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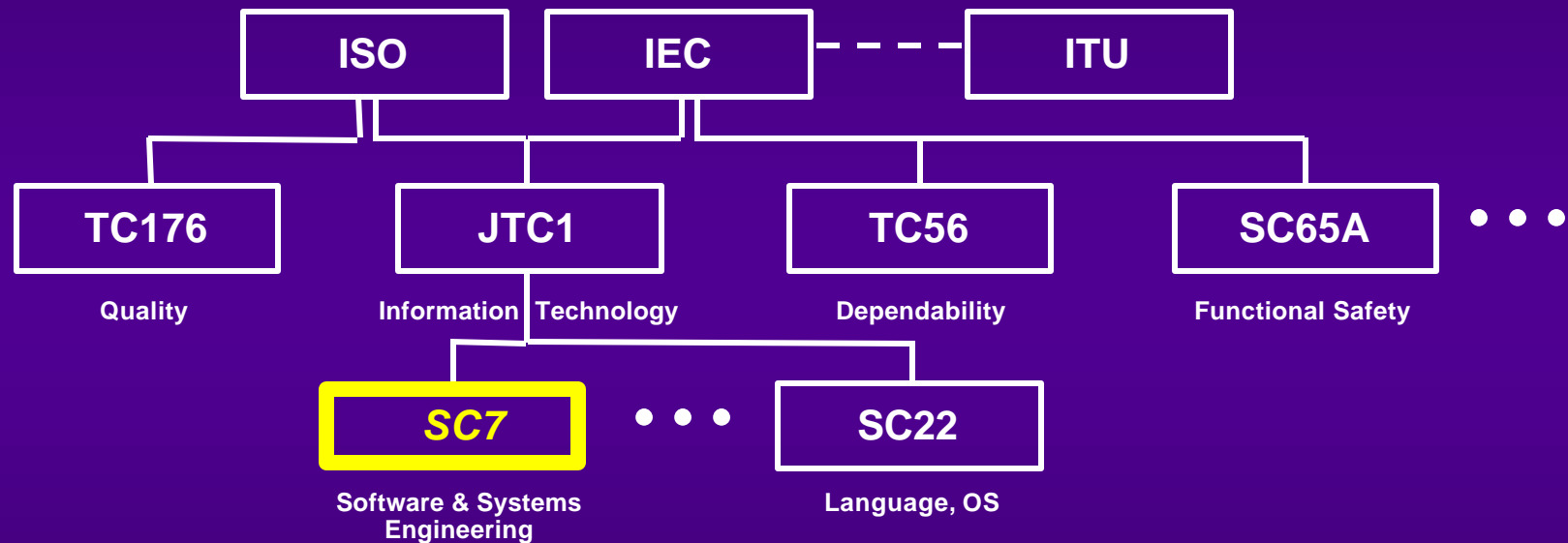
International Software & Systems Engineering Standards

Jim Moore

The MITRE Corporation

Chair, US TAG to ISO/IEC JTC1/SC7

James.W.Moore@ieee.org

Developers of International Standards related to SWE

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        ┌──────────┐   ┌──────────┐         ┌──────────┐
        │   ISO    │   │   IEC    │ - - - - │   ITU    │
        └──────────┘   └──────────┘         └──────────┘
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TC176	JTC1	TC56	SC65A • • •
Quality	**Information Technology**	**Dependability**	**Functional Safety**

SC7 • • • **SC22**

Software & Systems Engineering   **Language, OS**

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."

SC7 Plenary Attendance
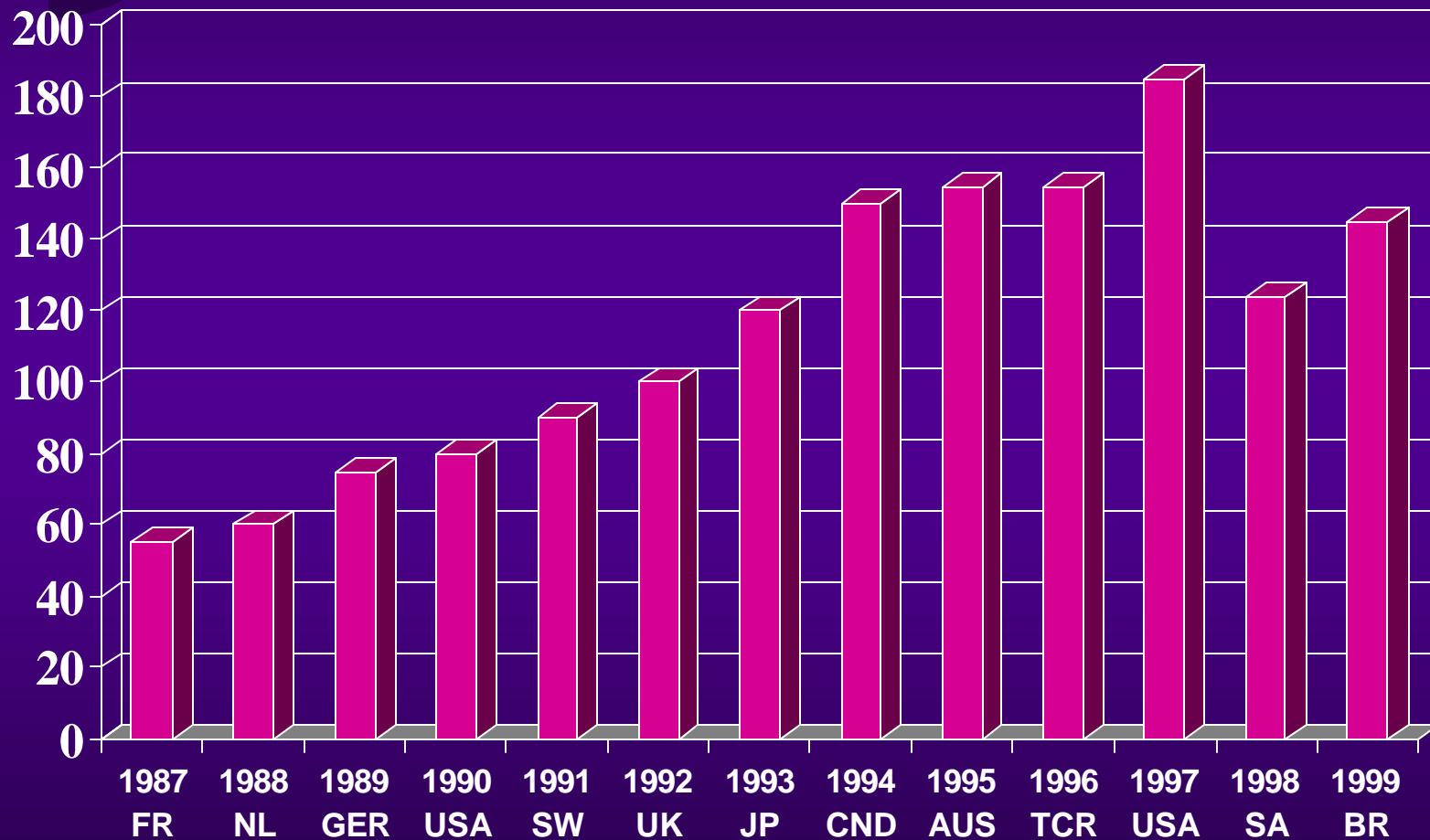
Based on a chart by François Coallier, SC7 Chair

ISO/IEC JTC1/SC7 Working Groups
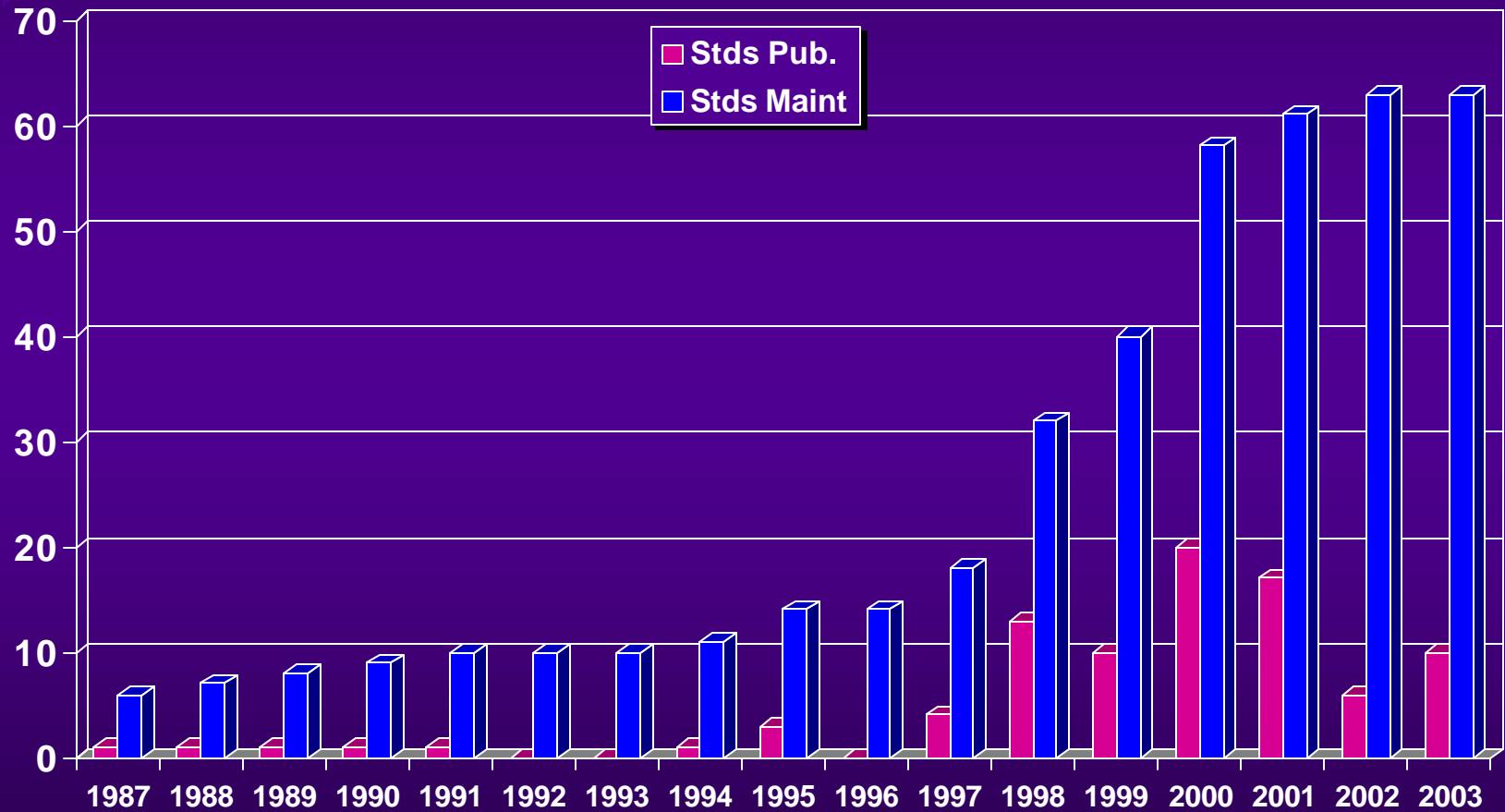
- WG2: System software documentation
- WG4: Tools and environment
- WG6: Evaluation & metrics
- WG7: Life cycle management
- WG9: System & SW integrity
- WG10: Process assessment
- WG11: Software data definition and representation

- WG12: Functional size measurement
- WG13: Software measurement process
- SWG1: Planning
- SWG2: Vocabulary
- SWG3: Process Architecture
- Ad Hoc: Quality Mgmt
- Study Group: SE Practices

Plus four other WGs inherited from SC33 dealing with ODP and LOTOS

SC7 Production (est.)

(No new NWI assumed - exclude dependability)

Based on a chart by François Coallier, SC7 Chair

- Several "legacy" standards
- ISO/IEC 6592:2000, Guidelines for the documentation of computer-based application systems
- *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 TR 12182:1998, Categorization of software
- *ISO/IEC 12207:1995, Software life cycle processes*
- ISO/IEC 14102:1995, Evaluation and selection of CASE tools
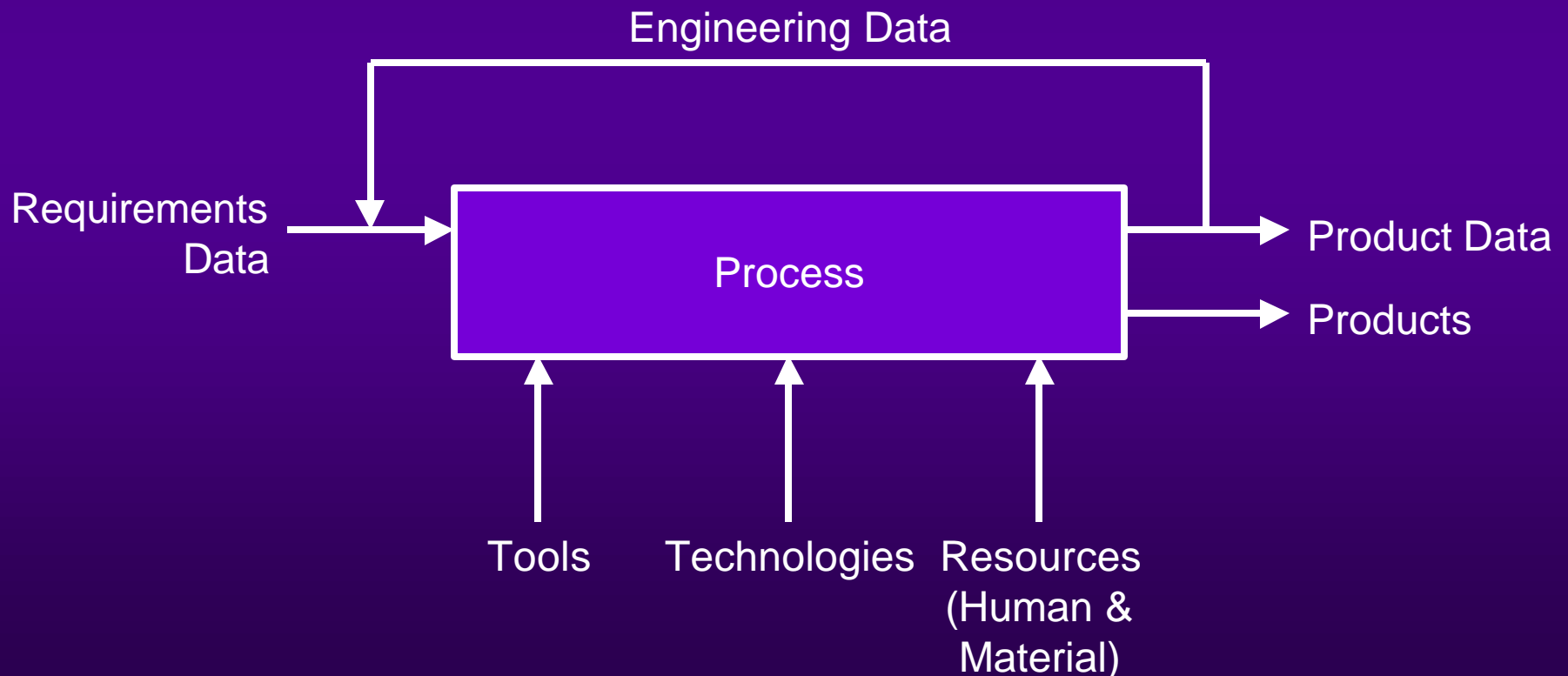- ISO/IEC 14143-1:1998, Functional size measurement
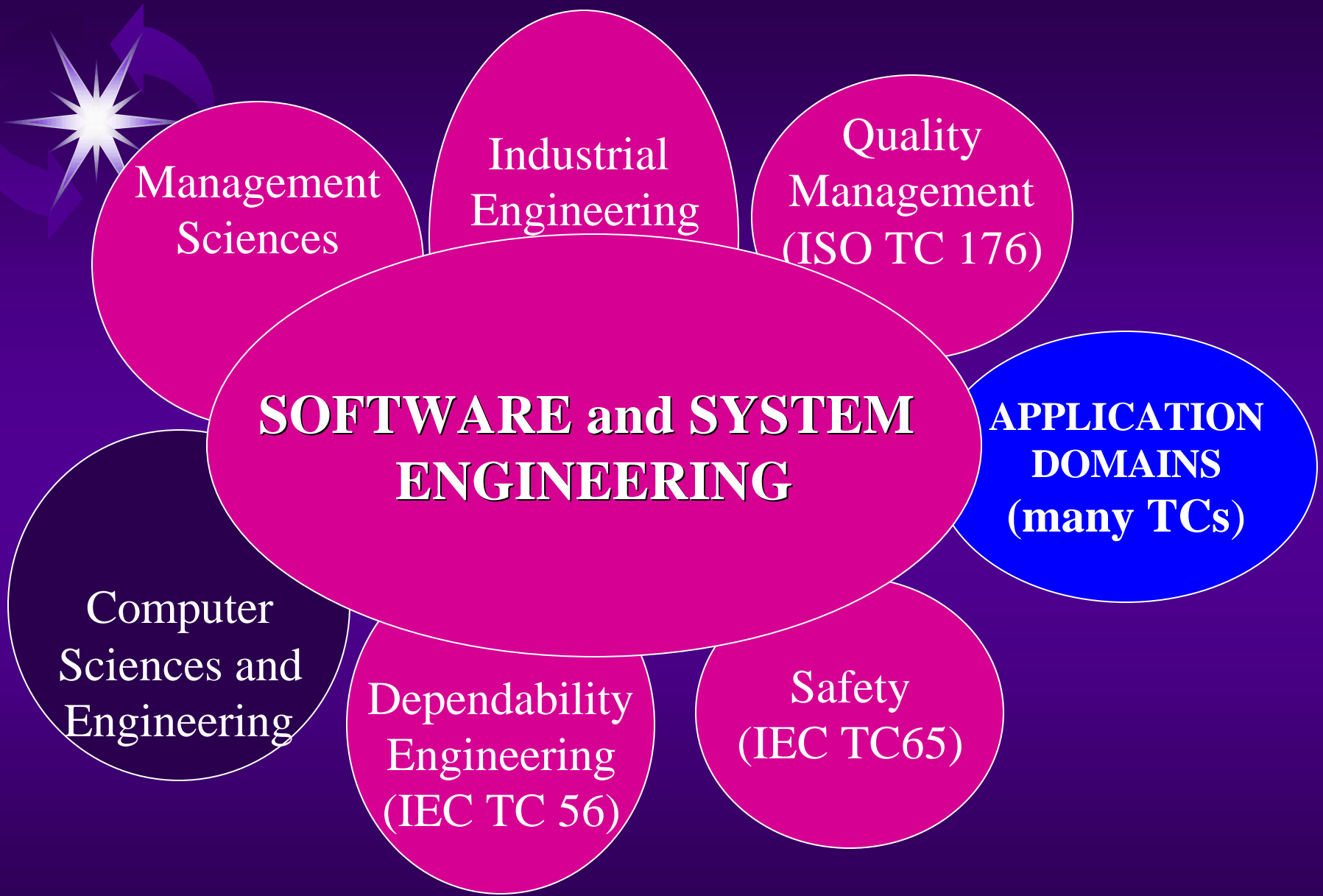
Current Standards of SC7 (2 of 2)

