Do we really re-use our knowledge (or not)?

Luigi Buglione, Ph.D.
Process Improvement & Measurement Specialist
Industry & Services Business Unit
Engineering Ingegneria Informatica SpA

Associate Professor
Ecole de Technologie Superieure (ETS), Montréal

www.eng.it
Reusing Knowledge

Goals of the presentation

1. Discuss the ‘lack of (knowledge) reuse’ in organizations and its possible root-causes
2. Introduce the ROI/VOI (→ ROK: Return on Knowledge) setting up a Knowledge Management strategy
3. Suggest some best practices for achieving better business results moving from a proper KM deployment
ENGINEERING GROUP

The first Italian IT player.

About 7,300 PEOPLE

7.2% Italian market share

more than 1,000 large accounts in all markets

System Integration & Application Maintenance

OUTSOURCING

Software Consulting

ORGANIZATION

40 offices in Italy and abroad.

RESULTS (in millions of Euro)

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating revenues</th>
<th>Ebitda</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>822.8</td>
<td>100.8</td>
</tr>
<tr>
<td>2012</td>
<td>770.0</td>
<td>92.6</td>
</tr>
<tr>
<td>2011</td>
<td>775.7</td>
<td>77.2</td>
</tr>
</tbody>
</table>
The Software Engineering Research Laboratory (GÉLOG) oversees various research projects both in the area of the definition of the Software Engineering principles as well as on specific technologies of this new engineering discipline. Members of the GÉLOG are involved in standardization activities as well as in the development of the international consensus on SWEBOK: the Guide to the Software Engineering Body of Knowledge. It also conducts research on specific technologies; Software Measurement, Quality Assurance, Cloud Computing, Software Maintenance, Design Patterns and Architecture. Working jointly with industry and various research centers, GÉLOG conducts applied research. GÉLOG’s research activities are overseen and supervised by five ÉTS professors. Graduate and postgraduate students also participate in its activities.

The mission of the Software Engineering Research Laboratory is to develop, for our software engineering managers to improve...
✓ Introduction
✓ Tailoring & Customizing
✓ Maturity & Capability Models (MCMs)
✓ The LEGO (Living EnGineering prOcess) Approach
✓ (Some) conclusions & Next Steps for learning (more)
✓ Q & A
You have more potential than you believe to do.

(Anonymous)
Introduction

Why do organizations fail?

OVERRUNS AND FEATURES

Time and cost overruns, plus percentage of features delivered from CHAOS research for the years 2004 to 2012.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TIME</strong></td>
<td>84%</td>
<td>72%</td>
<td>79%</td>
<td>71%</td>
<td>74%</td>
</tr>
<tr>
<td><strong>COST</strong></td>
<td>56%</td>
<td>47%</td>
<td>54%</td>
<td>46%</td>
<td>59%</td>
</tr>
<tr>
<td><strong>FEATURES</strong></td>
<td>64%</td>
<td>68%</td>
<td>67%</td>
<td>74%</td>
<td>69%</td>
</tr>
</tbody>
</table>

URL: www.standishgroup.com
Introduction

Why do organizations fail?

1. Competency
2. Position
3. Motivation
4. Togetherness
5. Training
6. Mentoring
7. Chemistry
8. Toxic
9. Turnover
10. Hot Groups

10 Success points for Skilled Resources in Small Groups

Project resolution for the calendar year 2012 in the new CHAOS database. Small projects are defined as projects with less than $1 million in labor content and large projects are considered projects with more than $10 million in labor content.

URL: www.standishgroup.com
### Introduction

#### Why do organizations fail?

1. Allowing to much complacency
2. Failing to create a powerful coalition
3. Underestimating the power of Vision
4. Under Communicating the Vision
5. Permitting Obstacles to Block the Vision
6. Failing to Create Short-Term Wins
7. Declaring Victory too soon
8. Neglecting to Anchor Changes Firmly

---

**A Losing Organization**

<table>
<thead>
<tr>
<th>9 Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fuzzy Vision</td>
</tr>
<tr>
<td>2. Lack of Leadership Skills</td>
</tr>
<tr>
<td>3. Discouraging Culture</td>
</tr>
<tr>
<td>4. High Bureaucracy</td>
</tr>
<tr>
<td>5. Lack of Initiative</td>
</tr>
<tr>
<td>6. Poor Vertical Communication</td>
</tr>
<tr>
<td>7. Poor Cross-functional Collaboration</td>
</tr>
<tr>
<td>8. Poor Teamwork</td>
</tr>
<tr>
<td>9. Poor Idea and Knowledge Management</td>
</tr>
</tbody>
</table>

---

**URL:** [http://goo.gl/WCBe1w](http://goo.gl/WCBe1w)
**Introduction**

A bit of humour...

---

**URL:**
www.dilbert.com
Introduction

Which could be the **solution**?
Introduction

...in order to create... Value! [ITIL v3 2011]

- Value ← Utility + Warranty
Introduction

A ‘service’ is more than typically thought...

- **Service** → A means of delivering value to Customers by facilitating Outcomes Customers want to achieve without the ownership of specific Costs and Risks.
- **Project** → A temporary organization, with people and other assets, that is required to achieve an objective or other outcome. Each project has a lifecycle that typically includes initiation, planning, execution, and closure. Projects are usually managed using a formal methodology such as PRojects IN Controlled Environments (PRINCE2) or the Project Management Body of Knowledge (PMBOK).
Introduction

ITIL v3 – Service Lifecycle

The business/customers

Requirements

Service strategy

Strategies

Policies

Resources and constraints

Change proposals and service charters

Service design

Solution designs

Architectures

Standards

Service design packages

Service transition

New/changed/retired services

Tested solutions

SKMS updates

Implementation of transition plans

Service operation

Achievements against targets

Operational/live services

Service portfolio

Continual service improvement

CSI register, improvement actions and plans

Business value

Service knowledge management system

Service catalogue
Where to start? Questions FIRST, answers LATER!
Where to start?

Questions FIRST: The ‘5W+2H’ rule

- **The original ‘5W+H’ journalist rule**
  - Typically a good paper should contain:
  - Who: not well expressed now → RACI matrix for describing who should collect, prepare, and analyze data

- **The 2° H – a possible addition**
  - ‘How Much’ → threshold(s) value(s)
  - As in Control Charts (TQM), possibly two (2) thresholds:
    - UCL (Upper Control Level)
    - LCL (Lower Control Level)
  - Threshold(s) should be periodically (re)evaluated from MEB data

- **Utility and applicability**
  - Same suggestion for a good (whatever) plan: Project, Quality, Communication, Measurement, Improvement plan...
  - In such way it could be possible to check easily with a structured manner what has/hasn’t included in a plan
Where to start?

Questions FIRST: Open vs Closed Questions

• **Open-Ended Questions**
  → Explore possibilities, feelings, reasons why, freedom to answer, useful for problem-solving
  • Why...?
  • How...?
  • What do you think about...?
  • ...

