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Software Engineering — Guide to the Software Engineering Body of Knowledge (SWEBOK)

Ingénierie du logiciel — Guide du corps de connaissance de l'ingénierie du logiciel (SWEBOK)

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Technical Report ISO/IEC TR 19759:2005(E)

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 19759, which is a Technical Report of type 3, was prepared by the IEEE Computer Society as the *Guide to the Software Engineering Body of Knowledge*, 2004 Version, and was adopted without change by ISO/IEC JTC 1/SC 7, Software and Systems Engineering.

International Organization for Standardization/International Electrotechnical Commission
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Introduction

The purpose of the Guide to the Software Engineering Body of Knowledge is to provide a consensually validated characterization of the bounds of the software engineering discipline and to provide a topical access to the Body of Knowledge supporting that discipline. The Body of Knowledge is subdivided into ten software engineering Knowledge Areas (KA) plus an additional chapter providing an overview of the Knowledge Areas of strongly related disciplines. The descriptions of the KAs are designed to discriminate among the various important concepts, permitting readers to find their way quickly to subjects of interest. Upon finding a subject, readers are referred to key papers or book chapters selected because they succinctly present the knowledge.

An emphasis on engineering practice leads the Guide toward a strong relationship with the normative literature. Most of the computer science, information technology and software engineering literature provides information useful to software engineers, but a relatively small portion is normative. A normative document prescribes what an engineer should do in a specified situation rather than providing information that might be helpful. The normative literature is validated by consensus formed among practitioners and is concentrated in standards and related documents. From the beginning, the SWEBOK project was conceived as having a strong relationship to the normative literature of software engineering. The two major standards bodies for software engineering (IEEE Computer Society Software and Systems Engineering Standards Committee and ISO/IEC JTC1/SC7) are represented in the project. Ultimately, it is hoped that software engineering practice standards will contain principles directly traceable to the Guide.

The Guide is oriented toward a variety of audiences, all over the world. It aims to serve public and private organizations in need of a consistent view of software engineering for defining education and training requirements, classifying jobs, developing performance evaluation policies or specifying software development tasks. It also addresses practicing, or managing, software engineers and the officials responsible for making public policy regarding licensing and professional guidelines. In addition, professional societies and educators defining the certification rules, accreditation policies for university curricula, and guidelines for professional practice will benefit from the SWEBOK Guide, as well as the students learning the software engineering profession and educators and trainers engaged in defining curricula and course content.

Software Engineering — Guide to the Software Engineering Body of Knowledge (SWEBOK)

1 Scope

This Technical Report characterizes the boundaries of the software engineering discipline and provides topical access to the literature supporting that discipline.

2 Recommendations

As a type 3 Technical Report, this document does not make technical recommendations. The information provided is that contained in the following publication (reproduced on the following pages), which is adopted as a Technical Report:

Guide to the Software Engineering Body of Knowledge, 2004 Version, IEEE Computer Society.

3 Revision of the IEEE Computer Society publication

It has been agreed with the IEEE Computer Society that ISO/IEC JTC 1/SC 7 will be consulted in the event of any revision or amendment of this IEEE Computer Society publication. Consultation will be accomplished by the existing Category A liaison relationship between SC7 and IEEE Computer Society.

4 Publication

The report of the IEEE Computer Society appears on the following pages.

Guide to the Software Engineering Body of Knowledge

2004 Version

SWEBOK®

A project of the IEEE Computer Society Professional Practices Committee

Guide to the Software Engineering Body of Knowledge

2004 Version

SWEBOK®

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FOREWORD

In this Guide, the IEEE Computer Society establishes for the first time a baseline for the body of knowledge for the field of software engineering, and the work partially fulfills the Society's responsibility to promote the advancement of both theory and practice in this field. In so doing, the Society has been guided by the experience of disciplines with longer histories but was not bound either by their problems or their solutions.

