The Development of a Set of Tools to Facilitate the Adoption and the Implementation of the ISO/IEC 29110 Standard by Very Small Entities

Professor Claude Y Laporte, Eng., Ph.D.
Project Editor, ISO/IEC JTC1 SC7 Working Group 24
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Content

- Introduction
- Needs for Standards for Very Small Entities (VSEs)
- Approach used to develop the ISO/IEC 29110 Standard
- