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Using Continuous Models as "Dynamic and Specific Staged Models" for Process Improvement

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Software Industry and SPI in Brazil

- about 5000 software intensive organizations
- growing usage of SPI
- software and SPI are integral part of Brazilian Industrial Policy (2004-2007) (www.mdic.gov.br)
- dominant model: SW-CMM / CMMI-SE/SW staged

current maturity profile (2004)				
level	2	3	4	5
# orgs.	24	6	1	1

based on reported official CBI-IPI, SCE and SCAMPI appraisals http://www.mct.gov.br/Temas/info/Dsi/qualidad/CMM.htm

- alternative: ISO/IEC 15504-5 (SPICE)
- 200+ serious SPI projects in progress *(my estimation!)*
- many SPINs, conferences, courses and R&D in SPI

CenPRA (www.cenpra.gov.br)

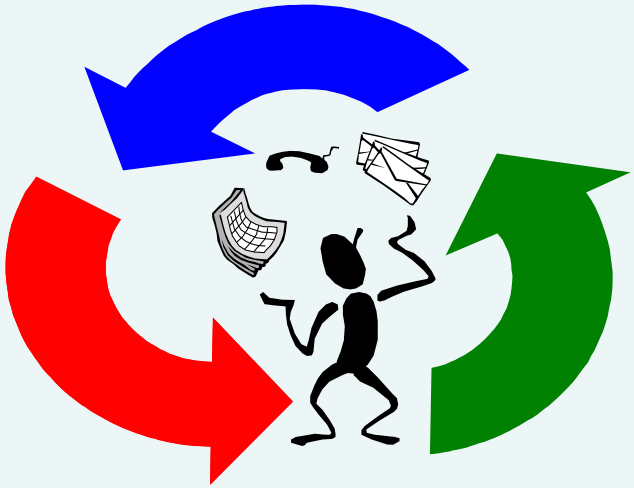
"Renato Archer" Research Center, IT R&D institution from the Ministry of Science and Technology
Founded in 1982, located in Campinas, SP, Brazil
300+ people, 12 Divisions in IT related R&D, including a Software Process Improvement Division

Background

- Software (and System) Process Improvement (SPI) based on Process Capability/Maturity Models
- Model architecture or representation:
  - Staged: SW-CMM, CMMI-SE/SW staged
  - Continuous: ISO/IEC 15504-5, CMMI-SE/SW continuous
- ISO/IEC 15504 (SPICE) (www.isospice.com):
  - Framework for process assessment (and improvement)
  - 1998: TR version: for software engineering (SE)
  - 2003: IS version: generic, including 15504-5 as an Exemplar Process Assessment Model for SE
  - More than 3000 utilization worldwide
- Traditional view Staged versus Continuous (S&C):
  - Staged: proven path for organizational maturity
  - Continuous: flexible, for individual process improvement
  - Equivalent staging in continuous described in CMMI Models, [Ahern et al., CMMI Distilled, 2001] and others

Three key points of this presentation

insights from helping 20+ SPI projects using continuous (and staged) models since 1998



A view on staged *vs.* continuous debate, proposing three generations of Process Capability Models

A proposal for "using continuous models as dynamic and specific staged models for process improvement" or PRO2PI: "process capability profile for process improvement"

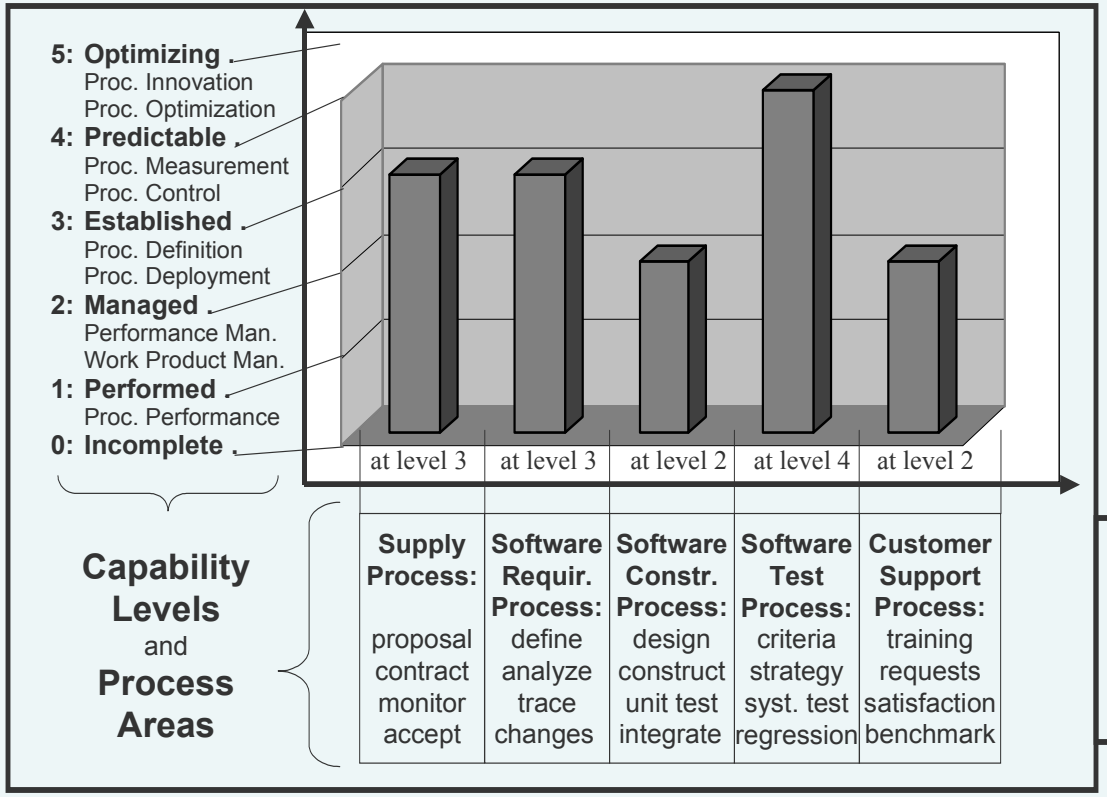
PCP: Staged/Continuous Unification

PA: Process Area

PCL: Process Capability Level

PCP: Process Capability Profile

PCP = set of PAs, each one at a PCL



Example of a PCP (in ISO/IEC 15504-5)

Staged vs. Continuous: Our vision

Staged Model: A (very good) example of an hierarchy of (4) fixed PCPs ("maturity levels")

Continuous Model: Although structured by individual processes, should be used by defining appropriate PCPs for organizational improvement

Therefore: Continuous as an evolution from Staged

Actually: Three generations of Process Capability Models and Frameworks, based on variations on stability and flexibility of PA, PCL and PCP, going for more flexibility

Generations of Process Capability Models and Frameworks

	1st Generation	2nd Generation	3rd Generation
Main framework and release year	SW-CMM version 1.1 Model : 1993	ISO/IEC TR 15504 Framework : 1998	ISO/IEC 15504 Framework : 2003
Other models	CMMI-S v1.1 : 2002	CMMI-C v1.1: 2002	
Architecture	Staged	Continuous	Continuous
Alternative Name	Fixed Staged	Closed Continuous	Open Continuous
Major fixed elements	PCPs (“maturity levels”)	Process Areas and Capability Levels	Capability Levels
Major variable elements (flexibility)	Interpretation of PCPs	PCPs and their interpretation	Process Areas, PCPs and their interpretation
comment	good results, essential to establish the area limited flexibility	decoupling of process area and capability level	best stability and flexibility balance, needs methodology

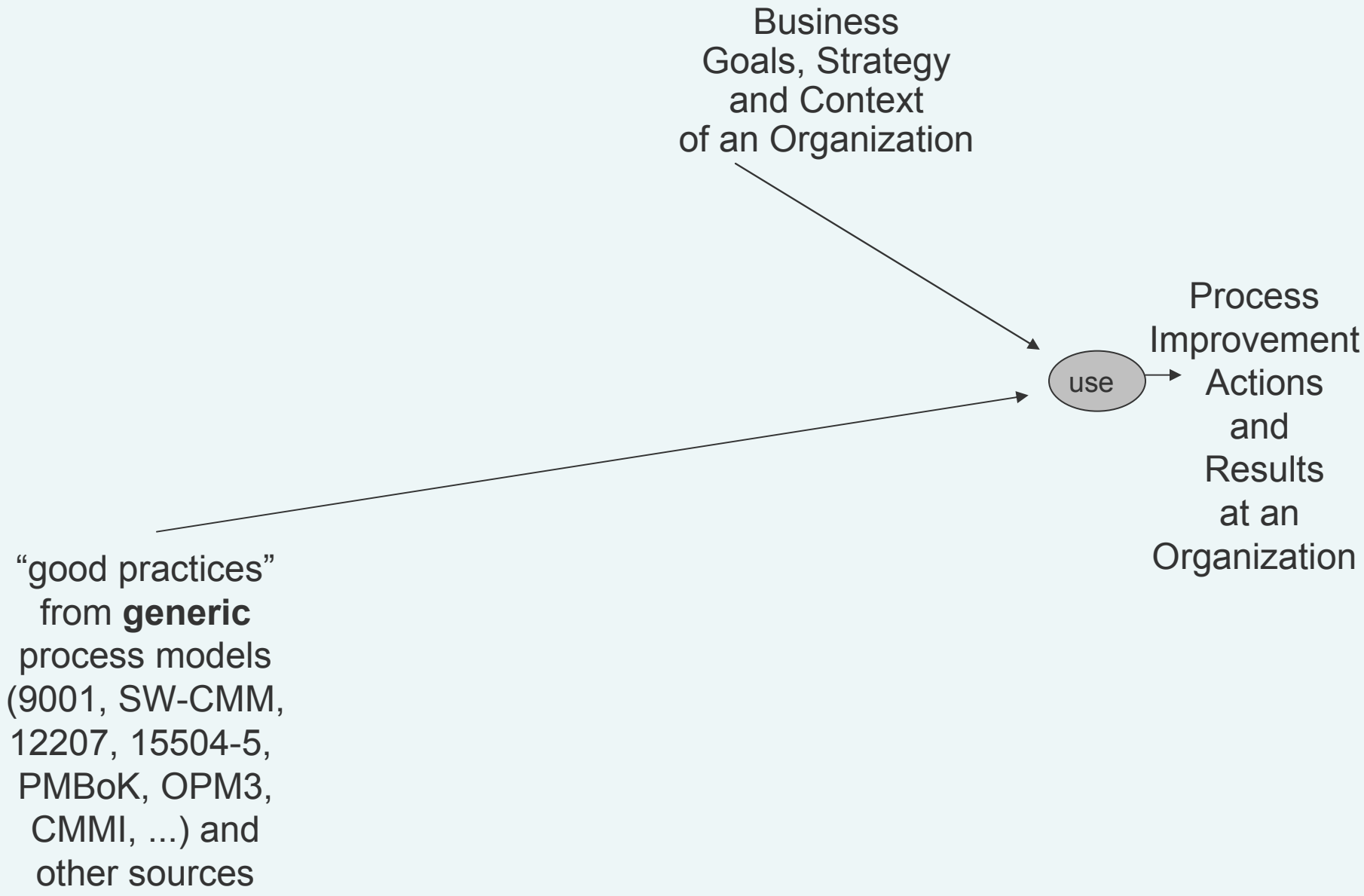
PRO2PI

towards a methodology to define, use and update
"useful and effective" **Pro**cess Capability **Pro**file
("dynamic and specific staged models")
to Process **I**mprovement
based on multiple reference models

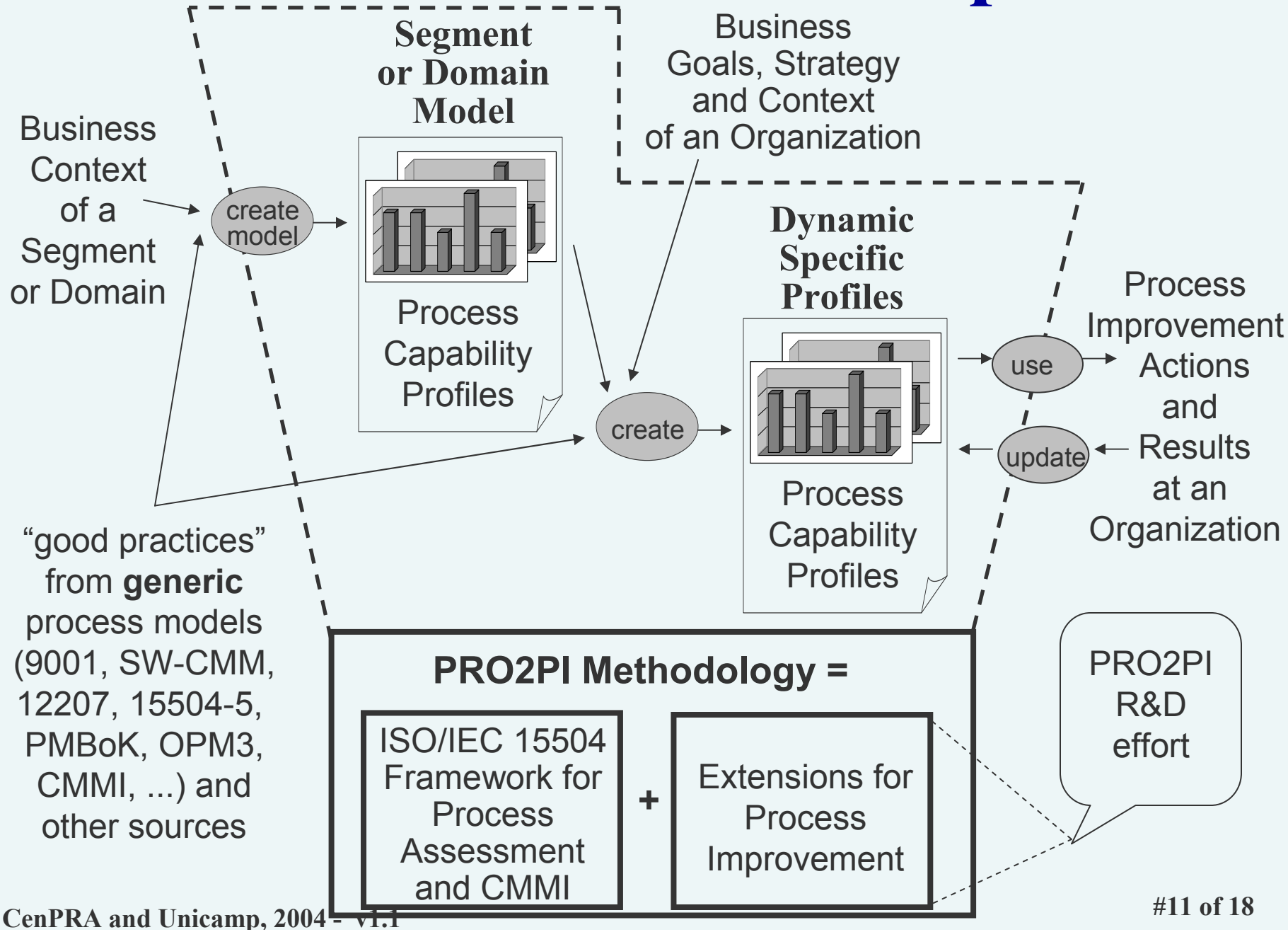
Methodology major elements:

- proposal and rationale
- metamodel to integrate models and support PRO2PI
- PRO2PI properties
- method for define, use and update PRO2PI

Overview: Current Situation



PRO2PI Overview: Proposal



Properties of a PRO2PI

In order to be useful and effective for process improvement, i.e, to be a PRO2PI, a PCP should possess, to a sufficient extent, at least the following seven properties:

- ☑ Relevant to the organization's business context
- ☑ Systemic to support steady improvement
- ☑ Abstraction of the target process system
- ☑ Specific to the organization current characteristics
- ☑ Attainable given potential investment and constraints
- ☑ Dynamic to be modified as appropriate and needed
- ☑ Traceable to relevant process models
- ☑ Opportunist to use resources currently available

SPI in Org.$_a$ (1999-2002)

Context: Medium size, software product oriented, 10 years of success, started small (5 people), informal style not working well anymore

Reference Models: 15504-5 (and ISO 9001:2000)

Target PCP1999: (Customer Sup., Quality Assur., Project Man., Org. Alignment, and Proc. Established):CL 2, selected using our experimental method. [note: they were assessed as CL0/1]

Target PCP2001: include "ISO 9001:2000 requirements"

Result PCP2002: plus Sw.Req and Measurement, assessed as CL2

Results: more systematic style of work; organizational management with data, better knowledge about the clients

Ref: Salviano et al., "Experiência de Avaliação de Processos e Planejamento da Melhoria Utilizando ISO/IEC 15504 (SPICE)", WQS Workshop, Brazil 1999.

