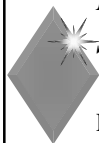12207 - Unit 1 - JWM - 9801   1

Unit 1

IEEE/EIA 12207
Software Life Cycle Processes

Prepared by:
  James W. Moore, `moorej@ieee.org`
  The MITRE Corporation
  January 1998

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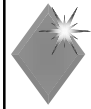

12207 - Unit 1 - JWM - 9801   2

Seminar themes (1 of 3)

◆ Nature of 12207
  ◆ A *framework of related names and concepts ...* not necessarily all of the best practices for software
  ◆ *Processes ...* not procedures
  ◆ *Life cycle processes ...* not a life cycle model

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Seminar themes (2 of 3)

◆ The best use of IEEE/EIA 12207 is *enterprise level adoption*.
  ◆ It is intended for *voluntary adoption* rather than contractual imposition.
  ◆ It emphasizes *specific one-party claims of compliance* rather than two-party tailoring.
  ◆ It has *relationships to contextual standards* affecting enterprise goals.
  ◆ It has *relationships to process and data standards* that may be used to implement its processes.

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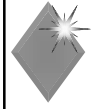12207 - Unit 1 - JWM - 9801   4

Seminar themes (3 of 3)

◆ IEEE/EIA 12207 is a *strategic, integrating standard* for the IEEE software engineering collection.
  ◆ It provides a unifying approach to *life cycle process standardization*.
  ◆ It provides a unifying approach to *life cycle data standardization*.
  ◆ IEEE is now *improving the fit*.
  ◆ IEEE plans to build upon the standard with *future strategic efforts*.

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Part 1 - Software engineering

◆ *Software Engineering*
  ◆ Definition
  ◆ Model
  ◆ Relationship to other Disciplines
◆ Software Engineering Standards
◆ Software Engineering Standards Developers

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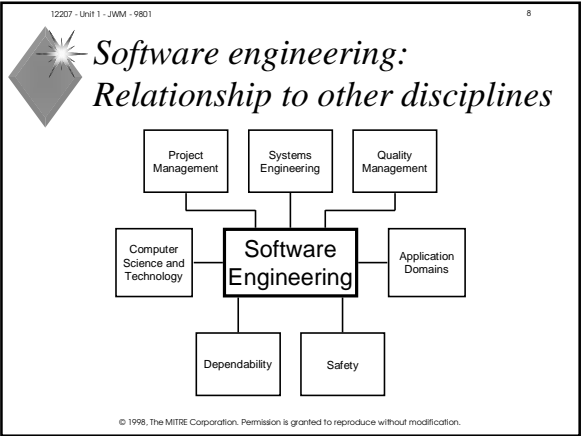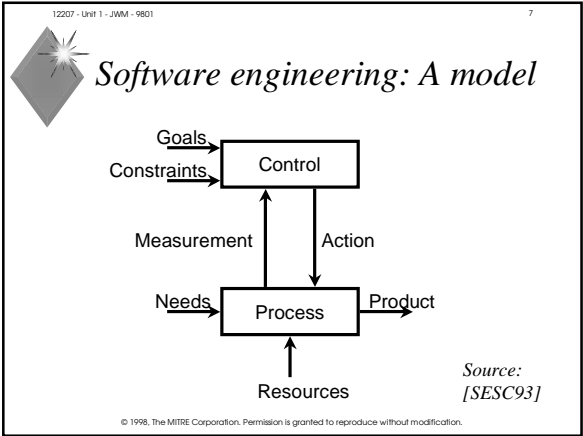
Software engineering: Definition

(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 Std 610.12

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Software engineering: A model

Goals
Constraints → **Control**

Measurement   Action

Needs → **Process** → Product

Resources

Source: [SESC93]

Software engineering: Relationship to other disciplines

Project Management   Systems Engineering   Quality Management

Computer Science and Technology

Software Engineering

Application Domains

Dependability   Safety

Part 2 – Software engineering standards

- ◆ Software Engineering
- ◆ *Software Engineering Standards*
  - ◆ Scope
  - ◆ Importance
  - ◆ Roles and uses
  - ◆ History
- ◆ Software Engineering Standards Developers

Software engineering standards

- ◆ Approximately 315 software engineering standards, guides, handbooks, and technical reports are maintained by approximately 46 professional, sector, national, and international standards organizations. -- *[Magee97]*
- ◆ In 1981, IEEE had one software engineering standard. By year end 1997, the collection had grown to 44. -- *[SESC97a]*
- ◆ The 1994 edition of IEEE Standards Collection: Software Engineering is 1300 pages long. The 1998 edition will be in four volumes totaling 2400 pages
- ◆ Most software engineering standards are *practice* standards rather than the more familiar *product* standards