• **Closed Questions**
  → Facts, quick, easy to answer, useful at the end of a conversation
  • What...?
  • How Many...?
  • Did you agree...?
  • When...?
  • Who...?
  • ...

Leading with QUESTIONS

Michael Marquardt

How Leaders Find the Right Questions at Knowing What to Ask
Where to start?

Questions FIRST, answers LATER!

• **GQM** (Goal-Question-Metric) [V.Basili, 1984]
• **MIM** (Measurement Information Model) [ISO/IEC 15939:1999 (R2007)]
Where to start?

Questions FIRST: RCA (Root-Cause Analysis)

- Other
- SLC phase origin
  - Requirements
  - H/L design
  - Component Implementation
  - Load building
- Review
  - Architecture
  - Component Spec/Design
  - Testing
  - No / Incomplete review
  - Inadequate participation
  - N/A

- Project
  - Time pressure
    - P01: Project Duration / Effort
  - Management pressure
    - N/A

- Human-related
  - Change coordination
    - Lack of tools knowledge
    - Lack of systems knowledge
  - Individual mistake
    - Lack of domain knowledge
  - Communication problems
    - Lack of process knowledge
    - H01: # of open issues within the team
  - N/A

- Software Defects
  - Introduced w/ other repair
    - H03: # of Estimated hrs for solving new generated problems
  - Missing awareness of need for documentation
    - H02: # of new generated defects
  - N/A

R02: Avg hrs spent for review preparation by assigned reviewers
R03: % of issues covered against planned
R01: % of attendees on invited reviewers
N/A
How to Design? The ‘User Experience’
How to Design?  

The ‘User Experience’ – Some bad experiences

No customizability

No Trash Bin...Shredder!

Few customizability
How to Design? 

The ‘User Experience’ – Some bad experiences
How to Design?

The ‘User Experience’ – Some bad experiences

Windows 8.0

Windows 8.1
SKMS – Service Knowledge Management System

- It’s the logical summation of ALL the data, information, knowledge available in an organization
- Quantitative + Qualitative data (experience, lessons learned, ...)
- CMS but also a Risk Register
- ...
**DIKW – Data/Information/Knowledge/Wisdom**

- Four KM waves
  - **Verifying** (DIKW): Data $\rightarrow$ Information $\rightarrow$ Knowledge $\rightarrow$ Wisdom
  - **Building** (WKID): Wisdom $\rightarrow$ Knowledge $\rightarrow$ Information $\rightarrow$ Data
- ‘5W’s+H’ rule (who, what, when, where, how, why)
- Two dimensions: Context; Understanding
Which main issues?

An initial list with questions types

- Requirements → WHY, WHAT’s (e.g. EAM analysis)
- Stakeholders → WHO
- Communication → HOW, HOW MUCH
- Measurement → HOW MUCH
- Reuse → WHAT, HOW
- Benchmarking → WHAT, HOW
- Scope Management → WHERE
- …
Which main issues?

Manage **Requirements**, that’s the issue!

- NFR (prod)
- FUR (prod)
- Other (prj)
Which main issues? | Which requirements?

- Expressed
- Ambiguous/Not granular
- Implicit
- Scope Creep
• Communication issues
  ✓ Partly addressed, even if fundamental
    – E.g. CMMI-x GP2.7 on stakeholders’ involvement
  ✓ Heavily documented and discussed how communication pitfalls represent a major problem which may make a process improvement initiative unsuccessful
Which main issues?  Is Communication an issue?

• Social Media
  ✓ How do you communicate?
  ✓ Which Social Media are you using? How?
  ✓ Are you overloaded or not?
  ✓ Are they taking you the right time? Or not?
  ✓ How many interruption during the day typically are you doing while working?
  ✓ ...how (real) hour are you working per day?

excessive email  pointless meetings  constant interruptions
Which main issues? Is Communication an issue?

- Interruptions and Social Media

**Too Many Interruptions at Work?**

*Office distractions are worse than you think — and maybe better*

A Q&A with Gloria Mark, associate professor at the Donald Bren School of Information and Computer Sciences at the University of California, Irvine, and a leading expert on work.

It’s discouraging to put in a busy 16-hour day, yet feel that you haven’t accomplished anything. From constant emails and phone calls to coworkers with quick questions that take all morning, it sometimes seems like the single most of work is interruption.

---

**A Diary Study of Task Switching and Interruptions**

Mary Czerwinski, Eric Horvitz, Susan Wilhite

Microsoft Research

One Microsoft Way, Redmond, WA USA

{marycz, horvitz, susanw}@microsoft.com

**ABSTRACT**

We report on a diary study of the activities of information workers aimed at characterizing how people interleave multiple tasks amidst interruptions. The week-long study revealed the type and complexity of activities performed, the nature of the interruptions experienced, and the difficulty of shifting among numerous tasks. We present key findings from the diary study and discuss implications of the findings. Finally, we describe promising directions in the design of software tools for task management, motivated by the findings.

---

**CubeSmart, Inc.**

Social Interruption and the Loss of Productivity
Which main issues?

Requirements: FUR vs NFR
What is a **NFR? ISO/IEC 25010:2011**

---

**System/Software Product Quality**

- **Functional Suitability**
  - Functional completeness
  - Functional correctness
  - Functional appropriateness

- **Performance Efficiency**
  - Time-behaviour
  - Resource utilisation
  - Capacity

- **Compatibility**
  - Co-existence
  - Interoperability

- **Usability**
  - Appropriateness
  - Recognisability
  - Learnability
  - Operability
  - User error prevention
  - User interface aesthetics
  - Accessibility

- **Reliability**
  - Maturity
  - Availability
  - Fault tolerance
  - Recoverability

- **Security**
  - Confidentiality
  - Integrity
  - Non-repudiation
  - Accountability
  - Authenticity

- **Maintainability**
  - Modularity
  - Reusability
  - Analysability
  - Modifiability
  - Testability

- **Portability**
  - Adaptability
  - Installability
  - Replaceability

---

- Evolution of **ISO/IEC 9126-x** series, good starting point for depicting a correct scope
- Valid also for services, not only products – see how much do they fit!
- Good checklist for not loosing/miss requirements from early stages when estimating
Which main issues?

Manage Requirements, that’s an issue!

Quality Function Deployment (QFD)

URL: [www.webducate.net/qfd/qfd.html](http://www.webducate.net/qfd/qfd.html)

- Technique proposed by Dr Yoji Akao in 1966
- Combine the ‘Voice of Customer’ (VoC) with Technical Requirements
- Help in prioritizing requirements
- Allow to do competitive benchmarks before producing a product/service
- Focus on the ‘internal’ knowledge of a provider, able to hear the other ‘stakeholders’

### DIRECTION OF IMPROVEMENT

<table>
<thead>
<tr>
<th>TECHNICAL REQUIREMENTS</th>
<th>PERFORMANCE MEASURES</th>
<th>SIZE OF RANGE</th>
<th>TECHNICAL DETAILS</th>
<th>PLANNING MATRIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to put on</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfortable when hanging</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fits over different clothes</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessible gear loops</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does not restrict movement</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightweight</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safe</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attractive</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TECHNICAL PRIORITIES

<table>
<thead>
<tr>
<th></th>
<th>54</th>
<th>81.2</th>
<th>63</th>
<th>23.4</th>
<th>70.2</th>
<th>11.1</th>
<th>49.6</th>
<th>66.4</th>
<th>30</th>
<th>6.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (100%)</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PERCENTAGE OF TOTAL

<table>
<thead>
<tr>
<th></th>
<th>9</th>
<th>13</th>
<th>10</th>
<th>4</th>
<th>12</th>
<th>31</th>
<th>16</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our product</td>
<td>Y</td>
<td>17.4</td>
<td>250</td>
<td>5</td>
<td>4</td>
<td>4 km</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Competitor A’s product</td>
<td>Y</td>
<td>19.3</td>
<td>321</td>
<td>3</td>
<td>5</td>
<td>8 km</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Competitor B’s product</td>
<td>Y</td>
<td>15.7</td>
<td>198</td>
<td>6</td>
<td>4</td>
<td>3 km</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

### DESIGN TARGETS

| | 1600 | 250 | 8 | 6 | 4 km | 2 | 4 |

Key to interrelationship matrix symbols
- Strong interrelationship
- Medium interrelationship
- Weak interrelationship

Cont.
Which main issues? Benchmarking: ‘Apples vs Oranges’
Which main issues?

Some common forms for **Reuse**…

- Ctrl + C
- Ctrl + V
- Cut, Copy, Paste
Which main issues?

...Reuse, also in Estimation...

- Source: PMI’s PMBOK 4, Chapter 6.3
- Source: www.dilbert.com
Which definition of **reuse** do you apply?

Is it yours a **functional** or **technical** reuse?

Have you a Reuse **repository**? Are you planning to have a **QIP-like experience**?

How much are you **mature** about Reuse practices?
Three steps back...

Measurement or Knowledge: where’s the issue?

You cannot control what you cannot measure but...

You cannot measure what you cannot define but...

You cannot define what you don’t know...
What is a **LOC**?

- Physical or Logical?
- With/without comments?
- Which variability (abs, %) in estimations?
## What to Measure?

### EAM Taxonomy

<table>
<thead>
<tr>
<th>E – Entity</th>
<th>A – Attribute</th>
<th>M - Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>Height</td>
<td>Cm / m / …</td>
</tr>
<tr>
<td>People</td>
<td>Weight</td>
<td>Kg / lbs / …</td>
</tr>
<tr>
<td>People</td>
<td>Intelligence</td>
<td>QI / …</td>
</tr>
</tbody>
</table>

### Source

What to Measure?

STAR – Software Taxonomy Revised

- **Inputs**
  - Requirements

- **Process**
  - Products
    - fsu – Functional Size Unit (FUR)
    - nfsu – Non-Functional Size Unit (NFR)
  - Other deliverables

- **Project**
  - Organization/ BU
  - Measurement

**Other deliverables**
Q: which control level (granularity) has your project?

(a) or (b)
Typical Primary Stakeholders

Customers
Suppliers & Business Partners
Local Communities
Competitors
Media & Academic Commenters
Trade Associations
Labour Unions
Civil Society Orgs / NGOs
Government / Regulators
Employees & Managers
Investors

Requirements and Stakeholders

Consulting Organization

Stakeholders’ Mgmt | PMBOK 5 (2013)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Project Integration Management</td>
<td>4.1 Develop Project Charter</td>
<td>4.2 Develop Project Management Plan</td>
<td>4.3 Direct and Manage Project Work</td>
<td>4.4 Monitor and Control Project Work</td>
<td>4.6 Close Project or Phase</td>
</tr>
<tr>
<td>5. Project Scope Management</td>
<td>5.1 Plan Scope Management</td>
<td>5.2 Collect Requirements</td>
<td>5.3 Define Scope</td>
<td>5.4 Create WBS</td>
<td>5.5 Validate Scope</td>
</tr>
<tr>
<td>6. Project Time Management</td>
<td>6.1 Plan Schedule Management</td>
<td>6.2 Define Activities</td>
<td>6.3 Sequence Activities</td>
<td>6.4 Estimate Activity Resources</td>
<td>6.5 Estimate Activity Durations</td>
</tr>
<tr>
<td>7. Project Cost Management</td>
<td>7.1 Plan Cost Management</td>
<td>7.2 Estimate Costs</td>
<td>7.3 Determine Budget</td>
<td>7.4 Control Costs</td>
<td></td>
</tr>
</tbody>
</table>

| 8. Project Quality Management | 8.1 Plan Quality Management | 8.2 Perform Quality Assurance | 8.3 Control Quality |
| 10. Project Communications Management | 10.1 Plan Communications Management | 10.2 Manage Communications | 10.3 Control Communications |
| 11. Project Risk Management | 11.1 Plan Risk Management | 11.2 Identify Risks | 11.3 Perform Qualitative Risk Analysis | 11.4 Perform Quantitative Risk Analysis | 11.5 Plan Risk Responses |
| 12. Project Procurement Management | 12.1 Plan Procurement Management | 12.2 Conduct Procurements | 12.3 Control Procurements | 12.4 Close Procurements |

**Source:** PMI’s PMBOK 5 (2013)
A: ... How to plan an activity if it’s not clear the ‘action space’?

A: ... in ICT – moreover than certifications on FSM – methods there are also specific paths (e.g. NorthernSCOPE, SouthernSCOPE, ECQA Scope Mgr, ...), to stress how relevant the topic is.

A: ... both PMI’s PMBOK than FSM methods ask to define the *scope* as a *preliminary* and needed action to deploy any further activity... What is in or out?
### Scope Management

**Source:** PMI's PMBOK 5 (2013)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Project Integration Management</td>
<td>4.1 Develop Project Charter</td>
<td>4.2 Develop Project Management Plan</td>
<td>4.3 Direct and Manage Project Work</td>
<td>4.4 Monitor and Control Project Work</td>
<td>4.6 Close Project or Phase</td>
</tr>
<tr>
<td>5. Project Scope Management</td>
<td>5.1 Plan Scope Management</td>
<td>5.2 Collect Requirements</td>
<td>5.3 Define Scope</td>
<td>5.4 Create WBS</td>
<td>5.5 Validate Scope</td>
</tr>
<tr>
<td>6. Project Time Management</td>
<td>6.1 Plan Schedule Management</td>
<td>6.2 Define Activities</td>
<td>6.3 Sequence Activities</td>
<td>6.4 Estimate Activity Resources</td>
<td>6.5 Estimate Activity Durations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10. Project Communications Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11. Project Risk Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12. Project Procurement Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13. Project Stakeholder Management</td>
</tr>
</tbody>
</table>
Scope Management

The ‘ABC’ Schema (2012)

Scope Management

The ‘ABC’ Schema – A ‘cookbook’ view

- **Stakeholder Engagement**
- **FSM methods (IFPUG, COSMIC, ...)**
- **ISBSG D&E r12+**

**IFPUG SNAP**

**ISO/IEC 25010:2011 (ex 9126-x)**

**...**

**WBS / Gantt model(s) -- tasks by nature**

Great minds discuss ideas
Average minds discuss events
Small minds discuss people

(Eleanor Roosevelt)
Some initial question...

