INF5180: Software Product- and Process Improvement in Systems Development

Part 10:

Process Improvement Frameworks

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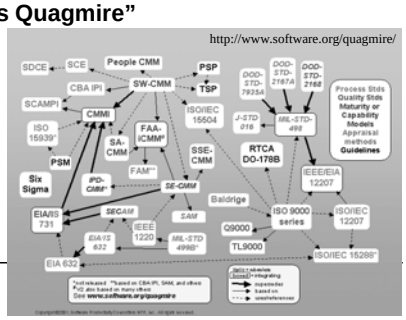
- Standards and Frameworks
  - CMM(I)-family
  - ISO-family (ISO 9000, SPICE)
  - TQM / EFQM / Quality Awards

”Frameworks Quagmire”

Note:
This graph is by far not complete!

http://www.software.org/quagmire/



Examples of Process Improvement Frameworks

- International Organization for Standardization (ISO)
  - **ISO 9001/9000-3** (international standard)
  - **ISO 9001:2000** (successor of ISO 9000-3)
  - **ISO 15504 / SPICE** (Software process Improvement and Capability determination
- Institute of Electrical and Electronics Engineers (IEEE)
  - IEEE 730-1989, IEEE 983-1986 (international IEEE quality standards)
  - ESA PSS-05-0 (European Space Agency - adaptation of IEEE standards)
- Software Engineering Institute (SEI) and "derivates"
  - **SW-CMM → CMMI**
  - **People-CMM(I)**
  - **BOOTSTRAP (ESPRIT)**
  - Software Technology Diagnostic (Compita), Trillium (Bell Canada), Siemens Assessment
- Total Quality Management (TQM) inspired frameworks
  - **EFQM**, Malcolm Baldridge Award, European Quality Award, Deming Award
- + many other international, national and company-specific frameworks

Question

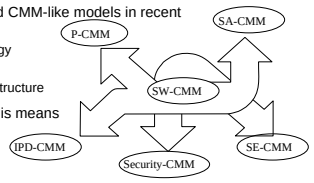
- The SPO framework makes a distinction between structure and process.
- One could claim (Hohmann does so about CMM) that Process Improvement Frameworks tend to focus too little on structure.
- What could be meant by such a statement?
- How could there be more structure?
- What is the trade-off?

CMM-Models

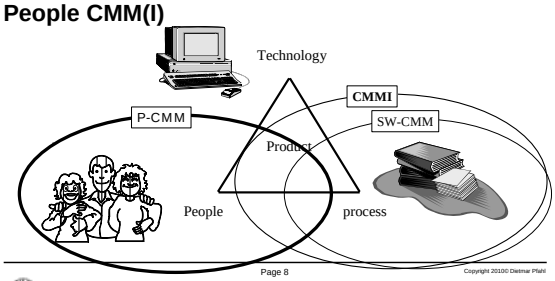
People CMM / CMMI

CMM(I)-Models

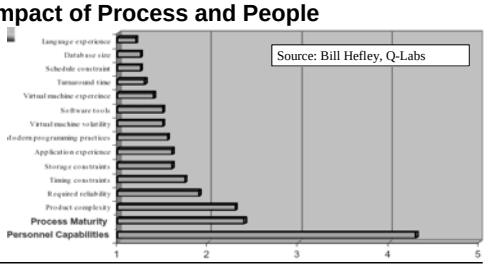
- SW-CMM appeared in 1991 and has since then had several additions.
- The "Explosion" of "CMMs" and CMM-like models in recent years resulted in:
  - partly contradictory terminology
  - partly overlapping areas
  - different representation and structure
- In addition, for organizations this means
  - several different evaluations
  - several training programs
  - big expenses.



People CMM(I)



The Impact of Process and People



A New View on People …

From		To
Doers differ from thinkers	→	Doers must be thinkers
Assets are things	→	Assets are people
Labour is an expense	→	People are an investment
Lifetime employment	→	Lifetime employability
Top down control	→	Decentralised decisions
Localised work	→	Networked problem solved
Measure for results	→	Measure for improvements

Top 10 ”People issues”

1. Get people to handle continuous changes in the organizations
2. Handle competence development and career
3. Ensure consistent communication between management and co-workers
4. Provide clear feedback on performance
5. Overcome low motivation and burnout
6. Measure subjectively, or measure wrong things
7. Identify competence
8. Define roles and responsibility
9. Set personal goals and hold them with the organization’s goals
10. Reduce ”turnover”

P-CMM Architecture

Level	Focus	Key Process Areas
5 Optimizing	Continuous workforce improvement	Continuous Workforce Innovation Coaching Personal Competency Development
4 Managed	Team-based and quantitatively managed workforce practices	Organizational Performance Alignment Organizational Competency Management Team-Based Practices Team Building Mentoring
3 Defined	Competency-based workforce practices	Participatory Culture Competency-Based Practices Career Development Competency Development Workforce Planning Knowledge and Skills Analysis
2 Repeatable	Managers take responsibility for managing and developing their people	Compensation Training Performance Management Staffing Communication Work Environment
1 Initial		

P-CMM "Process Threads"

Levels	Process threads			
	Developing competence	Building teams and culture	Motivating and managing performance	Shaping the workforce
5 Optimizing	Coaching Personal Competency Development	Continuous Workforce Innovation		
4 Managed	Mentoring	Team Building	Organization Performance Alignment Team-Based Practices	Organizational Competency Management
3 Defined	Competency Development Knowledge and Skills Analysis	Participatory Culture	Competency Based Practices Career Development	Workforce Planning
2 Repeatable	Training Communication	Communication	Compensation Performance Management Work Environment	Staffing

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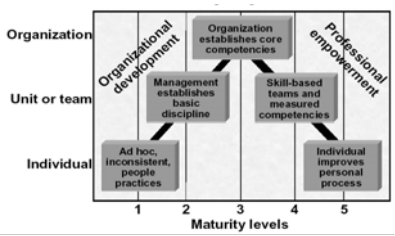
P-CMM – Cultural Changes and Re-Focusing



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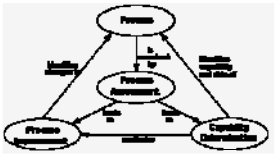
ISO Standards

ISO 15504 (SPICE)

http://www.sqi.gu.edu.au/spice/suite/

ISO 15504 Process Assessment

- The SPICE suite has been designed to satisfy the needs of acquirers, suppliers and assessors, and their individual requirements from within a single source.



- The benefits arising from the use of this suite of documents include:
  - For acquirers:
    - an ability to determine the current and potential capability of a supplier's software processes.
  - For suppliers:
    - an ability to determine the current and potential capability of their own software processes;
    - an ability to define areas and priorities for software process improvement;
    - a framework that defines a road map for software process improvement.
  - For assessors:
    - a framework that defines all aspects of conducting assessments.

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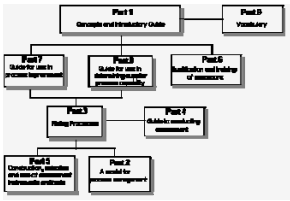
ISO 15504 Document Set



- **Part 1** is an entry point into the SPICE document set. It describes how the parts of the suite fit together, and provides guidance for their selection and use. It explains the requirements contained within the Standard and their applicability to the conduct of an assessment, to the construction and selection of supporting tools, and to the construction and selection of other Process Reference Models which may include base practices additional to those defined in the part 2 of the Standard, or which are entirely new processes, for example to meet industry specific requirements.
- **Part 2** of the SPICE document set defines, at a high level, the fundamental activities that are essential to software engineering, structured according to increasing levels of process capability. These baseline practices may be extended, through the generation of application or sector specific practice guides, to take account of specific industry, sector or other requirements.
- **Part 3** of the SPICE document set defines a framework for conducting an assessment, and sets out the basis for rating, scoring and profiling process capabilities.
- **Part 4** of the SPICE document set provides guidance on the conduct of software process assessments. This guidance is generic enough to be applicable across all organizations, and also for performing assessments using a variety of different methods and techniques, and supported by a range of tools.
- **Part 5** of the SPICE document set defines the framework elements required to construct an instrument to assist an assessor in the performance of an assessment. In addition, it provides guidance to acquirers or designers on the selection and usability aspects of various types of assessment instruments.
- **Part 6** of the SPICE document set describes the competence, education, training and experience requirements for assessors. It also describes mechanisms that may be used to demonstrate competence and to validate education, training and experience.
- **Part 7** of the SPICE document set describes how to define the inputs to and use the results of an assessment for the purposes of process improvement. The guide includes examples of the application of process improvement in a variety of situations.
- **Part 8** of the SPICE document set describes how to define the inputs to and use the results of an assessment for the purpose of process capability determination. It addresses process capability determination in both straightforward situations and in more complex situations involving constructed or future capability. The guidance on conducting process capability determination is applicable either for use within an organization to determine its own capability, or by an acquirer to determine the capability of a (potential) supplier.
- **Part 9** is a consolidated vocabulary of all terms specifically defined for the purposes of the SPICE document set.

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Process Categories ISO 15504

- *Customer-supplier (CUS)*
- Engineering (ENG)
- Project (PRO)
- Support (SUP)
- Organizing (ORG)

Customer-supplier process category:

- **CUS.1 Acquire software product and/or service**
- **CUS.2 Establish contract**
- **CUS.3 Identify customer needs**
- **CUS.4 Perform joint audits and reviews**
- **CUS.5 Package, deliver, and install the software**
- **CUS.6 Support operation of software**
- **CUS.7 Provide customer service**
- **CUS.8 Assess customer satisfaction**

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http://www.rad.fr/spice1.htm

Process Categories ISO 15504

- Customer-supplier (CUS)
- *Engineering (ENG)*
- Project (PRO)
- Support (SUP)
- Organizing (ORG)

Engineering process category:

- **ENG.1 Develop system requirements and design**
- **ENG.2 Develop software requirements**
- **ENG.3 Develop software design**
- **ENG.4 Implement software design**
- **ENG.5 Integrate and test software**
- **ENG.6 Integrate and test system**
- **ENG.7 Maintain system and software**

http://www.rad.fr/spice1.htm

Process Categories ISO 15504

- Customer-supplier (CUS)
- Engineering (ENG)
- *Project (PRO)*
- Support (SUP)
- Organizing (ORG)

Project process category:

- **PRO.1 Plan project life cycle**
- **PRO.2 Establish project plan**
- **PRO.3 Build project teams**
- **PRO.4 Manage requirements**
- **PRO.5 Manage quality**
- **PRO.6 Manage risks**
- **PRO.7 Manage resources and schedule**
- **PRO.8 Manage subcontractors**

http://www.rad.fr/spice1.htm

Process Categories ISO 15504

- Customer-supplier (CUS)
- Engineering (ENG)
- Project (PRO)
- *Support (SUP)*
- Organizing (ORG)

Support process category:

- **SUP.1 Develop documentation**
- **SUP.2 Perform configuration management**
- **SUP.3 Perform quality assurance**
- **SUP.4 Perform problem resolution**
- **SUP.5 Perform peer reviews**

http://www.rad.fr/spice1.htm

Process Categories ISO 15504

- Customer-supplier (CUS)
- Engineering (ENG)
- Project (PRO)
- Support (SUP)
- *Organizing (ORG)*

Organizing process category:

- **ORG.1 Engineer the business**
- **ORG.2 Define the process**
- **ORG.3 Improve the process**
- **ORG.4 Perform training**
- **ORG.5 Enable reuse**
- **ORG.6 Provide software engineering environment**
- **ORG.7 Provide work facilities**

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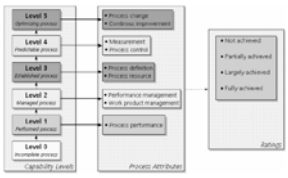
http://www.rad.fr/spice1.htm

Capability Levels in ISO 15504



- Level 0: Incomplete Process (no requirements)
- Level 1: Performed Process (exists)
- Level 2: Managed Process (controlled)
- Level 3: Established Process (institutionalized)
- Level 4: Predictable Process (quantitative control)
- Level 5: Optimized Process (continuing improvement)

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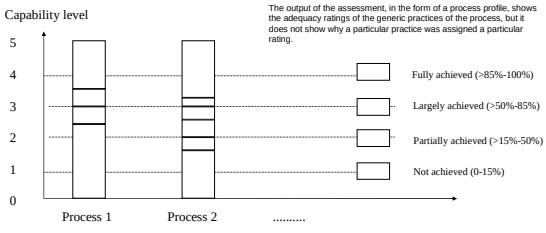
Capability Rating in ISO 15504



The output of the assessment, in the form of a process profile, shows the adequacy ratings of the generic practices of the process, but it does not show why a particular practice was assigned a particular rating.

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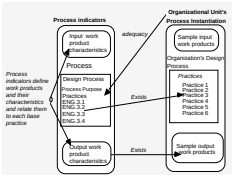
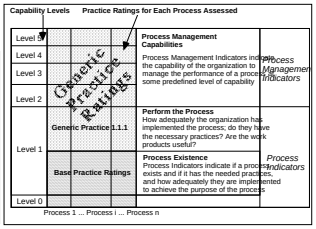
Determining a Rating in ISO 15504

The rating of a process is based on the evaluation of indicators: base practices, generic practices, work products





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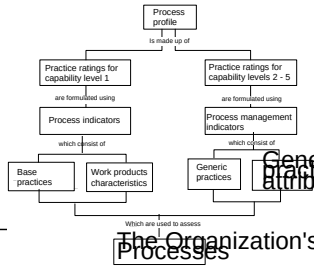
Determining a Rating in ISO 15504 – Summary

- Assessment ratings are assigned for the base practices and generic practices of assessed processes according to the requirements for rating in part 3 of the standard.
- The output is represented as process profiles, containing generic practice ratings and derived capability level ratings, and an assessment record, containing the base practice ratings and supporting information.
- Actual practice adequacy ratings are determined for each assessed process instance.
- Generic practice adequacy ratings may be aggregated to form a view of the performance of a process at each of the capability levels.



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ISO 15504 Rating Scales

Base practice adequacy rating scale

- Base practice adequacy shall be rated using the base practice adequacy rating scale defined below.
- **N; Not adequate:** The base practice is either not implemented or does not to any degree contribute to satisfying the process purpose;
- **P; Partially adequate:** The implemented base practice does little to contribute to satisfying the process purpose;
- **L; Largely adequate:** The implemented base practice largely contributes to satisfying the process purpose;
- **F; Fully adequate:** The implemented base practice fully contributes to satisfying the process purpose.

