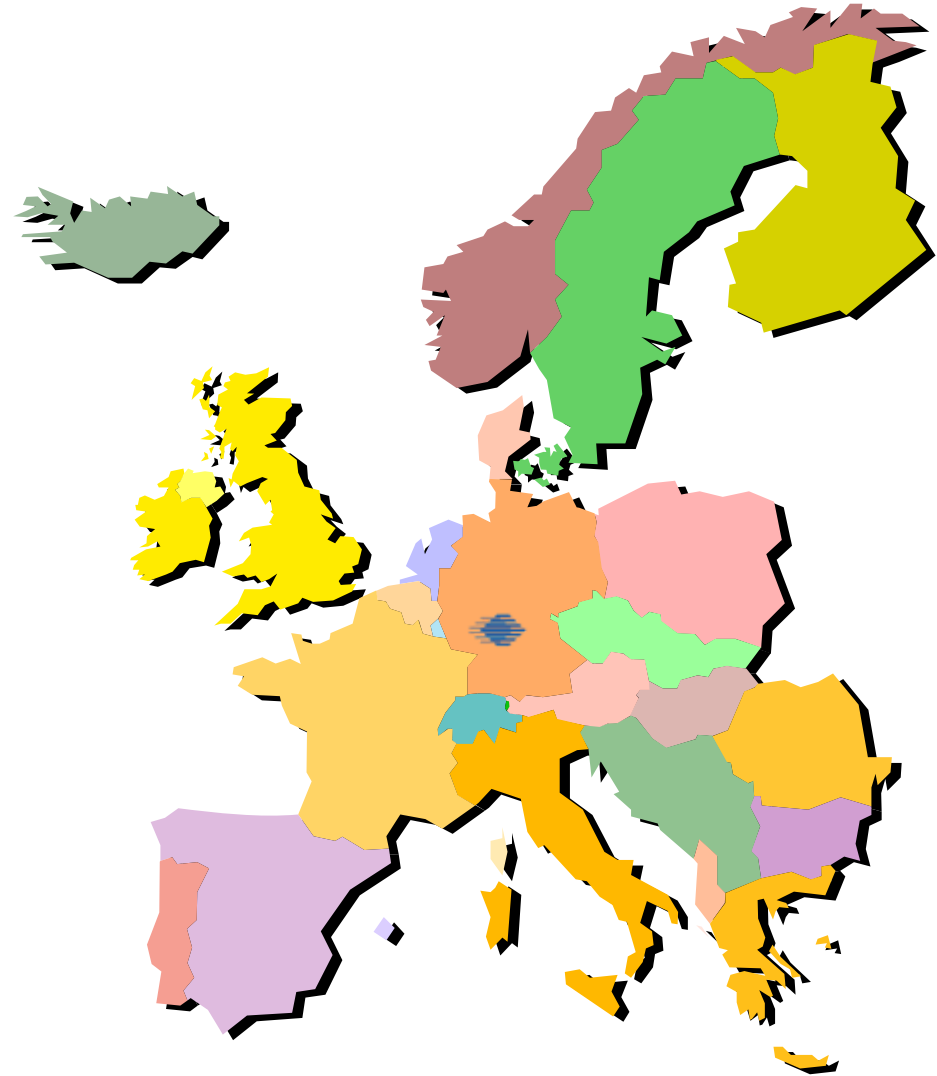




# **A Comparative Analysis of CMMI and Automotive SPICE**

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# 1. Why this Analysis?

Some of the key European automotive manufacturers (OEMs) have created an industry sector specific process reference model and process assessment model (collectively known as Automotive SPICE or ASPICE) using the framework established by ISO/IEC 15504; these artifacts were published in August 2005. Because some of the organizations in this industry sector already have CMMI-based process improvement programs in place there is a need to have an understanding of how the two approaches compare as well as insights into how ASPICE process profiles might be derived from the results of CMMI appraisals.



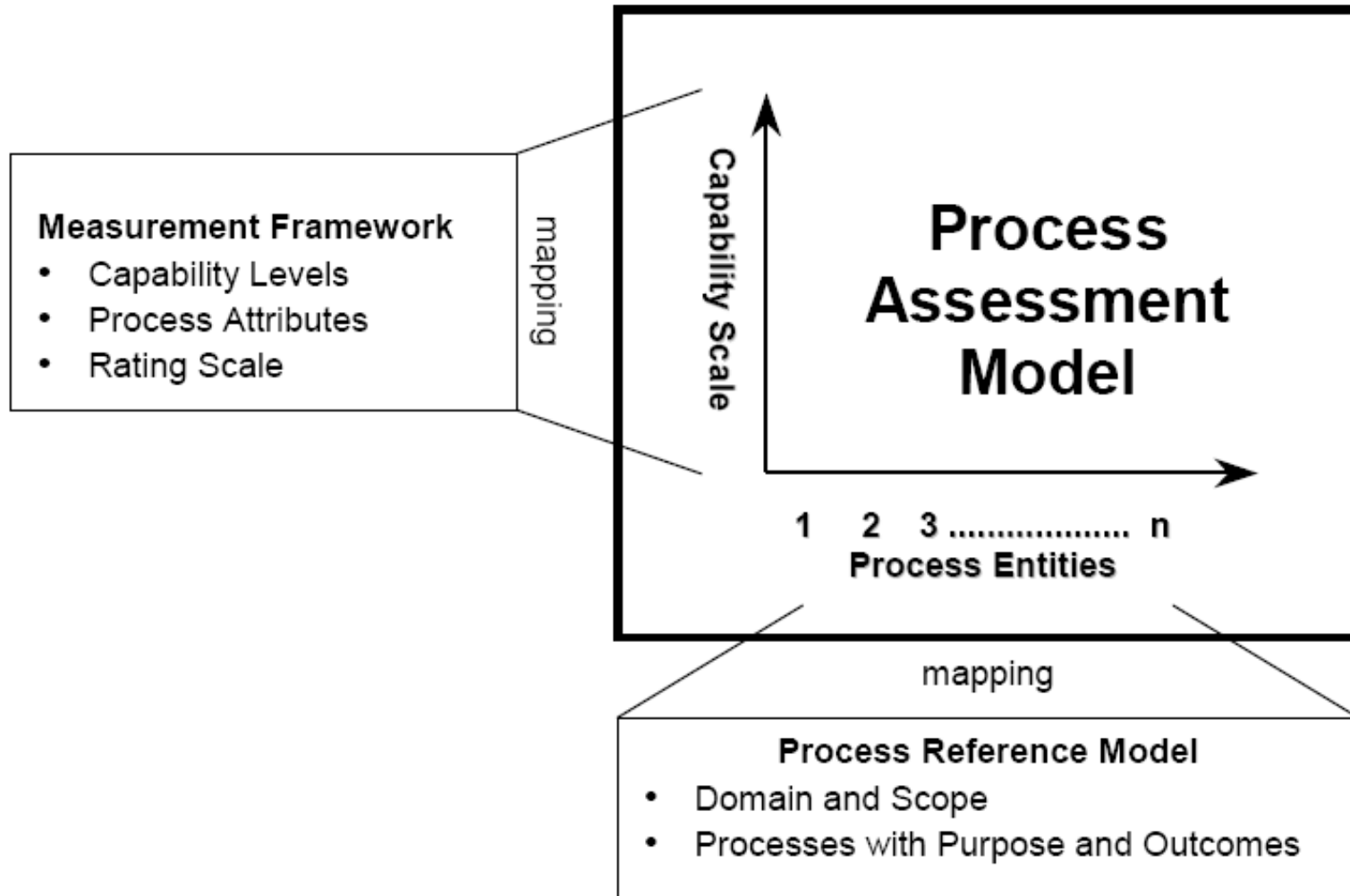
## 2. Overview of Automotive SPICE

ISO/IEC 15504-2 was developed, in part, to provide a basis for relating assessment results from process improvement models and assessment methods; it specifies the conditions under which the results of appraisals based on different process assessment models are comparable.

ISO/IEC 15504-2 specifies requirements for process reference models (PRM), process assessment models and process assessment methods (PAM) as well as defining a measurement framework for process capability.



# Role of ISO/IEC 15504-2





# Automotive SPICE (ASPICE)

Process Reference Model (August 2005, v4.2):

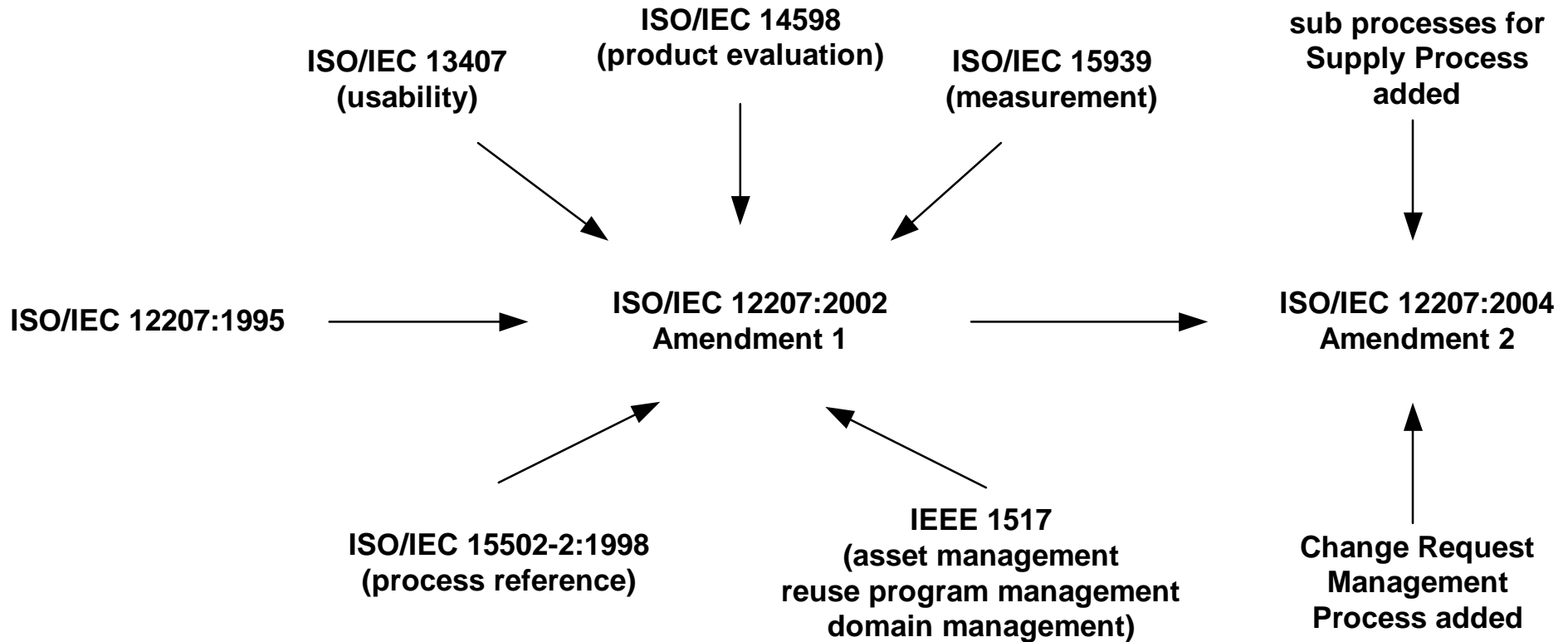
- defines the processes composing ASPICE
- claims complies with the ISO/IEC 15504-2 requirements
- developed by selecting and modifying processes defined in ISO/IEC 12207 (as amended)
- composed of 31 processes (ISO/IEC 12207: 50-60)

Process Assessment Model (August 2005, v2.2):

- related to the ASPICE PRM in satisfying the ISO/IEC 15504-2 conformity requirements
- an example of a process assessment model satisfying the relevant ISO/IEC 15504-2 requirements relative to the ASPICE PRM



# History (ISO/IEC) 12207





# Correspondence of 12207 and ASPICE

The relationship is described in the ASPICE PRM by the following extract from clause 1.1 –

*“The Automotive SPICE PRM defined in this document is derived from Annex F and H of ISO/IEC 12207 AMD1: 2002 and ISO/IEC 12207 AMD2: 2004. It contains a subset of the total processes with minor editorial changes together with a number of other changes to reflect consistency in use of terminology and application in the automotive sector.”*



# Legend

- ✓ signifies that the wording is either identical or considered to be semantically equivalent,
- ? signifies that the wording is different and there is a *possibility* of being interpreted differently from the 12207 process,
- × signifies that the wording is different and there is a *likelihood* of being interpreted differently from the 12207 process,

NO means no,

NA means not applicable (e.g. there were no notes in either process definition).