Q: Do you prefer to start from scratch (create) or by something similar and modify later (customize)? Why?

Q: What do you need to do that?

Q: How much time do you spend per week for updating your skills, knowledge and capabilities?
Knowledge Mgmt

The SECI Model

URL: http://goo.gl/2i3kYT
Knowledge Mgmt | Knowledge vs Experience

EXPERIENCE

KNOWLEDGE

URL: http://goo.gl/4K5iJJ
Knowledge Mgmt

From Knowledge to Experience...

URL: http://goo.gl/SKVNm (original) + http://goo.gl/7BAFAk (elaboration)
Knowledge Mgmt ...towards Creativity

URL: http://goo.gl/SKVNmc (original) + http://goo.gl/7BAFAk (elaboration)
Tailoring examples  Some (our) examples in Process Improvement

• **Q-RCA (Quantitative RCA)**
  - **Idea:** Fishbone diagram stops at root-causes...how to help in prioritizing causes for taking corrective/improvement action?
  - **Potential (added) value:** refining Fishbone diagram, adding the ‘measurement’ leaf + making it easier to be worked using a mind maps

• **QF²D (QFD through Quality Factor)**
  - **Idea:** QFD is an ‘open’ tool...but how to repeat the technical spec’s using standards?
  - **Potential (added) value:** using the ISO sw product quality model as ‘tech spec’ dimension
  - **Source:** L.Buglione & A.Abran, *QF2D: a different way to measure Software Quality*, IWSM2000 (10th International Workshop on Software Measurement), Berlin, Germany, October 4-6, 2000

• **LEGO (Living EnGineering prOcess)**
  - **Idea:** A model is just a model, not the absolute truth...is there a way to keep the best from any model/framework of interest? How?
  - **Potential (added) value:** The target is my refined process model, keeping best pieces from valuable sources after a comparison and extractions
• Definition: “A mind map is a diagram used to represent words, ideas, tasks or other items linked to and arranged radially around a central key word or idea [...]” (from Wikipedia)

• Origins
  ✓ at least from the 300BC on (i.e. Porphyry of Tyros, a noted thinker)
  ✓ more recently proposed by psychologist Tony Buzan

• Perspectives
  ✓ several possible usages, with the common aim to represent concepts grouping them by some criteria
  ✓ brainstorming, creating a hierarchy of concepts, note-taking, etc...
Tailoring examples

Q-RCA: From RCA to Mind Maps (1/5)

Causes:
- Cause Group #1
- Cause Group #2
- Cause Group #3
- Cause Group #4

Effect
Tailoring examples

Q-RCA: From RCA to Mind Maps (2/5)

Cause Group #1

Effect

Cause Group #2

Cause Group #3

Cause Group #4
Tailoring examples

Q-RCA: From RCA to Mind Maps (3/5)

Cause Group #1

Cause Group #2

Cause Group #3

Cause Group #4

Effect
Tailoring examples

Q-RCA: From RCA to Mind Maps (4/5)

... Cause Group #1 
... Cause Group #2
...
... Cause Group #3 
... Cause Group #4

Effect
Tailoring examples

Q-RCA: From RCA to Mind Maps (5/5)

2.1 Sub-Cause x
2.2 Sub-Cause y
...  Cause Group 2
  Cause Group 4

1 Cause Group
2 Cause Group
3 Cause Group

Mind Maps software: http://goo.gl/ltxfao
Tailoring examples | Q-RCA: Possible Applications

✓ Meeting Reports (3 pages)
Tailoring examples

Within a wiki
**Tailoring examples**

**QF\(^2\)D: Refining the original QFD**

- Introduced the usage of a Quality Model (QM) for grouping requirements (e.g. ISO/IEC 25010:2011) for reducing the probability of missing/incomplete requirements from early stages between customer and provider
- Stress the relevance in properly balancing FUR and NFR by each project type looking at stakeholders’ needs and viewpoints
Tailoring examples

The LEGO Approach

1. MCM Repository
2. Process Architecture
3. Mappings & Comparisons
4. Appraisal Method

1. Identify goals
2. Query the MCM repository
3. Include new elements
4. Adapt & Adopt

Tailoring examples

Evaluating and Financing Ideas: not only ROI...

Demonstrating Value in Employee Recognition Programs: Why VOI is the New ROI

Rachel S. Permutt, PhD, MSPh - Godox
Guilherme Trivelato Andrade, MPH MBA 2014

Creating and sustaining a high performing workforce is the ultimate goal of modern human capital management. As career specialization becomes increasingly important and talent shortage looms globally, retaining human assets and engaging employees to contribute their full potential is vital to competitive success.

Source:

http://goo.gl/DkV4oc
Maturity is the capacity to endure uncertainty (John Huston Finley)

Maturity & Capability Models (MCMs)
Why do we need choosing a MCM?

- A plenty of free ideas...for free!
- Hundreds of Maturity/Capability Models
- Just need to know WHERE to find them
- ...start googling!
Where to start? Follow the...knowledge!
Where to start? Refining the BSC

MCMs

Differen order for Public Sector:
Citizens, Processes, Learning & Growth, Financial

FINANCIAL
To succeed financially, how should we appear to our shareholders?

CUSTOMER
To achieve our vision, how should we appear to our customers?

INTERNAL BUSINESS PROCESS
To satisfy our shareholders and customers, what business processes must we excel at?

Vision and Strategy

Infrastructure & Innovation

People / Employee
## MCMs

### Representations – Staged (CMMI-DEV)

<table>
<thead>
<tr>
<th>ML</th>
<th>Focus</th>
<th>Id.</th>
<th>PA Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Optimizing</td>
<td>OPM</td>
<td>Organizational Performance Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAR</td>
<td>Causal Analysis &amp; Resolution</td>
</tr>
<tr>
<td>4</td>
<td>Predictable</td>
<td>OPP</td>
<td>Organizational Process Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>QPM</td>
<td>Quantitative Project Management</td>
</tr>
<tr>
<td>3</td>
<td>Defined</td>
<td>RD</td>
<td>Requirement Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TS</td>
<td>Technical Solution</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PI</td>
<td>Product Integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VAL</td>
<td>Validation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VER</td>
<td>Verification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPD</td>
<td>Organizational Process Definition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OPF</td>
<td>Organizational Process Focus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OT</td>
<td>Organizational Training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IPM</td>
<td>Integrated Project Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RSKM</td>
<td>Risk Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DAR</td>
<td>Decision Analysis &amp; Resolution</td>
</tr>
<tr>
<td>2</td>
<td>Managed</td>
<td>REQM</td>
<td>Requirement Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PP</td>
<td>Project Planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PMC</td>
<td>Project Monitoring &amp; Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAM</td>
<td>Supplier Agreement Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MA</td>
<td>Measurement &amp; Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PPQA</td>
<td>Process &amp; Product Quality Assurance</td>
</tr>
</tbody>
</table>

