
Prepared by Claude Y. Laporte, Ph.D., Eng.
Project Editor of ISO/IEC 29110 for Very Small Entities
Co-chair of INCOSE VSE Working Group

INCOSE Webinar, November 18th 2015
Topics

• Introduction
• Standards and Guides developed for Very Small Entities (VSEs)*
• ISO/IEC 29110 for Systems Engineering
• Two case studies
• Conclusion

* Very Small Entities are enterprises, organizations (e.g. government and not-for-profit), projects or departments having up to 25 people.
Development of Systems Engineering Standards and Guides

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 VSEs in the context of prime or subcontractor, of commercial products
- To contribute to standardization
## Background - Size of Enterprises

- **European Union**
  - 92.2 % are micro enterprises (between 1 and 9 employees)*
- **Micro enterprises account for 70% to 90% of enterprises in OECD** **countries (about 95% in USA)** ***

### Type of enterprise

<table>
<thead>
<tr>
<th>Type of enterprise</th>
<th>Number of employees</th>
<th>Annual turnover (EUR)</th>
<th>Number of enterprises (% of overall)</th>
<th>Number of enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-enterprises</td>
<td>1 - 9</td>
<td>≤ 2 million</td>
<td>92.2 %</td>
<td>19 968 000</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>10 - 49</td>
<td>≤ 10 million</td>
<td>6.5 %</td>
<td>1 358 000</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>50 – 249</td>
<td>≤ 50 million</td>
<td>1.1 %</td>
<td>228 000</td>
</tr>
<tr>
<td>SMEs, total</td>
<td>87 100 000</td>
<td></td>
<td>99.8 %</td>
<td>21 544 000*</td>
</tr>
<tr>
<td>Large enterprises</td>
<td>&gt; 250</td>
<td>&gt; 50 million</td>
<td>0.2 %</td>
<td>43 000</td>
</tr>
<tr>
<td>Large enterprises, total</td>
<td>42 900 000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Independent companies only, excluding legally independent companies that are part of large enterprises.

* Moll, R., Being prepared – A bird’s eye view of SMEs and risk management, ISO Focus +, February 2013
** OECD: Organisation for Economic Co-operation and Development
The Business of System Development

- The supply chain of an electronic manufacturer selling millions of products all over the world

There are VSEs in most large organizations

Adapted from (Shintani 2006)
International Organization for Standardization (ISO)

Joint Committee for IT

Sub committee (SC) 7

Standardization of processes, supporting tools and supporting technologies for the engineering of software products and systems.

Working Group (WG) 24
The Strategy of WG 24 – 1/2

• 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 products (Generic Profile Group)
  • i.e. do not develop critical products.
The Strategy of WG 24 – 2/2

• Use two types of standards, as the input, for the development of standards and guides for VSEs:
  – **Process standards**, such as [ISO/IEC 15288](https://www.iso.org/obp/ui#iso:std:isoiec:15288) and [ISO/IEC/12207](https://www.iso.org/obp/ui#iso:std:isoiec:12207), that define the activities required to achieve identified objectives or outcomes;
  – **Product standards**, such as [ISO/IEC 15289](https://www.iso.org/obp/ui#iso:std:isoiec: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 *

- **Entry** - Targets VSEs typically developing 6 person-month projects or start-ups VSEs;
- **Basic** - Targets VSEs VSEs developing a single product by a single work team
- **Intermediate** – Targets VSEs involved in the development of more than one project in parallel with more than one work team
- **Advanced** – Targets VSEs which want to sustain and grow as an independent competitive system or software development business.

