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## Unit 1

# IEEE/EIA 12207 Software Life Cycle Processes

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## 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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## 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

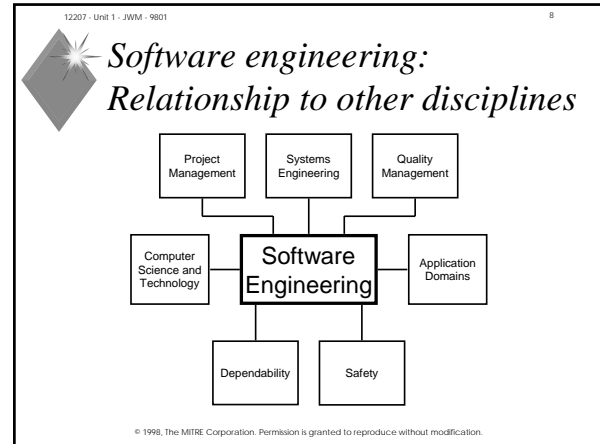
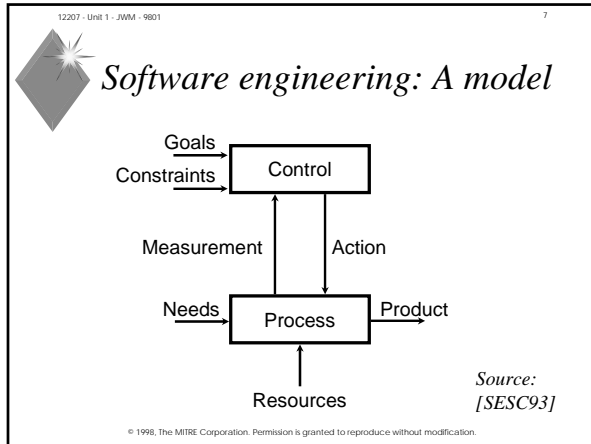
(1) *The application of a **systematic, disciplined, quantifiable** approach to the development, operation and maintenance of software, that is, the application of engineering to software*

(2) *The study of approaches as in (1)*

-- IEEE Std 610.12

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- Part 2 – Software engineering standards**
- ◆ Software Engineering
  - ◆ Software Engineering Standards
    - ◆ Scope
    - ◆ Importance
    - ◆ Roles and uses
    - ◆ History
  - ◆ Software Engineering Standards Developers
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- 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
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- 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]
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- 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
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### Software engineering standards: Roles

- ◆ 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 (IDEFO)
- ◆ 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 exciting ↑  
↓ More effective

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### Software engineering standards: Uses

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

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### 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

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### 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

The focal point in international SE 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.”

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### 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

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### 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

ANSI  
American National Standards Institute

NCITS AIAA ANS ASTM EIA ..... IEEE  
Institute of Electrical and Electronics Engineers

PMI INCOSE ..... SESC  
Electronic Industries Association  
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

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