- **ML**: 5
- **PA**: 24
- **N.min PA**: ML1 (0)
- **N.max PA**: ML3 (13)
### MCMs

#### Representations – Continuous (CMMI-DEV)

<table>
<thead>
<tr>
<th>Process Categories Maturity Levels</th>
<th>Process Management</th>
<th>Project Management</th>
<th>Engineering</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimizing</strong></td>
<td>OPM</td>
<td></td>
<td></td>
<td>CAR</td>
</tr>
<tr>
<td><strong>Predictable</strong></td>
<td>OPP</td>
<td>QPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Defined</strong></td>
<td>OPF</td>
<td>IPM</td>
<td>RD</td>
<td>DAR</td>
</tr>
<tr>
<td></td>
<td>OPD</td>
<td>RKSM</td>
<td>TS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OT</td>
<td></td>
<td>PI</td>
<td></td>
</tr>
<tr>
<td><strong>Managed</strong></td>
<td>PP</td>
<td></td>
<td>VER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PMC</td>
<td></td>
<td>VAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SAM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Initial</strong></td>
<td>Ad-hoc processes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **PA categories**: 4
- **PA**: 24 → 22
- **N.min PA per Category**: Process Management (5)
- **N.max PA per Category**: Project Management (7)
Current PRM in ISO/IEC 15504-5 contains 3 macro-groups, 9 process groups and 48 processes:

- **Primary**
  - ACQ – Acquisition
  - SPL – Supply
  - ENG – Engineering
  - OPE – Operation

- **Organizational**
  - MAN - Management
  - PIM – Process Improvement
  - RIN – Resource & Infrastructure
  - REU - Reuse

- **Supporting**
  - SUP - Support
MCMs

A-SPICE (Automotive SPICE)

- Management Process Group (MAN)
  - MAN.1 Organizational alignment
  - MAN.2 Organization management
  - MAN.3 Project management
  - MAN.4 Quality management
  - MAN.5 Risk management
  - MAN.6 Measurement

- Engineering Process Group (ENG)
  - ENG.1 Requirements elicitation
  - ENG.2 System requirements analysis
  - ENG.3 System architectural design
  - ENG.4 Software requirements analysis
  - ENG.5 Software design
  - ENG.6 Software construction
  - ENG.7 Software integration
  - ENG.8 Software testing
  - ENG.9 System integration
  - ENG.10 System testing
  - ENG.11 Software installation
  - ENG.12 Software and system maintenance

- Supporting Process Group (SUP)
  - SUP.1 Quality assurance
  - SUP.2 Verification
  - SUP.3 Validation
  - SUP.4 Joint review
  - SUP.5 Audit
  - SUP.6 Product evaluation
  - SUP.7 Documentation
  - SUP.8 Configuration management
  - SUP.9 Problem resolution management
  - SUP.10 Change request management

- The Acquisition Process Group (ACQ)
  - ACQ.1 Acquisition preparation
  - ACQ.2 Supplier selection
  - ACQ.3 Contract agreement
  - ACQ.4 Supplier monitoring
  - ACQ.5 Customer acceptance
  - ACQ.11 Technical requirements
  - ACQ.12 Legal and administrative requirements
  - ACQ.13 Project requirements
  - ACQ.14 Request for proposals
  - ACQ.15 Supplier qualification

- Resource & Infrastructure Process Group (RIN)
  - RIN.1 Human resource management
  - RIN.2 Training
  - RIN.3 Knowledge management
  - RIN.4 Infrastructure

- Supply Process Group (SPL)
  - SPL.1 Supplier tendering
  - SPL.2 Product release
  - SPL.3 Product acceptance support

- Process Improvement Process Group
  - PIM.1 Process establishment
  - PIM.2 Process assessment
  - PIM.3 Process improvement

- Operation Process Group (OPE)
  - OPE.1 Operational use
  - OPE.2 Customer support

- Reuse Process Group (REU)
  - REU.1 Asset management
  - REU.2 Reuse program management
  - REU.3 Domain engineering

- Automotive-SPICE
- not included in ISO/EC 15504

- HIS (VW, Audi, BMW, Porsche, D&C)
- FIAT
- FORD

MCMs

MPS.BR (www.softex.br/mpsbr/guias/)

- People/Pessoas (MR-MPS-RH)
- Service/Serviços (MR-MPS-SV)
- Software (MR-MPS-SW)
- Acquisition/Aquisição
- Evaluation/Avaliação (MA-MPS)

Guia Geral de Gestão de Pessoas

- Guia Geral de Gestão de Pessoas: 2014 – versão Beta
Este guia contém a descrição geral do Modelo MPS e detalha o Modelo de Referência MPS-RH e as definições comuns necessárias para seu entendimento e aplicação.

Guia Geral de Serviços

- Guia Geral de Serviços: 2012 (Agosto de 2012)
Este guia contém a descrição geral do Modelo MPS e detalha o Modelo de Referência MPS-SV e as definições comuns necessárias para seu entendimento e aplicação.

Guia Geral de Software

- Guia Geral de Software: 2012 (Agosto de 2012)
Este guia contém a descrição geral do Modelo MPS e detalha o Modelo de Referência MPS-SW e as definições comuns necessárias para seu entendimento e aplicação.

MCMs

MPS.BR – Structure, Deliverable, Sources

- 4 models
- 7 maturity levels (A till G)
- 5 capability levels (AP1.1 till AP 5.2)
- 9 AP (Atributos de Proceso – 1.1 till 5.2)
- 46 RAP (Resultados esperados de atributos de proceso)
<table>
<thead>
<tr>
<th>Nível</th>
<th>Processos</th>
<th>Atributos de Processo</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Melhoria Contínua da Capacidade – MCC</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
<tr>
<td></td>
<td>Alinhamento do Desempenho Organizacional – ADO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inovação Contínua da Força de Trabalho – ICF</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Integração de Competências e Grupos de Trabalho Habilitados – ICG</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
<tr>
<td></td>
<td>Gerência Quantitativa de Desempenho – GQD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência da Capacidade Organizacional – GCP</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Desenvolvimento de Carreira – DCA</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
<tr>
<td></td>
<td>Mentoring – MEN</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Práticas Baseadas em Competências – PBC</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
<tr>
<td></td>
<td>Desenvolvimento de Competências – DVC</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Desenvolvimento de Grupos de Trabalho – DGT</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
<tr>
<td></td>
<td>Planejamento da Força de Trabalho – PFT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Análise de Competências – ACP</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Reconhecimento – REC</td>
<td>AP 1.1, AP 2.1 e AP 2.2</td>
</tr>
<tr>
<td></td>
<td>Gerência de Pessoas – GPE (evolução)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Capacitação e Desenvolvimento – CDV</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Gerência de Pessoas – GPE</td>
<td>AP 1.1 e AP 2.1</td>
</tr>
<tr>
<td></td>
<td>Gerência de Recursos - GRC</td>
<td></td>
</tr>
</tbody>
</table>