* Do not develop critical systems/software products
ISO 29110 Documents Targeted by Audience

29110 Overview (TR 29110-1)

For VSEs and customers

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 (IS/TR)

- Assessment Guide (IS/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, customers and VSEs

For VSEs and customers

‘How to do’

TRs are available from ISO at no cost
http://standards.iso.org/ittf/PubliclyAvailableStandards/index.html
ISO/IEC 29110 is not intended to preclude the use of different lifecycles such as waterfall, iterative, incremental, evolutionary or agile.
Management and Engineering Guides
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
## One Task of the Requirement Engineering Activity

<table>
<thead>
<tr>
<th>Role</th>
<th>Task</th>
<th>Input Product</th>
<th>Output Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACQ</td>
<td>SR.2.7 Validate that System Requirements Specifications satisfies Stakeholders Requirements Specifications.</td>
<td>System Requirements Specifications [verified]</td>
<td>Validation Report</td>
</tr>
<tr>
<td>STK</td>
<td>The results found are documented in a Validation Report and corrections are made until the document is approved by the SYS.</td>
<td>Stakeholders Requirements Specifications [published]</td>
<td>System Requirements Specifications [validated]</td>
</tr>
<tr>
<td>SYS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ISO/IEC 29110
### Example of the proposed Content of a Document

**• Change Request**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Request</td>
<td>Identifies a Software, or documentation problem or desired improvement, and requests modifications. It <em>may</em> have the following characteristics:</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td>- Identifies purpose of change</td>
<td>Project Management</td>
</tr>
<tr>
<td></td>
<td>- Identifies request status</td>
<td>Software</td>
</tr>
<tr>
<td></td>
<td>- Identifies requester contact information</td>
<td>Implementation</td>
</tr>
<tr>
<td></td>
<td>- Impacted system(s)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Impact to operations of existing system(s) defined</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Impact to associated documentation defined</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Criticality of the request, date needed</td>
<td></td>
</tr>
</tbody>
</table>

The applicable statuses are: *initiated, evaluated, and accepted*
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
Deployment Packages for the **Systems Engineering Basic Profile**

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

Available on SEBoK Wiki and INCOSE VSE WG
Polarsys Autonomous Rover

• Goal: Develop an Autonomous Rover capable to carry a sensor payload into a confined theatre to:
  – Map the zone
  – Collect sensor data

• Uses Dagu Electronics Rover 5 chassis
  – 2 DC Motors with encoders

• Multi-specialty development exposure
  – Electronics
  – Microcontrollers
  – Printed Circuit Board
  – Mechanical
  – Software

• Supports training activities for all Deployment Packages
Case Study 1

A Project in a Large Engineering Firm
Context

- A Canadian division of a large American engineering company,
- Offers a range of services in the production of hydro-electric, wind, geothermal, solar or biomass-related energy,
- Company was established 10 years ago,
- Over 500 employees spread over 10 offices in Canada,
- The company was already using a robust project management process for their large-scale projects.
- A project was launched to document small and medium scale project management processes.
## Business Objectives Targeted of the Improvement Project

<table>
<thead>
<tr>
<th>Identification Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-1</td>
<td>Facilitate the integration of new project managers.</td>
</tr>
<tr>
<td>O-2</td>
<td>Reach an overall customer satisfaction level 80%.</td>
</tr>
<tr>
<td>O-3</td>
<td>On average projects should reach cost and schedule targets within 5%</td>
</tr>
<tr>
<td>O-4</td>
<td>Reduce overload of staff by 10%</td>
</tr>
<tr>
<td>O-5</td>
<td>Reduce schedule slippage to less than one week and 5% of initial cost for mismanaged risks of projects</td>
</tr>
<tr>
<td>O-6</td>
<td>Reduce rework by 10%</td>
</tr>
<tr>
<td>O-7</td>
<td>Reduce non billable hours by 10%</td>
</tr>
</tbody>
</table>

Adapted from (Laporte & Chevalier 2015)
# Frameworks for Small and Medium Scale Projects

<table>
<thead>
<tr>
<th>Project Size</th>
<th>Small Project</th>
<th>Medium project</th>
<th>Large project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duration of project</strong></td>
<td>Less than 2 months</td>
<td>Between 2 and 8 months</td>
<td>More than 8 months</td>
</tr>
<tr>
<td><strong>Size of team</strong></td>
<td>Equal or less than 4 people</td>
<td>Between 4 and 8 people</td>
<td>More than 8 people</td>
</tr>
<tr>
<td><strong>Number of engineering specialties involved</strong></td>
<td>One specialty</td>
<td>More than one specialty</td>
<td>Many specialties</td>
</tr>
<tr>
<td><strong>Engineering fees</strong></td>
<td>Between 5,000$ and 70,000$</td>
<td>Between 50,000$ and 350,000$</td>
<td>Over 350,000$</td>
</tr>
<tr>
<td><strong>Percentage of projects</strong></td>
<td>70%</td>
<td>25%</td>
<td>5%</td>
</tr>
</tbody>
</table>

- **Small** projects used ISO/IEC 29110 Entry Profile
- **Medium** projects used ISO/IEC 29110 Basic Profile
- **Large** projects used the PMBOK® Guide of PMI

Adapted from (Laporte & Chevalier 2015)
Initial Evaluation of Medium-Scale PM Process

• Project Management process for medium projects was evaluated against Basic Profile of ISO 29110

- Project Planning (15 tasks)
  - Project Plan Execution (6 tasks)
  - Project Assessment and Control (3 tasks)
  - Project Closure (2 tasks)

  % of tasks performed

• PM tasks were not performed systematically
• PM practices varied from project manager to project manager

Adapted from (Laporte & Chevalier 2015)
Documentation of Processes

XXX-YY – Title of Activity of a Process

Inputs

Tasks

Outputs

Input Criteria

Measure

Exit Criteria

Adapted from (Laporte & Chevalier 2015)
Documentation of PM Processes - 1

**SPP- 01 – Plan the Project**

**Inputs**
- Statement of Work (SOW)
- Historical Data
- Design Criteria
- Hypothesis
- Availability of resources
- OSV and/or Contract
- Lessons Learned Folder

**Output Criteria**
- Project Plan
- Project Framework
- Project Authorization Form
- Project Success Criteria

**Input Criteria**
- Proposal approved

**Measure**
- Effort (staff-hour)

**Exit Criteria**
- Project Plan approved by Sponsor and Dept. Head

**SPP = Small-scale Project Process**

Adapted from (Laporte & Chevalier 2015)
# Documentation of PM Processes - 2

<table>
<thead>
<tr>
<th>Procedure:</th>
<th>&lt;Name of Process or Procedure&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase:</td>
<td>&lt;Name of phase where the procedure is used&gt;</td>
</tr>
<tr>
<td>Process/Procedure Owner:</td>
<td>&lt;Owner of this process/procedure&gt;</td>
</tr>
<tr>
<td>Description:</td>
<td>a brief description, background and purpose of the process/procedure</td>
</tr>
<tr>
<td>Entry Criteria:</td>
<td>&lt;entry criteria&gt;</td>
</tr>
<tr>
<td>Exit Criteria:</td>
<td>&lt;exit criteria&gt;</td>
</tr>
<tr>
<td>Inputs:</td>
<td>&lt;work products as input&gt;</td>
</tr>
<tr>
<td>Outputs:</td>
<td>&lt;work products as output&gt;</td>
</tr>
<tr>
<td>Roles:</td>
<td>&lt;list of all the actors and their responsibilities&gt;</td>
</tr>
<tr>
<td>Reference(s)</td>
<td>&lt;Document required to use this procedure&gt;</td>
</tr>
<tr>
<td>Assets:</td>
<td>&lt;Tools; methodologies; references; guidelines; checklists; other procedures&gt;</td>
</tr>
<tr>
<td>Tasks:</td>
<td>&lt;Itemized list of tasks (summarized) which need to be accomplished to satisfy this process/procedure (using an active verb and a noun)&gt;</td>
</tr>
<tr>
<td>Measures:</td>
<td>&lt;Measures captured during execution of process/procedure&gt;</td>
</tr>
</tbody>
</table>

Adapted from (Laporte & Chevalier 2015)
Documentation of PM Processes - 3

• Checklists Developed
  – Project management process of small projects
  – Project management process of medium projects
  – Project management process of large projects
  – Preparation of service offerings
  – Preparation of detailed project planning

• Project Management Forms and Templates
  – To guide Project Managers in the execution of management tasks and enable a consistency of results.
  – To guide managers unfamiliar with some project management practices.

Adapted from (Laporte & Chevalier 2015)
Testing the Solutions Developed

• Three pilot projects have been performed.
  – To validate that the proposed solutions were consistent, feasible, complete and acceptable to PMs

• Lessons learned have identified minor adjustments to the processes and tools.

• PMs evaluated the proposed processes, identified problems and potential improvements.
  – PMs also indicated that they would like to have examples of how to implement the tools.

Adapted from (Laporte & Chevalier 2015)
Deployment Strategy - 1

- A 2-phase strategy was developed for the deployment to all PMs in the division (i.e. about 30 PMs)
- Components of the deployment strategy
  - Communication
  - Training
  - Diffusion of the processes and their supporting documents

Adapted from (Laporte & Chevalier 2015)
Deployment Strategy - 2

• First phase – Inform PMs
  – To reduce questioning and to mitigate the negative impacts of 'unknowns'
    • emails were sent;
    • Articles were published in the monthly Newsletter
    • Messages have been added to the intranet.
    • One-day training sessions have been prepared for PMs.

• Second phase - Distribute process documents to all PMs
  – A section of the intranet was created as a main access to project management documents
  – The intranet also contains information relevant to project management
    • Links to websites, the identification of project management standards and other information such as projects management books.

Adapted from (Laporte & Chevalier 2015)
Cost/Benefit analysis

- Used the ISO method *Economic Benefits of Standards*
- Value chain

Support activities
- Management & Administration
- Human Resource Management
- Research & Development
- Procurement

Primary activities
- Inbound logistics
- Production/Operations
- Outbound logistics
- Marketing & Sales
- Service

Adapted from (Laporte & Chevalier 2015)
Cost/Benefit analysis

• Anticipated costs and benefits
  – Over a period of three years
    • e.g. training, updating process documentation and intranet
  – Over 6 dimensions
    • Internal information transfer, staff training, cost of staff, quality of deliverables, management of quality and internal standardization

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost to Implement and Maintain</td>
<td>59 600$</td>
<td>50 100$</td>
<td>50 100$</td>
<td>159 800$</td>
</tr>
</tbody>
</table>

Adapted from (Laporte & Chevalier 2015)
Project in a Large Engineering Firm

- INCOSE International Symposium,
- Seattle, July 2015
- A 20-page paper

An Innovative Approach to the Development of Project Management Processes for Small-scale Projects in a Large Engineering Company

Claude Y. Laporte
École de technologie supérieure
Department of Software and IT Engineering
1100 Notre-Dame Street West, Montréal
Québec H3C 1K3, Canada,
Claude.Y.Laporte@etsmtl.ca

Frédéric Chevalier
Tetra Tech
Power division
5100 Sherbrooke Street East, Suite 900,
Montréal Québec H1V 3R9, Canada,
Frederic.Chevalier@tetratech.com

Copyright © 2015 by C. Y. Laporte, F. Chevalier, Permission granted to INCOSE to publish and use.

Abstract: A Canadian division of a large American engineering company has developed and implemented project management processes for their small-scale and medium-scale projects. The company was already using a robust project management process for their large-scale projects. The objectives of this process improvement project were to reduce cost overruns and project delays, standardize practices to facilitate the integration of new managers, increase the level of customer satisfaction and to reduce risk-related planning deviations. For this improvement project, the engineering organization used the new ISO/IEC 29110 standard developed specifically for very small entities. An analysis of the cost and the benefits of the implementation of small and medium scale project management processes was performed using the ISO economic benefits of standard methodology. The engineering enterprise estimated that, over a three-year timeframe, savings of about 780,000$ would be realized due to the implementation of project management processes using the ISO/IEC 29110 standard.

Introduction
A large majority of enterprises worldwide are very small entities (VSEs). In Europe, for instance, as illustrated in table 1, over 92% of enterprises, called micro-enterprises, have up to 9 employees and another 6.5% have between 10 and 49 employees. Micro enterprises account for 70% to 90% of enterprises in Organisation for Economic Co-operation and Development (OECD 2005) countries and about 57% in USA.

Available at (Publication or Pilot Project Tab: http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html)
Project in a Large Engineering Firm

Book Chapter

• A 40-page chapter
• IGI Global, 2016


Claude Y. Laporte
Ecole de technologie supérieure, Canada

Frédéric Chevallier
Tetra Tech, Canada

ABSTRACT
A 400-employee Canadian division of a large American engineering company has developed and implemented project management processes for their small-scale and medium-scale projects. The company was already using a robust project management process for their large-scale projects. The objective of this project was to reduce cost overruns and project delays, standardize practices to facilitate the integration of new managers, increase the level of customer satisfaction and to reduce risk-related planning deviations. For this project, the engineering organization used the ISO/IEC 29110 standards developed specifically for very small entities, i.e., organizations, having up to 25 people. An analysis of the costs and the benefits of the implementation of small and medium scale project management processes was performed using the ISO economic benefits of standard methodology. The engineering enterprise estimated that, over a three-year timeframe, savings of about 78,000 would be realized due to the implementation of project management processes using the ISO/IEC 29110 standard.

Keywords: Project Management, Very Small Entity, Small-Scale Project, Medium-Scale Project, Process, ISO/IEC 29110, Standards, Economic Benefits

INTRODUCTION
Standards are sources of codified knowledge and studies have demonstrated the benefits of standards, such as product interoperability, increased productivity, market share gains, and improved interaction with stakeholders such as enterprises, government organizations and the public. Standards and associated technical documents could be considered as a form of technology transfer and, if the right standards are selected and used correctly, they should have an economic impact in an organization.

Many advantages or benefits as well as disadvantages or costs have been reported regarding the use of voluntary standards. Table 1 lists a few of the advantages and disadvantages reported.

Case Study 2

Young Transportation Enterprise
Overview

• Public transportation customers often require a CMMI® maturity level for system and sub-system suppliers.
• In 2012, CSiT was composed of 4 people (7 presently).
  – Implementing the CMMI® Level 2 Process Areas was too demanding at that time.
• Strategy
  – Implement the draft version of Systems Engineering ISO 29110 Basic profile as a foundation
    • Used other frameworks to complete process descriptions
      – e.g. INCOSE Handbook, PMBOK Guide of PMI and CMMI®
  – Perform a gap analysis between CMMI® level 2 and the SE Basic Profile
  – Implement the practices needed for a CMMI® level 2 assessment.
# Classification of CSiT processes

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>Light Process</th>
<th>Standard Process</th>
<th>Full Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Project</td>
<td>Proof of Concept, Prototype</td>
<td>Typical Project</td>
<td>Project when CMMI level 2 is required by a Customer</td>
</tr>
<tr>
<td></td>
<td>Concept validation or Product Deployment at Customer Site</td>
<td>Product intended to be installed at Customer Site</td>
<td>Product Testing or Product Deployment at Customer Site</td>
</tr>
<tr>
<td>Framework to be used</td>
<td>ISO/IEC TR 29110-5-6-1 <strong>Entry</strong> Profile + CMMI - Supplier Agreement Management</td>
<td>ISO/IEC TR 29110-5-6-2 <strong>Basic</strong> Profile + CMMI - Supplier Agreement Management</td>
<td><strong>CMMI</strong> (Level 2)</td>
</tr>
</tbody>
</table>

Adapted from (Laporte et al 2016)
Guidelines for the Project

• To avoid additional process and produce too many documents, stakeholders gave themselves the 2 sets of guidelines
  – Process guideline
    • Add tasks, not described in the Basic profile, only if they add value to the context and projects of the company or provided an alignment with CMMI® level 2
  – Document template guidelines
    • Group different documents into one where this is possible
    • Each section of a template must be relevant and applicable. If a section does not provide added value, it will not be included

Adapted from (Laporte et al 2016)
Supplier Management Process

• CSiT, as a system integrator, has to purchase components from suppliers
• Basic profile has only a few tasks about the ‘make or buy’ decisions and follow-up actions (e.g. document, review and issue a purchase order)
• Basic profile does not describe a supplier management process
  – This process is covered in the Intermediate Profile
• The supplier process put in place contains a detailed description about planning and managing acquisitions from suppliers
• Additional templates were created
  – Request for proposal, supplier selection matrix, purchase order and purchase agreement (i.e. a contract)
• New sections have been added to the ISO 29110 project plan
  – A list of acquisitions and potential suppliers
  – An acquisition plan/strategy,
  – A supplier management plan.

