WHO WE ARE

Aragon Institute of Technology, www.ita.es

IWT2 Research Group, University of Seville, www.iwt2.org
Who we are

Aragon Institute of Technology, www.ita.es

IWT2: Web Engineering and Early Testing research group, University of Seville, www.iwt2.org
Aragón Institute of Technology (ITA)

The Aragón Institute of Technology is a non-profit Technology Centre whose main objective is to promote competitiveness in the industrial sector and to support the growth of business sectors by means of the development, acquisition, adaptation, transfer and diffusion of innovative technologies in a multi-agent collaborative framework.
ITA in figures

- 2 headquarters located in Zaragoza and Huesca
- Facilities with more than 15,000 m²
- 210 employees with more than 180 qualified technicians
- > 1100 customers / year
- Equipments average investment > 1.7 M€
- Annual budget 15 M€ (2010)

Personnel indicators

Staff qualification. Year 2010

Financing indicators

Evolución de Ingresos por Tipo de Producto

0
1.000.000
2.000.000
3.000.000
4.000.000
5.000.000
6.000.000
7.000.000
2008 2009 2010 2011 2012

PhD's

Superior technicians

Intermediate technicians

Assistance staff

I+D

Diagnóstico y consultoría

Asistencia Técnica

Formación

Otros
ITA Divisions

MATERIALS

INDUSTRIAL SYSTEMS

IT & LOGISTICS

MULTIMEDIA

LABORATORIES

TECHNOLOGY QUALIFICATION
IWT2 Research Group, University of Seville

- Web Engineering and Early Testing Group (IWT2)
  - TIC021 – PAIDI Group
  - Work Group of Foundation Fidetia
  - Attached to the Department of Computer Languages and Systems, University of Seville

- Software Engineering
- Testing Engineering
- Processes Engineering
- Software Quality
IWT2 Main Research Lines

- The main objective is to bring research results withing the same business reality:

- Main research lines:
  - **Methods and techniques** to develop quality software, based on the methodology NDT (Navigational Development Techniques).
  - **Metrics** for systematic validation of models, though the application of the principles of the Model-Driven Engineering (MDE), which provides a set of guidelines for structuring specifications expressed as models.
  - **Techniques of early testing** by systematically generating test form the early stages of the life cycle and very focuses on the navigational models.
SOFTWARE QUALITY & SMEs

SoftAragon: A Software Process Improvement Program for SMEs

NDT: a methodology designed to support the life cycle of the development of web-oriented software
Software companies in Aragon are mainly SMEs.
- People working from 7-150

These organizations are very specialized in some fields:
- Web development
- Financial Software
- Security

These organizations didn’t have software process knowledge and the development of their products was ad-hoc.
The main objective was to increase the SMEs competitiveness through software process improvement.

But,
- They needed to learn many new concepts
- They needed to involve everyone there
- They needed funding support (especially Very Small Settings)

A Software Process Improvement Program was developed from 2005 to 2010 for Aragon SMEs. The reference model was CMMI.
SoftAragon Program

First of all: a Manager Seminar, with main concepts of software processes and CMMI. We looked for Management Commitment.

For each SME:

1 week - First Presential Assessment
- interviews to different roles
- documentation reviews
- Result: a Initial State Snapshot: Strengths and Weakness

A improvement project was defined for 1 year
- prioritized tasks according to company’s context
SoftAragon Program

- A “structure” for the improvement was created: Sponsor, EPG and Specific Process People.
- Each week or 15 days (they decided), they sent an advance report.
- Each month we met EPG to analyze the project evolution.
- In the middle of the project, we made a mini-evaluation.
- At the end of the project, Final Assessment.
Additionally, they could require specific workshops:

- Project Estimation
- Measurement and Analysis
- Quality Assurance
- Process Definition

And Official and non-Official Courses of CMMI (for everyone in the organization).

TOTAL Our Support Effort per SME
- 300 – 350 hours/per year
SoftAragon Program

2003-2004 Program Definition

2005-2011 Program Implementation

> 50 SMEs involved (from 7 to 155 employees)

First national associative SPI project

Best SPI project ESI award
1-year Improvement

Context

Objectives

Methodology

Results

**Process Area Level 2 CMMI**

-REQM
-PP
-PMC
-SAM
-MA
-PPQA
-CM

Not Implemented
Partially Implemented
Largely Implemented
Fully Implemented
2-years Improvement

Context

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Results

Situación final 2006 global

0%

10%

20%

30%

40%

50%

60%

70%

80%

90%

100%

REQM PP PMC SAM MA PPQA CM

Situación inicial 2005 global

0%

10%

20%

30%

40%

50%

60%

70%

80%

90%

100%

REQM PP PMC SAM MA PPQA CM

Process Area Level 2 CMMI
After 3-years developing a SPI project

- On average, number of employees: 45
- Software Process Improvement Project Cost
  - Person-Months: 10,5
  - External Costs: 38300€
- How many people have participated in the improvement group
  - Full time: 0,25
  - Partial time: 7 (15%)
- How long considered necessary to pass a CMMI-DEV L2 SCAMPI-A Class (official)
  - At the beginning: 19,7 months
  - After 1,5 years in a SPI project: 21,8 months
  - After 3 years in a SPI project: 26 months
Importance of SPI Process Areas

Context
- Importance of SPI Process Areas
- Methodology
- Objectives
- Results

Bar chart showing the importance and effort in various areas:
- Most important:
  - Project Planning
  - Project Management
  - Quality Assurance
  - Requirements Management
- Least important:
  - Project Planning
  - Project Management
  - Quality Assurance
  - Requirements Management
- Most effort:
  - Project Planning
  - Project Management
  - Quality Assurance
  - Requirements Management
- Tools needed:
  - Project Planning
  - Project Management
  - Quality Assurance
  - Requirements Management

Legend:
- PP - Project Planning
- PMC - Project Management
- PPQA - Quality Assurance
- REQM - Requirements Mng
- SAM - Supply Agreements Mng
- MA - Measurement
The model-driven paradigm is offering a new way for software building.
What about practical experiences?
Is MDE useful for enterprise environment?
MDE adoption by industry in practice
Navigational Development Techniques

- To develop a model-based methodology to be adopted by industry in practice

- Initial purpose: Fill the gap in Web requirements treatment by using MDE

<table>
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<th>Context</th>
<th>Objectives</th>
<th>Methodology</th>
<th>Results</th>
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<tr>
<td></td>
<td></td>
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<td>Testing (ISO EN 29119)</td>
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<td></td>
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<td>Requirements</td>
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<td>Design</td>
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<td>Maintenance</td>
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An iterative method where the experimental parameters are modified according to the results of observation

Phases
- Planning: Identify and specify the problems
- Action: Perform the tasks
- Observation: Real-cases pilots, quantitative analysis
- Reflection: Results analysis
It defines all processes currently supported by NDT

- Development Processes: supporting different types of life cycles: traditional, agile, iterative or incremental.
- Software maintenance Processes, based on ITIL® and CMMi®.
- Security CMMi® and PMBOK®: based on ISO 27001.
NDT-Suite

Context

Objectives

Methodology

Results

A set of tools that applies the NDT Methodology

- NDT-Profile: a specific profile for use with Enterprise Architect
- NDT-Driver: automates models transformation
- NDT-Quality: automates the methodological review
- NDT-Prototypes: generates a set of XHTML prototypes from the navigation models
- NDT-Glossary: automates the glossary generation
- NDT-Counter: use-case point based estimator
- NDT-Report: PDF based reporting
Adoption in practice

Example NDT-Quality: if you don’t follow the method, source code and forms are not automatically generated.

NDTQ-Framework and support NDT-Tools have been successfully deployed in more than 30 organizations.
Motivation in SQ adoption by SMEs

- Increase productivity
- Customer oriented

<table>
<thead>
<tr>
<th>Objective</th>
<th>Percentage</th>
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<tr>
<td>Improve product quality</td>
<td>~75%</td>
</tr>
<tr>
<td>Improve processes</td>
<td>~90%</td>
</tr>
<tr>
<td>Improve productivity</td>
<td>~85%</td>
</tr>
<tr>
<td>Improve market access</td>
<td>~55%</td>
</tr>
<tr>
<td>Increase customer satisfaction</td>
<td>~90%</td>
</tr>
<tr>
<td>Increase sales</td>
<td>~80%</td>
</tr>
<tr>
<td>Reduce costs</td>
<td>~60%</td>
</tr>
<tr>
<td>Reduce defects</td>
<td>~70%</td>
</tr>
<tr>
<td>Reduce customer complaints</td>
<td>~50%</td>
</tr>
</tbody>
</table>
Difficulties in SQ adoption by SMEs

- Lack of resources and knowledges
- “Translation” to VSMEs domain

Bar chart showing:
- It is not a priority for the company
- Cost is excessive
- It is difficult to adapt to an SME
- Lack of human resources
- Lack of tools
- Difficulty learning the models
- Excessive bureaucracy
Benefits in SQ adoption by SMEs

- Lack of previous measures difficulties ROI evaluation
- It is a medium-term investment

Bar chart showing:
- More predictable schedule and budget
- Improved development time
- Improved productivity
- Improved product quality (number of defects)
- Improved customer satisfaction
- Improved employee motivation
- Reduced cost of quality
Comparison SME – VSME in a SPI Project

- SME (150 people)
  - Full time people to be EPG (at least 1)
  - Many people involved in to define process (Groups per process area)
  - It is more difficult to detect the resistance to change
  - Process deployment and institutionalization need time

- Very SME (7 people)
  - No-Full time people
  - All are involved in to all process definition
  - Everyone must be convinced
  - Deployment is almost immediate
Main Lessons Learned

➢ A relationship among SPI project (cost and effort) and ROI would be more clear to value this kind of initiatives.

➢ It is necessary to reduce the gap between Defined Processes and Executed/Real Processes

➢ Software Quality is really accessible for SMEs: only the method changes
Future Work

- Defined vs Real Processes gap
  - Software Process Modeling Languages
  - Software Process Execution

- Collaboration between enterprises
  - No more effort in process definition
  - Tools integration
  - “To be as competitive as you are alone”

- MIDAS project
  - A MDE approach for SOA Testing
Thank you

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