- Not present a specific KM process (“Gestão do Conhecimento”)
- Present processes on Competencies and Capability (individual, group)
### MCMs

<table>
<thead>
<tr>
<th>Nivel</th>
<th>Processos</th>
<th>Atributos de Processo</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1, AP 3.2, AP 4.1, AP 4.2, AP 5.1 e AP 5.2</td>
</tr>
<tr>
<td>B</td>
<td>Gerência de Projetos – GPR (evolução)</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2, AP 4.1 e AP 4.2</td>
</tr>
<tr>
<td>C</td>
<td>Gerência de Riscos – GRI</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2</td>
</tr>
</tbody>
</table>

#### Desenvolvimento para Reutilização – DRU
- AP 3.2

#### Gerência de Decisões – GDE

#### Verificação – VER
- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Validação – VAL
- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Projeto e Construção do Produto – PCP
- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Integração do Produto – ITP
- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Desenvolvimento de Requisitos – DRE
- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Gerência de Projetos – GPR (evolução)

- AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2

#### Gerência de Reutilização – GRU

#### Gerência de Recursos Humanos – GRH

#### Definição do Processo Organizacional – DFP

#### Avaliação e Melhoria do Processo Organizacional – AMP

#### Mediçao – MED
- AP 1.1, AP 2.1 e AP 2.2

#### Garantia da Qualidade – GQA

#### Gerência de Portfólio de Projetos – GPP

#### Gerência de Configuração – GCO

#### Aquisição – AQU

#### Gerência de Requisitos – GRE
- AP 1.1 e AP 2.1

#### Gerência de Projetos – GPR
- AP 1.1 e AP 2.1

---

- **Not present a specific KM process** ("Gestão do Conhecimento")
- **Present a Reuse process**
<table>
<thead>
<tr>
<th>Nível</th>
<th>Processos</th>
<th>Atributos de Processo</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1, AP 3.2, AP 4.1, AP 4.2, AP 5.1 e AP 5.2</td>
</tr>
<tr>
<td>B</td>
<td>Gerência de Trabalhos – GTR (evolução)</td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1 e AP 3.2, AP 4.1 e AP 4.2</td>
</tr>
<tr>
<td>C</td>
<td><strong>Gerência de Capacidade – GCA</strong></td>
<td>AP 1.1, AP 2.1, AP 2.2, AP 3.1, AP 3.2, AP 4.1 e AP 4.2</td>
</tr>
<tr>
<td></td>
<td>Gerência da Continuidade e Disponibilidade dos Serviços – GCD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Decisões – GDE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Liberação – GLI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Riscos – GRI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência da Segurança da Informação – GSI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relato de Serviços – RLS</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Desenvolvimento do Sistema de Serviços – DSS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Orçamento e Contabilização de Serviços – OCS</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Avaliação e Melhoria do Processo Organizacional – AMP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definição do Processo Organizacional – DFP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Mudanças – GMU</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Recursos Humanos – GRH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Trabalhos – GTR (evolução)</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Aquisição – AOU</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Configuração – GCO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Garantia da Qualidade – GQA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Problemas – GPL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Portfólio de Trabalhos – GPT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medicação – MED</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Entrega de Serviços - ETS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Incidentes – GIN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Nível de Serviço - GNS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Requisitos – GRE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gerência de Trabalhos – GTR</td>
<td></td>
</tr>
</tbody>
</table>

- Present processes for Capacity Management and Problem Management
- Not present a specific KM process ("Gestão do Conhecimento")
MCMs

• The same can be done using the ISO/IEC 15504 PAM as for MPS.BR

Representations – Continuous (example)

Special cause (GP.2.2 @ OT)

Common cause (GP.2.9 @ +PA)

Source: SQI Appraisal Assistant- http://goo.gl/i6IvI
MCMs

Classifying MCMs by Dimension

- **Horizontal**: MMs going through the whole supply chain
  - SwEng: ISO/IEC 15504 (SPICE), CMMI, FAA i-CMM, ...

- **Vertical**: MMs focusing on a single perspective/group of processes
  - Test Mgmt: TMM, TPI, ...
  - Project Mgmt: PM-MM, OPM3, ...
  - Requirement Mgmt: ....

- **Diagonal**: MMs focused on Organizational/Support processes
  - People CMM, TSP, PSP, ...
The LEGO (Living EnGineering prOcess) Approach

Don’t forget to play!
(Anonymous)
The LEGO Approach

The Philosophy

LEGO (Living Engineering Process)
The LEGO Approach

The Four Elements

1. MCM Repository
2. Process Architecture
3. Mappings & Comparisons
4. Appraisal Method
The LEGO Approach

1. MCM Repository - www.gqs.ufsc.br/mcm
The LEGO Approach

2. Process Architecture

Portfolio, Programme & Project Management Maturity Model
Level 1: Initial process

Lifecycle function / Key process area description:

1.1 Project definition
The purpose of project definition is to gain a common and agreed understanding within an organisation that it conducts discrete projects, and that these projects are explicitly recognised. In defining projects, the organisation should identify some project objectives.

A project should also be managed i.e. subject to at least some management activities, including activity identification. A project is also likely to have some form of project lifecycle, which may be of benefit in high level planning.

Functional achievement / Process goals
- Recognise and establish the objectives for the project.
- Gather the necessary resources to achieve the project objectives, within a specific timescale and agreed budget.

Approach
- Each project should have agreed objectives and be given the necessary resources to achieve those objectives.
- The organisation should recognise the projects they are undertaking.
- Each project manager should possess the ability to identify the key activities that must be carried out.

Deployment
- Outline Project plans are drawn up to distinguish project phases and/or stages.
- Any changes in project requirements should be recognised.

Review
- The projects should ideally be reviewed by senior management on a periodic basis.

Perception
- The views of stakeholders should be sought regarding the project progress.

Performance measures
- Projects may have either qualitative or simple measures of their planned and actual performance relating to budget and/or timescale.
- Changes in project objectives or customer requirements should be identified.
The LEGO Approach

3. Mappings & Comparisons

<table>
<thead>
<tr>
<th>Goal</th>
<th>Specific Practice</th>
<th>Description</th>
<th>ISO 9001:2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG 1</td>
<td></td>
<td>Project Planning</td>
<td></td>
</tr>
<tr>
<td>SP 1.1-1</td>
<td>Estimate the Scope of the Project</td>
<td>7.1, 7.3.1</td>
<td></td>
</tr>
<tr>
<td>SP 1.2-1</td>
<td>Establish Estimates of Work Product and Task Attributes</td>
<td>7.1, 7.3.1</td>
<td></td>
</tr>
<tr>
<td>SP 1.3-1</td>
<td>Define Project Life Cycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 1.4-1</td>
<td>Determine Estimates of Effort and Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG 2</td>
<td></td>
<td>Develop a Project Plan</td>
<td></td>
</tr>
<tr>
<td>SP 2.1-1</td>
<td>Establish the Budget and Schedule</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 2.2-1</td>
<td>Identify Project Risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 2.3-1</td>
<td>Plan for Data Management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Management Process Groups**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Integration Management</td>
<td>IPM/ SG1; GP 2.1.</td>
<td>4.1 Develop Project Charter</td>
<td>4.2 Develop Project Management Plan</td>
<td>4.3 Direct and Manage Project Execution</td>
<td>4.4 Monitor and Control Project Work; 4.5 Perform Integrated Change Control; 4.6 Close Project or Phase</td>
</tr>
<tr>
<td>Project Scope Management</td>
<td></td>
<td>PP/ SP 1.1, 1.3; RD/ SP 1.1, 1.2</td>
<td>REQM/ SP 1.1, 1.3, 1.4, 1.5</td>
<td>PP/ SP 1.1, 1.2; IPM/ SP 1.2; GP 2.1, 2.6</td>
<td></td>
</tr>
<tr>
<td>Project Time Management</td>
<td></td>
<td>PP/ SP 1.1, 1.3; RD/ SP 1.1, 1.2; 2.1</td>
<td>RD/ 3.4; PMC/ SP 1.1, 1.3, 1.4</td>
<td>6.1 Define Activities; 6.2 Sequence Activities; 6.3 Estimate Activity Resource; 6.4 Estimate Activity Durations; 6.5 Develop Schedule</td>
<td>6.6 Control Schedule</td>
</tr>
</tbody>
</table>

**Cost Domain: Plan and Organise**

<table>
<thead>
<tr>
<th>PO10 Manage Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO10.1 Project management framework</td>
</tr>
<tr>
<td>PO10.2 Methodology covering responsibilities, task breakdown, budgeting of time and resources, milestones, check points, approvals</td>
</tr>
<tr>
<td>PO10.3 ICT Infrastructure Management, Design and Planning, 2.4.4 Design and implementing a plan</td>
</tr>
<tr>
<td>PO10.4 ICT Infrastructure Management, Annex 3B, Running a Deployment</td>
</tr>
</tbody>
</table>

**ITIL Supporting Information**

<table>
<thead>
<tr>
<th>ISO 17799 Supporting Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Information security infrastructure</td>
</tr>
</tbody>
</table>

The LEGO Approach

4. Appraisal Method


Software Engineering Institute

March 2011

SCAMPI Upgrade Team

Software Engineering Process Management

http://www.sei.cmu.edu

Carnegie Mellon
## LEGO: Process and...

### The Process (4 steps)

1. **Identify goals**
2. **Query the MCM repository**
3. **Include new elements**
4. **Adapt & Adopt**

<table>
<thead>
<tr>
<th>Process Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify your informative/business goals</td>
<td>Clearly identify your needs, moving from the current BPM version and content.</td>
</tr>
<tr>
<td>2. Query the MCM Repository</td>
<td>Browse the MCM repository, setting up the proper filters in order to obtain the desired elements (processes; practices; etc.) to be inserted in the target BPM.</td>
</tr>
<tr>
<td>3. Include the selected element(s) into the target BPM</td>
<td>Include the new element(s) in the proper position in the target BPM (e.g. process group, maturity level, etc.).</td>
</tr>
<tr>
<td>4. Adapt &amp; Adopt the selected element(s)</td>
<td>According to the process architecture of both process models (the target and the source one), the selected elements may need to be adapted, tailoring such elements as needed.</td>
</tr>
</tbody>
</table>
LEGO: Process and

Some LEGO Applications

---

**Europi² 2012**

The LEGO Strategy
Guidelines for a Profitable Deployment

Luigi Buglione
Christiane Gresse von Wangenheim
Fergal McCaffery
Jean C.R. Hauck

---

**ICSOFT 2012**

Hybriding CMMI and Requirement Engineering Maturity & Capability Models

Applying the LEGO Approach for Improving Estimates

Luigi Buglione
Jean C.R. Hauck
Christiane Gresse von Wangenheim
Fergal McCaffery

---

**ICSR 2013**

Knowledge Leveraging Reuse-related Maturity Issues for Achieving Higher Maturity & Capability Levels

Luigi Buglione
Giuseppe Lami
Christiane Gresse von Wangenheim
Fergal McCaffery
Jean C.R. Hauck

---

www.slideshare.net/lbu_measure/
Here the four LEGO steps and related activities and outcomes:

1. **Identify Goals**
   - Improve the estimation capability and results by a refinement in the overall management of requirements (business, technical)
   - Assumed the target BPM (Business Process Model) to improve is *generically* the **CMMI RD** process area

1. **Query the MCM repository**
   - Considered RE as the summation of CMMI RM (Req. Management) and RE (Req. Elicitation) process areas
   - Filtered the list of available RE MCMs from the MCM repository
   - Next table (**EoI – Element of Interest**) is a filter of the elements by each of the RE MCMs considered

1. **Include new elements into the target BPM**
   - Next table (**Suggested Improvements**) lists the possible EoI matched with the **CMMI RD** process (both SPs and GPs)

1. **Adapt & Adopt**
   - Map each practice of the improved process to the related internal QMS process(es)
   - Validate the mapping results before using it in the daily activities
**LEGO and Req.Eng.**

**Step 2 - EoI: Elements of Interest (1/2)**

<table>
<thead>
<tr>
<th>Model/ Framework</th>
<th>Elements of Interest (EoI)</th>
</tr>
</thead>
</table>
| **IAG RMM**       | • **Technology**: the introduction of workflow environments for easily sharing information for keeping requirements could be useful → CMMI-DEV RD GP2.3 (Elaboration section in Part 1)  
  • **Staff competency**: suggested the introduction of Bloom’s levels as informative notes for all GP 2.5, not only for those two PAs |
| **PRTM CRMM**     | • **Level 1**: link between product and customer requirements, using e.g. QFD (quality function deployment) → it could be introduced also in CMMI-DEV RD SP 3.4, not only in SP 2.1 (as currently done) for closing the analysis |
| **BTH REPM**      | • **RE.SI (Stakeholders and Req. Source Identification)** → more specific practice to be added about Requirement Elicitation to CMMI-DEV RD SG1  
  • **RE.GA.a2 (Qualify and Quantify Quality Requirements)** → currently missing a more clear and direct link with CMMI-DEV PP SP 1.2  
  • **DS.GA.a2 (Define Requirement Attributes)** → currently less stressed (e.g. FUR vs NFR for FSM/FPA – Function Point Analysis, as requested in CMMI-DEV PP, SP 1.4 |
<p>| <strong>R-CMMi</strong>        | • <strong>ML2: P20: Institute Process to Maintain Stability within Project</strong> → always about the need to minimize ‘volatility’, in terms of management → same comment than for REAIMS practice 9.8 |</p>
<table>
<thead>
<tr>
<th>Model/ Framework</th>
<th>Elements of Interest (EoI)</th>
</tr>
</thead>
</table>
| **REAIMS Process MM** | **Basic practices:**  
• **3.1 Define a standard document structure**: missing, could be added in CMMI-DEV RD SG1, stressing the need for having an organizational ‘standard’ for comparing different types of requirements, having impact also on planning (different roles, productivities and schedules for different activities → PP SP 1.4). Again, it’d help also PP SP 1.2 because it’d address better the  
• **3.8 Make the document easy to change** → criteria for writing better requirements, could be stressed more in CMMI-DEV RD SG1 / RM SG1, SP 1.3  
• **6.2 Use language simply and concisely** → criteria for writing better requirements could be added as a note for CMMI-DEV RD SP 1.2, sub-practice #1  

