customer satisfaction data. Chapter 12 describes the software quality management system that was used for the development of the AS/400 computer system. This chapter explicitly or implicitly refers to the approaches, methods, metrics and models, and AS/400 examples discussed in previous chapters. Finally, Chapter 13 provides several observations with regard to software measurement in general and software quality metrics and models in particular, and offers a perspective on the future of measurement in software engineering.

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Stephen H. Kan, Ph. D.
Rochester, Minnesota
August 1994

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Users Review

From reader reviews:

Eddie Drennan:

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