- ISO/IEC TR 14471:1999 Information technology -- Software engineering -- Guidelines for the adoption of CASE tools
- ISO/IEC 14568:1997, Diagram exchange language for tree charts
- ISO/IEC 14598:2000, Software product evaluation (6 parts)
- ISO/IEC 14756:1999, Measurement and rating of performance
- ISO/IEC TR 14759:1999, Mockup and prototype
- ISO/IEC 14764:1999, Software maintenance
- *ISO/IEC 15026:1998, System and software integrity levels*
- ISO/IEC TR 15271:1998, Guide for ISO/IEC 12207
- *ISO/IEC TR 15504:1998, Software process assessment (9 parts)*
- ISO/IEC TR 15846:1998, SWLC processes - Configuration management
- ISO/IEC 15910:1999, Software user documentation process
- ISO/IEC TR 16326:1999, Software project management

Scope of ISO/IEC JTC1/SC7

"Standardization of processes, supporting tools and supporting technologies for the engineering of software products and systems."

Engineering Data

Requirements Data → | Process | → Product Data → Products

Tools   Technologies   Resources (Human & Material)

Management Sciences

Industrial Engineering

Quality Management (ISO TC 176)

SOFTWARE and SYSTEM ENGINEERING

APPLICATION DOMAINS (many TCs)

Computer Sciences and Engineering

Dependability Engineering (IEC TC 56)

Safety (IEC TC65)