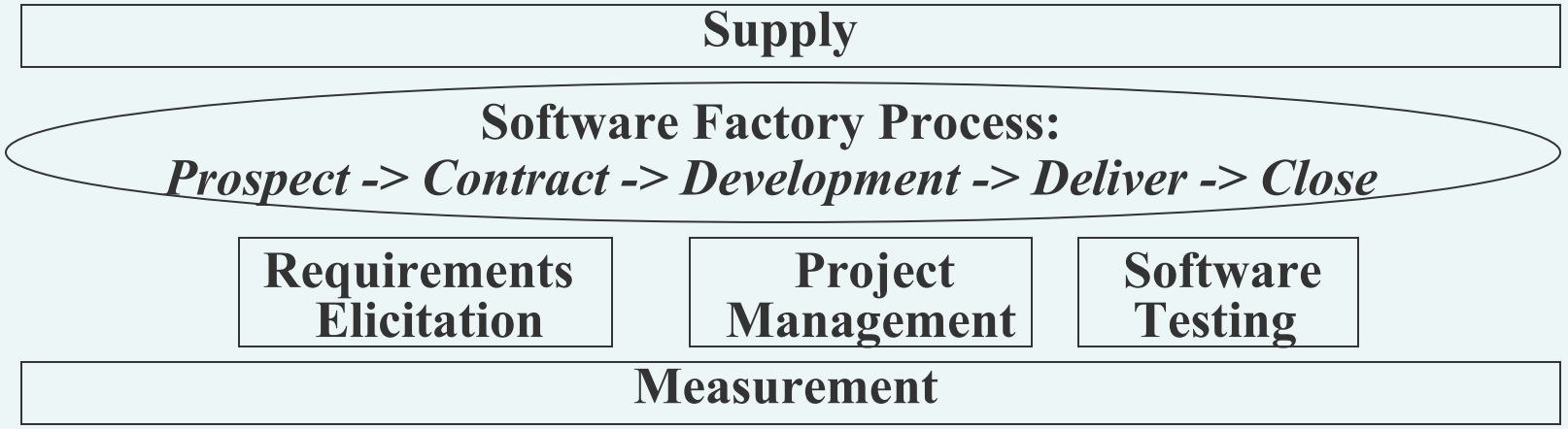
Nicoletti and Salviano, "An Experience using ISO/IEC TR 15504 and ISO 9000:2000 for SPI", SPICE Conference, Netherlands, 2003.

SPI in $Org._b$ [2002-...]

Context: small size (8 people), (small) project oriented, success

Reference: 15504-5 (and RUP, PMBoK, IEEE829, CMMI-SE/SW)

PCP:



(five 15504 processes, selected based on business context, without a formal method, and assessed in 2002 as CL.1)

Results: software factory process as CL.2 (partial CL.3), better customer satisfaction, better control of requirements and product

Ref: Silva et al., An ISO/IEC 15504-Based SPI Project in a Small Brazilian Software Organization, SPICE Conference, Netherlands, 2003;

SPI in $Org._c$ [2003 ...]

Context: sw. development for internal use (governmental org.)

Reference: SW-CMM (and Rational Tools, 15504-5)

PCPs: started as SW-CMM ML.2 and made changes:

Step	Operation	Result PCP	Comment
1	P1 = Create	{RM, SPP, SPTO, SSM, SQA,SCM}:CL2	based on SW-CMM level 2
2	P2 = P1 + SwTest:CL2	{RM, SPP, SPTO, SSM, SQA, SCM, SwTest}:CL2	add Software Test, reference for an assessment
3	P3 = P2 – {SPP, SPTO,SSM,SQA}	{RM,SCM,SwTest}:CL2	after assessment, reduce scope to be feasible
4	P4 = P3 + Infrastr:CL2	{RM,SCM,SwTest,Infrastr} :CL2	add Infra-structure for software tools

Comment: example of breaking (and expanding) ML 2 to better address org. context.

PCP	Processes and capability level included
$PCP_{a.2}$	{SPP, SPTO, SSM, SQA}:CL2
$PCP_{a.1}$	{RM, SCM, SwTest ,Infrastr}:CL2

SPI Method for Small [2003..]

Goal: develop and apply a process assessment method to start a SPI in small size organizations using 15504 (and CMMI)

Strategy: include a method to define a useful and effective PCP for each organization

Ref.: Anacleto et al, A Method for Process Assessment in Small Software Companies, in SPICE Conference, Lisbon, Portugal, April 2004

SPI for Group of Orgs. [2003 ..]

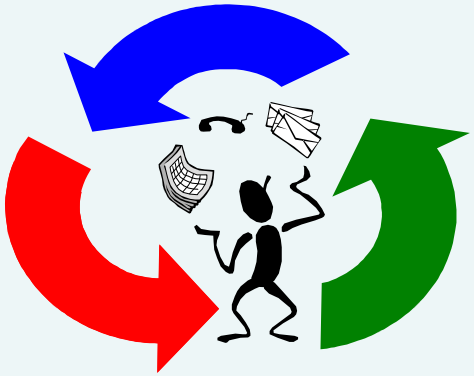
Goal: cooperation of 9 sw. orgs. for CMMI-SE/SW ML.2

Strategy: share training and process knowledge, but each one define and use their own processes; and
breaking ML.2 into two:
a1: RM,PP and PMC for basic project management, and
a2: include SAM, CM, PPQA and MA for institutionalization

Ref: projeto cooperativa CMMI (http://www.its.org.br)

Conclusions

insights from helping 20+ SPI projects using continuous (and staged) models since 1998



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Thanks for your attention!

CenPRA Centro de Pesquisas Renato Archer

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