# The *SPICE* Project

- An international cooperative effort established to support the development of an international standard framework for software process assessment
- Representatives from more than 20 countries
- Resultant international standard is ISC/IEC 15504 (but still commonly referred to by the original project name: SPICE)
- Revised and reissued as ISO/IEC 330XX series

Software Process Improvement and Capability dEtermination

# Examining process capability using ISO 15504 / 330XX


- Provides an approach for the assessment of software processes:
  - By or on behalf of an organisation to **improve** its own processes
  - By or on behalf of an organisation to **determine** its **capability** for a particular (class) of requirement
  - By a **procurer** to determine **a supplier's capability** for a particular type of contract
- The framework for process assessment:
  - encourages self-assessment
  - takes into account the context in which the assessed processes operate
  - produces a set of process ratings (profile) rather than pass/fail
  - through the generic practices, addresses the adequacy of the management of the assessed processes
  - is appropriate across all application domains and sizes of organization

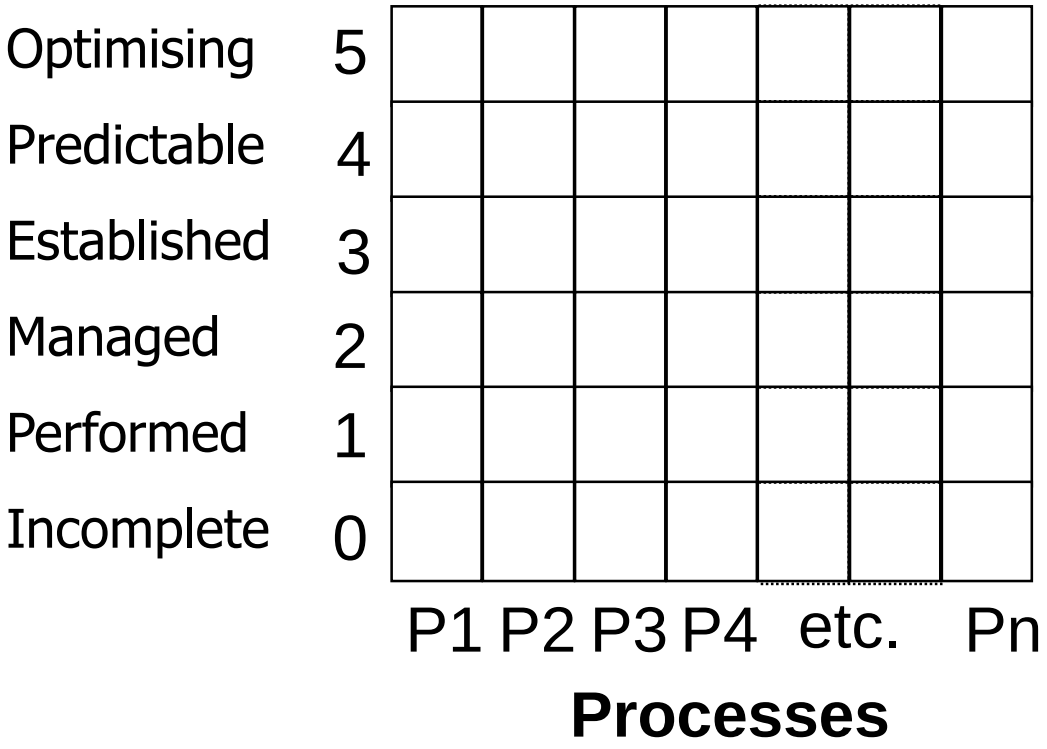
# ISO 330XX Assessment Framework

- A **framework** for conducting **consistent assessments** of **process capability**
- A **reference model** for software activities covering both processes and process capability, enabling expression of results in consistent terms
- **Guidance** for applying **assessment results** in two contexts:
  - **Process Improvement**
  - **Process Capability Determination**

# A Measurement Scale of Capability

- Process capability is defined on a six point ordinal scale of measurement:
  - the bottom of the scale - the incomplete process; – the top of the scale - the optimising process.
- The scale represents increasing capability of the process:
  - incomplete - performance that is not capable of fulfilling its purpose;
  - optimising - performance that is capable of achieving its purpose and sustaining continuous process improvement.
- The scale defines a well defined route for improvement for each individual process.

# Process Capability Levels



# Level 0 Capability

- Performance in a Level 0 organization is frequently chaotic and lacking in purpose.

# Level 1: The Performed Process

- The implemented process achieves its process purpose.
- The Performed process systematically achieves its process purpose
  - the routine performance of necessary actions; and
  - the presence of appropriate input and output work products which, collectively, ensure that the process purpose is achieved

- The work is done, but there is limited control or repeatability.
- Outcomes are frequently dependent on individual heroics.

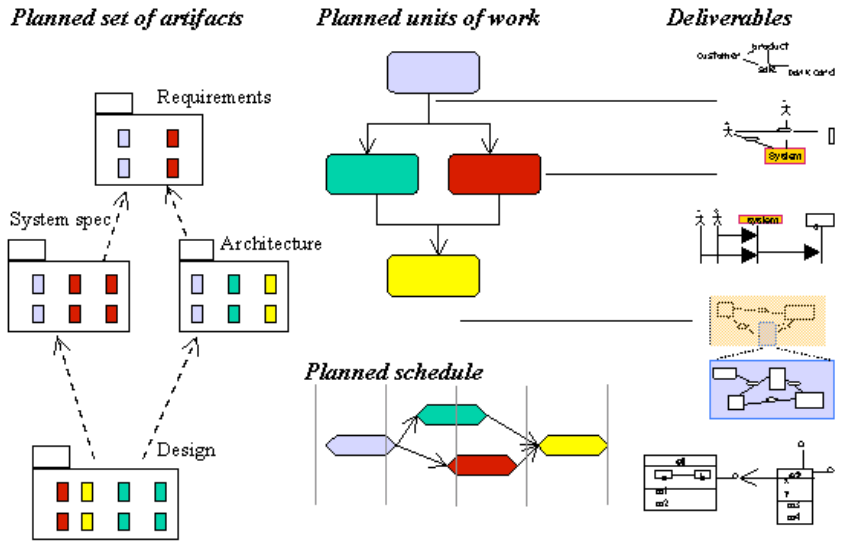
# Level 2: The Managed Process

- The Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained
- The Managed process meets identified performance objectives and produces work products that fulfill expressed quality requirements within defined timescales and resource needs.

- The Process is planned, monitored and adjusted to achieve its objectives.

# Level 3: The Established Process

- The Managed process is now implemented using a defined process that is capable of achieving its process outcomes.
- The Established process is based upon a standard process which is tailored and effectively deployed as a defined process to achieve its process outcomes.

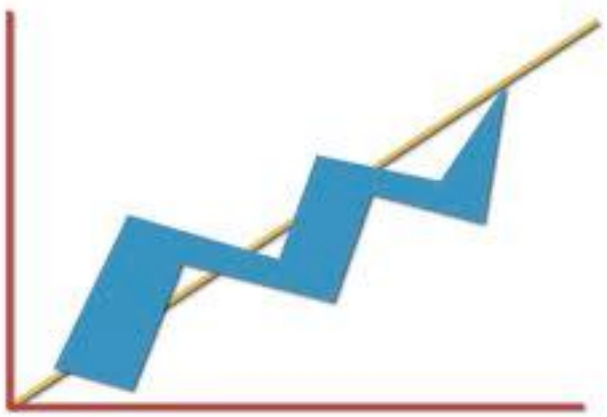


# Level 4: The Predictable Process

- The Established process now operates within defined limits to achieve its process outcomes.
- The Predictable process operates consistently within defined limits to achieve its process outcomes.
- Its implementation is supported and driven through quantitative information derived from relevant measurement.
- The performance of the process is understood in quantitative terms.

# Level 5: The Optimizing Process

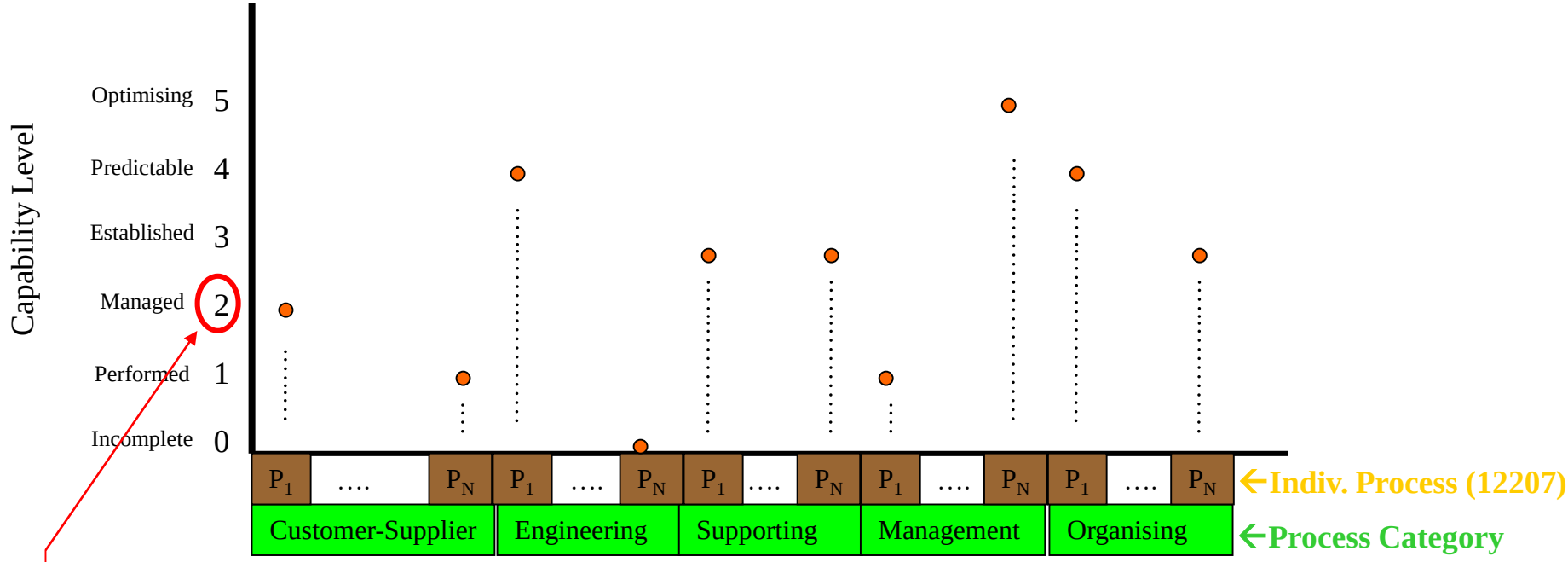
- The Predictable process is continuously improved to meet relevant current and projected business goals.
- The Optimizing process is changed and adapted in an orderly and intentional manner to effectively respond to changing business goals; this takes place on an ongoing basis.
- Performance of the predictable process is continuously improved to meet current and projected business goals.



# Attribute Ratings

- Process attributes are the basic elements for the assessment scheme:
  - each process attribute represents a measurable characteristic of any process as defined.
- The extent of achievement of a process attribute is measured using an ordinal scale.
- The ordinal points can be understood in terms of a percentage scale representing extent of achievement.
- The four defined points identified on the scale for rating purposes are:
  - N - Not achieved 0% to 15% achievement
  - P - Partially achieved 15% to 50% achievement
  - L - Largely achieved >50% to 85% achievement
  - F - Fully achieved >85% to 100% achievement

# ISO 15504 – 2 Dimensions




Used to calculate the overall Process capability

Each process $P_i$ consists of:

$P_i$

## 1. Attributes

Adequacy Rating
**N-P-L-F**

| | |
|---|---|
| N | 1.1 Process Performance |
| L | 2.1 Performance Management |
| P | 2.2 Work Product Management |
| P | 3.1 Process Definition |
| F | 3.2 Process Deployment |
| N | 4.1 Process Measurement |
| P | 4.2 Process Control |
| P | 5.1 Process Innovation |
| P | 5.2 Process Optimisation |

Each attribute consists of one or more **Generic** practices that characterise the capability of the process

## 2. Outcomes

Consists of one or more **Specific / Base** practices that indicate successful achievement of the process goals

# Relationship to other Standards

- ISO 330XX is complementary to several other International Standards.
  - ISO 9001- Model for quality assurance in design, development, production, installation and servicing
    - ISO 330XX **incorporates the intent of the ISO 9000** series to provide confidence in a **supplier's quality management** whilst providing acquirers with a framework for assessing whether potential suppliers have the capability to meet their needs
  - ISO 12207 - Software Life Cycle Processes
    - ISO 12207 provides an overall contextual framework for software life cycle processes, and ISO 15504-2 is closely mapped to this framework.

# Conclusions

- Usage of ISO/IEC 330XX has witnessed growth throughout the world in particular over the past 10 years
- Particular emphasis in Europe and in specific industry domains, most notably in the automotive sector (automotive SPICE).
- Interest in other domains (medical devices)
- Wider usage will accompany adoption by disparate domains outside software and systems engineering
- Software Asset Management, IT Operations and Service.
- The future evolution of the Standard will enable more open access for alternative models and approaches to assessment, within a coherent context.

# Conclusions – CMFs in general

- SPICE is adopted in Europe in the automotive domain as *automotive SPICE*.
- Further informal insights on automotive SPICE in practice here: Automotive SPICE: Ensuring ASPICE Compliance - Overview
- CMMI is adopted by the US Dept. of Defense
- These both sectors may typically involve larger rather than smaller budgets.
- Quality might be more important than for many other software sectors.
- Projects may be larger and may involve multiple integrators.

# ISO/IEC 15504 has changed

- The ISO/IEC 15504 has become ISO/IEC 330XX series of standards