Systems Engineering International Standards for Very Small Entities

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Editor of ISO/IEC JTC1 SC7 Working Group 24
INCOSE International Workshop, Jacksonville, Florida
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• Needs for Software Standards for Very Small Entities (VSEs)
• Establishment of ISO Working Group 24
• Approach used by Working Group 24
• Survey of VSEs
• Description of ISO/IEC 29110 Standards and Technical Reports
• Network of VSE Support Centers
• Deployment Packages
• Pilot Projects
• Development of Systems Engineering Standards and Guides
• Next Steps

VSEs = Very Small Entities are enterprises, projects or departments having up to 25 people.
Size of Enterprises

- European Union
  - 93% are micro enterprises (less than 10 employees)
- Micro enterprises account for 70% to 90% of enterprises in OECD* countries (about 57% in USA)
- Greater Montréal Area - Software Enterprises.

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<thead>
<tr>
<th>Number of employees</th>
<th>Number of Software Enterprises</th>
<th>Percentage</th>
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<tr>
<td>1 to 25</td>
<td>540</td>
<td>78%</td>
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<td>25 to 100</td>
<td>127</td>
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<td>Over 100</td>
<td>26</td>
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About 50% of enterprises have less than 10 employees
Source: Montreal International, 2006

* OECD: Organisation for Economic Co-operation and Development
The Importance of VSEs

A software defect from one of the producers went into a product and resulted in a loss of over $200 million by the manufacturer

(Adapted from: Shintani, Small Settings Workshop, Software Engineering Institute, 2006)

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Observations, Vision and Strategy

• Observations
  – Most software engineering standards have not been designed having in mind VSEs;
  – VSEs’ negative perceptions of software engineering standards are primarily driven by negative views of cost, documentation and bureaucracy;
  – In many VSEs software processes are ad hoc and chaotic;
  – Worldwide, VSEs’ software products are very important to the economy.

• Vision
  – VSEs worldwide are using, in their daily development activities, software engineering standards, adapted to their needs, which guide them develop required products, constantly improving their performances and their competitiveness.

• Strategy
  – Participate actively to the development of international software engineering standards adapted for VSEs;
  – Lead the development of means to accelerate the adoption and implementation of new standards by VSEs;
  – Lead the development of educational material to teach the standards to undergraduate and graduate software engineering students;
Development of International Standards for VSEs

- **Phase 1 - Recognition of Needs and Problems.**
  - Began in Australia at an ISO Plenary meeting (2004)

- **Phase 2 - Basic and Applied Research**
  - Survey of Process Improvement Initiatives (2005)
  - Survey of VSEs worldwide (2006)

- **Phase 3 - Development**
  - The Development of International Standards for VSEs (2006 - 2010)

- **Phase 4 – Commercialization (2010)**

- **Phase 5 - Diffusion and Adoption**
  - Development of the Means to Accelerate the Adoption and Utilization of International Standards by VSEs (2006 - )

- **Phase 6 - Consequences (2011 - )**

(adapted from Rogers, 2003)
SC7 Plenary Meeting - Australia – 2004

• Canada raised the fact that small enterprises require standards adapted to their size and maturity,

• A meeting of interested parties was held with 8 delegates from national bodies (Australia, Canada, Czech Republic, South Africa, and Thailand)
  – **Consensus reached:**
    • Make the current software engineering standards more accessible to VSEs;
    • Provide turn key material that require minimal tailoring and adaptation effort;
  – **Approach selected:**
    • Establish a Special Interest Group (SIG) to develop:
      – Statement of requirements;
      – The outline of key deliverables, and the associated process to create them
        » e.g. how to create profiles;
      – Terms of Reference for the group;
      – Prepare a Proposal for the next Plenary meeting in Finland.
Establishment of ISO Working Group 24

- **Two Workshops in Thailand – 2005**
  - Sponsored by the Thai Industrial Standard Institute and the Thai Software Industry Promotion Agency,
  - Representatives
    - Australia, Belgium, Brazil, Canada, Czechoslovakia, Finland, South Africa, South Korea, USA and Thailand.

- **SC7 Plenary Meeting in Finland – May 2005**
  - Proposal to establish a new Working Group (WG) was tabled
  - Twelve countries offered their support to staff WG 24
    - Belgium, Canada, the Czech Republic, Ireland, Italy, Japan, Korea, Luxembourg, South Africa, Thailand, the United Kingdom, and the United States

- **Working Group 24 (WG 24) was approved - Fall 2005**
  - Mr. Tanin Uthayanaka (Thailand) was appointed Convener.
  - Mr. Jean Bérubé (Canada) was appointed Secretary.
  - Mr. Claude Y. Laporte (IEEE Computer Society) was appointed Project Editor
Use of Software Engineering Standards by VSEs 
Hypothesis of the SIG (Bangkok 2005)

• **Reasons for not using Standards**
  • Not written for or difficult to use by VSEs,
  • Current SW standards do not specifically address VSEs’ needs,
  • Current SW standards requires critical mass (staff, budget, time) to implement,
  • Compliance with existing standards difficult to achieve,
  • Net benefits not obvious,
  • Most VSEs do not have the expertise to implement standards.

• **Benefits of Use** (but not seen by VSEs)
  • Reduction of risk (business, cost, schedule, quality),
  • Enables measurement of productivity and quality,

**Standards are often developed by large organisations for large organisations!**

SW = Software Engineering
Agenda

• Phase 1 - Recognition of Needs and Problems (2004)

• Phase 2 - Basic and Applied Research
  – Survey of VSEs worldwide (2006)

• Phase 3 – Development (2006-2010)

• Phase 4 – Commercialization (2010)

• Phase 5 - Diffusion and Adoption (2006 -)

• Phase 6 - Consequences (2011 -)
2. Research

Initiatives to Help SMEs and VSEs

- **Europe**
  - Ireland - Centre for Software Process Technologies (CSPT)
  - Belgium - Centre d’Excellence en Technologies de l’Information et de la Communication (CETIC)
  - Ireland (LERO)
  - Luxembourg - Public Research Center Henri Tudor
  - UK – National Computing Center
  - European Software Institute

- **Australia** - Software Quality Institute (Rapid)

- **Latin Countries**
  - Mexico - Moprosoft
  - COMPETISOFT Project – 13 Latin American countries, Spain, Portugal.
  - Columbia – ParqueSoft Foundation

- **Asia**
  - Thailand - Association of Thai Software Industry
  - Hong Kong – Productivity Council

- **North America**
  - Software Productivity Center (SPC) - Vancouver
  - Software Engineering Institute - Improving Processes in Small Settings (IPSS)

**SME** = Small and Medium Enterprises
• Non-profit organization established in Columbia in 1999
• Purpose
  – Create and develop enterprises providing goods and services to the information technology
• Integrates 11 sites in Columbia
  – Cali, Popayán, Pasto, Buga, Tuluá, Palmira, Buenaventura, Armenia, Manizales, Ibagué, Villavicencio, Medellín, Sincelejo and Pereira.
• Houses more than 200 VSEs
  – Over 120 VSEs under the same roof in Cali
  – 1000 Software Engineering Professionals,
  – About 200 professionals provide support in technical, administrative and business development processes
    • Q.A., Test, Finance, Communication, Contract, Publication, etc.
  – Cost of expertise is pay-as-you-use and shared between VSEs.

www.parquesoft.com
Survey of VSEs

• **Objectives**
  • Identify VSEs' utilization of standards
  • Identify problems and potential solutions to help VSEs apply standards and become more capable and competitive.