Based on a chart by François Coallier, SC7 Chair

Some Important SC7 Standards

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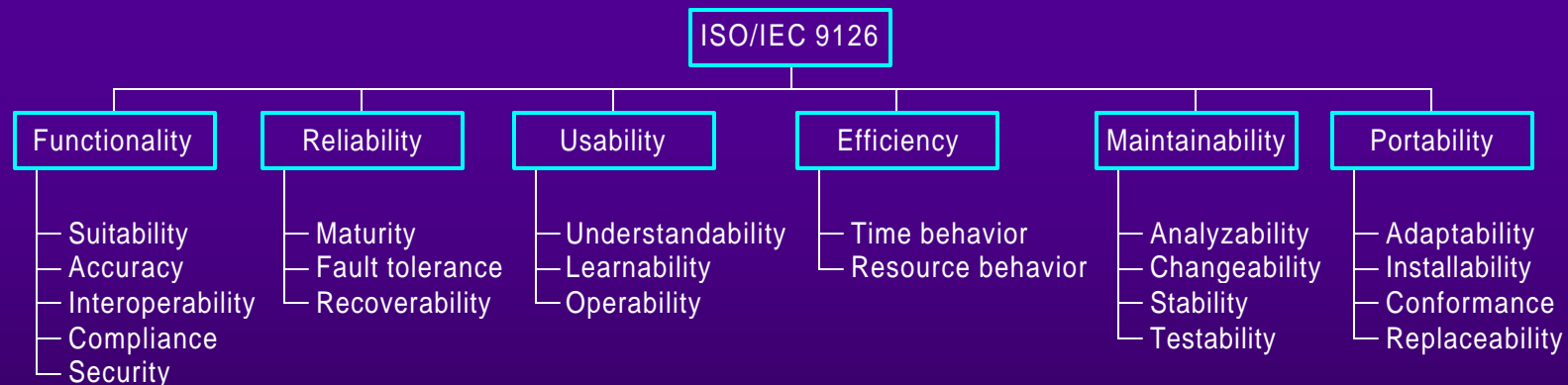
ISO/IEC 9126:1991, Software Product Quality Characteristics

◆ 9126 defines the characteristics and subcharacteristics intended to cover all aspects of software quality resulting from the ISO definition of quality.

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                        ┌──────────────┐
                        │ ISO/IEC 9126 │
                        └──────────────┘
```

Functionality	Reliability	Usability	Efficiency	Maintainability	Portability
Suitability	Maturity	Understandability	Time behavior	Analyzability	Adaptability
Accuracy	Fault tolerance	Learnability	Resource behavior	Changeability	Installability
Interoperability	Recoverability	Operability		Stability	Conformance
Compliance				Testability	Replaceability
Security					

New Generation of 9126 Family

ISO/IEC 9126 Quality Model and Metrics

ISO/IEC14598 Product Evaluation

ISO/IEC 12119 Quality Requirement and Testing

Adapted from a chart by Motoei Azuma

- 9126-1 Quality Model

- 9126-2 External Char. and Metrics

- 9126-3 Internal Char. and Metrics

- 9126-4 Quality in Use Char. and Metrics

- 14598-1: General Overview

- 14598-2: Planning and Management

- 14598-3: Developers Process

- 14598-4: Acquirers Process

- 14598-5: Evaluators Process

- 14598-6: Documentation of Evaluation Module

ISO/IEC 12207:1995, Software Life Cycle Processes

◆ To establish a common framework for the life cycle of software

  ◆ Broad scope: Acquire, supply, develop, operate, and maintain software

  ◆ Recognizes that software is part of a system and that a project is part of an enterprise

◆ To establish a basis for world trade in software

◆ *Amendment underway to describes processes at level of purpose and outcome*
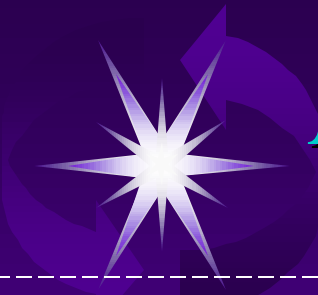
Example Use of 12207 Processes

An Enterprise

An Enterprise

Acquisition

Supply

Management

Infrastructure

Training

Improvement

Development | **Operation** | **Maintenance** |

Documentation

Quality Assurance

Verification

Validation

Configuration Mgmt

Joint Review

Audit

Problem Resolution

ISO/IEC TR 15504, Software Process Assessment
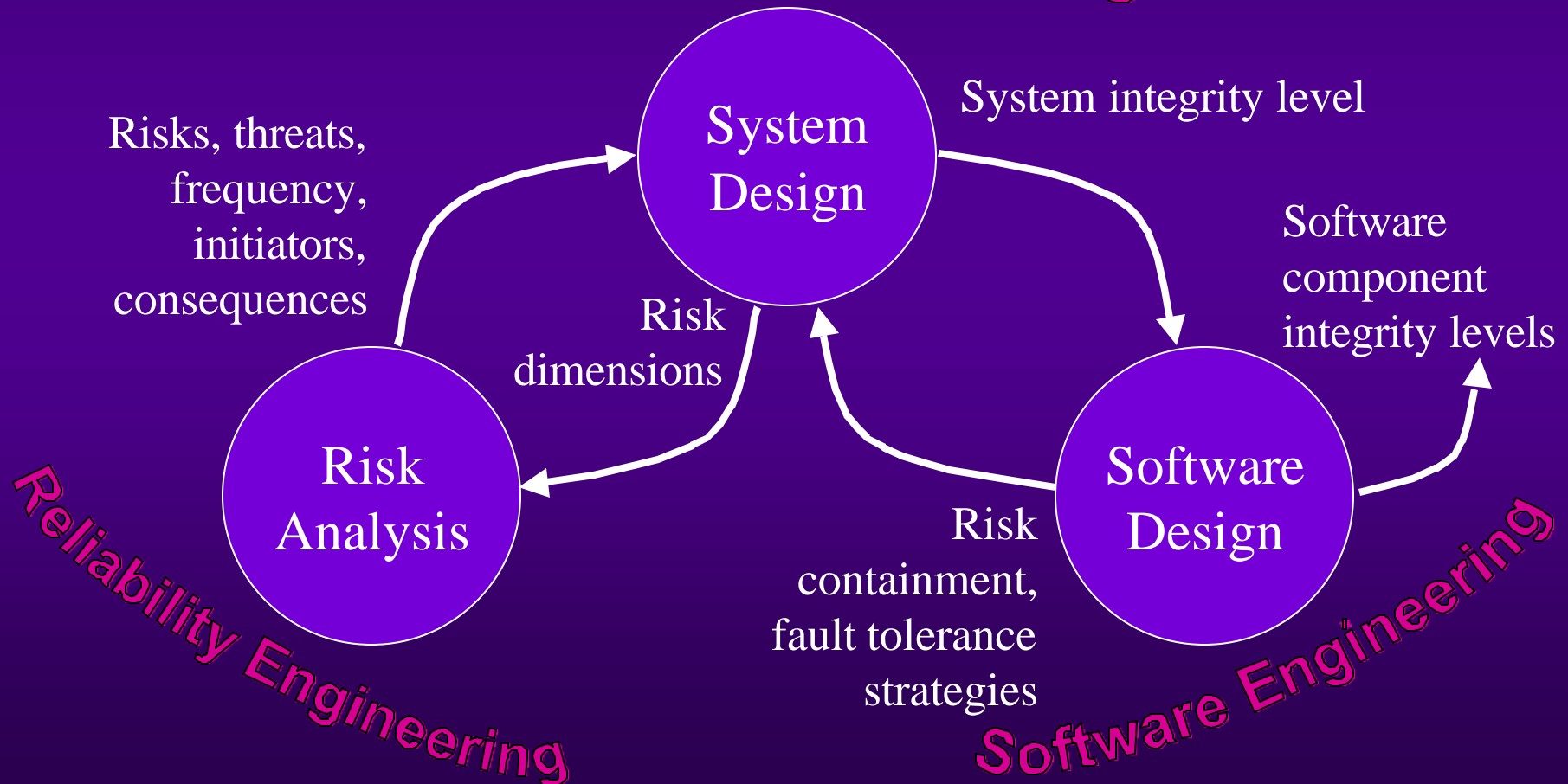
- A nine-part *Technical Report* -- not a standard
- Currently under revision to become a five-part Standard
  - Will have a "process dimension" provided by an externally supplied process reference model*
  - Will have a 6 point "capability dimension": Incomplete through Optimizing
- What conforms to 15504? -- the *assessment*.

Processes other than software may be supplied.

ISO/IEC 15026, System and Software Integrity Levels

Systems Engineering

System integrity level

System Design

Risks, threats, frequency, initiators, consequences

Software component integrity levels

Risk dimensions

Risk Analysis

Software Design

Risk containment, fault tolerance strategies

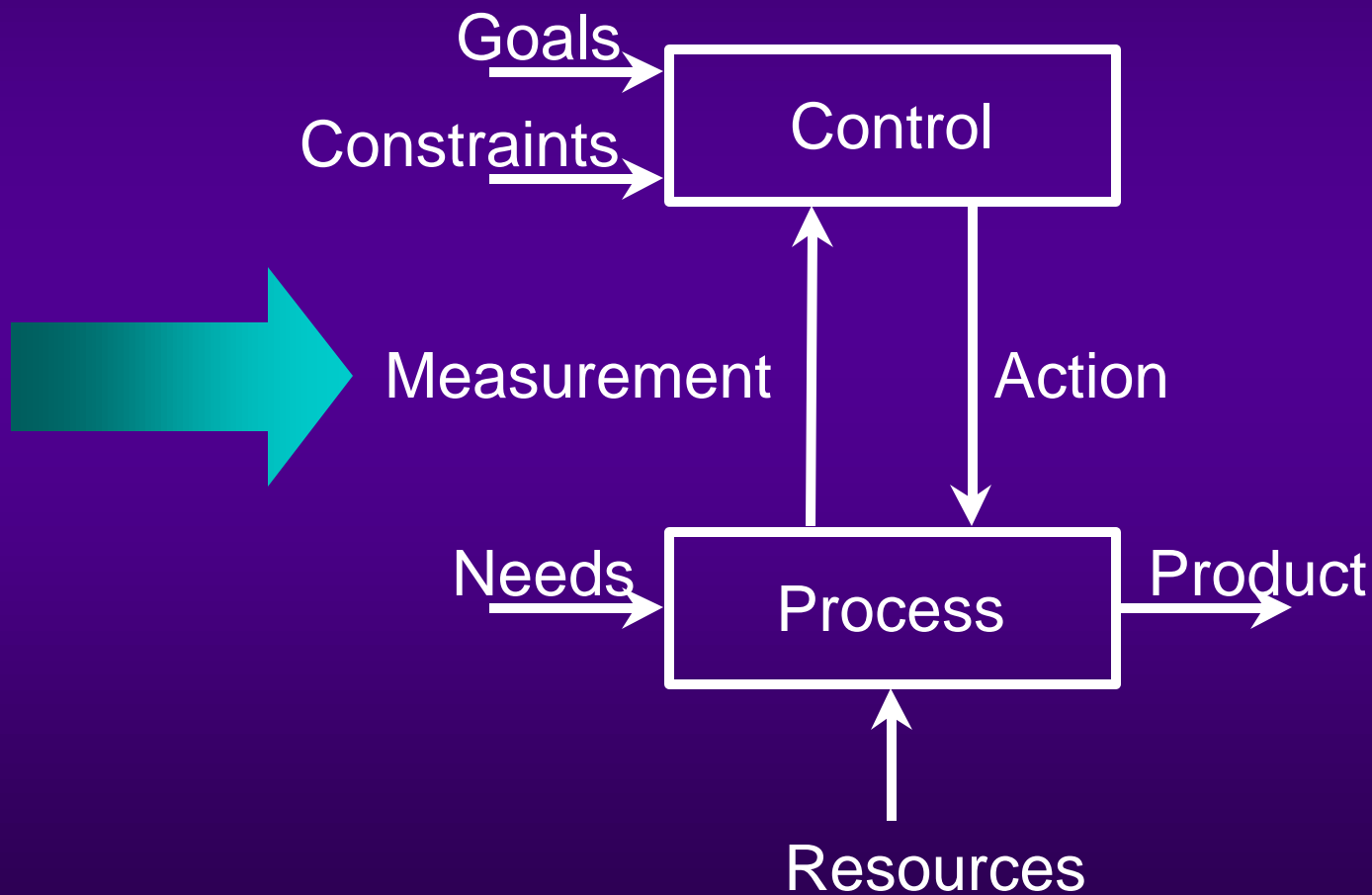Reliability Engineering

Software Engineering

Draft ISO/IEC 15939, Software Measurement Process

- ◆ Activities and tasks necessary to identify, define, select, apply and improve software measurement with a project or organization.

- ◆ Based on principles of Practical Software Measurement (PSM)

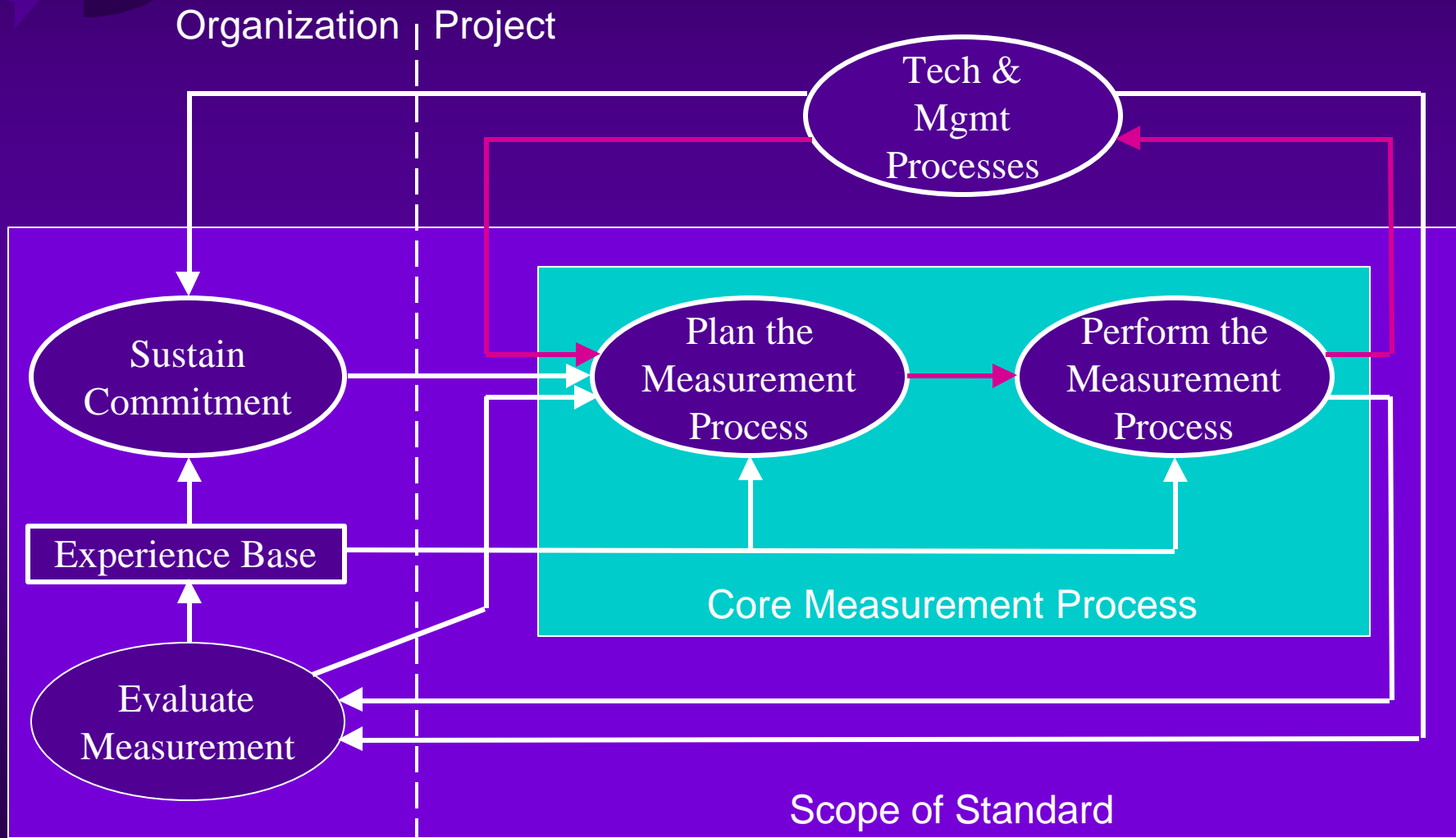- ◆ Designed to fit with ISO/IEC 12207, ISO/IEC 15504, and ISO 9000 series.

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How to Characterize Measurement as a Process?

Goals →

Constraints →

Control

Measurement ↑   Action ↓

Needs → **Process** → Product

↑

Resources

Source: [SESC93]

Draft ISO/IEC 15939

Organization | Project

Tech & Mgmt Processes

Sustain Commitment

Plan the Measurement Process

Perform the Measurement Process

Experience Base

Core Measurement Process

Evaluate Measurement

Scope of Standard

Relationship to Quality Management Standards

Current Situation

| ISO 9001	ISO 9000-3	ISO/IEC 12207
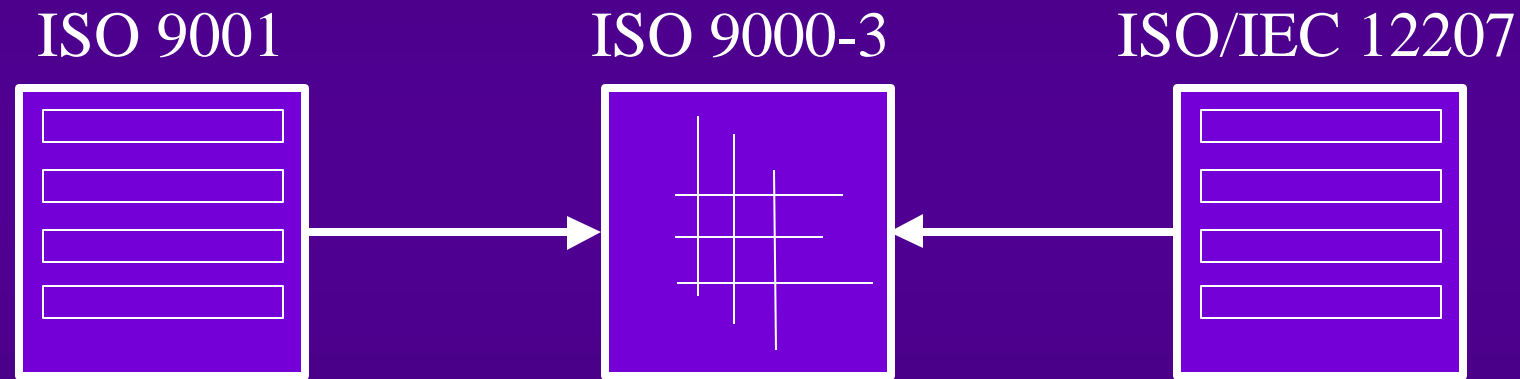
- ◆ Current relationship will be made obsolete by the circa 2000 revision of the ISO 9000 series.

- ◆ SC7 will take responsibility for the replacement of ISO 9000-3 *and other documents on SW QM*

Systems Engineering in SC7

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Scope of SC7 was Changed in 1997

◆ ***Standardization of processes, supporting tools and supporting technologies for the engineering of software products and systems***

JTC1

Scope: *Information technology*

SC7

Scope: *Engineering of software products and systems*
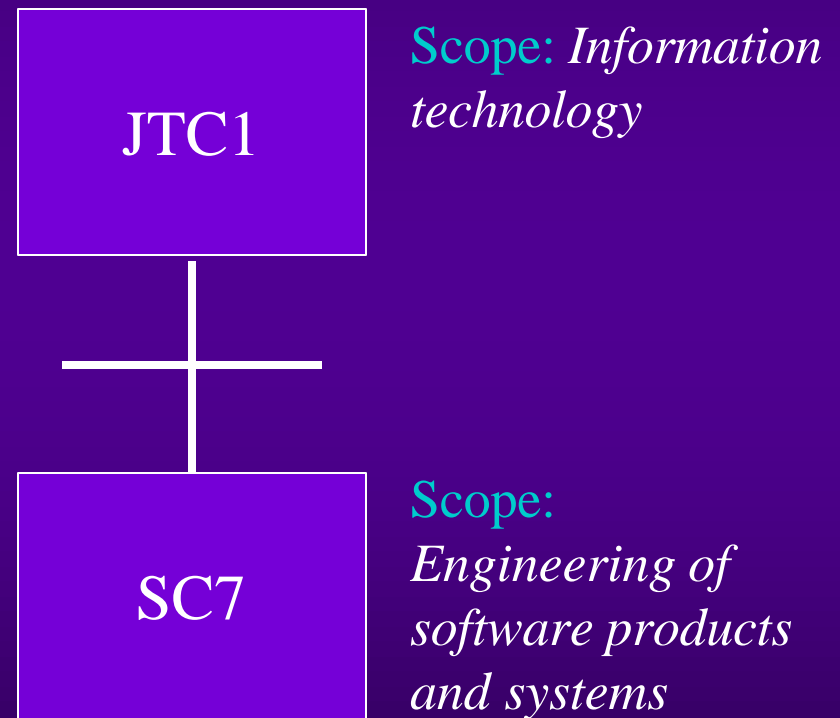
Rationale

- ◆ Software generally is part of a system or product
- ◆ Tight integration of software and other component in many software based systems. Examples:
  - ◆ Telecommunication products (Hardware, Silicon, Software)
  - ◆ Fly-by-wire aircraft

Based on a chart by François Coallier, SC7 Chair

Working Groups with System Scope

- *WG2: System software documentation*
- WG4: Tools and environment
- *WG6: Evaluation & metrics*
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Plus four other WGs inherited from SC33 dealing with ODP and LOTOS

How Can You Participate?

◆ US delegates to meetings of ISO/IEC SC7 and its working groups are selected from representatives to the US Technical Advisory Group.

◆ US positions are developed by the TAG.

◆ Any US-domiciled organization can join the TAG -- $300 per year.

◆ The TAG meets three times a year.

Help Wanted!

◆ SW *product* quality models and metrics

◆ Systems processes and systems engineering practices

◆ Extension of process assessment to systems and business processes

◆ System/software dependability issues

◆ Non-traditional functional size measurement

◆ Comprehensive SW quality management

◆ Also... Documentation, CASE, electronic data interchange