---

Software engineering standards: Scope

Process	**Technique/Tool**	**Applicability**
◆ Acquisition	◆ CASE tools	◆ General
◆ Requirements definition	◆ Languages and Notations	◆ Defense
◆ Design	◆ Metrics	◆ Financial
◆ Code and Test	◆ Privacy	◆ Medical
◆ Integration	◆ Process improvement	◆ Nuclear
◆ Maintenance and Operations	◆ Reliability	◆ Process control
◆ CM	◆ Safety	◆ Scientific
◆ Documentation	◆ Security	◆ Shrink-wrap
◆ Project management	◆ Software reuse	◆ Transportation
◆ Quality assurance	◆ Vocabulary	
◆ V & V		

Source: [Magee97]

Software engineering standards: Importance

- ◆ They consolidate existing technology into a firm basis for introducing newer technology
- ◆ They increase professional discipline
- ◆ They protect the business
- ◆ They protect the buyer
- ◆ They improve the product

Slide 13

Software engineering standards: Roles

More exciting

- Specify techniques to develop software faster, cheaper, better → IEEE 982.1 (Measures for Reliable SW)
- Provide consensus validity for "best practices" that cannot be scientifically validated → IEEE 1008 (Unit Testing)
- Provide a systematic treatment of "*ilities*" → IEEE 730 (SW Quality Assurance)
- Provide uniformity where agreement is more important than small improvements → IEEE P1320.1 (IDEF0)
- Provide a framework for communication between buyer and seller → IEEE/EIA 12207 (SW Life Cycle Processes)
- Give precise names to concepts that are fuzzy, complex, detailed and multidimensional → IEEE 1028 (SW Reviews)

More effective

Slide 14

Software engineering standards: Uses

- Terminology
- Best practice adoption
- Organizational badge
- Contractual agreement

Slide 15

Software engineering standards: Organizational goals

- Improve and evaluate software competence
- Framework for two-party agreements
- Evaluation of software products
- Assurance of high integrity levels for software products

Slide 16

Software engineering standards: History

- 1968: Term *software engineering* coined at NATO conference
- 1973: US National Bureau of Standards writes *Guidelines for Documentation of Computer Programs and Automated Systems*
- 1974: US Navy initiates Mil-Std-1679, *Weapons System Development,* including guidelines for embedded computing resources.
- 1976: IEEE creates predecessor of SESC
- 1979: IEEE Std 730, *Software Quality Assurance Plans*
- 1987: ISO and IEC form JTC1 on Information Technology [Industry]
- 1998: JTC1/SC7 gains "horizontal" status

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Part 3 – Software engineering standards developers

- Software Engineering
- Software Engineering Standards
- *Software Engineering Standards Developers*
  - International : ISO/JTC1/SC7 and others
  - US: IEEE and others

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SWE standards developers: International

International Organisation for Standardisation — **ISO**   **IEC** — International Electrotechnical Commission ·········· **ITU**

TC176 (Quality) **JTC1** (Information Technology) **TC56** (Dependability) **SC65A** (Functional Safety)

SC1 (Terminology) **SC7** (Software Engineering) **SC22** (Language, OS)

WG7 (Life cycle processes) **Other WGs** **WG9** (Ada) **WG15** (POSIX) C++

The focal point in international standards is **ISO/IEC JTC1/SC7.**

Other committees, though, deal with related work.

Members of these committees are "national bodies," i.e. countries, represented by "national delegations."

SWE standards developers: ISO/IEC JTC1/SC7 program

- WG2: System software documentation
- WG4: Tools and environment
- WG6: Evaluation and metrics
- **WG7: Life cycle management**
- WG8: Integral life cycle processes

- WG9: Classification and mapping
- WG10: Process assessment
- WG11: Software engineering data definition and representation
- WG12: Functional size measurement
- WG13: Software measurement process

SWE standards developers: Current standards of SC7

- Six "legacy" standards
- ISO/IEC 9126:1991, Product quality characteristics
- ISO 9127:1988, User documentation and cover information for consumer software packages
- ISO/IEC TR 9294:1990, Management of software documentation
- ISO/IEC 11411:1995, Representation of state transition diagrams
- ISO/IEC 12119:1994, Software packages: Quality requirements and testing
- ISO/IEC 12207:1995, Software life cycle processes
- ISO/IEC 14102:1995, Evaluation and selection of CASE tools
- ISO/IEC 14143-1:1997, Functional size measurement
- ISO/IEC 14568:1997, Diagram exchange language for tree charts

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SWE standards developers: US

American National Standards Institute

ANSI

NCITS | **AIAA** | **ANS** | **ASTM** | **EIA** ······ **IEEE**

Institute of Electrical and Electronics Engineers

PMI   **INCOSE**

Electronic Industries Association

······ **SESC**

Software Engineering Standards Committee

About 550 organizations in the U. S. make standards.

About half of them are accredited by **ANSI**, allowing them to participate in international standardization activity.

The focal point (in the U. S.) is the **SESC** of the IEEE Computer Society

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SWE standards developers: IEEE

IEEE Board of Directors

Other Societies   *Computer Society*   *IEEE Standards Board*

Similar organizations

Standards Activity Board

Other "Sponsors"   Stds Coordinating Committees   *SW Engineering Standards Committee*