Base practice existence rating scale

- Base practice existence shall be rated using the base practice existence rating scale defined below:
- **N; Non-Existent:** The base practice is either not implemented or does not produce any identifiable work products;
- **Y; Existent:** The implemented base practice produces identifiable work products.

Generic practice adequacy rating scale

- Generic practice adequacy shall be rated using the generic practice adequacy rating scale defined below.
- **N; Not adequate:** The generic practice is either not implemented or does not to any degree satisfy its purpose;
- **P; Partially adequate:** The implemented generic practice does little to satisfy its purpose;
- **L; Largely adequate:** The implemented generic practice largely satisfies its purpose;
- **F; Fully adequate:** The implemented generic practice fully satisfies its purpose.

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An Example Evaluation

FAME: Fraunhofer Assessment Method

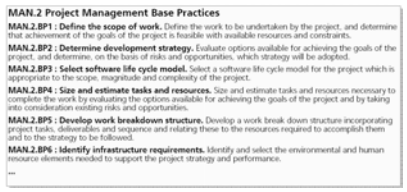
FAME – A slightly different (but SPICE conformant) Assessment Method

- Management Process (MAN)

Note: MAN is for FAME what PRO is for SPICE

FAME – Project Management (MAN.2)

- MAN.2 – Base Practices



FAME – Project Management (MAN.2)

- MAN.2 – Work Products

Associated Input Work Products of MAN.2	
1)	Software development methodology
2)	Life cycle model
4)	Job procedure, practice
5)	Schedule
9)	Standard
18)	Process performance data
22)	Risk analysis
23)	Risk management strategy / plan
24)	Quality statement/policy
37)	Project measure
38)	Process measure
50)	Commitment /agreement
51)	Contract
52)	Requirement specification (customer, software, system)
91)	Configuration management strategy /plan
98)	Tracking system
104)	Development environment

Associated Output Work Products of MAN.2	
2)	Life cycle model
5)	Schedule
6)	Work breakdown structure
8)	Interface
11)	Estimate
17)	Project plan
20)	Progress status report
21)	Analysis result
35)	Review record
30)	Review strategy/plan
33)	Project's reuse strategy
37)	Project measure
45)	Project's acquisition strategy/plan
87)	Communication mechanism
91)	Configuration management plan
97)	Corrective action
108)	Personnel record

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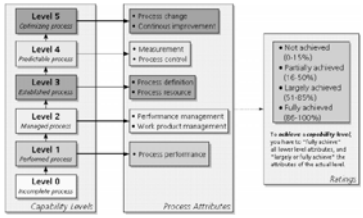
FAME = Fraunhofer Assessment Method

FAME – Project Management (MAN.2)

- Evaluation Model
  - Note: *Process Attributes* in FAME are similar to *Generic Practices* (or Process Indicators) in SPICE



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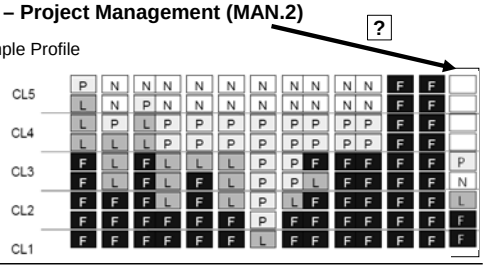
FAME = Fraunhofer Assessment Method

FAME – Project Management (MAN.2)

- Example Profile



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FAME = Fraunhofer Assessment Method

FAME – Project Management (MAN.2)

- Example Summary of Strengths and Weaknesses

Strengths:
- A Project Plan is documented and reviewed for each project
- A schedule is produced and updated regularly
- Responsibilities have been defined

Weaknesses:
- Schedules are not under configuration control
- Project Plans are not being defined according to the standard process
- The standard process is not being updated or verified
- Resources are not being allocated appropriately

FAME = Fraunhofer Assessment Method

ISO Standards

ISO 9000: 1994 (ISO 9001-3)

ISO 9001: 2000

ISO 9000 Series – What is it?

- It is an international quality management system standard applicable to organizations within all type of businesses.
- It addresses *internally* an organization's processes and methods and *externally* the quality of delivered products and services.
- It is a process oriented approach towards quality management. That is, it proposes designing, documenting, implementing, supporting, monitoring, controlling and improving (more or less) each of the following processes:

- Quality Management Process
- Resource Management Process
- Regulatory Research Process
- Market Research Process
- Product Design Process
- Purchasing Process
- Production Process
- Service Provision Process
- Product Protection Process
- Customer Needs Assessment Process
- Customer Communications Process
- Internal Communications Process
- Document Control Process
- Record Keeping Process
- Planning Process
- Training Process
- Internal Audit Process
- Management Review Process
- Monitoring and Measuring Process
- Nonconformance Management Process
- Continual Improvement Process

ISO 9000:1994 Standard Family (1)

- ISO 9001: Quality systems -- Model for quality assurance in design, development, production, installation and servicing
- ISO 9002: Quality systems -- Model for quality assurance in production, installation and servicing
- ISO 9003: Quality systems -- Model for quality assurance in final inspection and test
- ISO 9004: Guidelines for Quality Management and Quality System Elements

ISO 9000:1994 Standard Family (2)

- ISO 9000-1: Guidelines for Selecting and Using ISO 9000 Concepts and Standards
- ISO 9000-2: Guidelines for applying the ISO 9001:1994, ISO 9002:1994, and ISO 9003:1994 quality management standards
- **ISO 9000-3: Guidelines for Applying ISO 9001:1994 to Computer Software**
- ISO 9000-4: Guidelines for Designing and Managing Product Dependability Programs

ISO 9000:2000 Standard Family

- Since 2000, the ISO 9000 family consists of a core of three International Standards plus many associate quality standards, technical reports and guides (two of which are mentioned below).
- The family consists of:
  - ISO 9000: 2000 Quality management systems – Fundamentals and vocabulary
  - ISO 9001: 2000 Quality management system – Requirements
  - ISO 9004: 2000 Quality management system – Guidelines for performance improvement
- Associated with the above are:
  - ISO 10012 Quality assurance requirements for measuring equipment – Metrological confirmation system for measuring equipment
  - ISO 19011 Auditing quality and environmental management systems

Overview ISO 9000-3: 20 Topics

4.1 Management responsibility
4.2 Quality system
4.3 Contract review
4.4 Software development and design
4.5 Document and data control
4.6 Purchasing requirements
4.7 Customer-supplied products
4.8 Product identification and tracing
4.9 Process control requirements
4.10 Product inspection and testing
4.11 Control of inspection equipment
4.12 Inspection and test status of products
4.13 Control of nonconforming products
4.14 Corrective and preventive action
4.15 Handling, storage, and delivery
4.16 Control of quality records
4.17 Internal quality audit requirements
4.18 Training requirements
4.19 Servicing requirements
4.20 Statistical techniques

***Guiding Principle**: "Describe what to do, do it, document it, and control that it was actually done"*

ISO 9000-3: Management Responsibility (1)

Quality policy

- **Define a policy that describes your organization's attitude towards quality. Your quality policy should:**
  - State a clear commitment to quality.
  - Recognize customer needs and expectations.
  - Be actively supported by senior management.
  - List the quality objectives you want to achieve.
  - Be understood by everyone in the organization.
  - Be consistent with your organization's goals.
  - Be maintained throughout your organization.
  - Be applied throughout your organization.

ISO 9000-3: Management Responsibility (2)

Organization

- **Define the organizational structure that you will need in order to manage a quality system.**
  - Responsibility and authority: Define quality system responsibilities, give quality system personnel the authority to carry out these responsibilities, and ensure that the interactions between these personnel are clearly specified. And make sure all of this is well documented.
  - Resources: Identify and provide the resources that people will need to manage, perform, and verify quality system work.
  - Management representative: Appoint a senior executive to manage your quality system and give him or her the necessary authority. This senior executive must ensure that your quality system is developed and implemented.

ISO 9000-3: Management Responsibility (3)

Management review

- **Define a procedure that your senior managers can use to review the effectiveness of your quality system.**
- **Quality system reviews should be:**
  - Carried out on a regular basis.
  - Documented and records should be maintained.
- **Quality system reviews should ensure that your:**
  - Quality system requirements are being met.
  - Quality objectives are being achieved.
  - Quality policy is being applied.

http://www.praxiom.com/iso-9000-3.htm

ISO 9000-3: Quality System

General

- **Develop a quality system and a manual that describes it.**
  - Your quality system should ensure that your products conform to all specified requirements.
  - Your quality manual should: state your quality policy; list your quality objectives; provide an overview of your quality system; describe the structure of your organization; discuss your quality system procedures; introduce your quality documents and records; teach people about your quality system; control quality system work practices; guide the implementation of your quality system; explain how your quality system will be audited.

Quality system procedures

- Develop and implement quality system procedures that are consistent with your quality policy.

Quality planning

- Develop quality plans that show how you intend to fulfill quality system requirements. You are expected to develop quality plans for products, processes, projects, and customer contracts.

