Software Engineering Body of Knowledge (SWEBOK Guide)
IEEE Computer Society

Agenda
- Who is the IEEE Computer Society
- Introduction to the SWEBOK Guide
- How SWEBOK influences academia
- How SWEBOK influences industry
- How can you use this to your advantage?
Who Are We?

- Institute of Electrical and Electronics Engineers (IEEE):
  - 395,000 members in 160 countries.
  - Publishes 30% of the world’s technical literature within its scope of interest.
- The Computer Society is the largest of IEEE’s 38 technical societies:
  - 85,000 members, 40% outside the US.
  - Founded in 1946
  - Have been involved in Software Engineering since the 1970’s

What is Software Engineering?

- (1) The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.
- (2) The study of approaches as in (1).”
  - (IEEE 1990)
Software Engineering as a Profession

Body of Knowledge
- Curriculum
- Accreditation criteria
- Competency definition
- Professional development programs
- Standards of practice

Code of ethics

Initial professional education
Skills Development
One or both
Certification Licensing
Full Professional Status

We have the key foundation elements for a well defined professional area: Body of Knowledge + Int’l Standards, driving curriculum and accreditation, certification in multiple tiers, and emerging licensing.

History of the SWEBOK Guide
- 2001: Trial version; 10 Knowledge Areas
- 2008: Ratified by ISO-IEC 24773 standard as the BOK for software engineering certifications world-wide
- 2009: First certifications (CSDA and CSDP) conform to ISO-IEC 24773
- 2010: Version 3 development begins; adding 5 new knowledge areas + point-wise security updates
- 2011: Version 3 to be published in 1Q’11
SWEBOK Guide Categories of Knowledge

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<th>Specialized</th>
<th>Generally Accepted</th>
<th>Advanced and Research</th>
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Target of the SWEBOK Guide

“Applicable to most projects, most of the time, and widespread consensus about their value and usefulness”
Project Management Institute - PMI

SWEBOK Guide V3 Knowledge Areas

- Software Requirements
- Software Design
- Software Construction
- Software Testing
- Software Maintenance
- Software Configuration Management
- Software Engineering Management
- Software Engineering Process
- Software Engineering Economics
- Software Quality
- Software Engineering Methods
- Software Engineering Professional Practices
- Computing Foundations
- Mathematical Foundations
- Engineering Foundations
How the SWEBOK Guide Influences Academia

SWEBOK Guide Influence

- SWEBOK Guide
- SE 2004 Curriculum
- CSDA Certification
- GSw2009 Graduate Curriculum
- CSDP Certification
- SWE Licensing (US)
SWEBOK Guide Influence in Academia

- The SWEBOK Guide is the basis of software engineering curriculums in Universities worldwide: US, China, India, Russia etc.
- SE2004: Undergraduate software engineering curriculum based on SWEBOK Guide
- GSw2009: Graduate software engineering curriculum based on the SWEBOK Guide

How the SWEBOK Guide Influences Industry
Software Is Pervasive

- Today, everyone is a developer:
  - Kids writing apps for their smartphones
  - MBAs writing financial analysis apps
  - Engineers writing mission-critical code
- How can you distinguish whether one developer is better than another?
- Given the examples above, is there a way to validate their knowledge base?
Answer: Knowledge-Based Certification

- Software complexity has resulted in poor product quality, costly defects and unsuccessful projects.
- The software industry is growing faster than academia can produce skilled engineers, with a disconnect between academic knowledge and real-word expectations.
- Process-oriented products (PMP, CMMI, Agile) cannot alone solve this trend; structure and assessment of the fundamentals of software engineering practices are needed to help advance the industry.
- Product-specific certifications (Microsoft, Cisco) do not address the need for establishing and assessing fundamental software practices.

Knowledge-based certifications measure software engineering fundamentals and ensure that standard, disciplined practices are established and followed.

IEEE CS Certification Offerings

- **CSDP**: Designed for mid-career SW professionals (4+ years) looking to advance in their field and demonstrate their proficiency of established development practices.
- **CSDA**: Designed to provide entry-level SW professionals (< 2 years) with a baseline knowledge of fundamental development practices and a growth path to the CSDP and beyond.
Certification and Professional Education Roadmap

- **Licensed Software Engineer (US)**
  - Launched: 2008
  - Target: SW Engineering graduates and entry-level professionals

- **CSDA Assessment Course**
  - Launched: 2002
  - Target: Mid-career professionals

- **CSDM Specialty Courses 2011**

- **CSDP Assessment Course**
  - Launched: 2008
  - Target: SW Engineering graduates and entry-level professionals

- **SWEBOK Certificate Program (SCP) Emerging Markets**
  - 2011
  - Target: Specialists (Architecture, Security)

Who Benefits?

- **Individuals**: SW development professionals looking to confirm and demonstrate their knowledge of established development practices and advance in their careers
- **Employers**:
  - Recognize the benefits of adopting standardized SW practices
  - Can use the CSDA/P as a hiring tool, or as an assessment of individual’s knowledge
- **Academia**:
  - Schools that use SWEBOK as a foundation for courseware
  - Graduating SWE students
- **Government**:
  - Acquisition, contractor qual/selection, product specification
  - CSDP is covered under GI Bill with $400 reimbursement
US Software Licensure Update

- As of 2009, ten US States have indicated their interest in a formal licensing scheme for software engineers.
- This has enabled the NCEES to agree to develop a formal Principles & Practices exam.
- The IEEE-USA will serve as the lead society to create the exam and will work closely with the IEEE CS and other organizations.
- It is anticipated that the SWEBOK Guide and CSDP examination will be used in the development of the exam.
- Exam development is expected to begin in 2010, with completion sometime in 2012.
- The minimum requirement for licensure will be a licensed professional engineer in the US, practicing in the field of software engineering.

CSDA/P Qualifications

CSDP
Licensed SW Engineers and IEEE Senior Members are already qualified. All others must meet:

- Education: (need at least one)
  - Bachelor’s degree
  - CSDA certificate holder
  - Educator at the post-baccalaureate level
  - Full member of the IEEE

- Experience: (need at least one)
  - Advanced degree in software engineering and min. two years (~3,500 hrs) of experience in software development
  - At least four years (~7,000 hrs) experience in software development

CSDA
- No formal requirements.

Profile:

- Recent software or computer engineering graduates
- Under-graduates who are in their final year of a bachelor’s degree program in software or computer engineering
- Non-degree professionals with more than 2 years of programming experience
CSDA/P Exam Details - 1

- Exam development conforms to ISO-IEC 17024, global standard for certifications
- 180 multiple-choice questions, 150 of which are scored (30 are development questions)
- Computer-Based Training (CBT) platform, offered at select Prometric centers world-wide
  - See list:
- Exams take 3.5 – 4 hours to complete
- Score report issued before leaving the test center
- Credential package is issued within 4-6 weeks

CSDA/P Exam Details - 2

- CSDA Exam details
  - Developed in 2007, launched in Spring 2008
  - Based on 2004 SWEBOK Guide (10 KAs) + 5 supplemental KAs
  - Due to be refreshed in 2011 based on 2010 SWEBOK Guide (15 KAs)
- CSDP Exam details
  - Developed in 2001, launched in 2002
  - Current version refreshed in 2004 and based on 2004 SWEBOK Guide (11 KAs)
  - New refresh in progress based on 2010 SWEBOK Guide and will launch 1Q’10 (15 KAs)
What Employers are Saying

Mike Gayle, Senior Manager, Boeing Integrated Defense Systems:
"The CS Certifications are valuable to have in these times of increased competition and global markets. The CSDA and CSDP are a means to increasing the professionalism of a software engineering staff, allowing for greater commonality in training of software engineers, and possibly leading to an enhanced reputation in the industry."

Raghu Nambiar, General Manager, Siemens Information Systems Ltd
"We selected the CSDA and CSDP as the benchmark for software certifications at Siemens as they will help raise the level of competence in our organization."

Tori Wenger, Sr. Engineering Manager, Rockwell Collins
"The CSDA is effective as a graduating tool for several reasons. It gives students who take the exam an industry benchmark by which to measure their education progress."

What Professionals are Saying

Steve Tockey, Principal Consultant, Construx Software
"The CS Certifications are valuable to have in these times of increased competition and global markets. The CSDA and CSDP are a means to increasing the professionalism of a software engineering staff, allowing for greater commonality in training of software engineers, and possibly leading to an enhanced reputation in the industry."

Gary Kuehn, Dir. of Application Development, Barclays Capital
"I could not think of a better way to bolster my credentials and help set myself apart than through the CSDP certification. Earning the right to advertise the credential clearly demonstrates my dedication to our profession."

Larry Cox, Deputy Director, Los Alamos Laboratories
"With my CSDP, I can demonstrate that not only am I a scientist but I also have professional certification that will go a long way toward maintaining the reputation of this laboratory, and that the work I'm doing is valid and trustworthy."

Rajeev Shakar, CSDP
"There is no other certification that comes close to the CSDP, which demonstrates one's capability in the software development life cycle."
### Employers That Have CSDA/Ps

- Accenture
- Agilent Technologies
- Air Force Research Laboratory
- Alcatel USA
- Anheuser-Busch
- Antares Management Solutions
- AOL
- Avaya
- BAE Systems
- Barclays Capital
- Barclays Global Investors Inc.
- BEA Systems India
- Bearingpoint
- Bosch
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### For More Information

**Computer Society Certifications:**
- [www.computer.org/certification](http://www.computer.org/certification)
- Email: certification@computer.org

**CSDA Certification**
- [www.computer.org/csda](http://www.computer.org/csda)
- Email: csda@computer.org

**CSDP Certification**
- [www.computer.org/csdp](http://www.computer.org/csdp)
- Email: csdp@computer.org