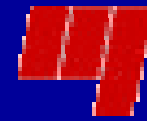


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# Creativity & Innovation in SPI: an exploratory paper on its measurement

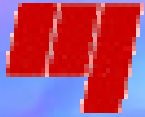
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*Montréal, Québec - CANADA*

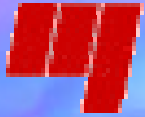
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- ◆ **Introduction**
- ◆ Creativity & Innovation with SPI: two faces of the question
  - ❖ Creativity & Innovation vs. SPI
  - ❖ Creativity & Innovation with SPI
- ◆ A third way to manage Creativity
- ◆ A possible way to measure Creativity
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- ◆ Creativity Management and SPI models
- ◆ Conclusions and Prospects



# Introduction

Some relevant questions has to be faced with respect to Creativity Management in the ICT field.

**For instance:**

**Q1:** What are the boundaries of SPI with respect to other disciplines? And with TQM?

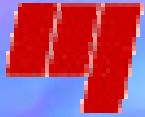
**Q2:** What is the relationship between SPI and TQM?

**Q3:** And which role is played by Creativity & Innovation in prescriptive paths such as the ones prescribed by SPI frameworks



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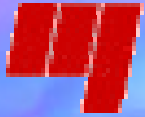
# Creativity & Innovation with SPI

What is **Creativity**? *The ability to create specifically new and original things*

What is **Innovation**? *The introduction of something new*

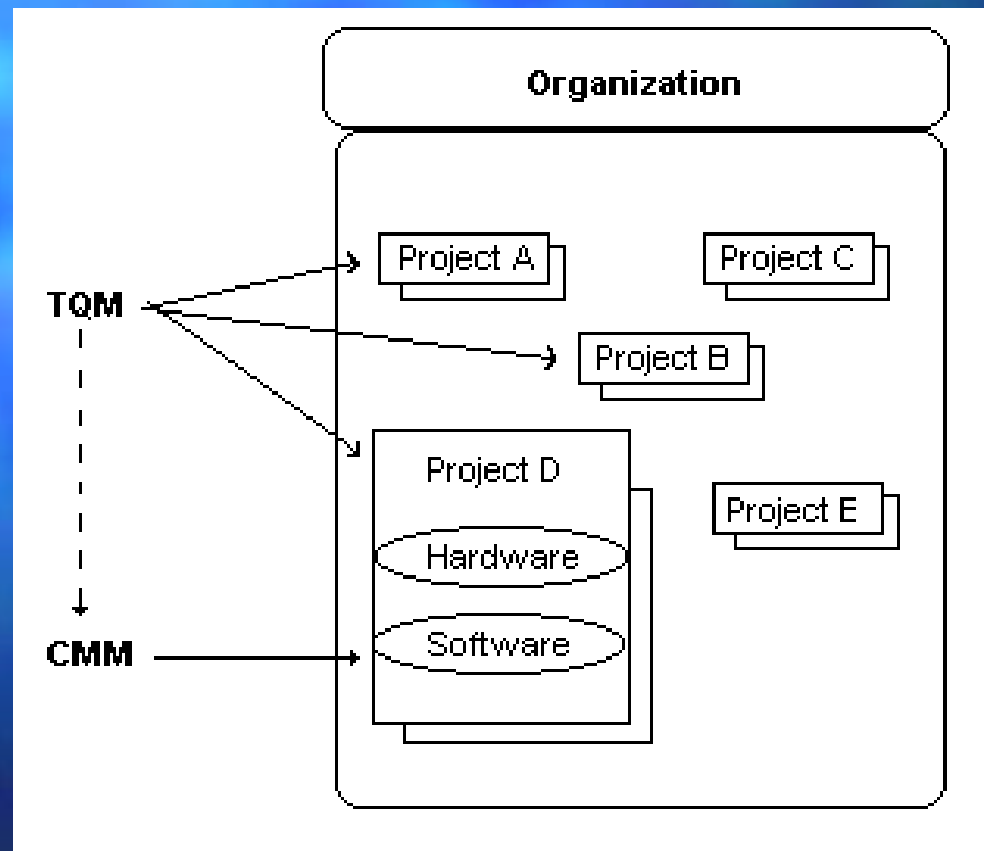
*(Merriam-Webster dictionary)*

**Q:** Creativity and Innovation are really important in the TQM arena, but are they in SPI frameworks?



# Creativity & Innovation with SPI

## Relationship between TQM and SPI models





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# Creativity & Innovation with SPI: side A of the coin

## Creativity & Innovation vs. SPI

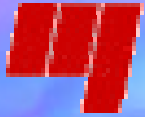


First viewpoint states that SPI frameworks reverses processes, but ignores people.

### Rationale:

- SPI models miss the dynamics of the processes
- Processes imply you don't have to think
- Big companies (MS, Borland...) rated low on CMM levels





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# Creativity & Innovation with SPI: side B of the coin

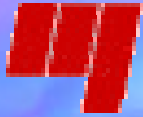
## Creativity & Innovation with SPI



Second viewpoint states that SPI frameworks leave people more time to think and to be creative

### Rationale:

- SPI models give you an organised way to work, a useful guide to follow
- SPI models prevent people becoming useless “heros”: when people are affected by hypoxia and stress, it is easier to fail and make errors. Creativity is strongly indered in such contexts.



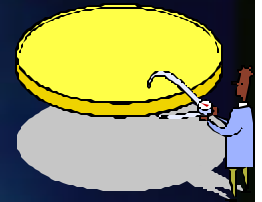
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# Creativity & Innovation with SPI: side "C" of the coin

**A way in the middle...**



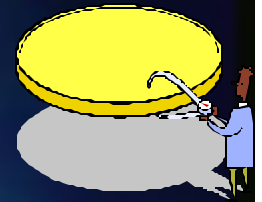
Third viewpoint states that SPI frameworks offers greater process stability that allows people to reduce the effort through the tailored usage of those models as checklists

## **New questions to answer:**

- How to properly manage the Creativity of the employees?
- How to measure it?
- How to read and interpret this issue within current SPI models?



# Creativity & Innovation with SPI: side "C" of the coin



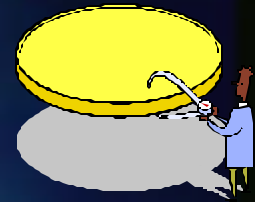
## Towards a Learning Organisation

- **QM**s such as Malcolm Baldrige and EFQM strongly state that people cannot be managed as a 2nd-level asset.
- **PM**s such as the ESI's Balanced IT Scorecard (**BITS**) also separated the fourth perspective (*Learning & Growth*) into two different ones (*Infrastructure & Innovation* + *People*)

Final aim to reach: from a traditional management style towards a Learning Organisation (*an organisation that learns and encourages learning among its people. It promotes exchange of information between employees hence creating a more knowledgeable workforce. This produces a very flexible organisation where people will accept and adapt to new ideas and changes through a shared vision*)



# Creativity & Innovation with SPI: side "C" of the coin



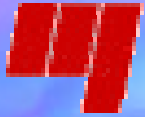
## Reshaping SPI boundaries

Another open point remains: Should SPI frameworks reshape, or not, their boundaries, at the light of what said right now?

### Questions:

- Should some processes actually covered by other models (i.e. P-CMM) be incorporated into the current ones (i.e. CMMI) or not?
- And the usage of the Total Quality tools?

**Answer:** going back towards the broader TQM boundary



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# A possible way to manage Creativity

**Starting point:** analysis of the **OID** PA (L5) in the CMMI model

CMMI v1.02 (2000)	
<b>KPA</b>	<b>OID</b> – Organizational Innovation and Deployment
<b>Maturity Level</b>	Level 5 ( <i>Optimizing</i> )
<b>KPA Main Objective (first sentence)</b>	<i>“The purpose of OID is to select and deploy incremental and innovative improvements that measurably improve the organization’s processes and technologies. The improvements support the organization’s quality and process performance objectives as derived from the organization’s business objectives”</i>

CMMI v1.02 (2000)	
<b>Metrics and Indicators</b>	The “Measurement & Analysis” CF has been deleted in CMMI, since the measurement issue has become a Level 2 Process Area (PA). The new CFs are four: <ul style="list-style-type: none"><li>◦ Commitment (CO)</li><li>◦ Ability (AB)</li><li>◦ Direct Implementation (DI)</li><li>◦ Verifying (VE)</li></ul> Some measurement activities are in the: <ul style="list-style-type: none"><li>◦ Selection (SP 1.4)</li><li>◦ Deployment (SP 2.3)</li><li>◦ Monitor and Control of processes (GP 2.8 – DI3)</li></ul>
<b>Remarks</b>	<i>Focus on the selection and deployment of methods and tools. <b>More attention to the innovation aspects in the maturity evolution path.</b></i>





# A possible way to manage Creativity

**Previous works:** few studies have approached Creativity & Innovation from a quantitative (or a “not-qualitative”) viewpoint, such as those by Redelinguys, but with a different approach

	REDELINGHUYS	BUGLIONE & ABRAN
Measurement object	Performance of a single designer	Innovation management from a SBU / Corporate viewpoint
Measurement focus	Product quality by a stronger individual creativity level	Application of individual creativity skills in terms of their relate processes and application into the SBU / Corporate reality
Representation format	Usage of a N-dimensional vector  <b>Criticism:</b> <i>a correspondent relationship between the number of elements to represent and the dimension in which the representation format is expressed must exist (max. representability for a vector is 3 variables in a 3D space)</i>	Usage of a bi-dimensional matrix (CA matrix), respecting the “dimensional principle”.



# A possible way to manage Creativity

What should be measured to properly manage Creativity?

According to the journalistic “5 Ws + H” rule there are 6 elements to take into account. The already known are...

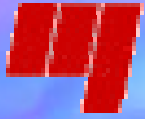
- 1) **Why**: to measure Creativity & Innovation level in an organisation
- 2) **Where**: at the SBU / Corporate level
- 3) **Who**: the owner of the measurement task (PQA-PQM)
- 4) **When**: at the established frequencies



# A possible way to manage Creativity

...while the remaining to analyse in detail are these **three** things:

- 1) **What (*object*)**: methods, techniques, tools to improve processes and their results
- 2) **How (*modality*)**: 4-level scale evolutionary path for the adoption of an object (① base application -> ② advanced application -> ③ tailoring -> ④ innovation-creation)
- 3) **How (*format*)**: logical structure to express such as path



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# CA Matrix

The **C**reativity versus **A**pplication (**CA**) matrix is the way used to express how and how much Creativity impacts on the software organisation.

## Two dimensions

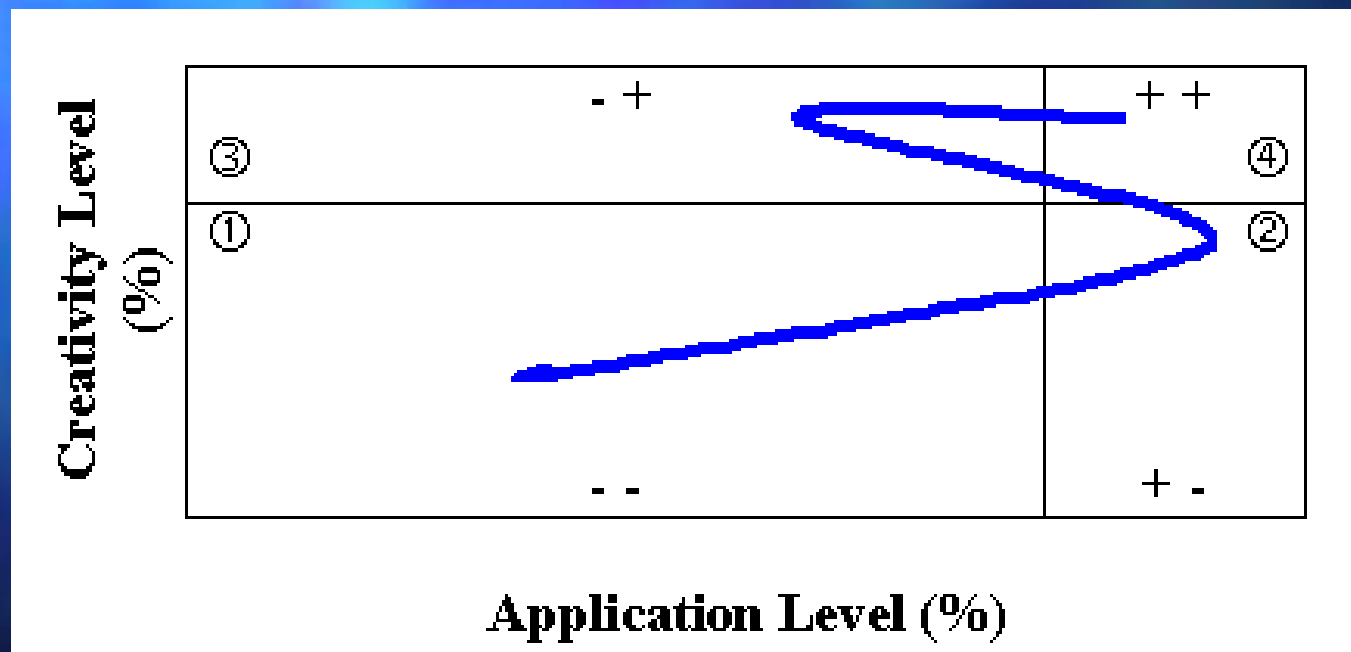
- Creativity Level (%)
- Application Level (%)

Creativity Level (%)	③	- +	+ +	④
	①	- -	+ -	②
		Application Level (%)		



# CA Matrix: S-shaped curve trend

CA matrix should progress its trace according to a S-shaped curve trend, as in the following image.





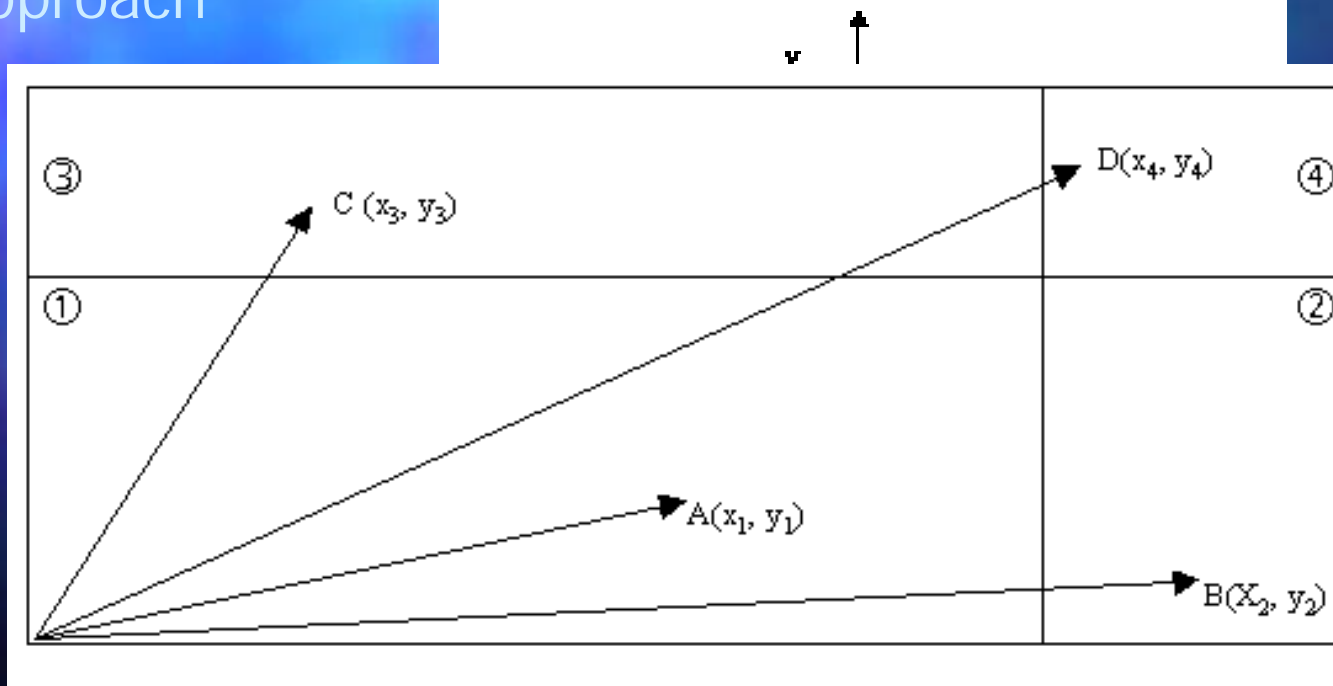
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# CI: Creativity Index

**CI** is the quantitative measure derived from CA matrix to measure the Creativity adoption level with a geometrical approach



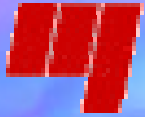
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$CI = \sum_{j=1}^4 \sum_{i=1}^m \frac{P_{ji} * w_j}{n}$$

**where:**

- n**= number of total applications (*points*)
- m**= number of points in the quadrant under exam
- i**= current application
- j**= current quadrant / weight





# CI: an example

**Hp:** 4 applications of methods/techniques in our company

Quadrant	Point Name	X value	Y value	Dist from Origin	Weight	Final Value
1	A	45	18	48.466	w 1	
2	B	83	10	83.600	w 2	
3	C	23	86	89.022	w 3	
4	D	79	90	119.754	w 4	
				Total		<b>340.842</b>

The maximum CVA value is equal to

$$d = \sqrt{100^2 + 100^2} = \sqrt{20000} = 141.421$$

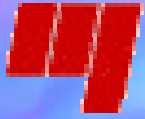
And normalising the CI index

$$0 \leq CI\% \leq 1$$

$$CI\% = \frac{CI - CI_{\min}}{CI_{\max} - CI_{\min}}$$

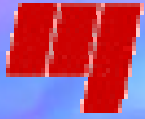
The CI% index will be equal to

$$CI\% = \frac{85.2015 - 0}{141.421 - 0} \cong 0.6025$$



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# Creativity Mgmt and SPI models

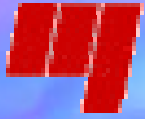
Creativity and Innovation are actually managed by CMMI  
1.02 L5 OID PA and Sw-CMM 1.1 L5 TCM KPA

## Problems:

- no reference to people and the way they could express creativity in the company's goals

## Question:

- why *Training* is a KPA in P-CMM (L2) and CMMI (L3) and *Creativity Management* not?



# Creativity Mgmt and SPI models

## Other Questions:

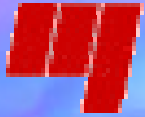
- why waiting for L5 to manage new ideas? See “.com” companies and the CMM rating they have achieved...
- is the Creativity considered a “perturbation” element and would it be better to have reached a L5 state before facing it?
- ...but problems can be partially overcome also by *continuous models* in place of *staged models*



# Creativity Mgmt and SPI models

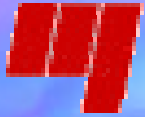
So...

- Why not pass from CMMI's OID PA (L5) to L2-L3 (see the MEA - MEasurement Analysis PA at L2)?
- Or...why not add some *Common Features* (CFs) in the Training Program (TP) PA, inserting new related items?



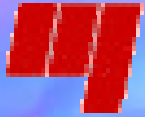
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# Conclusions & Prospects

- Creativity & Innovation in ICT companies are issues partially managed in L5 in most common SPI frameworks (CMMI, Sw-CMM...)
- Little attention has been devoted to these issues, despite their relevance from a business viewpoint (.com companies), while a greater attention is paid in TQM models
- A way to manage and measure the impact of Creativity in ICT company has been proposed, through the CA matrix and the CI index
- An example has shown how CA and CI can be applied
- Finally, a discussion on the future of Creativity Management in SPI models has been initiated, highlighting the discrepancies between what the market results and some recommended best practices say.



# Question Time



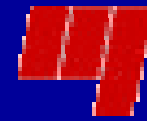
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