• **Method**
  • Web-based Survey
  • Questionnaire translated in 9 languages
    • English, French, German, Korean, Portuguese, Russian, Spanish, Thai and Turkish.
  • Invitation to participate in survey widely broadcasted via:
    • WG 24 Network of contacts
    • Centers and initiatives focused on SMEs/VSEs
      – e.g., SIPA (Thailand), CETIC (Belgium), Parquesoft (Colombia)
Over 435 Responses from 32 Countries

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Why don't VSEs use Standards?

- Not required: 24%
- Lack of support: 9%
- Lack of resources: 14%
- Too time-consuming: 15%
- Other: 10%
- Standard(s)*: 15%

* Difficult, Bureaucratic, not enough guidance.
Requests from VSEs

• Certification and Recognition
  • Only 18% are certified
    • Over 53% of larger companies are certified
  • Over 74% indicated that it was important to be either recognized or certified
    • ISO certification requested by 40%.
    • Market recognition requested by 28%
    • Only 4% are interested in a national certification

• Needs Regarding Documentation
  • 62% are asking for more guidance and examples
  • 55% are requiring 'lightweight' standards that are easy to understand and apply and come with templates
Subset of Requirements to Develop Standards for VSEs

- R 08 - Use of the set of workproduct must be **affordable**.
  - i.e. consultant services should not be necessary.
- R 15 - The set of workproduct should provide the **whole spectrum** of documents
  - i.e. from standards and guides to education material
- R 33 - The set of workproduct should propose **definition of documents**.
  - e.g. typical content of a document, templates (e.g. requirements templates - use cases)
- R 52 - The guide should provide **examples**
  - e.g. plans, workproducts and other deliverables.
- R 57 - The guide should be **available free** on the web
Agenda

• Phase 2 - Basic and Applied Research (2005-2006)
• Phase 3 - Development
  – The Development of International Standards for VSEs (2006 - 2010)
• Phase 4 – Commercialization (2010)
• Phase 5 - Diffusion and Adoption (2006 - )
• Phase 6 - Consequences (2011 - )
The Strategy of WG 24
To develop standards and guidelines for VSEs

• Use the notion of ‘Profile’ to develop a roadmap and standards to meet the needs of VSEs.
  – A profile is an ‘assemblage’ from one or more base standards to accomplish a particular function.
  – A Profile Group (PG)
    • A collection of profiles which are related either by composition of processes (i.e. activities, tasks), or by capability level, or both.
• Focus first on VSEs developing Generic software (Profile Group),
• Use the Mexican national standard MoProsoft as a referential to start the development of profiles,
• Use two types of standards, as the input, for the development of standards for VSEs:
  – Process standards, such as ISO 12207, that define the activities required to achieve identified objectives or outcomes;
  – Product standards, such as ISO 15289, that define the structure and content of artefacts produced by the processes;
• Develop a set of documents to describe and specify the profiles.
The "Generic" Profile Group

- Applicable to VSEs that do not develop critical software products.

Critical software
Software whose failure could have an impact on safety or could cause large financial, environmental or social losses. (adapted from IEEE 610.12)

- In the future domain-specific profiles may be developed
The Generic Profile Group

- **Four Profiles within the Generic Profile Group**
  - **Entry** - Targets VSEs typically developing 6 person-month projects or start-ups;
  - **Basic** - Targets VSEs developing only one project at a time;
  - **Intermediate** – Targets VSEs developing multiple projects within the organizational context;
  - **Advanced** – Targets VSEs which want to sustain and grow as an independent competitive software development business.
Set of 29110 Documents Targeted by Audience

29110 Overview (TR 29110-1)

For VSEs

29110 Profiles (IS)

- Framework and Taxonomy (IS 29110-2)
- Specifications of VSE Profiles (IS 29110-4)
- Specification - VSE Profile Group m
  (IS 29110-4-m)

For Standard producers, tool vendors, methodology vendors

List the Requirements i.e. ‘What to do’

29110 Guides (TR)

- Assessment Guide (TR 29110-3)
- Management and Engineering Guide (TR 29110-5)
- Management and Engineering Guide
  VSE Profile m-n
  (TR 29110-5-m-n)

For Assessors and VSEs

For VSEs

‘How to do’

Included in the ISO/IEC 29110

Obtained approval from ISO to make TRs available at no cost
Preparation Steps for the Basic Profile

1. VSEs' Characteristics
2. VSEs' Needs and Competencies
3. IS 29110-2
   VSE Framework and Taxonomy
4. IS 29110-4-1
   Basic VSE Profile Specification
5. TR 29110-5-1
   Management and Engineering Guide

- ISO/IEC 12207: Elements
- ISO/IEC 15289: Elements
- IS 29110-4-1: VSE Framework and Taxonomy
- ISO/IEC 29110-5-1: Management and Engineering Guide

Base Standards:
- ISO/IEC 12207
- ISO/IEC 15289
- IS 29110-4-1

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Part 5 provides a Management and Engineering Guide for the Basic Profile described in ISO/IEC 29110 Part 4

i.e. the profile specifications
## Table of Contents

**Foreword**

**Introduction**

1. **Scope**
   2. Normative references
   3. Terms and definitions
   4. Conventions and abbreviated terms
   5. Overview

6. **Project Management (PM) process**
7. **Software Implementation (SI) process**
8. **Roles** (all roles)
9. **Product description** (all products)
10. Software tools requirements

Annex A (informative) – Deployment Package

Bibliography
Process Structure Description and Notation

1. Name
2. Purpose
3. Objectives
4. Input Products
5. Output Products
6. Internal Products
7. Roles involved
8. Process Diagram
9. Activity Description
   - **Task** - Description of the tasks to be performed.
   - **Role** - Abbreviation of roles involved in the task execution.
   - **Input Products** - Products needed to execute the task.
   - **Output Products** - Products created or modified by the execution of the task.
Part 5 - Project Management (PM) Process

• **Purpose**
  – To establish and carry out in a systematic way the tasks of the software implementation project, which allows complying with the project’s objectives in the expected quality, time and costs.

• **Seven Objectives**
  – **PM.O1.** The Project Plan for the execution of the project is developed according to the Statement of Work and reviewed and accepted by the Customer. The tasks and resources necessary to complete the work are sized and estimated.

<table>
<thead>
<tr>
<th>6.3.1 Project Planning Process</th>
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</thead>
<tbody>
<tr>
<td>a) the scope of the work for the project is defined;</td>
</tr>
<tr>
<td>c) the tasks and resources necessary to complete the work are sized and estimated;</td>
</tr>
<tr>
<td>e) plans for the execution of the project are developed; and</td>
</tr>
<tr>
<td>f) plans for the execution of the project are activated.</td>
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</table>

<table>
<thead>
<tr>
<th>6.3.7 Measurement Process</th>
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<tbody>
<tr>
<td>a) the information needs of technical and management processes are identified.</td>
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</table>

[ISO/IEC 12207, 6.3.1, 6.3.7]
Project Management (PM) Process – 7 Objectives

1. **PM.O1.** The Project Plan for the execution of the project is developed according to the Statement of Work and reviewed and accepted by the Customer. The tasks and resources necessary to complete the work are sized and estimated.

2. **PM.O2.** Progress of the project is monitored against the Project Plan and recorded in the Progress Status Record.

3. **PM.O3.** The Change Requests are addressed through their reception and analysis. Changes to software requirements are evaluated for cost, schedule and technical impact.

4. **PM.O4.** Review meetings with the Work Team and the Customer are held. Agreements are registered and tracked.

5. **PM.O5.** Risks are identified as they develop and during the conduct of the project.

6. **PM.O6.** A software Version Control Strategy is developed. Items of Software Configuration are identified, defined and baselined. Modifications and releases of the items are controlled and made available to the Customer and Work Team including the storage, handling and delivery of the items.

7. **PM.O7.** Software Quality Assurance is performed to provide assurance that work products and processes comply with the Project Plan and Requirements Specification.
## Project Management Process
### Example of 2 Tasks of the Planning Activity

<table>
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<td>PM CUS</td>
<td><strong>PM.1.2 Define</strong> with the Customer the Delivery Instructions of each one of the deliverables specified in the Statement of Work.</td>
<td>Statement of Work [reviewed]</td>
<td>Delivery Instructions</td>
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</table>
Software Implementation (SI) Process – 7 Objectives

1. **SI.O1.** Tasks of the activities are performed through the accomplishment of the current Project Plan.

2. **SI.O2.** Software requirements are defined, analyzed for correctness and testability, approved by the Customer, baselined and communicated.

3. **SI.O3.** Software architectural and detailed design is developed and baselined. It describes the software items and internal and external interfaces of them. Consistency and traceability to software requirements are established.

4. **SI.O4.** Software components defined by the design are produced. Unit test are defined and performed to verify the consistency with requirements and the design. Traceability to the requirements and design are established.

5. **SI.O5.** Software is produced performing integration of software components and verified using Test Cases and Test Procedures. Results are recorded at the Test Report. Defects are corrected and consistency and traceability to Software Design are established.

6. **SI.O6.** A Software Configuration, that meets the Requirements Specification as agreed to with the Customer, which includes user, operation and maintenance documentations is integrated, baselined and stored at the Project Repository. Needs for changes to the Software Configuration are detected and related Change Requests are initiated.

7. **SI.O7.** Verification and Validation tasks of all required work products are performed using the defined criteria to achieve consistency among output and input products in each activity. Defects are identified, and corrected; records are stored in the Verification/Validation Results.
Part 5 - Software Implementation – 6 Activities

ISO/IEC 29110
## Comments Processed by Working Group 24

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Agenda

1. Recognition of Needs and Problems
2. Basic and Applied Research
3. Development
4. Commercialization
5. Diffusion and Adoption
6. Consequences

• Phase 1 - Recognition of Needs and Problems (2004)
• Phase 2 - Basic and Applied Research (2005-2005)
• Phase 3 – Development (2006-2010)
• Phase 4 – Commercialization (2010)
• Phase 5 - Diffusion and Adoption
• Phase 6 - Consequences (2011 - )
4. Commercialization

ISO Standard Development Processes

- SC7 develops
- SC7 controls
- ISO controls
- ISO edits and publishes

Adapted from: SC7 Secretariat Training for ISO Editors, Hyderabad 2009

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4. Commercialization

**Publication by ISO**

- **Commercialization begins when ISO publishes the Standard**
  - ISO Working Groups are *not involved* in commercialization

- **Needs of VSEs (from Survey)**
  - *Not completely fulfilled* with ISO/IEC 29110 Part 5 - Engineering and Management Guide
  - VSEs requested *readily usable processes*

- **The concept of Deployment Packages (DPs) - Moscow Meeting**
  - To accelerate diffusion and adoption worldwide
    - By providing *readily usable* information and made *freely available*
      - e.g. detailed process descriptions (steps), templates, checklists, etc.
    - Linked to ISO/IEC 29110 Part 5 - Annex A
Agenda

1. Recognition of Needs and Problems
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- **Phase 1 - Recognition of Needs and Problems (2004)**
- **Phase 2 - Basic and Applied Research (2005-2005)**
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- **Phase 4 – Commercialization (2010)**
- **Phase 5 - Diffusion and Adoption (2006 - )**
  - Development of the Means to Accelerate the Adoption and Utilization of International Standards by VSEs (2006 - )
- **Phase 6 - Consequences (2011 - )**
Commitment Curve and the Adoption of a Technology - Standard

Degree of Support

Commitment Phase

Acceptance Phase

Preparation Phase

Contact

Time

Connor 1992
5. Diffusion

Network of Support Centers for VSEs

- Objectives
  - Help accelerate the development of ISO standards for VSEs
  - Accelerate deployment of VSE Standards
  - Accelerate the development and application of Deployment Packages

- Belgium (Cetic)
- Brazil
- Canada (ÉTS)
- Colombia (Parquesoft)
- Finland
- France (UBO)
- Haiti
- Honk Kong
- Ireland (LERO)
- Luxembourg (Tudor Research Center)
- Mexico
- Thailand (Institute of Software Promotion for Industries)

http://profs.logti.etsmtl.ca/claporte/English/VSE/VSE-network.html
Deployment Packages (DPs)

• A Deployment Package (DP) is a set of artifacts developed to facilitate the implementation of a set of practices, of the selected framework, in a VSE.

  – Deployment packages are not intended to preclude or discourage the use of additional guidelines that VSEs find useful.

• By deploying and implementing a Deployment Package, a VSE can see its concrete step to achieve or demonstrate coverage to Part 5.

• Deployment Packages are designed such that a VSE can implement its content, without having to implement the complete framework at the same time.

• Each DP is reviewed and edited by at least 2 persons.
Content of Deployment Packages

1. Technical Description
   Purpose of this document
   Why this topic is Important?

2. Definitions
   Generic Terms
   Specific Terms

3. Relationships with ISO/IEC 29110 Part 5

4. Description of Processes, Activities, Tasks, Steps, Roles and Products

5. Template

6. Example

7. Checklist

8. Tool


10. References

11. Evaluation Form

Deployment Packages are free!
Deployment Packages for the Software Basic Profile

Construction and Unit testing

Verification and Validation

Integration and Tests

Architecture and Detailed Design

Product Delivery

Version Control

Self-Assessment

Project Management

Requirements Analysis

January 21, 2012
# Deployment Packages for the Basic Profile

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- **Additional DP**: Conduct of [Pilot Projects DP](http://profs.logti.etsmtl.ca/claporte/English/VSE/VSE-packages.html) (Canada, Uruguay) *
5. Diffusion

Pilot Projects

• **Definition**
  – A method for exploring the value of a new technological concept via an objective study conducted in a somewhat realistic setting (adapted from Glass 1997).

• Successful pilot project is also an effective means of building adoption of new practices by members of a VSE.

• To be credible, the pilot projects should satisfy the following requirements (Fenton 1994):
  – The pilot project experiment has to be designed correctly,
  – The pilot project has to be performed in a real situation.
    • It is not a toy project, i.e. an artificial problem in an artificial situation,
  – The measurements have to be appropriate to the goals of the experiment,
  – The experiment has to be run for long enough.

* To develop a solid business case to promote the adoption of ISO 29110 by VSEs internationally

http://profs.logti.etsmtl.ca/claporte/English/VSE/VSE-pilot.html
Select and Conduct Pilot Project Deployment Package

• **Purpose**
  – To provide tailorable and usable guidelines and materials in order to select and conduct pilot projects in VSEs.

• **Overview of the 4 Tasks**
  – Task 1 - Assess the opportunity to conduct a pilot project *
  – Task 2 - Plan the Pilot Project
  – Task 3 - Conduct the Pilot Project
  – Task 4 - Evaluate the Results of the Pilot Project
Task 1 - Assess the Opportunity to Conduct a Pilot Project

• *Goals*
  – The pilot project coordinator and the management of the VSE assess the opportunity to conduct a pilot project.
  – If the conclusion of the assessment is positive, the commitment of VSE’s management to conduct the pilot project is obtained.

• *Steps*
  – Step 1: Sign the Confidentiality Agreement (optional)
  – Step 2: Define the characteristics and context of the VSE
  – Step 3: Define the problem(s) to be addressed
    • e.g. Perform an assessment using the Self-Assessment DP and tool
  – Step 4: Select the technology to pilot
  – Step 5: Select the project which will pilot the technology
  – Step 6: Examine the cost and benefits of the pilot project
  – Step 7: Obtain the commitment of VSE’s management
Pilot Projects Support

• Support Tools for the Deployment Package
  – Assessment Tool Spreadsheet
  – Pilot Project Plan Template
  – Pilot Project Report Template
  – Confidentiality Agreement Template

• Description of Pilot Projects*
  – Projects Completed
  – Projects Underway
  – Projects Planned
Pilot Projects Completed in Canada - 1

• Pilot Project in a Computer Aided Design (CAD) Software Support Organisation
  – Distributes and supports three types of software products:
  – Products serve mainly the aerospace and the automobile industries.
  – Defined the tasks of 4 developers and undertook to improve the following processes:
    • Project management, Software configuration management, Issue tracking and Requirements management

• Project conducted at a School Board of the Montréal Area
  – Provide a stimulating environment for student learning.
  – It represents 54 primary schools, 14 secondary schools, 2 general training centers and 4 vocational training centers.
    • Over 8,000 employees,
  – IT department with a staff of 4: 1 analyst and 3 developers.
  – Studied, translated and implemented 3 DPs:
    • Software Requirements, Version Control, Project Management
Pilot Projects Completed in Canada - 2

- **Software Engineering Graduate students – SQA Course**
  - **Insurance Company**
    - French global insurance companies group headquartered in Paris.
    - IT staff of 11 in Montréal
  - **Support Organisation for Notaries**
    - Support the notary profession's transition into a virtual environment
      - 3,200 notaries in Québec
    - Organisation of 70 people
    - IT staff of 8
  - **Geographic Information System Modeling Company**
    - Leader in modeling and mapping software and technology
    - Organisation of 1000 employees
    - IT staff of 6 in Montréal
  - **Support Organisation for Lawyers**
    - Organisation of 200 employees: IT staff of 5
  - **University Research Laboratory**
    - Research Laboratory of a Business School
    - ERP simulation (e.g. SAP)

* In each team, one student is a staff of the Organisation
Pilot Projects Completed in Canada - 3

- **Acme Software for Building Maintenance**
  - VSE of 8 in Canada and 3 in France.
  - Will pilot verification practices: code review and requirements inspection

- **Acme Insurance**
  - About 300 staffs.
  - QA department of 20
  - Will pilot configuration management practices

- **Acme Security**
  - Develop security platforms
  - VSE of 29 employees
  - Will pilot requirements practices in the R&D group of 9 software developers

- **Acme Web Site Development**
  - Develop internet sites
  - VSE of 25 employees
  - Will pilot test practices

- **Acme Communications**
  - VSE of 25 employees spread in 2 cities
  - IT staff of 2
  - Will pilot requirements practices

* In each team, one student is a staff of the Organisation*
Pilot Projects Underway

• Belgium (CETIC)
  – VSE of 25 people have developed a solution for managing Tram / bus / subway tickets in Brussels.
  – Pilot project started in June with a process assessment phase aiming to identify strengths and weaknesses in development related processes.
  – CETIC is preparing, with this company, the improvement actions mainly based on the following Deployment Packages:
    • Requirement Analysis, Version Control, Project Management

• France (UBO)
  – A VSE of 14 employees producing pedestrian counters
  – VSE of 2 IT staffs

• Ireland (LERO)
  – VSE of 10 people who are involved in designing software solutions for a range of business types and in addition they have created an in-house development platform.
Pilot Projects Underway in Haïti

• Pilot projects in Montréal and Haiti
  – Graduate student from Haiti
  – Learns and implements a 29100 process in VSE in Montréal
  – Implements a 29110 process in a VSE in Haiti
5. Diffusion

Education Interest Group

• Concept: Deployment Packages for Education
• Proposed at the Hyderabad meeting (May 2009)
  – To help educators teach the future ISO standards for VSEs by developing and providing at no cost educational material,
  – To sensitize undergraduate and graduate students to the ISO standard for VSEs.

• Courses to Support ISO 29110 Standards and Technical Reports
  1. Introduction to ISO/IEC Software Engineering Standards (Ireland)
  2. Introduction to the ISO/IEC 29110 Standards, Technical Reports and Deployment Packages for VSEs (Canada)
  5. Self-Assessment of an ISO/IEC 29110-Based Software Process
  6. Conduct Deployment of ISO/IEC 29110 Standard in a VSE (Canada)

http://profs.logti.etsmtl.ca/claporte/English/VSE/VSE-Education.html
A Public Web Site

- Members of WG
- Introduction
- Survey of VSEs
- Network of Centers
- Generic Profiles
- Deployment Packages
- Pilot Projects
- Education DPs
- Publications

http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html
Technology Transfer Center for VSEs at the ÉTS

• **Mission**
  – To accelerate technology transfer to small and very small structures in Québec developing software products or software-based systems, or to provide IT services to make them more competitive, both at the national level and internationally, by developing and deploying software engineering practices tailored to their needs.

• **Objectives**
  1. Identify, promote, and disseminate best practices in software engineering and services for very small entities;
  2. Accelerate the process of technology transfer in software engineering for VSEs;
  3. Provide information and technical and strategic information to managers of VSEs, outsourcers, and Government of Québec agencies;
  4. Participate in the development of international standards for VSEs;
  5. Promote international standards for VSEs in Québec;
  6. Promote research in software engineering for VSEs;
  7. Promote training and development courses on ISO standards for VSEs.
Thailand and APEC/ASEAN Countries

- **Thailand**
  - **Budget**
    - 1,000,000 $ over 3 years
  - **Objectives**
    - ISO 29110 as a standard in Thailand **within 2 years** after publication by ISO
    - At least 10% growth rate of Thai industries especially a small size of entrepreneurs
    - Strengthen the ability of competitiveness of the Thai software industry
  - **Target**
    - 300 Thai VSEs assessed over 3 years
  - **Education**
    - Incorporate 29110 in undergraduate and graduate programs
  - **APEC (Asia-Pacific Economic Cooperation) / ASEAN (Association of Southeast Asian Nations, 10 countries)**
    - 6 other countries are in the process of adopting ISO 29110

January 21, 2012

www.center4vse.net
5. Diffusion

Strategy of Thailand

- Thailand is now using the new software engineering standard ISO 29110 in piloting software procurement related in Thai government agencies.
- There are around 200 government agencies interested in this direction.
- **Within 3 years**, Thailand hope to mandate ISO 29110 as the minimum requirement for all Thai government related for software and system procurement.

Dr. Anukul Tamprasirt, Nov 29th, 2010
Thai Implementation of ISO/IEC 29110

1. Promotion
   - IB/CB
   - Purchasing Entity
   - Education
   - Enterprise/Company
   - Student
   - Train the trainer

2. Standardization
   - Scheme Standard
   - Certificate
   - Personal Certificate
   - Company Certificate

3. Supporting Center
   - Supporting tools
   - Certificate Data Center
   - Marketing

4. Meeting
   - Host
   - Participation
   - Interim meeting
   - Primary meeting

Innova Foundation

ICT Purchasing Standard of Government
VSE international Forum

Accredit IB/CB and Specialists

Develop Standards

ASEAN / APEC

Export

January 21, 2012
Thai VSE support Web Site

VSE/WG24 progress

Industry recognizes very small entities (i.e. those with less than 25 people) for their contribution of valuable products and services. As software quality increasingly becomes a subject of concern, and as process approaches are maturing and earning the confidence of companies, the use of ISO/IEC JTC1/SC7 international standards is spreading in organizations of all sizes. However, these standards were not written for VSEs and are consequently difficult to apply in such settings. A new ISO/IEC JTC1/SC7 Working Group has been established to address these difficulties by developing profiles and providing guidance for compliance with ISO software engineering standards. A survey was conducted among very small entities on their utilization of standards, as well as to collect data to identify problems and potential solutions to help very small enterprises apply them.

Read more...

Supporting Network for VSE

From the effort of Thailand in pushing small software industry, Thailand can

www.center4vse.net
Agenda

1. Recognition of Needs and Problems
2. Basic and Applied Research
3. Development
4. Commercialization
5. Diffusion and Adoption
6. Consequences

- Phase 3 – Development (2006-2010)
- Phase 4 – Commercialization (2010)
- Phase 5 - Diffusion and Adoption (2006 - )
- Phase 6 - Consequences (2011 - )
6. Consequences

Consequences

• Promoters of an innovation are often optimistic
  – Change agents and agencies tacitly assume that the consequences of innovations will be positive.

• Consequences of an innovation usually manifest themselves over extended periods of time (e.g. months, years)

• Possible consequences (undesirable, direct or indirect, anticipated or unanticipated) by:
  – **Imposing** the standards on all the VSEs in a country or on all a customer’s VSEs
    • e.g. from a large enterprise or a government agency
  – **Motivating** VSEs to adopt the standards
    • Government support: Awareness, training, certification, etc.
  – **Not imposing** the standards on VSEs (*laissez-faire*)
Next Steps

• Develop/finalize the remaining 3 software profiles
  – **Entry**: six person-months effort or start-up VSEs *
  – **Intermediate**: Management of more than one project
  – **Advanced**: business management and portfolio management practices.

• Develop Profile Groups for other domains
  – Critical software: e.g. medical, aerospace
  – Game industry
  – Scientific software development

• Development of self-learning course modules to support DPs
• Development of plug-in modules (e.g. Eclipse) to support DPs
### First Draft of Entry Profile – PM Objectives

<table>
<thead>
<tr>
<th>Objective ID</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM.01</td>
<td>The <em>Project Plan</em> for the execution of the project is developed according to <em>the Statement of Work</em> and reviewed and accepted by the Customer. The tasks and resources necessary to complete the work are sized and estimated. Progress of the project monitored against the <em>Project Plan</em> and recorded in the <em>Progress Status Record</em>. Corrections to remediate problems and deviations from the plan are taken when project targets are not achieved. Closure of the project is performed to get the Customer acceptance documented in <em>the Acceptance Record</em>.</td>
</tr>
<tr>
<td>PM.02</td>
<td>The <em>Changes Requests</em> are addressed through their reception and analysis. Changes to the software requirements are evaluated for cost, schedule and technical impact.</td>
</tr>
<tr>
<td>PM.03</td>
<td>Review meetings with the Work Team and the Customer are held. Agreements are registered and tracked.</td>
</tr>
<tr>
<td>PM.04</td>
<td>Risks are identified as they develop and during the conduct of the project.</td>
</tr>
<tr>
<td>PM.05</td>
<td>A software <em>Version Control Strategy</em> is developed. Items of <em>Software Configuration</em> are identified, defined and baselined. Modifications and releases of the items are controlled and made available to the Customer and Work Team. The storage, handling and delivery of the items are controlled. Items of <em>Software Configuration</em> are identified and controlled.</td>
</tr>
<tr>
<td>PM.06</td>
<td><em>Software Quality Assurance</em> is performed to provide assurance that work products and processes comply with the <em>Project Plan</em> and <em>Requirements Specification</em>.</td>
</tr>
<tr>
<td>PM.07</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:** Information **added or modified** to the Basic Profile is shown in **blue** while information **deleted** is shown like this: **strike-out**.
## First Draft of Entry Profile – SI Objectives

<table>
<thead>
<tr>
<th>Objective ID</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI.01</td>
<td>Tasks of the activities are performed through the accomplishment of the current <em>Project Plan</em>. Software requirements are defined, analyzed for correctness and testability, approved by the Customer, baselined and communicated.</td>
</tr>
<tr>
<td>SI.02</td>
<td><strong>Software components are identified.</strong> Software architectural and detailed design is developed and baselined. It describes the software components and internal and external interfaces of them. Consistency and traceability to software requirements are established.</td>
</tr>
<tr>
<td>SI.03</td>
<td>Software components defined by the design are produced. Unit test are defined and performed to verify the consistency with software requirements and the design. Traceability to the requirements and design are established.</td>
</tr>
<tr>
<td>SI.04</td>
<td><strong>Software is integrated and tested, and defects are corrected.</strong> Software is produced performing integration of software components and verified using Test Cases and Test Procedures. Results are recorded at the <em>Test Report</em>. Defects are corrected and consistency and traceability to Software Design are established.</td>
</tr>
<tr>
<td>SI.05</td>
<td><strong>Software configuration is prepared for delivery.</strong> A Software Configuration, that meets the Requirements Specification as agreed to with the Customer, which includes user, operation and maintenance documentations is integrated, baselined and stored at the <em>Project Repository</em>. Needs for changes to the Software Configuration are detected and related Change Requests are initiated. Verification and Validation tasks of all required work products are performed using the defined criteria to achieve consistency among output and input products in each activity. Defects are identified, and corrected; records are stored in the <em>Verification/Validation Results</em>.</td>
</tr>
</tbody>
</table>

**Legend:** Information added or modified to the Basic Profile is shown in **blue** while information deleted is shown like this: **strike-out.**
Entry Profile Under Review *

Project Management Process

Software Implementation Process

* To be discussed at the WG24 meeting in Korea (May 2012)
Intermediate and Advanced Profiles

- **Intermediate Profile**
  - For VSEs developing multiple projects within the organizational context taking advantage of it.

- **Advanced Profile**
  - For VSEs which want to sustain and grow as an independent competitive software development business.

- **Examples of additional practices**
  - Additional QA practices,
  - Configuration management (e.g. versus version control)
  - Testing
    - Improved Integration and Acceptance testing
  - Other Practices
    - Supplier management
    - Measurement

* To be discussed at the WG24 meeting in Korea
Application of ISO/IEC 20000 to VSEs

• IT Service Management
  – Defines the requirements for a service provider to deliver managed services of an acceptable quality for its customer.

• Development of Deployment Packages
  – Pilot projects conducted in a Computer support VSE
Development of Profiles and DPs in Systems Engineering

- Project done under sponsorship of INCOSE/AFIS
  - International Council on Systems Engineering (INCOSE)
  - Association Française d’ingénierie système (AFIS)

- Goals
  - To improve or make product development efficient by using Systems Engineering methodology
  - To elaborate tailored practical guidance to apply to VSMEs in the context of prime or subcontractor, of commercial products
  - To contribute to standardization

VSMEs = Very Small and Small Entities or Enterprises
Systems Engineering for VSEs

- The initial strategy was to use the INCOSE Systems Engineering (SE) Handbook as the framework for a new ISO standard for VSEs involved in SE.
- It was proposed, in December 2010, to ‘switch’ the reference used to develop a new SE standard from the INCOSE Handbook to the ISO/IEC 15288 standard and keep the Handbook for the development of the set of Deployment Packages.

- **Accomplishments**
  - A survey was performed
  - Workshop conducted during INCOSE IW (Phoenix) in 2011
    - ISO/IEC 29110 has been presented and discussed
    - Systems engineers reviewed Software Basic Profile to propose SE Activities, tasks, documents, etc. to the Project Management Process and Implementation Process
    - Draft document has been sent for reviews and updated
  - A proposal to develop a new Standard for VSEs involved in SE has been tabled by Canada at the ISO SC7 Plenary meeting in Paris (May 2011)
    - To develop a SE Basic profile (i.e. Part 4 and Part 5) to match the ISO 29110 Basic profile
Survey

Survey of Systems Engineering for VSMEs and Small Projects

Charter of a Working Group

A Working Group (WG) mandated by INCOSE (International Council on Systems Engineering) and AFIS (Association Francaise d’Ingenierie Systeme), the Systems Engineering for Very Small and Micro Enterprises (SE for VSMEs) WG, is to assist in the application of systems engineering for product development in very small micro enterprises or small projects.

VSMEs stands for Very Small and Micro Enterprises where a small enterprise is defined as an enterprise which normally employs fewer than 50 persons and a micro enterprise is defined as an enterprise which normally employs fewer than 10 persons.

The goals of this WG are:

- To improve and make product development within VSMEs and small projects more efficient by using Systems Engineering concepts
- To elaborate tailored guidance for VSMEs to apply, in the context of either a prime or subcontractor role.
- To elaborate tailored guidance to apply to small projects.
- To contribute to standardization in the context of Systems Engineering.

Goals of this survey:

- Identify strengths and weaknesses of product development practices in VSMEs and small projects in Various Domains
- Characterize the state of development practices in this context
- Identify areas where the practice of systems engineering can better assist product development in this context.

Why Should You Participate to this survey?

- Access to Proven Engineering Expertise
- Feedback on Engineering Best Practices
- Improve Your Product Development Processes
- Enhance Your Customer Supplier Relationship

Please note that all data will be kept confidential, only summary results and project data that cannot be matched to a specific VSME will be included in published results.

If you would like to send us any comments on the survey you are welcome to send them to isosurvey@logti.etsmtl.ca.

We recommend using Internet Explorer or Mozilla Firefox to complete the survey.

Please, select language:

[English][Spanish][French][Deutsch][Italiano]

http://isosurvey.logti.etsmtl.ca/
Systems Engineering for VSEs

• Recent Developments - 1
  – The proposal to develop a new SE standard for VSEs was approved (Sep 2011)
    • The editor nominated at the Paris meeting (Claude Y Laporte)
  – At the 2011 meeting (Ireland) it was proposed to use existing ISO 29110 documents instead of developing a new set of document for each profile
    • Part 1 - Overview – Enlarge the scope from software engineering to system and software engineering
    • Part 2 – Framework and taxonomy - Enlarge the scope from software engineering to system and software engineering
    • Part 3 – Assessment Guide - Enlarge the scope from software engineering to system and software engineering
    • Part 4 – Specifications of VSE Profile – Separate documents for SE and SW
    • Part 5 – Engineering and management guide - Separate documents for SE and SW

January 21, 2012
**Systems Engineering for VSEs**

- **Recent Developments – 2**
  - A better understanding was developed during the WG24 Dublin meeting
    - An hypothesis from people who developed the ISO 15288
      - Engineers in a VSE have the expertise to select, from ISO 15288, the appropriate processes for a specific project, tailor them and develop the process for a specific project.
    - It was also noted that many delegated of WG24 are from developing countries, which is not the case for most other SC7 working groups
      - Most VSEs of developing countries do not have the expertise to tailor ISO 15288 for a specific project.
SE Project Management Process

• No new activity, no change to name of activities, 3 new tasks

Software Project Management Process

- PM.1.2 - Define with the Acquirer the Delivery Instructions (*instead of Customer*)
- PM.1.3 - Define the System Breakdown Structure (*new task*)
- PM.1.10 - Identify and document a Risk Management Approach (*instead of Identify and document risks*)
- PM.1.11 - Identify and document a Disposal Management Approach (*new task*)
- PM.1.12 - Document the Configuration Management Strategy in the Project Plan (*instead of Version Control Strategy*)

System Project Management Process
SE Project Management Process

Software Project Management Process

- PM.2.5 Perform backup and recovery testing according to the Configuration Management Strategy (instead of Version Control Strategy)

System Project Management Process

- No Change

- PM.4.3 Execute the Disposal Management Approach (new task)
System Engineering Process

- One new activity (Physical Construction), changes to name of activities, new tasks
System Engineering Process

Software Implementation Process

System Implementation Process

• No Change
• Instead of SI 2.2 Document or update the Requirements Specifications:
  • SY.2.2 - Elicit acquirer and other stakeholders requirements and analyze system context
  • SY.2.3 - Elaborate System Requirements
  • SY.2.4 - Elaborate System element Design Requirements
• SY.2.6 Validate and obtain approval of the System Requirements Specification from the Acquirer and the Stakeholders (instead of Validate and obtain approval of the Requirements Specification)
• SY.2.7 Document the preliminary version of the System User Documentation (instead of Software User Documentation)
• SY.2.8 Verify and obtain approval of the System User Documentation (instead of Software User Documentation)
• SY.2.9 Incorporate the Requirements Specifications, and System User Documentation to the System Configuration in the baseline (instead of Incorporate the Requirements Specifications, and Software User Documentation to the Software Configuration in the baseline)
**System Engineering Process**

**Software Implementation Process**

- SY.3.2 Review System Requirements Document (instead of Understand Requirements Specification)
- SY.3.3 Document or update the Logical System Design (instead of Document or update the Software Design)
- SY.3.4 Make trade-offs of the System Architecture (new task)
- SY.3.5 Document or update the Physical System Design (new task)
- SY.3.6 Make trade-offs of the Physical Architecture (new task)
- SY.3.7 Verify and obtain approval of the System Design (instead of Verify and obtain approval of the Software Design)
- SY.3.8 Establish or update IVVQ plans and Verification Procedures (instead of Test Cases and Test Procedures)
- SY.3.9 Verify and obtain approval of the IVVQ plan and Verification Procedures (new task)
- SY.3.11 Incorporate the System Design, and Traceability Record to the System Configuration as part of the baseline (instead of Incorporate the Software Design, and Traceability Record to the Software Configuration as part of the baseline)
System Engineering Process

Software Implementation Process

- SY.4 Software Construction
- SY.5 Physical Construction (*new activity*)
  - SY.5.1 Assign Tasks to the Work Team
  - SY.5.2 Review Physical System Design.
  - SY.5.3 Construct or update System Elements based on the Physical System Design.
  - SY.5.4 Design or update IVVQ plans and Verification Procedures and apply them
  - SY.5.5 Correct the defects found until successful verification (reaching exit criteria) is achieved.
  - SY.5.6 Update the Traceability Record incorporating Components data (Requirements, Computer Aided Design, IVVQ data) constructed or modified.
  - SY.5.7 Incorporate Components data and Traceability Record to the System Configuration as part of the baseline.

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System Engineering Process

Software Implementation Process

- **SY.6 System Integration, Verification, Validation**
  - SY.6.2 Review IVVQ plans and Procedures (instead Understand Test Cases and Test Procedures)
  - SY.6.3 Integrates the System using Components (Physical, Physical and Software, Software) and updates IVVQ plan and IVVQ Procedures for integration testing, as needed (instead of Integrates the Software using software Components and update Tests Cases and Test Procedures as needed)
  - SY.6.4 Perform System verification using IVVQ plan and IVVQ Procedures (instead of Perform Software tests …)
  - SY.6.5 Perform System validation using IVVQ plan and IVVQ Procedures and document results in Validation Report (new task)
  - SY.6.9 Verify and obtain approval of the System Operation Guide (instead of the Product Operation Guide)
  - SY.6.10 Document the System User Documentation (instead of the Software User Documentation)
  - SY.6.12 Incorporate the IVVQ plan and Verification Procedures (instead of Test Cases and Test Procedures)
System Engineering Process

Software Implementation Process

- Project Plan
- Project Repository
- Validation Results
- Requirements Specification
- Change Request
- Test Cases and Test Procedures
- Traceability Record
- Software Design
- Components
- Test Report
- Software Configuration
- Product Operation Guide
- Software User Documentation
- Maintenance Documentation

System Implementation Process

- SY.7 Product Delivery
  - SY.7.2 Review System Configuration (instead of Understand Software configuration)
  - SY.7.3 Document the System Maintenance Documentation or update the current one (instead of Maintenance documentation)
  - SY.7.4 Document the System training to prepare transition with System Requirements Document and IVVQ plan (new task)
  - SY.7.5 Verify and obtain approval of the System Maintenance Documentation and System Training Document (instead of Maintenance Documentation)
  - SY.7.6 Incorporate the System Maintenance Documentation and System Training Document as baseline for the System Configuration (instead of Maintenance Documentation)
System Engineering Process

• Roles added to the Software Basic Profile
  – Acquirer
    • Knowledge of the Customer processes and ability to explain the Customer requirements.
  – System engineer
  – IVVQ Engineer (Integration, Verification, Validation, Qualification)

• Products (i.e. Documents) added to the Software Basic Profile
  – System Breakdown Structure, System Requirements Specification
  – System Elements, System Configuration, System Design Document
  – System User Documentation, System Operation Guide
  – Justification Document
    • Documents the rationale (e.g. choices, decisions) during the System Implementation.
  – IVVQ Plan, IVVQ Procedures, IVVQ Report
Proposed Deployment Packages to Systems Engineering Basic Profile

- Verification & Validation
- Integration
- Functional & Physical Architecture
- Product Deployment
- Change Management
- Configuration Management
- Requirements Engineering
- Project Management
- Interface Management

January 21, 2012

Translated from (Fanmuy 2011)
Systems Engineering for VSEs

• Next Steps
  • Draft Basic profile will be circulated for review within SC7 in January
    • Comments will be analysed at WG24 meeting in Korea (May 2012)
    • The ‘interim’ document number is «ISO/IEC PDTR 30126-5»
      • At the meeting in Korea a resolution will be voted to change to «ISO/IEC TR 29110-5»
  • Development of the SE Entry profile using the Software Entry Profile
    • Draft Entry profile will be reviewed in Korea
  • An article about this project will be sent to Insight
  • A paper will be presented at INCOSE Symposium in Italy.
Next Steps

• For members of WG 24
  – Update actual ISO/IEC 29110 Part 1 and Part 3 to cover System and Software Profiles
  – Produce a Part 4 (i.e. Specification) for System Engineering Profiles

• For participants of INCOSE International Workshop
  – Review Draft Systems Engineering (SE) Basic Profile
  – Develop SE Deployment Packages using:
    • Software Deployment Packages (DP)
    • INCOSE Handbook
    • Other sources (TBD)
Conclusion

- **Phase 1** - Recognition of Needs and Problems (2004)
- **Phase 2** - Basic and Applied Research (2005-2006)
- **Phase 3** – Development (2006-2010)
- **Phase 4** – Commercialization (2010)
- **Phase 5** - Diffusion and Adoption (2006 - )
- **Phase 6** - Consequences (2011 - )
Thank you for your attention

Questions ?
Contact Information

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  – Voice: +1 514 396 8956
  – E-Mail: Claude.Y.Laporte@etsmtl.ca
  – Web: http://profs.etsmtl.ca/claporte/English/index.html

• Public site of WG 24
  – Free access to Deployment Packages, presentation material and articles:
    • http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html
References

- ISO/IEC 15289:2006 - Systems and software engineering - Content of systems and software life cycle process information products (Documentation)
Back-up Slides
Example of a Modern Air Transport System

Air Transport System

- Ticketing system
- Air traffic control system
- Airports system
- Fuel distribution system

Aircraft System

- Airframe system
- Life support system
- Propulsion system
- Air Crew
- Flight control system
- Navigation system
- Global positioning receiver system

Ground Transportation System

- Maritime Transport System
  - Display System
## ISO/IEC 12207 Life Cycle Processes Standard

### System Context Processes

<table>
<thead>
<tr>
<th>Agreement</th>
<th>Project Planning Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition Process</td>
<td>Project Assessment and Control Process</td>
</tr>
<tr>
<td>Supply Process</td>
<td>Decision Management Process</td>
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<tr>
<td></td>
<td>Risk Management Process</td>
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<tr>
<td></td>
<td>Configuration Management Process</td>
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<tr>
<td></td>
<td>Information Management Process</td>
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<tr>
<td></td>
<td>Measurement Process</td>
</tr>
</tbody>
</table>

### Technical Processes

<table>
<thead>
<tr>
<th>Stakeholder Reqmts Definition Process</th>
<th>System Requirements Analysis Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Architectural Design Process</td>
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<td>Software Operation Process</td>
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<tr>
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<tr>
<td>Software Disposal Process</td>
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</tr>
</tbody>
</table>

### SW Implementation Processes

<table>
<thead>
<tr>
<th>Software Implementation Process</th>
<th>Software Requirements Analysis Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Architectural Design Process</td>
<td>Implementation Process</td>
</tr>
<tr>
<td>Software Detailed Design Process</td>
<td>System Integration Process</td>
</tr>
<tr>
<td>Software Construction Process</td>
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<td>Software Disposal Process</td>
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</tbody>
</table>

### SW Support Processes

<table>
<thead>
<tr>
<th>Software Documentation Management Process</th>
<th>Software Configuration Management Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Quality Assurance Process</td>
<td>Software Detailed Design Process</td>
</tr>
<tr>
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</tr>
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<tr>
<td>Software Disposal Process</td>
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<tr>
<td>Software Problem Resolution Process</td>
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</tr>
</tbody>
</table>

## Organizational Project-Enabling Processes

<table>
<thead>
<tr>
<th>Life Cycle Model Management Process</th>
<th>Infrastructure Management Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality Management Process</td>
<td>Software Documentation Management Process</td>
</tr>
</tbody>
</table>

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January 21, 2012
ISO/IEC 15288 Life Cycle Processes Standard
## ISO/IEC 12207 Life Cycle Processes Standard

### System Context

<table>
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<th>Agreement</th>
<th>Project</th>
<th>Technical</th>
</tr>
</thead>
<tbody>
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<td>Acquisition Process</td>
<td>Project Planning Process</td>
<td>Stakeholder Requirements Definition Process</td>
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<tr>
<td>Supply Process</td>
<td>Project Assessment and Control Process</td>
<td>System Requirements Analysis Process</td>
</tr>
<tr>
<td>Organizational Project-Enabling</td>
<td>Decision Management Process</td>
<td>System Architectural Design Process</td>
</tr>
<tr>
<td>Infrastructure Management Process</td>
<td>Configuration Management Process</td>
<td>System Integration Process</td>
</tr>
<tr>
<td>Project Portfolio Management Process</td>
<td>Information Management Process</td>
<td>System Qualification Testing Process</td>
</tr>
<tr>
<td>Quality Management Process</td>
<td></td>
<td>Software Acceptance Support Process</td>
</tr>
</tbody>
</table>

### Project Management

- Project Planning Process
- Project Assessment and Control Process
- Decision Management Process
- Risk Management Process
- Configuration Management Process
- Information Management Process
- Measurement Process

### Technical Processes

- Stakeholder Requirements Definition Process
- System Requirements Analysis Process
- System Architectural Design Process
- Implementation Process
- System Integration Process
- System Qualification Testing Process
- Software Installation Process
- Software Acceptance Support Process
- Software Operation Process
- Software Maintenance Process
- Software Disposal Process

• Purpose
  – To establish and maintain the integrity of the software items of a process or project, and make them available to concerned parties.

• Outcomes
  – As a result of the successful implementation of the Software Configuration Management Process:
    • a software configuration management strategy is developed;
    • items generated by the process or project are identified, defined, and baselined;
    • modifications and releases of the items are controlled;
    • modifications and releases are made available to affected parties;
    • the status of the items and modifications is recorded and reported;
    • the completeness and consistency of the items is ensured; and
    • the storage, handling, and delivery of the items are controlled.

• Activities and Tasks
  1. Process implementation (Activity)
     • This activity consists of the following task:
       – A software configuration management plan shall be developed. The plan shall describe:
         » the configuration management activities; procedures and schedule for performing these activities;
         » the organization(s) responsible for performing these activities; and their relationship with other organizations, such as software development or maintenance.
       – The plan shall be documented and implemented.
     • NOTE The plan may be a part of the system configuration management plan.
  2. Configuration identification
  3. Configuration control
  4. Configuration status accounting
  5. Configuration evaluation
  6. Release management and delivery
Differences between small and large companies

Characteristics

• Specific business models and goals
• Market niche
• Limited financial resources
• Very good responsiveness and flexibility as competitive advantage
• Informal management
• Resource constraints
• Lack of regular employee training

Standardization aspects

• Aware of importance of standards
• Difficulties in implementing complex standards
• Inability to make effective use of standards available
• Lack of understanding of the language, terminology, etc. of the standards
The Survey - Weaknesses

• The Sample
  – Survey was initiated through WG24 contacts
    • Not a true random sample

• Geographical Distribution of the Responses
  – Strong representation: Latin America (50%)
  – Weak representation: Europe (11%), US (0.6%)

• Application Domain
  – Strong representation
    • 40% of life/mission-critical systems
    • 34% of regulated developments.
Number of Employees in Enterprises Surveyed

- 0-9: 36%
- 10-25: 17%
- 26-49: 16%
- 50-249: 9%
- 250+: 22%

January 21, 2012
Role of Respondents

- Director: 31%
- Manager: 31%
- QA: 1%
- Coordinator: 21%
- Consultant: 11%
- Consultant: 1%
- Blank: 4%
- Other: 1%

January 21, 2012
Types of Software Development

Number of Responses

- Customized
- In-house
- COTS
- Specialized Product
- Embedded
- Integrated
- Other

January 21, 2012
### CMMI Level 2 Coverage by Moprossoft

<table>
<thead>
<tr>
<th>Category</th>
<th>Fully</th>
<th>Largely</th>
<th>Partially</th>
<th>Not Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements Management</td>
<td>70%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Project Planning</td>
<td>66%</td>
<td>17%</td>
<td>13%</td>
<td>4%</td>
</tr>
<tr>
<td>Project Monitoring and Control</td>
<td>70%</td>
<td>20%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Measurement and Analysis</td>
<td>61%</td>
<td>17%</td>
<td>22%</td>
<td>0%</td>
</tr>
<tr>
<td>Process and Product Quality Assurance</td>
<td>72%</td>
<td>0%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>Configuration Management</td>
<td>55%</td>
<td>0%</td>
<td>28%</td>
<td>17%</td>
</tr>
<tr>
<td>Supplier Agreement Management</td>
<td>70%</td>
<td>0%</td>
<td>18%</td>
<td>12%</td>
</tr>
</tbody>
</table>

- 84 practices are Fully covered
- 13 practices are Largely covered
- 22 practices are Partially covered
- 7 practices are Not covered
Mexican Standard

Top Management
• Business Management

Management
• Process Management
• Project Portfolio Management
• Resource Management

Operations
• Specific Projects Management
• Software Development and Maintenance

ISO 9001:2000 92%
ISO/IEC 12207 95%
CMMI Level 2 77%
PMBOK (PMI) 90%

COMPETISOFT Project

- To provide Latin-American countries with a reference framework for the improvement and certification of their software processes,
- To be more competitive in the global market,
- Participants: 13 Latin American countries, Spain, Portugal,
- Pilot projects: 6 organisations over 4 months.
Scope of SEI Project in Small Settings

Small Companies (<100)

Small Organizations (<50)

Small Projects (<20)

Focus of WG24

Prototype of field guide available on www.sei.cmu.edu/iprc/ipss.html

S. Garcia, Montréal SPIN, 2005
Improving Processes in Small Setting (IPSS)

- Part of the International Process Research Consortium (IPRC)
- To explore the unique challenges of improving processes in small settings.
  - Establish an effective method or methods for process improvement in several different examples of small settings
  - Codify the method(s) for use by others
- Process improvement initiative - IPSS Phase 1
  - A small business operating within a large software/system development program
  - A small or short-term project operating within a large organization
  - A small business improving for competitive advantage

Caroline Graettinger, May 2007
www.sei.cmu.edu/iprc/ipss.html
http://www.sei.cmu.edu/publications/books/process/cmmi-survival-guide.html
Examples of Issues and Solutions
(Proposed by Thailand)

SMEs are not ready to implement the whole standard. → Standard should be broken down into stages or levels in order to fit all sizes of SMEs.

Not all standard activities are suitable for SMEs' operations → Need to modify activities to suit SMEs’ operation – product and project based type of business.

There is no assessment model. → A set of checklists was developed for use by assessors.

Most software developers are not document-oriented. → Provide packaged templates and examples for rapid documentation.

Source: