Università “La Sapienza” di Roma

CORSO DI LAUREA MAGISTRALE in INFORMATICA

Master Degree in Computer Science

«*Information Systems*»

Sezione 2 – *Section 2*

DIPARTIMENTO
DI INFORMATICA

SAPIENZA
UNIVERSITÀ DI ROMA

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Management Information Systems

- **Quality concepts**
- **Process quality models**
- **Software product quality models**
- **ICT service quality models**
- **Feasibility study**

Quality concepts

- Over the years, the term quality has been defined differently
  - "conformance to requirements" (Phil Crosby)
  - "achieving excellent levels of fitness for use " (Watts Humphrey)
  - "market-driven quality" where the "customer is the final judge" (IBM)

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.6.2 Quality: ***degree to which a set of inherent characteristics (3.10.1) of an object (3.6.1) fulfils requirements (3.6.4)***

Note 1 *the term "quality" can be used with adjectives such as poor, good or excellent*

Note 2 *the attribute "inherent", as opposed to "assigned", means existing in the object (3.6.1)*

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.10.1 Characteristic : distinguishing feature

- **Note 1: a characteristic can be inherent or assigned**
- **Note 2: a characteristic can be qualitative or quantitative**
- **Note 3: there are various classes of characteristic, such as the following:**
  a) **physical (e.g. mechanical, electrical, chemical or biological one)**
  b) **sensory (e.g. related to smell, touch, taste, sight, hearing)**
  c) **behavioral (e.g. courtesy, honesty, truthfulness)**
  d) **temporal (e.g. punctuality, reliability, availability, continuity)**
  e) **ergonomic (e.g. physiological characteristic, or related to human safety)**
  f) **functional (e.g. maximum speed of an aircraft)**

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.6.1 Object: entity, item or anything perceivable or conceivable

- **Example: product (3.7.6), service (3.7.7), process (3.4.1), person, organization (3.2.1), system (3.5.1), resource**
- **Note 1: objects can be material (e.g. an engine, a sheet of paper, a diamond), immaterial (e.g. conversion ratio, a project plan) or imagined (e.g. the future state of the organization)**

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.6.4 Requirement: need or expectation that is stated, generally implied or obligatory

- **Note 1: "Generally implied" means that it is custom or common practice for the organization (3.2.1) and interested parties (3.2.3) that the need or expectation under consideration is implied**
- **Note 2: a specified requirement is one that is stated, for example in documented information (3.8.6)**

(continues)

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.6.4 Requirement: need or expectation that is stated, generally implied or obligatory

- **Note 3: a qualifier can be used to denote a specific type of requirement, e.g. product (3.7.6) requirement, quality management (3.3.4) requirement, customer (3.2.4) requirement, quality requirement (3.6.5)**
- **Note 4: requirements can be generated by different interested parties or by the organization itself**
- **Note 5: it can be necessary for achieving high customer satisfaction (3.9.2) to fulfill an expectation of a customer even if it is neither stated nor generally implied or obligatory**

Quality concepts

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.10.2 Quality characteristic: inherent characteristic (3.10.1) of an object (3.6.1) related to a requirement (3.6.4)

- **Note 1: inherent means existing in something, especially as a permanent characteristic**
- **Note 2: a characteristic assigned to an object (e.g. the price of an object) is not a quality characteristic of that object**

Quality models

- Quality assurance
- Capability maturity model
- Quality Software product
- Quality services

Process quality models

Quality assurance – ISO 9000 international standards

- **A family of quality management systems (QMS) standards, including**
  - **ISO 9000** Quality management systems - Fundamentals and vocabulary
  - **ISO 9001** Quality management systems - Requirements
  - **ISO 9004** Managing for the sustained success of an organization - A quality management approach
- **First published in 1987 by the International Organization for Standardization (ISO)**
  - In continuous updating (version 2015 is last update)
  - Integrated with other standards (ISO/20000, ISO/14000, ISO/27000, etc.)

Process quality models

Quality assurance – ISO 9000 international standards

- **Designed to help organizations ensure that they meet the needs of customers and other stakeholders while meeting statutory and regulatory requirements related to a product or program**
- **Quality management principles are described in ISO 9000**
- **Based on**
  - Process approach
  - PDCA cycle
  - Risk-based thinking

Process quality models

Quality assurance – ISO 9000 international standards

- **ISO 9001 specifies requirements for a QMS**
  - It promotes the adoption of a process approach when developing, implementing and improving the effectiveness of a quality management system, to enhance customer satisfaction by meeting customer requirements
  - Any organization may implement a Quality Management System compliant to ISO 9001 requirements
  - This compliance can be certified by third-party certification bodies through a set of formal auditings
- **ISO 9001 is widely used because**
  - It is generic, so
  - It can be applied in any segment market

Process quality models

Definitions - ISO 9000:2015

Quality management systems -- Fundamentals and vocabulary

3.3.6 Quality assurance: part of quality management** (3.3.4) **focused on providing confidence that quality requirements** (3.6.5) **will be fulfilled

***3.3.4 Quality management: management** (3.3.3) **with regard to quality** (3.6.2)*

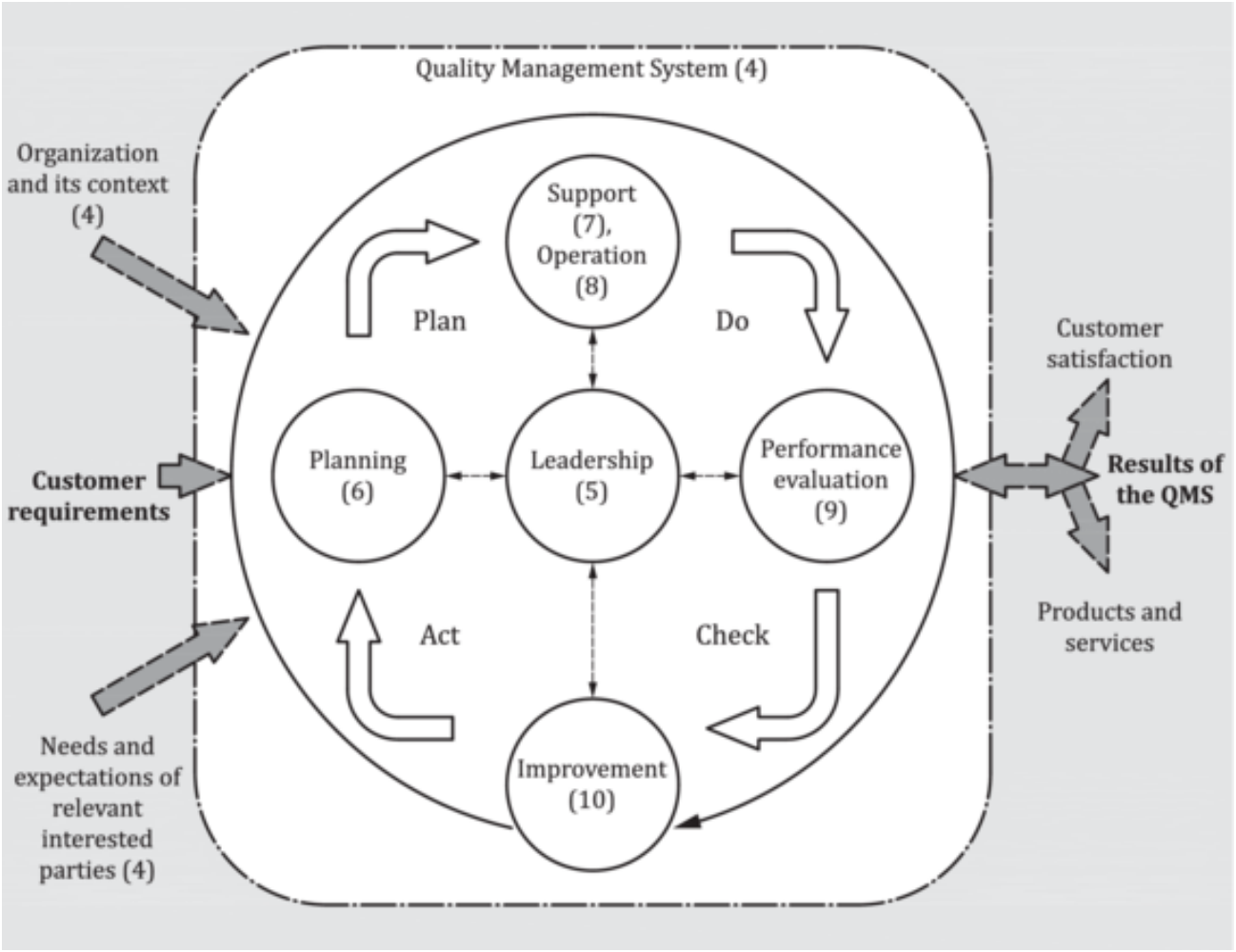
- Note 1: Quality management can include establishing quality policies (3.5.9) and quality objectives (3.7.2), and processes (3.4.1) to achieve these quality objectives through quality planning (3.3.5), quality assurance (3.3.6), quality control (3.3.7), and quality improvement (3.3.8).

Process quality models

Quality assurance

ISO 9001

Quality Management System and PDCA cycle

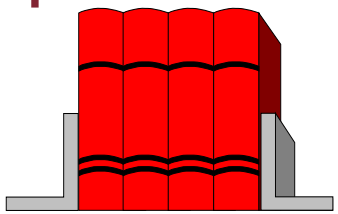


Only QMS may be certified from third party certification body

Process quality models

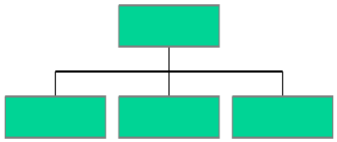
Quality assurance – ISO 9001

documented procedures



processes

organization



People

Required to implement

Quality Management System

Process quality models

Standards for software quality processes

- **IT Software international standards**
  - **ISO 90003: Software engineering -- Guidelines for the application of ISO 9001:2008 to computer software**
  - **ISO/IEC 12207: Information technology software life cycle processes**

- **Capability maturity model frameworks**
  - **CMMI: Capability maturity model integration**
  - **ISO/15504: Information technology – Process assessment, also termed Software Process Improvement and Capability Determination (SPICE)**

Process quality models

Standards for software quality processes

ISO 90003:2014

- **Software engineering -- Guidelines for the application of ISO 9001:2008 to computer software**
  - ***It's a guideline***
  - ***It allows the application of ISO/9001 standard to computer software***
  - ***Includes a complete cross reference to ISO/IEC 12207***

ISO/IEC 12207:2008

- **Information technology software life cycle processes**
  - ***It establishes a common framework that contains processes, activities, and tasks that are to be applied during***
    - **the acquisition of a system that contains software**
    - **a stand-alone software product and software service**
    - **the supply, development, operation, and maintenance of software products**

Process quality models

CMMI

What is it?

- It is a method to evaluate and measure the maturity of the software development process of an organization
- It Measures the maturity of the software development process on a scale from 1 to 5
- V1.0 was developed by the Software Engineering Institute (SEI) at Carnegie Mellon University in Pittsburgh, USA

How is it composed? Five models

- *CMMI for development (CMMI-DEV)*
- *CMMI for acquisition (CMMI-ACQ)*
- *CMMI for services (CMMI-SVC)*
- *People CMM (P-CMM)*
- *Data Management Maturity (DMM)*

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

CMMI

What is maturity?

Definitions vary, but mature processes are generally thought to be:

- **Well-defined**
- **Repeatable**
- **Measured**
- **Analyzed**
- **Improved**
- **Effective**

Poor but mature processes are just as bad as no maturity at all!

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

CMMI – Maturity levels

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

CMMI

What is capability?

Capable process: a process that can satisfy its specified product quality, service quality, and process performance objectives.

In CMMI models with a continuous representation, there are six capability levels graded from 0 through 5

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

CMMI

Capability levels

0 – Incomplete: An "incomplete process" is a process that is either not performed or partially performed.

1 – Performed: At this level a process is expected to perform all of the Capability Level 1 specific and generic practices. Performance may not be stable and may not meet specific objectives such as quality, cost, and schedule, but useful work can be done.

2 – Managed: At this level a process have to be planned, performed, monitored, and controlled for individual projects, groups, or stand-alone processes to achieve a given purpose.

(continues)

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

CMMI

Capability levels

3 – Defined: A this level a defined process is tailored from the organization's set of standard processes according to the organization's guidelines, and contributes work products, measures, and other process improvement information to the organizational assets.

4 - Quantitatively Managed: At this level a defined (capability level 3) process is controlled using statistical and other quantitative techniques.

5 – Optimizing: At this level a quantitatively managed process is improved, based on an understanding of the common causes of process variation inherent in the process.

Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

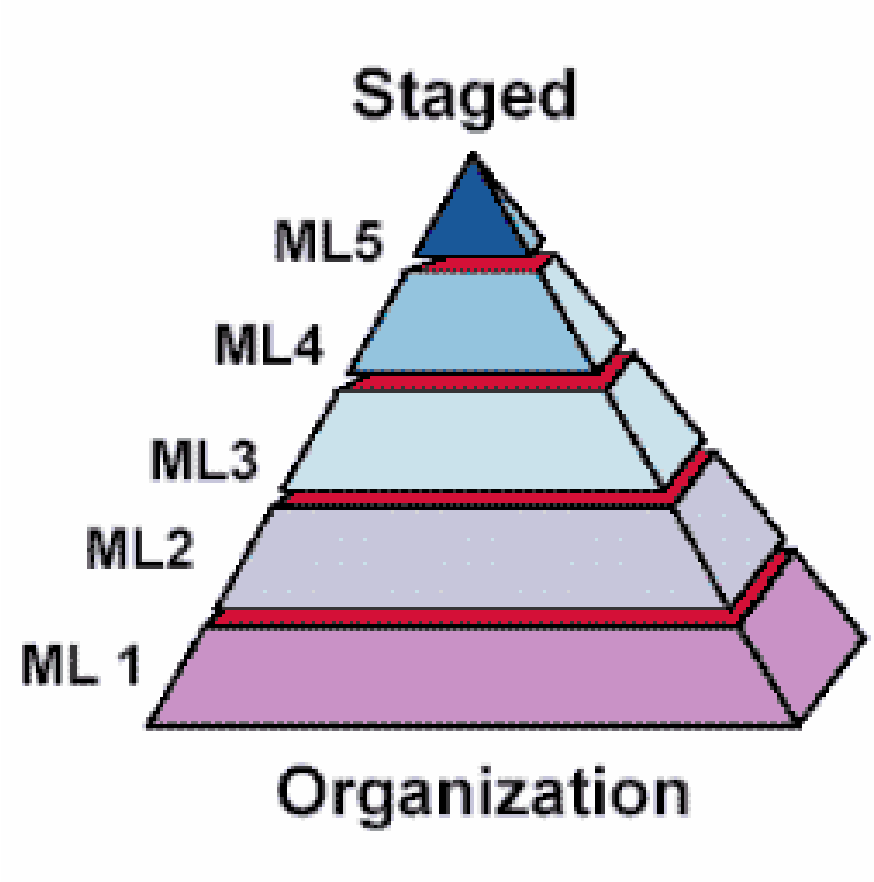
Process quality models

CMMI

CMMI Representations

Staged Representation:

- An approach using a predefined sets of process areas to define an improvement path for the organization.
- This improvement path is described by a model component called a Maturity Level
- A maturity level is a well-defined evolutionary stage toward achieving improved organizational processes



Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

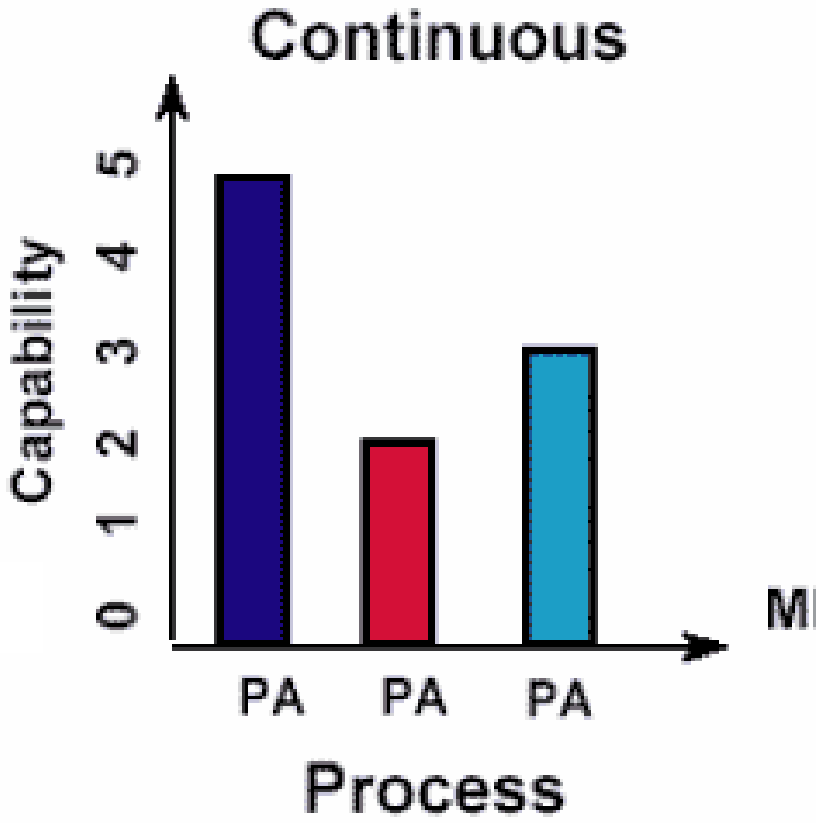
Process quality models

CMMI

CMMI Representations

Continuous Representation

- This approach allows an organization to select a specific process area and improve relative to it.
- The continuous representation uses Capability Levels to characterize improvement relative to an individual process area.



Source: www.tutorialspoint.com/cmmi/cmmi_overview.htm

Process quality models

ISO/IEC 15504

a set of technical standards documents for

- the computer software development process and related business management functions
- continuous improvement

organized in 6 parts

- *1 Concepts and vocabulary*
- *2 Performing an assessment*
- *3 Guidance on performing an assessment*
- *4 Guidance on use for process improvement and process capability determination*
- *5 An exemplar process assessment model*
- *6 Target process profile*

Process quality models

ISO/IEC 15504

Two defined dimensions in the reference model

- ***a process dimension***
- ***a capability dimension***

The process dimension divides processes into five categories

- ***customer/supplier***
- ***engineering***
- ***supporting***
- ***management***
- ***organization***

For each process, ISO/IEC 15504 defines

- ***a capability level***
- ***on the following scale***

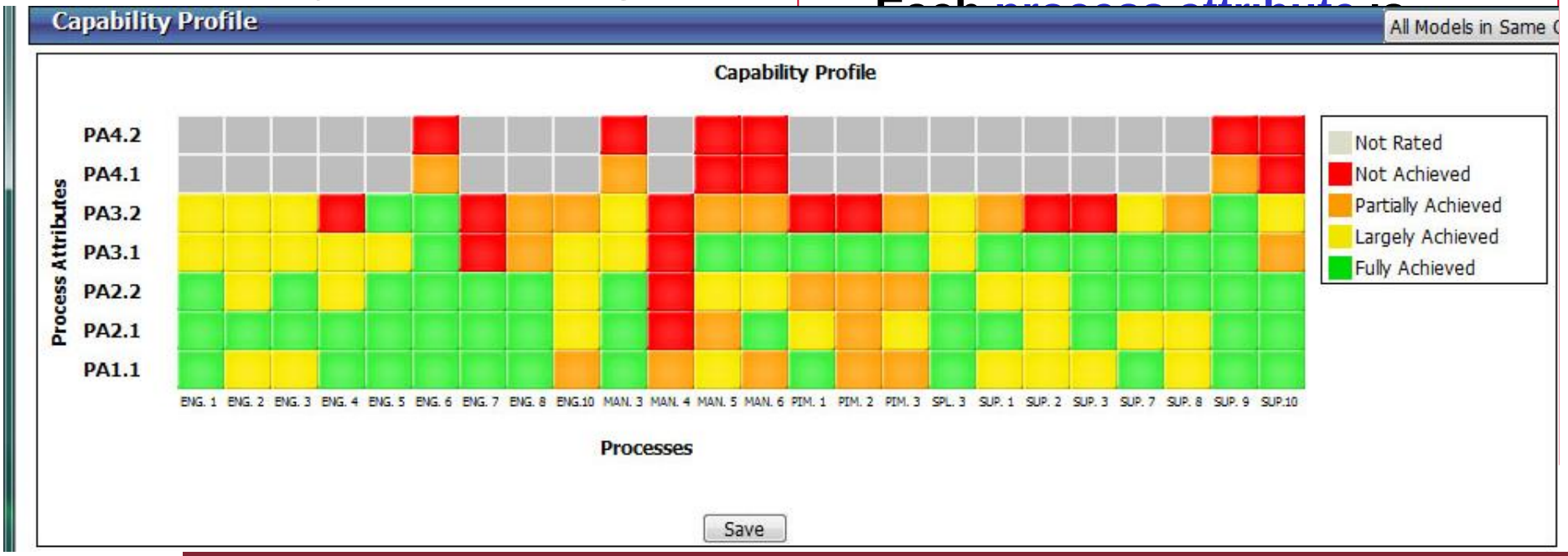
Level	Name
5	Optimizing process
4	Predictable process
3	Established process
2	Managed process
1	Performed process
0	Incomplete process

Process quality models

ISO/IEC 15504

9 process attributes mesure processes capability

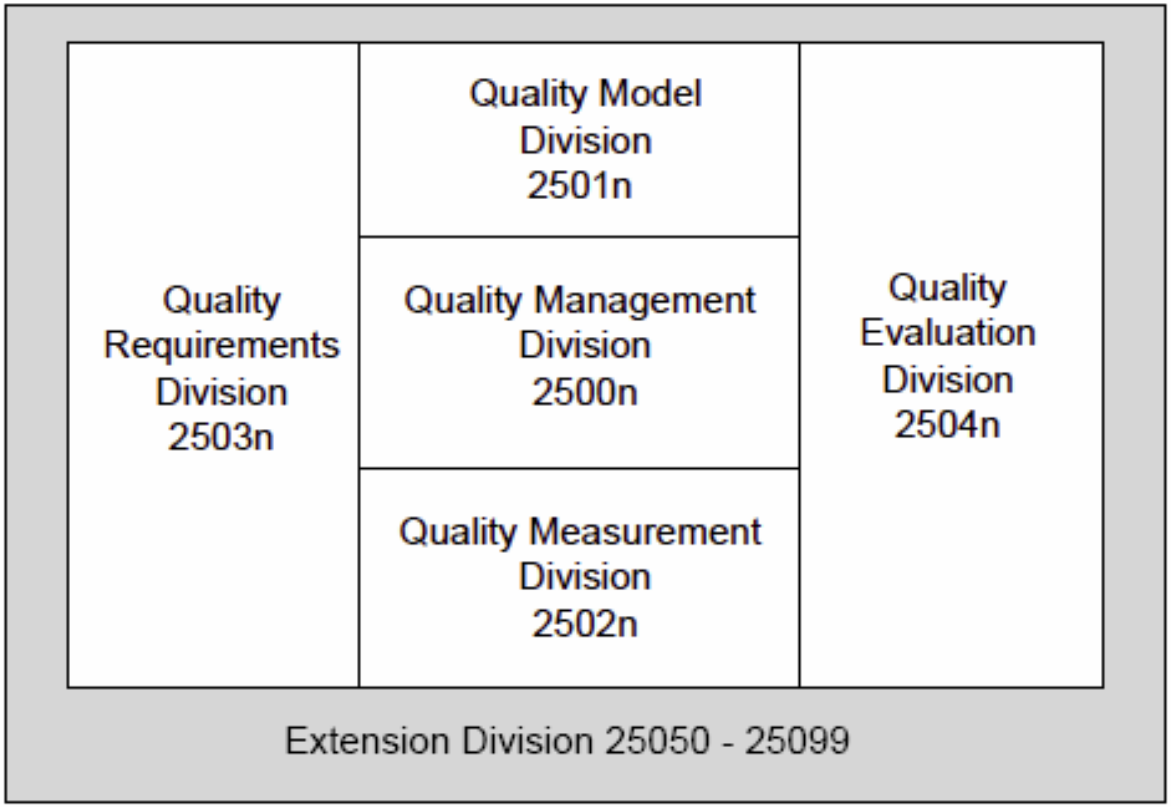
- ***1.1 Process Performance***
- ***2.1 Performance Management***



Software quality product

ISO/IEC 25000:2014

Software Quality Requirements and Evaluation (SQuaRE) - Architecture



Software quality product

ISO/IEC 25000:2014

Software Quality Requirements and Evaluation (SQuaRE) - Architecture

- ***ISO/IEC 25010 - System and software quality models***
  - describes the model, consisting of characteristics and sub-characteristics, for software product quality, and software quality in use
- ***ISO/IEC 25012 - Data Quality model***
  - defines a general data quality model for data retained in a structured format within a computer system. It focuses on the quality of the data as part of a computer system and defines quality characteristics for target data used by humans and systems
- ***ISO/IEC 25011 – IT Service Quality model***
  - about IT services quality

http://iso25000.com/index.php/en/iso-25000-standards?limitstart=0

Software quality product

ISO/IEC 25000:2014

Software Quality Requirements and Evaluation (SQuaRE) - Architecture

Three Qualities of ISO 25010 standard

- **External quality:** set of characteristics of the software product from an external view. It is the quality when the software is executed, which is typically measured and evaluated while testing in a simulated environment with simulated data using external metrics
- **Internal quality:** set of characteristics of the software product from an internal view. Internal quality is measured and evaluated against the internal quality requirements.
- **Quality in use**: user's view of the quality of the software product when it operates in a specific environment and in a specific context of use. It measures the extent to which users can achieve their goals in a particular environment

http://iso25000.com/index.php/en/iso-25000-standards?limitstart=0

Software quality product

ISO/IEC 25000:2014

Software Quality Requirements and Evaluation (SQuaRE) - Architecture

- ***ISO/IEC 25020 - Measurement reference model and guide:***
  - Presents introductory explanation and a reference model that is common to quality measure elements, measures of software product quality and quality in use. Also provides guidance to users for selecting or developing, and applying measures.

- ***ISO/IEC 25021 - Quality measure elements:***
  - Defines a set of recommended base and derived measures, which are intended to be used during the whole software development life cycle. The document describes a set of measures that can be used as an input for the software product quality or software quality in use measurement

http://iso25000.com/index.php/en/iso-25000-standards?limitstart=0

Software quality product

ISO/IEC 25000:2014

Software Quality Requirements and Evaluation (SQuaRE) - Architecture

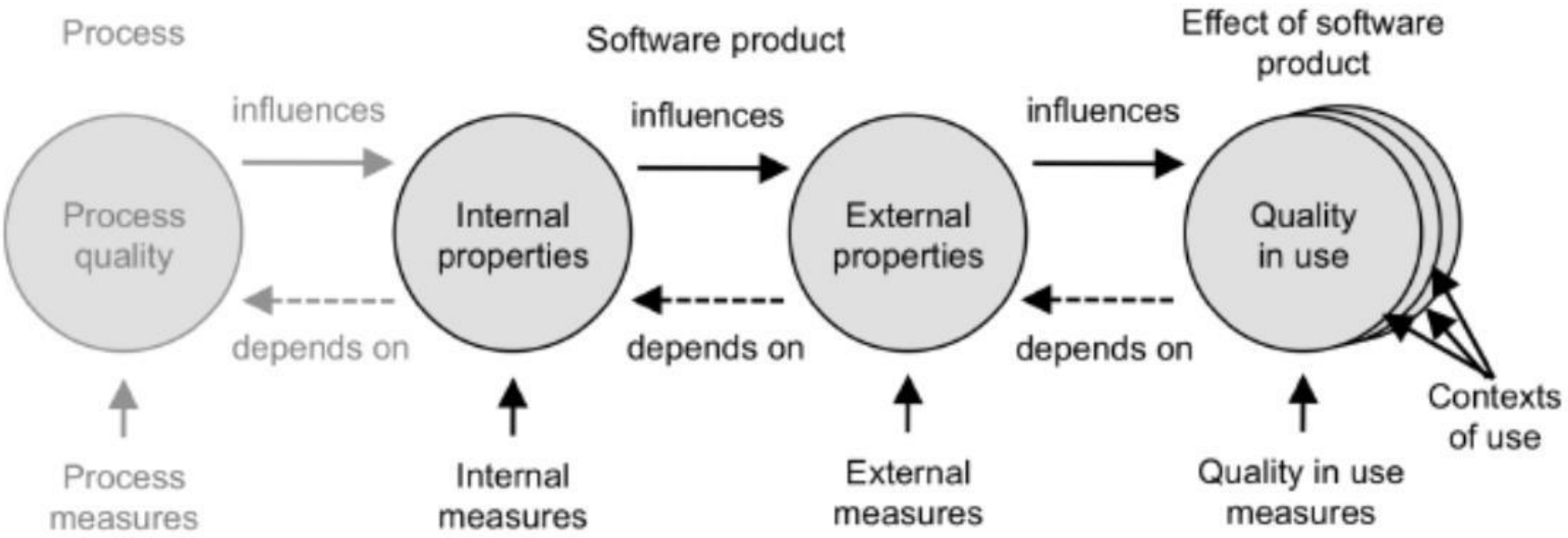
- ***ISO/IEC 25022 - Measurement of quality in use***
  - Describes a set of measures and provides guidance for measuring quality in use
- ***ISO/IEC 25023 - Measurement of system and software product quality:***
  - Describes a set of measures and provides guidance for measuring system and software product quality.
- ***ISO/IEC 25024 - Measurement of data quality***
  - Defines quality measures for quantitatively measuring data quality in terms of characteristics defined in ISO/IEC 25012.

http://iso25000.com/index.php/en/iso-25000-standards?limitstart=0

Software quality product

ISO/IEC 25010:2011

Model of quality in the product life cycle



ISO/IEC 25010:2011 – Annex C

Software quality product

ISO/IEC 25010:2011

Internal/external software characteristics

Internal/external quality							
Application quality			Tecnical quality				
Functional suitability	**Maintenability**	**Usability**	**Performance efficiency**	**Compatibility**	**Reliability**	**Security**	**Portability**
Completeness	Modularity	Appropriateness recognisability	Time behavior	Co-existence	Maturity	Confidentiality	Adaptability
Correctness	Reusability	Learnability	Resource utilization	Interoperability	Availability	Integrity	Installability
Appropriateness	Analizability	Operability	Capacity		Fault tolerance	Non-reputation	Replaceability
	Modifiability	User error protection			Recoverability	Accountability	
	Testability	User interface aesthetics				Authenticity	
		Accessibility					

ISO/IEC 25010:2011 – Annex C

Software quality product

ISO/IEC 25010:2011

In use software characteristics

Quality in use				
Effectiveness	**Efficiency**	**Satisfaction**	**Freedom from risk**	**Context coverage**
Effectiveness	Efficiency	Usefulness	Economic	Completeness
		Trust	Health and Safety	Flexibility
		Pleasure	Environmental	
		Comfort		

Source: ISO/IEC 25010:2011 – Annex C

Software quality product

ISO/IEC 25010:2011

Internal/external software metrics - examples

Characteristics/ sub-characteristics	Metrics	Descriptions	Formulas
Functionality/ Completeness	Functional completeness	Released functions versus required functions	X = 1-(A/B) A = number of missing functions B = number of required functions
Performance efficiency/ Time behaviour	Response time	Average time between the request and the delivery	$X = T_{average} / Tx_{average}$ $T_{average} = \sum(Ti) / N$, (for i=1 a N) $TX_{average}$ = requested average response time
Maintenability/ testability	Methods in a class	Number of methods implemented in a Java class	Number of implemented methods Treshold < 14
Reliability/ Maturity	mean time between failures (MTBF)	Total up time divided by number of breakdowns	Y = T / A , where T= Total up time periods A=number of failures

IT quality services

ITIL – Information Technology Infrastructure Library

What is

- ***An international framework (not a method) that groups the best practices in the world of IT services management***
- ***A set of guidelines that provides information about how to deliver IT services of quality specifying processes, resources and tools to support them***
- ***Developed in the 80s, but was widely adopted only in the mid 90s***
- ***There are different recent versions:***
  - ***In 2007 they published V3 version which is still widely used***
  - ***In 2011 they published a new version where all guidelines have been updated***

Source: itSMF_An_Introductory_Overview_of_ITIL_V3-2011.pdf

IT quality services

ITIL – Information Technology Infrastructure Library

Definition

- ***Service***
  - ***a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks***
- ***Service management***
  - ***a set of specialized organizational capabilities for providing value to customers in the form of services***

Source: itSMF_An_Introductory_Overview_of_ITIL_V3-2011.pdf

IT quality services

ITIL – Information Technology Infrastructure Library

It consists of five core books covering the service lifecycle

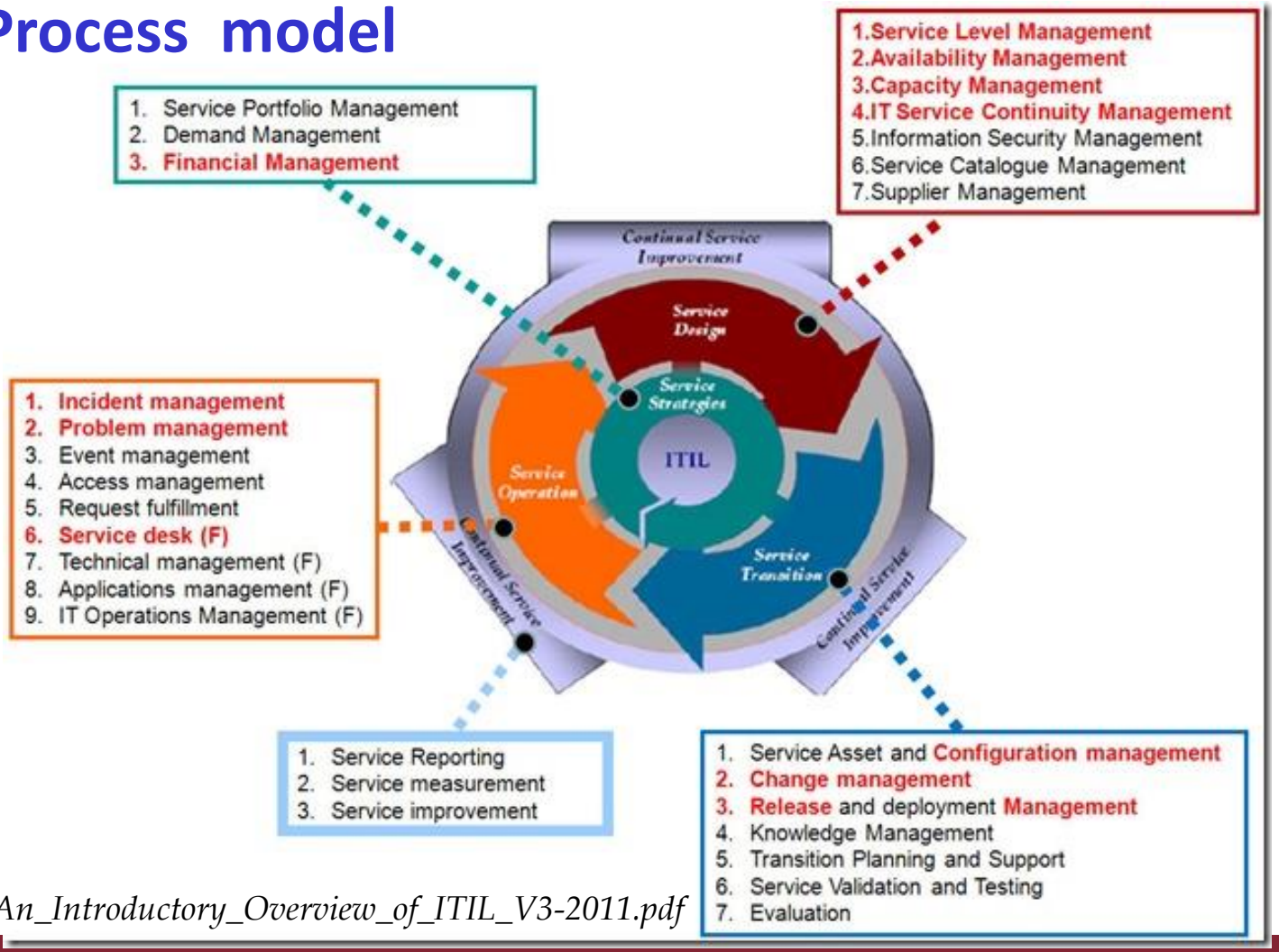
1. **IT Service Strategies**
   - *The guide shows how to transform service management into a strategic asset.*
2. **IT Service Design**
   - *The guide on designing IT services to create strategy and facilitate the introduction of services into the live environment provision.*
3. **IT Service Transition**
   - *The guide for transitioning new and changed services into operation*
4. **IT Service Operations**
   - *The guide on achieving effectiveness and efficiency in the delivery and support of services to ensure value for the customer and the service provider*
5. **Continuous Service Improvement**
   - *The guide for creating and maintaining value for customers linking improvement efforts and outcomes with service strategy, service design, service transition and service operation*