Adapted from (Laporte et al 2016)
**Verification, Validation and Acceptance of Work Products**

- Selection of types of peer review for each work product
  - For internal work products and deliverables

<table>
<thead>
<tr>
<th>Deliverables and Internal Work Products</th>
<th>Peer Review</th>
<th>Tests</th>
<th>Acceptance and Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Peer Review</strong> (Y=Yes, N=No)</td>
<td><strong>Type of Review</strong> (P=Personal, D=Desk-Check, W=Walkthrough, I=Inspection)</td>
<td><strong>Output Documents</strong> (ANN = Annotations, RR = Review Report, MoM = Minutes of Meeting, CHKL = Checklist)</td>
</tr>
<tr>
<td>Technical – System Requirement Specification</td>
<td>Y</td>
<td>D, W</td>
<td>RR then MoM</td>
</tr>
<tr>
<td>Technical – Software Requirement Specification</td>
<td>Y</td>
<td>D, W</td>
<td>RR then MoM</td>
</tr>
<tr>
<td>Technical – System Architecture Design</td>
<td>Y</td>
<td>D, W</td>
<td>RR then MoM</td>
</tr>
<tr>
<td>Technical – Software Architecture Design</td>
<td>Y</td>
<td>D, W</td>
<td>RR then MoM</td>
</tr>
<tr>
<td>Technical – Interface Control Document</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>Technical – Customer Requirements Specification</td>
<td>Y</td>
<td>D, W</td>
<td>RR then MoM</td>
</tr>
<tr>
<td>Technical – Factory Acceptance Test</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>Technical – Site Acceptance Test</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>Technical – Drawing</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>Project Management – Project Management Plan</td>
<td>Y</td>
<td>D</td>
<td>ANN and/or MoM</td>
</tr>
<tr>
<td>Project Management – Risk Register</td>
<td>Y</td>
<td>D</td>
<td>ANN and/or MoM</td>
</tr>
<tr>
<td>Project Management – Project Schedule</td>
<td>Y</td>
<td>W</td>
<td>MoM</td>
</tr>
<tr>
<td>User documentation – User Manual Installation</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>User documentation – User Manual Operation</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>User documentation – User Manual Maintenance</td>
<td>Y</td>
<td>D</td>
<td>RR</td>
</tr>
<tr>
<td>Product – Piece of software</td>
<td>Y</td>
<td>D</td>
<td>CHRL</td>
</tr>
<tr>
<td>Product – Piece of hardware</td>
<td>Y</td>
<td>D</td>
<td>CHRL</td>
</tr>
<tr>
<td>Product – System</td>
<td>Y</td>
<td>W, I</td>
<td>MoM</td>
</tr>
</tbody>
</table>

Adapted from (Laporte et al 2016)
Young Transportation Enterprise

- Submitted to INCOSE International Symposium,
- Edinburgh, July 16-21, 2016
Translations of Systems Engineering ISO 29110 Guides

• French
  • Basic Profile translated by Michel Galinier of AFIS and approved by AFNOR
    • [https://www.afis.fr/](https://www.afis.fr/)

• German
  • Basic profile translated by Martin Geisreiter of the German INCOSE Chapter GfSE (Gesellschaft für Systems Engineering e.V.)
    • [http://www.gfse.de](http://www.gfse.de)
  • Basic profile should be published in 2016
    • By DIN (Deutsches Institut für Normung)
      • [http://www.din.de/en](http://www.din.de/en)
Next Steps for ISO WG 24 and INCOSE VSE WG - 1

- **SE Entry Profile**
  - Should be published late 2015/early 2016
  - Develop Deployment Packages (~ 2)

- **SE Profile Specifications Document**
  - Should be published late 2016/early 2017
  - Once published, VSEs could be formally audited

- **SE Intermediate and Advanced Profiles**
  - Should start development early 2016
  - Develop Deployment Packages to support the 2 profiles

- **Mappings between ISO 29110 to ISO 9001 and CMMI-DEV**

- **Conduct more pilot projects and document case studies**
Next Steps for ISO WG 24 and INCOSE VSE WG - 2

• ISO/IEC 29110 ‘Service Delivery’ Profile
  – Project approved in May 2015
  – Objective
    • To guide VSEs in providing services after the delivery of a product
    – A set of ‘Service’ requirements have been imported from existing standards/frameworks
      • e.g. ISO/IEC 15288, ISO 9001
    – Two new ISO 29110 documents are developed
      • A Guide (TR)
      • A Profile Specification (IS)
Conclusion

• ISO 29110 has been specifically developed for VSEs (company, organization, project, department) developing systems and/or software,
• ISO 29110 is intended to help VSEs who have neither the expertise, nor the budget or the time to adapt existing standards (e.g. ISO 15288) to their needs,
• ISO and INCOSE WGs have worked together to develop a set of DPs to help VSEs in implementing and using ISO 29110,
• ISO 29110 brings many benefits to VSEs, their clients and their business partners,
• Other profiles (Intermediate and Advanced) and their DPs will start to be developed in 2015,
• A new ‘Service Delivery’ profile will help VSEs in delivering better ‘after delivery’ services to their customers.
A Public Web Site

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

- Certification

- Service Delivery

Public Site of the ISO Working Group Mandated to Develop ISO/IEC 29110 Standards and Guides for Very Small Entities involved in the Development or Maintenance of Systems and/or Software

As systems and software quality increasingly become a subject of concern, and as process approaches are maturing and earning the confidence of organizations, the use of ISO/IEC 15504-1/SC7 international standards is spreading in organizations of all sizes.

A Very Small Entity (VSE) is an entity (enterprise, organization, department or project) having up to 25 people. However, most standards were not written having in mind Very Small Entities (VSEs) and are consequently difficult to apply in such settings. Worldwide, the percentage of micro and small enterprises is quite high. The table below shows that 92.2% of European enterprises have up to 9 employees, another 6.5% have between 10 to 49 employees. Micro enterprises account for 70% to 90% of enterprises in OECD countries and are about 57% in the USA.

<table>
<thead>
<tr>
<th>Type of enterprise</th>
<th>Number of employees</th>
<th>Annual turnover (EUR)</th>
<th>Number of enterprises (% of overall)</th>
<th>Number of enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-enterprises</td>
<td>1-9</td>
<td>≤ 2 million</td>
<td>92.2%</td>
<td>19,968,000</td>
</tr>
<tr>
<td>Small enterprises</td>
<td>10-49</td>
<td>≤ 10 million</td>
<td>6.5%</td>
<td>1,358,000</td>
</tr>
<tr>
<td>Medium enterprises</td>
<td>50-249</td>
<td>≥ 50 million</td>
<td>1.1%</td>
<td>228,000</td>
</tr>
<tr>
<td>SMEs, total</td>
<td></td>
<td></td>
<td>99.8%</td>
<td>21,544,000*</td>
</tr>
<tr>
<td>Large enterprises</td>
<td>&gt;250</td>
<td>&gt; 50 million</td>
<td>0.2%</td>
<td>43,000</td>
</tr>
<tr>
<td>Large enterprises, total</td>
<td>42,900,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Independent companies only, excluding legally independent companies that are part of large enterprises.

Size of Enterprises in Europe (Moll, R., Being prepared – A bird’s eye view of SMEs and risk management, ISO Focus +, February 2013)

Many Medium and Large enterprises, as illustrated below, need hardware and/or software components produced by VSEs. Finally, in large organisations, many projects have up to 25 people. Therefore, VSEs are found at all level of the pyramid below.

![Diagram of development levels](http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html)
“As innovation fuels economies, standards smooth the ride”

S. Joe Bhatia,
President and CEO
American National Standards Institute (ANSI)

ISO focus, May/June 2015
감사합니다

Grazie
Danke
Ευχαριστίες
Thank You
Спасибо
Dank
谢谢
Merci
ありがとう
Natick
Dalu
Köszönöm
Tack
Gracias
See
Obrigado
Contact Information

• Claude Y Laporte
  – 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