# Correspondence of 12207 and ASPICE - 1

		Component Comparisons with 12207				
ASPICE Process Name	ASPICE Process ID	Name	Purpose	Outcomes	Notes	Revisit Reference 12207 Mapping?
<b>Acquisition process group (ACQ)</b>						
Contract agreement	ACQ.3	✓	?	?	NA	NO
Supplier monitoring	ACQ.4	✓	✓	✓	✓	NO
Technical requirements	ACQ.11	✓	✓	✓	✓	NO
Legal and administrative requirements	ACQ.12	✓	✓	✓	✓	NO
Project requirements	ACQ.13	✓	✓	?	NA	NO
Request for proposals	ACQ.14	✓	✓	✓	NA	NO
Supplier qualification	ACQ.15	✓	✓	✓	NA	NO
<b>Supply Process Group (SPL)</b>						
Supplier tendering	SPL.1	✓	✓	?	NA	NO
Product release	SPL.2	✓	✓	✓	NA	NO



# Correspondence of 12207 and ASPICE - 2

Engineering Process Group (ENG)						
Requirement elicitation	ENG.1	✓	?	?	?	YES
System requirements analysis	ENG.2	✓	✓	?	?	YES
System architectural design	ENG.3	✓	✓	x	?	YES
Software requirements analysis	ENG.4	✓	✓	x	?	YES
Software design	ENG.5	✓	✓	x	?	YES
Software construction	ENG.6	✓	✓	x	?	YES
Software integration test	ENG.7	x	x	x	?	YES
Software testing	ENG.8	✓	✓	x	?	YES
System integration test	ENG.9	x	✓	x	?	YES
System testing	ENG.10	✓	✓	x	?	YES



# Correspondence of 12207 and ASPICE - 3

Supporting Process Group (SUP)						
Quality assurance	SUP.1	✓	×	×	×	YES
Verification	SUP.2	✓	✓	?	NA	NO
Joint review	SUP.4	✓	✓	✓	?	NO
Documentation management	SUP.7	✓	✓	✓	?	NO
Configuration management	SUP.8	✓	✓	✓	✓	NO
Problem resolution management	SUP.9	✓	?	✓	✓	NO
Change request management	SUP.10	✓	✓	?	NA	NO
Management process group (MAN)						
Project management	MAN.3	✓	✓	?	?	NO
Risk management	MAN.5	✓	✓	✓	✓	NO
Measurement	MAN.6	✓	✓	✓	✓	NO
Process Improvement process group (PIM)						
Process improvement	PIM.3	✓	✓	?	✓	NO
Reuse process group (REU)						
Reuse program management	REU.2	✓	✓	✓	?	NO



# Questions ...

- ISO/IEC 15504-2 requirements
  - Why are they not met?
- Rephrasing process outcomes
  - Why not issue change requests for ISO/IEC 12207?
- Deleting/adding process outcomes
  - Why not issue change requests for ISO/IEC 12207?
- Claim that it is an “automotive specific” model
  - A few notes are “embedded software” specific
- Rationale
  - Why use this model when CMMI is used as the internal reference model for PI, at least by suppliers, but also by OEMs?



## 3. Comparative Analysis

Issues addressed:

- How do the models compare?
- Frame of reference
  - Process Appraisals
  - Training Support
  - Infrastructure
  - Adoption Status

# How do the two models compare?

Both cover the 4 categories of Process Areas associated with the development of software-intensive products:

- Process Management
- Project Management
- Engineering
- Support

However:

- coverage of specific practices vs. process outcomes are not at the same depth
- CMMI covers some process areas more thoroughly than ASPICE
- ASPICE covers some process areas more thoroughly than CMMI
- CMMI satisfies ISO/IEC 15504-2 requirements, whereas ASPICE not as PRM issues are addressed in PAM (base practices)



# Process Appraisals

## For CMMI:

- The CMMI Product Suite contains a standard appraisal method (SCAMPI<sup>SM</sup>). Wide use of a standard method significantly reduces variation in appraisal results
- The SEI has expanded on SCAMPI and now supports a family of appraisal methods:
  - SCAMPI Class C – Approach to process improvement
  - SCAMPI Class B – Deployment of processes
  - SCAMPI Class A – Benchmark appraisals

## For ASPICE:

- The users of ASPICE provide their own appraisal method
- Question: how can *inter-rater reliability* be assured?



# Training Support

## For CMMI:

- Introduction to CMMI
- Intermediate Concepts of CMMI
- Practical CMMI course being developed
- Introduction to CMMI Instructor Training
- SCAMPI Lead Appraiser<sup>SM</sup> Training
- Several other related/special topic courses

## For ASPICE:

- 3 Assessor Training courses
- Instructor and assessor training being developed
- No PRM/PAM trainings



# Infrastructure

## CMMI Steward (SEI):

- CMMI Initiative and other related SEI Initiatives
- Licensing and authorization/certification programs
- Instructor and Lead Appraiser Quality Assurance Programs
- SEPG and CMMI Conferences

## ASPICE:

- Automotive Special Interest Group of the joint Procurement Forum / SPICE User Group
- HIS “Assessment” Working Group



# Adoption Status

For CMMI – 10/31/05 :

- |                                 |        |
|---------------------------------|--------|
| - Introduction to CMMI students | 40,809 |
| - Authorized Intro. Instructors | 292    |
| - Authorized Lead Appraisers    | 398    |
| - Organizations Appraised       | 917    |

For ASPICE (information from HIS working group):

- Will be used at least by Audi, BMW, DaimlerChrysler, Fiat, Porsche, Volkswagen, Volvo Car Group (representing Ford Europe, Land Rover, Jaguar, Volvo Cars)
- Transition from SPICE to ASPICE will be in 2006 for most of the OEMs
- HIS members have performed 160 supplier assessments
- 60 ASPICE assessments/year beyond 2006



## 4. Analysis Results

Work document:

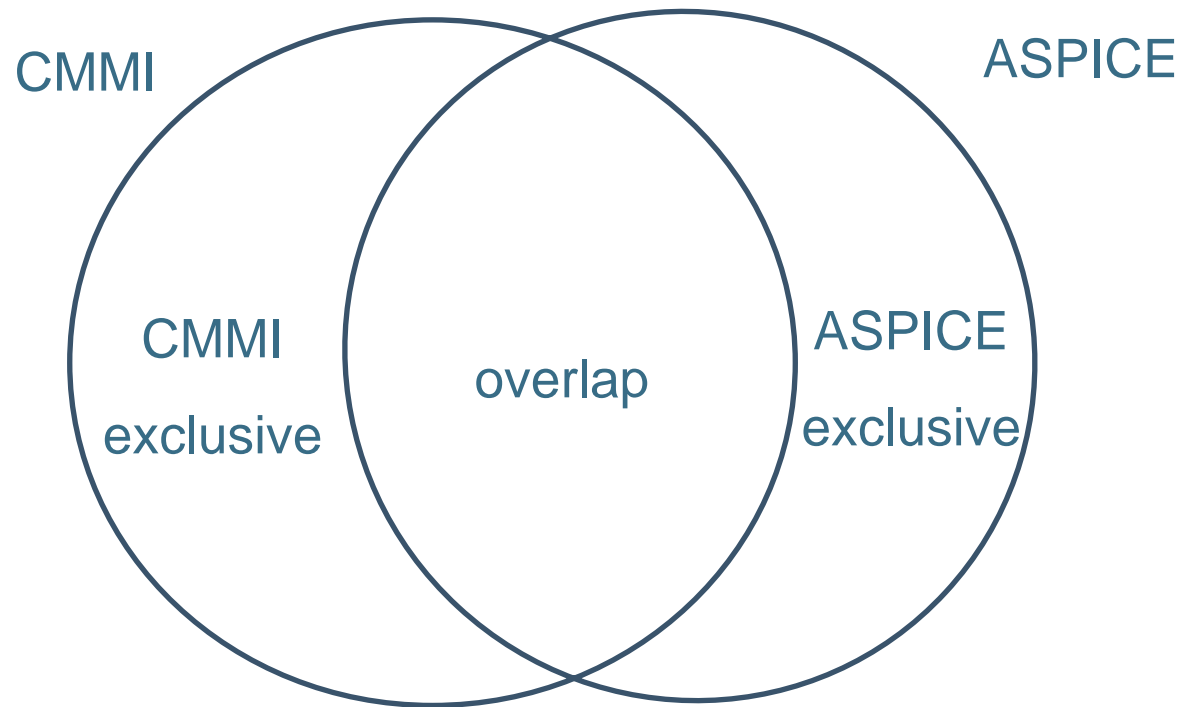
- In-depth analysis regarding differences between ISO/IEC 12207 and ASPICE process descriptions (name, purpose, outcomes, notes)

To be released (soon):

- Technical Note  
(status: draft; under review)
- Mapping rules between CMMI and ASPICE  
(status: draft; under review)



# 5. Generating a Mapping





# Assumptions

1. Mapping is one-directional: CMMI -> ASPICE

Motivation: CMMI is used as the internal reference model

2. Mapping is done of the following level:
  - CMMI: specific practices
  - ASPICE: process outcomes (PRM)

Motivation: a. Conform ISO/IEC 5504-2 requirements  
b. No more detail needed

3. Available:
  - a. Mapping rules between CMMI and ISO/IEC 12207
  - b. Automated tool support



# Generating ASPICE profiles from SCAMPI A/B results - 1

## Approach 1:

- Generate ISO/IEC 12207 process profile from SCAMPI A/B results
- Use additional evidence for non-covered issues
- Disregard processes not addressed in ASPICE PRM
- Perform manual inspection for differences between ISO/IEC 12207 and ASPICE process outcomes

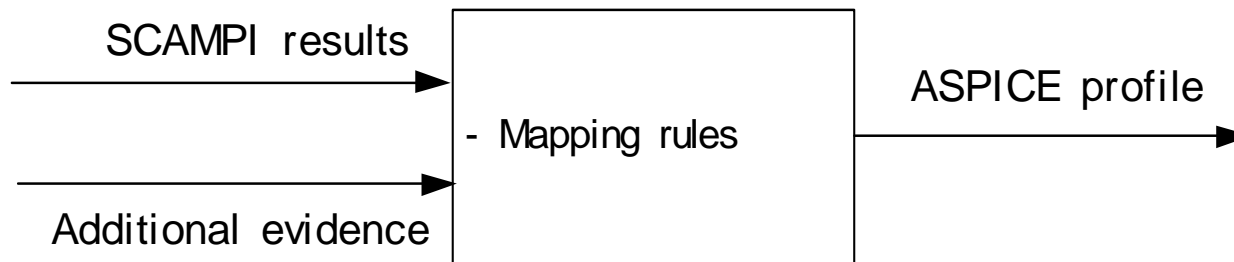




# Generating ASPICE profiles from SCAMPI A/B results - 2

## Approach 2:

- Develop direct mapping rules between CMMI and ASPICE
- Using additional evidence for non-covered issues





## 6. Conclusion

- CMMI has a broader scope of application than ASPICE, it has a significant supporting infrastructure capable of providing sustaining support over the long term, it has a significant community of users around the world and it is built on proven model-based process improvement technology
- There are some likely to be minor adjustments in the objective evidence required which might need to be made by organizations engaged in CMMI-based appraisal in order to support the derivation of an ASPICE process outcome profile as an outcome of a SCAMPI (A or B) appraisal



## 7. Proposed Next Steps (HIS)

1. Revise ASPICE PRM/PAM to satisfy ISO/IEC 15504-2 requirements and to reduce unwanted differences with ISO/IEC 12207
2. Determine ASPICE exclusive issues, not covered by CMMI
3. Execute pilot project(s) to investigate the feasibility of re-using SCAMP A/B results to generate ASPICE process profile
4. If feasible, provide automated tool support



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