http://www.praxiom.com/iso-9000-3.htm

ISO 9000-3: Quality System – Quality planning for software

- **Develop quality plans to control your software development projects.**
- **Your quality plans should control:**
  - **Project implementation.**
  - **Project schedules.**
  - **Project resources.**
  - **Project approvals.**
  - **Project phases.**
    - **When a phase can begin.**
    - **When a phase has been completed.**
- **Your quality plans should define:**
  - **Quality requirements.**
  - **Responsibilities.**
  - **Authorities.**
  - **Life cycle model.**
  - **Review methods.**
  - **Testing methods.**
  - **Verification methods.**
  - **Validation methods.**
- **Develop detailed quality plans and procedures, and define specific responsibilities and authorities to control:**
  - **Configuration management.**
  - **Product verification.**
    - **Verification of your developed products.**
    - **Verification of your purchased products.**
    - **Verification of your customer-supplied products.**
  - **Product validation.**
    - **Validation of your developed products.**
    - **Validation of your purchased products.**
  - **Nonconforming products.**
  - **Corrective actions.**
- **Your quality plans may include or refer to:**
  - **Generic project, product, or contract procedures.**
  - **Special project, product, or contract procedures.**
- **Your quality plan can be a separate document or it can be part of another larger document. Or, it can be made up of several specific documents.**
- **Your quality plan should be updated and refined as your software development plan is implemented.**
- **Make sure that all participating groups and organizations get a chance to review and approve the quality plan before it is implemented.**

http://www.praxiom.com/iso-9000-3.htm

ISO 9000-3: Software Development and Design

General
- Develop and document procedures to control the product design and development process. These procedures must ensure that all requirements are being met.

Design and development planning
- Create design and development planning procedures.

Organizational and technical interfaces
- Identify the groups who should be routinely involved in the product design and development process, and ensure that their design input is properly documented, circulated, and reviewed.

Design input
- Develop procedures to ensure that all design-input requirements are identified, documented, and reviewed; and that all design flaws, ambiguities, contradictions, and deficiencies are resolved.

Design output
- Develop procedures to control design outputs.

Design review
- Develop procedures that specify how design reviews should be planned and performed.

Design verification
- Develop procedures that specify how design outputs, at every stage of the product design and development process, should be verified.

Design validation
- Develop procedures that validate the assumption that your newly designed products will meet customer needs.

Design changes
- Develop procedures to ensure that all product design modifications are documented, reviewed, and formally authorized before the resulting documents are circulated and the changes are implemented.

http://www.praxiom.com/iso-9000-3.htm

ISO 9000 Family: Changes from 1994 to 2000

Previous members of the ISO 9000 family, i.e., 9001, 9002 and 9003, have all been integrated into 9001

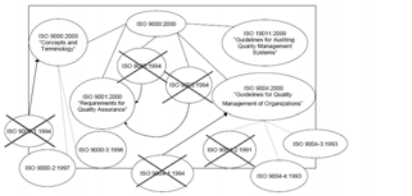


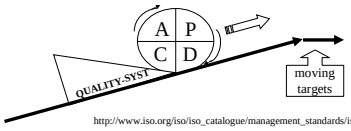
Figure 7: The ISO 9000:2000 standards. The crosses and arrows indicate changes made from the older ISO 9000 standard to the new ISO 9000:2000 standard.

ISO's Goals for 2000-Edition

- Easy to use, easy to understand
- Compliant with ISO 14001 (a standard against which organizations are assessed with regards to environmental management)
- Common structure of ISO 9001 and ISO 9004
- Efficiency and appropriateness (→ less documentation overkill)
- Contribute to benefits for all stakeholders
- Drop non-relevant requirements
- Continuous improvement
- Suitable for self-evaluation

Eight Quality Management Principles

- Customer focus
- Leadership
- People involvement
- Process approach
- System approach to management
- Continual improvement
- Fact-based approach to decision making
- Mutually beneficial supplier relationships



http://www.iso.org/iso/iso_catalogue/management_standards/iso_9000_iso_14000/qmp.htm

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Principle 1 – Customer Focus

ISO 9000 – 3

- Satisfy specified customer requirements.
- Reactive to customer complaints

ISO 9001:2000

Principle:

- *Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.*

Key benefits:

- Increased revenue and market share obtained through flexible and fast responses to market opportunities.
- Increased effectiveness in the use of the organization's resources to enhance customer satisfaction.
- Improved customer loyalty leading to repeat business.

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Principle 2 – Leadership

ISO 9000 – 3

- Establish a quality policy
- Define organizational structure
- Identify and obtain resources

ISO 9001:2000

Principle:

- *Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving the organization's objectives.*

Key benefits:

- People will understand and be motivated towards the organization's goals and objectives.
- Activities are evaluated, aligned and implemented in a unified way.
- Miscommunication between levels of an organization will be minimized.

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Principle 3 – People Involvement

ISO 9000 – 3	ISO 9001:2000
• Identify responsibility and authority. • Identify training needs, give training and make sure trainings will be taken.	Principle: • *People at all levels are the essence of an organization and their full involvement enables their abilities to be used for the organization's benefit.* Key benefits: • Motivated, committed and involved people within the organization. • Innovation and creativity in furthering the organization's objectives. • People being accountable for their own performance. • People eager to participate in and contribute to continual improvement.