It's possible only for professional certification

Source: itSMF_An_Introductory_Overview_of_ITIL_V3-2011.pdf

IT quality services

ITIL – Process model



Source: itSMF_An_Introductory_Overview_of_ITIL_V3-2011.pdf

IT quality services

ISO 20000 Standard

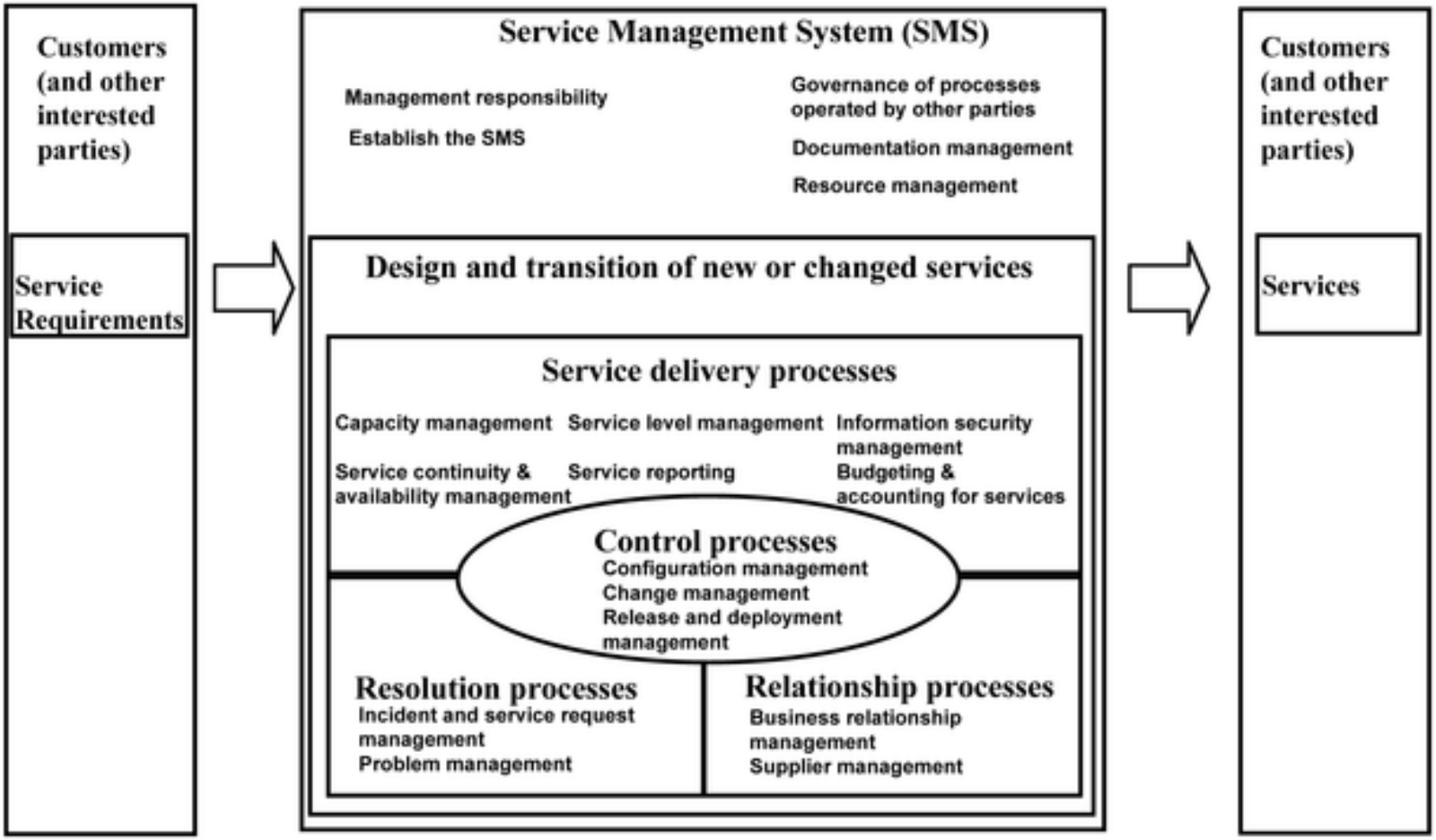
What is it in?

- Purpose of ISO/IEC 20000 is to provide a common reference standard for any enterprise offering IT services to internal or external customers
- Standard promotes adoption of an integrated process approach for the management of IT services positioned in a process model
- ISO/IEC 20001 represents a set of minimum requirements to audit an organization against effective IT service management
- Any organization may implement an ICT Service Quality Management System compliant to those requirements
- Compliance can be certified from third-party certification bodies through a set of formal auditing

Management Information Systems

IT quality services

ISO/IEC 20000 – Service Quality Management System



Feasibility Study

Objectives

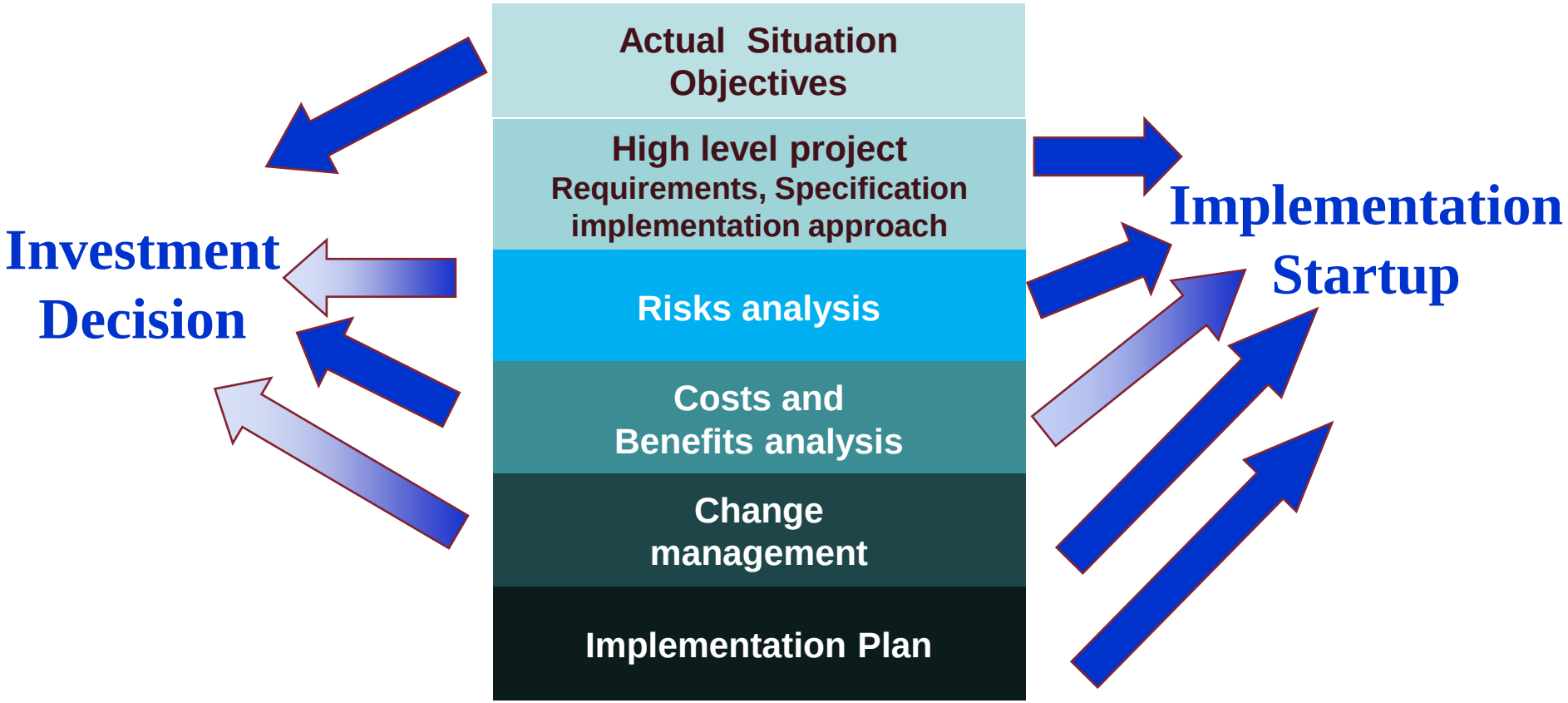
Provide to management all information on how:

- **To decide to make an ICT investment for a project**
  - Conditions that make a project more convenient
    - Implementation of ICT information systems
    - Delivery of ICT services
  - Expected benefits and how they fit improvement targets
  - Development and operations costs, project risks
- **To start an implementation project**
  - Change management processes from as-is to expected to-be situation
  - Find a suitable technical-organizational solution (constraints time and money)
  - Benchmark between different solutions based on explicit and defined criteria
  - objective criteria and ways to purchase market solutions

Management Information Systems

Feasibility Study

Content



Feasibility Study

Detail level

- In order to reach the objectives, a feasibility study has to be carried out at the right level of detail in order to:
  - estimate reliable costs
  - define expected benefits (which and how much)
  - evaluate main risks
  - write specification for procurement
  - define the high level work plan

"Without a rationale high level project any estimate done with whichever method is unreliable"

Feasibility Study

Table of contents

1. Actual situation (problems, organization, system, users, policies, functions, objectives,...)
2. High level solution (to-be)
   - solution requirements
   - system's general specifications
   - system's implementation approach
3. Risks analysis
4. Project's implementation approach
5. Impact and benefits analysis
6. Change management
7. Recommendations for the project implementation

Feasibility Study

Section 1 – Actual situation (1/2)

- **Feasibility study context**
  - Organization's strategic vision and objectives (products and services, organization, technologies), reasons for the project, business justification and sponsor
- **Context description**
  - problem/opportunity and its relevance, what it needs to fulfill (for external and internal users)
- **Actual situation description**
  - Involved processes, data flows, organization breakdown, involved users, actual level of digitalization

Feasibility Study

Section 1 – Actual situation (2/2)

- **Actual situation analysis and diagnosis**
  - Causes of the problem and impact on
    - business process components
    - organization (tasks, roles and responsibilities)
    - people (motivation, involvement, participation, etc.)
- **Constraints**
  - Regulatory framework and other internal and external constraints
- **Project objectives**
  - Objectives related to products, services, main stakeholders

Feasibility Study

Section 2 – High level project Solution requirements

- Description of the expected process (to be)
- Expected changes on data flows, organization breakdown, logistics, people , ...
- Changes on the internal rules of the Organization
- ICT system requirements
  - processed data and computerized functions
  - architectural requirements (need of integration with other internal or external IS)
  - quality requirements (products/services)
  - work processes

Feasibility Study

Section 2 – High level project

System's general specifications

- Business specifications
  - data architecture (alternatives)
  - application architecture (alternatives)
  - user interface

- Technological specifications
  - technological architecture (alternatives)
  - development model, lifecycle, framework, languages and tools (alternatives)

Feasibility Study

Section 2 – High level project System's Implementation approach

- "Make or buy" (alternatives)
- Reuse of existing software components (alternatives)
- System startup
- System operations and maintenance (alternatives)
- Users training and support

Feasibility Study

Section 2 – High level project Evaluation of alternatives

- FS defines univocally:
  - data and functional macro-requirements of the solution
  - architectural requirements deriving from
    - assumed technological vision
    - need of integration with other existing internal and external IS
- More alternatives to define a solution; to be considered
  - Data architecture and functional architecture
  - Technological architecture
  - “make or buy” options
  - Reuse existing software components

Feasibility Study

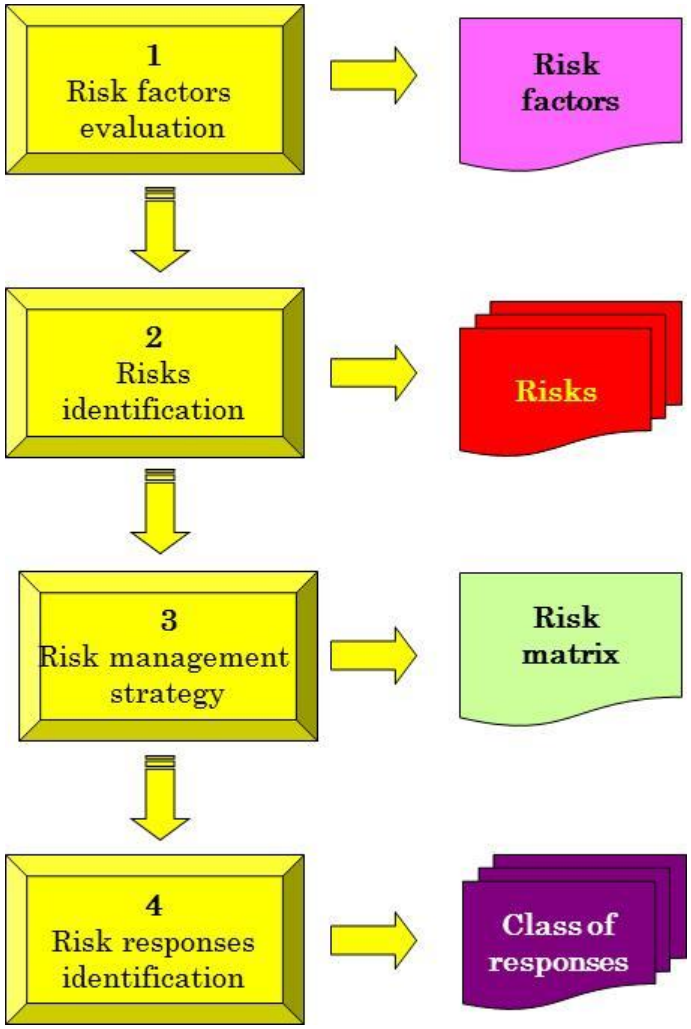
Section 2 – High level project Evaluation of alternatives

- Those alternatives have to be analyzed and evaluated
- A preferred choice can be
  - a binding element for the supplier
  - a preferential element to select the supply
- Tenders will describe different ways to implement the selected solution

Feasibility Study

Section 3 – Risks analysis

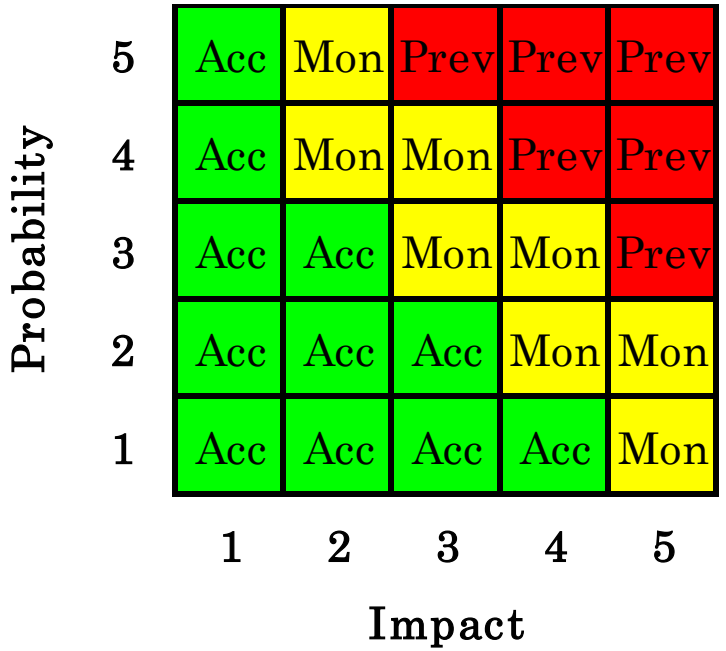
- **Risk factors**
  - Complexity
    - Management complexity
    - Project size
    - Other factors
  - Uncertainty
    - Requirements uncertainty
    - Technological innovation
- **Risk analysis**
- **Risk management**



Feasibility Study

Section 3 – Risks analysis

- **Prev – Prevent** (“red” color)
  - Perform all the actions aimed to avoid and / or reduce the causes of risks, acting on the probability of threats occurrence or mitigating the impacts (on time / costs / quality)
- **Mon – Monitor** (“yellow” color)
  - Monitor and control the causes of risks (risk factors) or the corresponding impacts, providing emergency plans to be activated when risks occur
- **Acc – Accept** (“green” color)
  - ignore risks, accepting the eventual associated impacts on costs, quality and time



Feasibility Study

Section 4 – Project's implementation approach

- **Project segmentation**
  - Implementing solution approach:
    - one shot, incremental, evolutionary, agile. …
  - Installation solution approach:
    - one shot, incremental, evolutionary
  - Milestones
- **Summary**
  - Identified purchases
  - Expected implementations

Feasibility Study

Section 4 – Project's implementation approach

- **High level project**
  - Delivery plan
  - Main activities plan
  - Milestones control
- **Quality plan**
  - Relevant content needed for the project (e.g. life cycle development model, configuration management process, test strategy, process review, etc.)

Feasibility Study

Section 5 – Impact and benefits analysis

- **EXPECTED BENEFITS EVALUATION**
  - Identification and description of expected benefits
  - Metrics definition and corresponding target values
  - Cross reference «Objectives/Benefits»
- **ESTIMATION OF COSTS**
  - Identification of main cost items
  - Documentation of used metrics
  - Estimated human resources effort
  - Estimated installation and operational costs

Feasibility Study

Section 5 – Impact and benefit analysis

- **INVESTMENT ANALYSIS**
  (costs&benefits in financial terms)
  - Cash flow, PBP, NPV, IRR …

- **IMPACT ANALYSIS**
  (measurable project outcome, but not in financial terms)
  - “Effectiveness“: related to external impacts
  - “Efficiency”: related internal improvement of organization
  - “Social Impact“: benefits, resulting from solutions, to citizen, firms, public administration, etc.

Feasibility Study

Section 6 – Change management

- **Effective achievement of expected project results** (innovation projects)
  - *Fast, correct and effective deployment and use of new system*
  - *Better acceptance, understanding and participation of involved organization and users*
- **Relevant aspects (to be considered in FS)**
  - *Identify actions that can encourage change*
    - **Involve key stakeholders of the organization**: define benefits for them
    - **Strong sponsorship**: senior and executive management have to support the change
      - Support the movement to expected innovation
      - Focus the communication process and then check achieved results
    - **Progressive delivery system**: plan system availability in parallel with change management plan
      - Avoid too much time for delivery
    - **Adopt different communication channels**
      - make easier the adoption of new system and emphasize the significance of change
  - *Carry it out in parallel with project implementation*

Feasibility Study

Section 7 – Recommendations for the project implementation

- **Procurement recommendations**
  - Criteria for vendors selection
  - Criteria for tenders selection
  - Procurement guidelines
- **Project management recommendations**
  - Relevant elements for project management
  - Relevant elements for quality plan
  - Decision points: number and timeframe
- **Summary of useful elements to write in procurement specs**

Feasibility Study

Tailoring of typical table of contents

- **Tailoring of table of contents is necessary and it needs to consider**
  - Types and main characteristics of single project
- **Some types of projects:**
  - Development of new business application systems
  - Reengineering existing business application systems
  - Implementation of new technological infrastructures
  - Reengineering existing technological infrastructures
  - Deployment and startup business application systems or technological infrastructures
  - Outsourcing ICT service operations
  - Deployment of office automation systems
  - ICT training

Feasibility Study

Time and efforts

- **Elapsed time**
  - From one to four months
    (+1 month for procurement specifications)
  - Two up to four people allocated
    (a high professional competence mix)
- **Effort**
  - Two up to sixteen months/person
  - Team leader of FS has to be an expert
  - At least one component has to be full time
    ("professional stability" of the team)
  - Partial contributions on specific topics
    (with specific competence)

Feasibility Study

Customer and User involvement

- ***Before***
  - *Preparing FS documentation*
  - *Make sure involved people are responsible*
- ***During***
  - *Identify firm's accountable*
  - *Provide them information and suggestions*
  - *Involve them in the work (training on the job)*
- ***After***
  - *Check and validate the work*

Stay tuned!

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