It should be noted that the Guide does not purport to define the body of knowledge but rather to serve as a compendium and guide to the body of knowledge that has been developing and evolving over the past four decades. Furthermore, this body of knowledge is not static. The *Guide* must, necessarily, develop and evolve as software engineering matures. It nevertheless constitutes a valuable element of the software engineering infrastructure.

In 1958, John Tukey, the world-renowned statistician, coined the term *software*. The term *software engineering* was used in the title of a NATO conference held in Germany in 1968. The IEEE Computer Society first published its *Transactions on Software Engineering* in 1972. The committee established within the IEEE Computer Society for developing software engineering standards was founded in 1976.

The first holistic view of software engineering to emerge from the IEEE Computer Society resulted from an effort led by Fletcher Buckley to develop IEEE standard 730 for software quality assurance, which was completed in 1979. The purpose of IEEE Std 730 was to provide uniform, minimum acceptable requirements for preparation and content of software quality assurance plans. This standard was influential in completing the developing standards in the following topics: configuration management, software testing, software requirements, software design, and software verification and validation.

During the period 1981-1985, the IEEE Computer Society held a series of workshops concerning the application of software engineering standards. These workshops involved practitioners sharing their experiences with existing standards. The workshops also held sessions on planning for future standards, including one involving measures and metrics for software engineering products and processes. The planning also resulted in IEEE Std 1002, Taxonomy of Software Engineering Standards (1986), which provided a new, holistic view of software engineering. The standard describes the form and content of a software engineering standards taxonomy. It explains the various types of software engineering standards, their functional and external relationships, and the role of various functions participating in the software life cycle.

In 1990, planning for an international standard with an overall view was begun. The planning focused on reconciling the software process views from IEEE Std 1074 and the revised US DoD standard 2167A. The revision was eventually published as DoD Std 498. The international standard was completed in 1995 with designation, ISO/IEC12207, and given the title of Standard for Software Life Cycle Processes. Std ISO/IEC 12207 provided a major point of departure for the body of knowledge captured in this book.

It was the IEEE Computer Society Board of Governors' approval of the motion put forward in May 1993 by Fletcher Buckley which resulted in the writing of this book. The Association for Computing Machinery (ACM) Council approved a related motion in August 1993. The two motions led to a joint committee under the leadership of Mario Barbacci and Stuart Zweben who served as cochairs. The mission statement of the joint committee was "To establish the appropriate sets(s) of criteria and norms for professional practice of software engineering upon which industrial decisions, professional certification, and educational curricula can be based." The steering committee organized task forces in the following areas:

1. Define Required Body of Knowledge and Recommended Practices.
2. Define Ethics and Professional Standards.
3. Define Educational Curricula for undergraduate, graduate, and continuing education.

This book supplies the first component: required body of knowledge and recommend practices.

The code of ethics and professional practice for software engineering was completed in 1998 and approved by both the ACM Council and the IEEE Computer Society Board of Governors. It has been adopted by numerous corporations and other organizations and is included in several recent textbooks.

The educational curriculum for undergraduates is being completed by a joint effort of the IEEE Computer Society and the ACM and is expected to be completed in 2004.

Every profession is based on a body of knowledge and recommended practices, although they are not always defined in a precise manner. In many cases, these are formally documented, usually in a form that permits them to be used for such purposes as accreditation of academic programs, development of education and training programs, certification of specialists, or professional licensing. Generally, a professional society or related body maintains custody of such a formal definition. In cases where no such formality exists, the body of knowledge and recommended practices are "generally recognized" by practitioners and may be codified in a variety of ways for different uses.

It is hoped that readers will find this book useful in guiding them toward the knowledge and resources they need in their lifelong career development as software engineering professionals.

The book is dedicated to Fletcher Buckley in recognition of his commitment to promoting software engineering as a professional discipline and his excellence as a software engineering practitioner in radar applications.

Leonard L. Tripp, IEEE Fellow 2003

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