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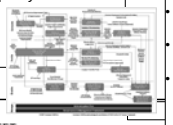
Principle 4 – Process Approach

ISO 9000 – 3	ISO 9001:2000
• Establish, implement and maintain documented procedures where lack of those will have unfavourable effect on quality.	Principle: • *A desired result is achieved more efficiently when activities and related resources are managed as a process.* Key benefits: • Lower costs and shorter cycle times through effective use of resources. • Improved, consistent and predictable results. • Focused and prioritized improvement opportunities.



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Principle 5 – System Approach to Management

ISO 9000 – 3	ISO 9001:2000
• Establish and maintain a documented quality system	Principle: • *Identifying, understanding and managing interrelated processes as a system contributes to the organization's effectiveness and efficiency in achieving its objectives.* Key benefits: • Integration and alignment of the processes that will best achieve the desired results. • Ability to focus effort on the key processes. • Providing confidence to interested parties as to the consistency, effectiveness and efficiency of the organization.

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Principle 6 – Continual Improvement

ISO 9000 – 3	ISO 9001:2000
• Use of data from management reviews, internal quality revisions, correcting and preventive measures to identify possibilities to improve the quality system's effectiveness.	Principle: • *Continual improvement of the organization's overall performance should be a permanent objective of the organization.* Key benefits: • Performance advantage through improved organizational capabilities. • Alignment of improvement activities at all levels to an organization's strategic intent. • Flexibility to react quickly to opportunities.

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Principle 7 – Decisions based on Facts

ISO 9000 – 3	ISO 9001:2000
• Management decisions are based on facts taken from audit reports, deviation registrations and customer complaints.	Principle: • *Effective decisions are based on the analysis of data and information* Key benefits: • Informed decisions. • An increased ability to demonstrate the effectiveness of past decisions through reference to factual records. • Increased ability to review, challenge and change opinions and decisions.

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Principle 8 – Mutually Beneficial Supplier Relationships

ISO 9000 – 3	ISO 9001:2000
• Define and document requirements which have to be met by subcontractors. • Evaluate their execution in order to manage the deliveries.	Principle: • *An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value* Key benefits: • Increased ability to create value for both parties. • Flexibility and speed of joint responses to changing market or customer needs and expectations. • Optimization of costs and resources.

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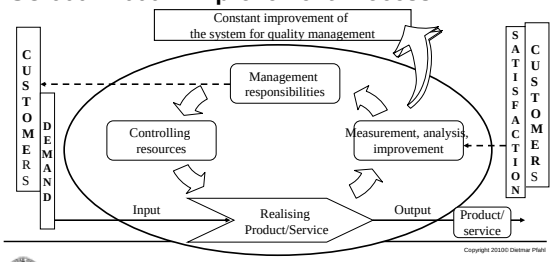
ISO 9001: 2000 – Use of Process Models

- ISO 9001: 2000 encourages the use of process models as the basis for development and maintenance of systems.
- ISO 9001: 2000 requires a comprehensive overview over – and management of – all business processes
  - This is one of the main changes from 1994 to 2000, and represents the company's biggest single challenge – and biggest reward – when transitioning to the new version

ISO 9001:2000 – Improvement Process



"Total Quality"

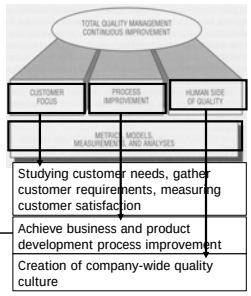
Total Quality Management (TQM)

EFQM

TQM: Total Quality Management

- TQM is a style of management aiming at achieving "long-term" success by linking quality with customer satisfaction
- Other names:
  - Total Quality Control (HP)
  - Market Driven Quality (IBM)
  - Experience Factory (Vic Basili)

Figure from Kan's Book



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TQM

- General "philosophy" to meet the customer's needs (not specially focused on Software Engineering)
- Addresses these issues:
  - quality as strategic business area
  - active participation in quality management by the top management
  - sufficient training and engagement at all levels
  - long term change of the organizational culture
  - organizing around processes, not around functions
  - customer satisfaction
  - continuous improvement

"Quality is free:
it's the missing quality of products, services and processes which cost"

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EFQM: European Foundation for Quality Management

- Is based on TQM-principles
  - Can be taken as a practical example of TQM
- Used for internal and external evaluations of organizations
- Used as a means to identify improvement areas
- Used as "benchmarking"-tool
  - In its extreme form as "competition", i.e., to win the EFQM award

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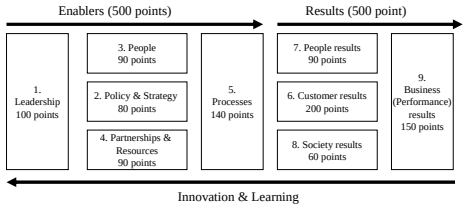
EFQM Business Excellence Model

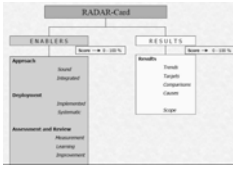


EFQM Evaluation

Procedure:
- Each criterion is evaluated independently
- Based on questionnaires and interviews

Mode:
- Internal – self-evaluation
- External – accredited experts (site visit)

Tools:
- RADAR Scoring Matrix



- PATHFINDER Card (→ a self-assessment tool)

EFQM Evaluation – RADAR Scoring Matrix

- **Approach** – This covers what an organization plans to do and the reasons for it.

  In an excellent organization the approach will be sound – having a clear rationale, well-defined and developed processes and a clear focus on stakeholder needs, and will be integrated – supporting policy and strategy and linked to other approaches where appropriate.
- **Deployment** – This covers the extent to which an organization uses the approach and what it does to deploy it.

  In an excellent organization the approach will be implemented in relevant areas, in a systematic way.
- **Assessment and Review** – This covers what an organization does to assess and review both the approach and the deployment of the approach.

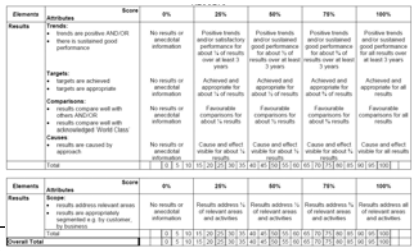
  In an excellent organization the approach, and deployment of it, will be subject to regular measurement, learning activities will be undertaken, and the output from both will be used to identify, prioritize, plan and implement improvement.
- **Results** – This covers what an organization achieves.

  In an excellent organization the results will show positive trends and/or sustained good performance, targets will be appropriate and met or exceeded, performance will compare well with others and will have been caused by the approaches.

  Additionally, the scope of the results will address the relevant areas.

EFQM Evaluation – RADAR Scoring Matrix

- Scoring Matrix for Results



Elements	Attributes	Score	0%	25%	50%	75%	100%
Results	**Trends:** • trends are positive AND/OR • there is sustained good performance		No results or anecdotal information	Positive trends and/or satisfactory performance for about ¼ of results over at least 3 years	Positive trends and/or sustained good performance for about ½ of results over at least 3 years	Positive trends and/or sustained good performance for about ¾ of results over at least 3 years	Positive trends and/or sustained good performance for all results over at least 3 years
	Targets: • targets are achieved • targets are appropriate		No results or anecdotal information	Achieved and appropriate for about ¼ of results	Achieved and appropriate for about ½ of results	Achieved and appropriate for about ¾ of results	Achieved and appropriate for all results
	Comparisons: • results compare well with others AND/OR • results compare well with acknowledged 'World Class'		No results or anecdotal information	Favourable comparisons for about ¼ results	Favourable comparisons for about ½ results	Favourable comparisons for about ¾ results	Favourable comparisons for all results
	Causes: • results are caused by approach		No results or anecdotal information	Cause and effect visible for about ¼ results	Cause and effect visible for about ½ results	Cause and effect visible for about ¾ results	Cause and effect visible for all results
	Total		0	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100			

Elements	Attributes	Score	0%	25%	50%	75%	100%
Results	**Scope:** • results address relevant areas • results are appropriately segmented e.g. by customer, by business		No results or anecdotal information	Results address ¼ of relevant areas and activities	Results address ½ of relevant areas and activities	Results address ¾ of relevant areas and activities	Results address all of relevant areas and activities
	Total		0	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100			
Overall Total			0	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100			

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EFQM Evaluation – PATHFINDER Card (1)

Do the results

- Cover all appropriate stakeholders
- Measure all the relevant approaches and deployment of approaches using both perception and performance indicators
- Show positive trends or sustained good performance. If yes, for how long
- Have targets. If yes, are the targets achieved
- Have comparisons with others, for example competitors, industry averages or 'best in class'
- Compare well with others
- Show a cause and effect link to approaches
- Measure a balanced set of factors both for now and the future
- Give a holistic picture

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EFQM Evaluation – PATHFINDER Card (2)

Approach

Is the approach:
- Soundly based
- Focused on stakeholder needs
- Supporting policy and strategy
- Linked with other appropriate approaches
- Sustainable
- Innovative
- Flexible
- Measurable

Deployment

Is the deployment of the approach:
- Implemented in all potential areas across the organisation
- Implemented to its full potential / capability
- Achieving all the planned benefits
- Systematic
- Understood and accepted by all stakeholders
- Measurable

Assessment & Review

Is the approach and its deployment:
- Measured for effectiveness regularly
- Providing Learning opportunities
- Benchmarked with others, e.g. competitors, industry averages or best in class
- Improved based on the outputs from learning and performance measures

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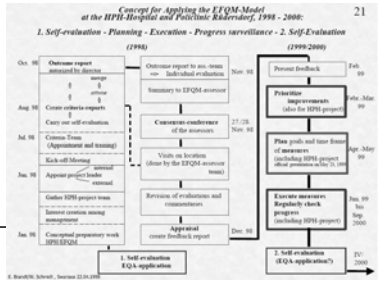
EFQM Evaluation – Example

- Schedule



EFQM Evaluation – Example

- Result