**Advanced practices:**  
• **9.8 Identify volatile requirements**: suggested to introduce the concept of ‘volatility’ also in the RD process definition by an informative note (e.g. “... verifying the new need will not be yet addressed by a formalized requirement...”, with a link to RM, SP 1.3), → see also R-CMMi P20 process, same issue |
<p>| <strong>R-CMM</strong> | <strong>• ML2: P19: Agree and document technical and organisational attributes specific to project</strong> → CMMI-DEV RD deals with customer and product requirements, not addressing with further informative notes about which could be possible ‘constraints’ such as those ones from the analysis of organizational attributes → reinforce RD SP 1.1 |</p>
<table>
<thead>
<tr>
<th>CMMI-DEV v1.3 RD process</th>
<th>Suggested Improvements</th>
</tr>
</thead>
</table>
| **SG 1 Develop Customer Needs** | • Introduce a new SP 1.0 about Stakeholders Identification and Engagement. **Rationale:** reinforce current formulation, before running SP 1.1. Nowadays, stakeholder engagement is the sub-practice #1 within SP 1.1.  
• Insert a note about possible standards (de jure/de facto) that could be consulted/useful for a better application of RD process (e.g., *(AccountAbility, 2011)*). |
| **SP 1.1 Elicit Needs** | • Introduce a sub-practice about the definition of requirement attributes, inserting a cross-link with PP SP 1.2 for the classification of work products (by attribute) to be sized.  
• Modify the current WP into: ‘results of requirement elicitation activities by entity and attribute’ (see previous comment) |
<p>| <strong>SP 1.2 Transform Stakeholders needs</strong> | • Rephrase and make more general sub-practice #2: not only functional vs. quality (non-functional) attributes, but possibly establish all valuable, possible requirements taxonomies and classifications for the organization (by other criteria) |</p>
<table>
<thead>
<tr>
<th>CMMI-DEV v1.3 RD process</th>
<th>Suggested Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SG 2 Develop Product Requirements</strong></td>
<td>• Introduce a note within the SG text about the need and relevance of define a (standard) document structure (in terms of 'documentability') and suggest – as informative note – some possible criteria to follow and appraise (e.g. readability, simple and concise language for writing requirements, etc.).</td>
</tr>
<tr>
<td><strong>SP 2.1 Establish Product and Product components</strong></td>
<td>• Sub-practice #3: refine the Example box, do no mention generic quality attributes, but be more specific about requirement classifications (e.g. ISO/IEC 14143-1:1998 → functional, quality, technical) → cross-link with PP 1.2 about attributes for sizing.</td>
</tr>
<tr>
<td><strong>SP 2.2 Allocate Product Components</strong></td>
<td>• ---</td>
</tr>
<tr>
<td><strong>SP 2.3 Identify Interface Requirements</strong></td>
<td>• ---</td>
</tr>
</tbody>
</table>
### CMMI-DEV v1.3 RD process

<table>
<thead>
<tr>
<th>CMMI-DEV v1.3 RD process</th>
<th>Suggested Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SG 3 Analyze and Validate Requirements</strong></td>
<td>•  ---</td>
</tr>
<tr>
<td>SP 3.1 Establish Operational Concepts and Scenarios</td>
<td>•  ---</td>
</tr>
<tr>
<td>SP 3.2 Establish a Definition of Required ...</td>
<td>•  ---</td>
</tr>
<tr>
<td>SP 3.3 Analyze Requirements</td>
<td>•  ---</td>
</tr>
<tr>
<td><strong>SP 3.4 Analyze Requirements to Achieve Balance</strong></td>
<td>• Introduce an informative note about the possible usage of QFD matrices also here, not only for eliciting and determining requirements in SP 2.1</td>
</tr>
<tr>
<td>SP 3.5 Validate Requirements</td>
<td>•  ---</td>
</tr>
<tr>
<td>CMMI-DEV v1.3 RD process</td>
<td>Suggested Improvements</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
</tbody>
</table>
| **GP 2.3 Provide Resources** | • **General**: stress the need and opportunity from workflow environments for an easier sharing of information among stakeholders, whatever the (CMMI) process  
• **Specific** (RD Elaboration): specific need because RD is the starting process for gathering needs to be translated into solutions |
| **GP 2.5 Train People** | • **General**: introduce the application of the six Bloom’s cognitive levels (Bloom et al., 1956) for classifying knowledge (see also IEEE SWEBOK – www.computer.org/swebok)  
• **Specific** (RD Elaboration): add ‘stakeholder engagement’ (AccountAbility, 2011) and ‘requirement sizing’ (ISO, 2011) |
| **GP 2.8 Monitor and Control the Process** | • **Specific** (RD Elaboration): introduce at least one measure about the effectiveness of RD SG1 goal (e.g. % of proposed vs validated requirements) |
Some conclusions & next steps for learning (more)
Reusing Knowledge

Conclusions & Future Works

• People
  ✓ Even if in ICT, People is the real wheel for innovation
  ✓ “Nothing is lost, nothing is created, everything is transformed” (Antoine Lavoisier)
  ✓ ...but you need ideas and somebody modeling knowledge into experience by creativity

• Reuse & Learning = Experience!
  ✓ It’s the most natural form of evolution...by analogy
  ✓ Not only ‘copy&paste’, but ‘Learn by Experience’ (LbE)
  ✓ The difference from a ‘one-shot’ application and a structured one is in your historical data
  ✓ SKMS, KMS, Project Historical Database, ...use the acronym you like more
  ✓ Quantitative+Qualitative: two sides of the same coin

• Starting point? Knowledge!
  ✓ The basic is to know, but then you need to know how apply your knowledge to the context
  ✓ Any kind of training, and (don’t stop) READING: we can access anything on the web...
  ✓ Be CURIOUS, trying to find VALUE from what you’re experiencing looking for contact points with you and your next project and SHARE it with your peers

• Next Steps
  ✓ Start doing things TODAY, don’t wait...include continual SELF-TRAINING in your project plan. You can also know the WHAT but not the HOW
  ✓ ...try & see!

“Creativity is allowing yourself to make mistakes. Art is knowing which ones to keep.” (Scott Adams)
Reusing Knowledge | Lessons Learned...

“I have... seen things you people wouldn't believe... Attack ships on fire off the shoulder of Orion. I watched c-beams glitter in the dark near the Tannhäuser Gate. All those... moments... will be lost in time, like [small cough] tears... in... rain. Time... to die...”

Memory ➔ Data ➔ Experience .... DIKW

Thanks for your attention!

Obrigado pela sua atenção!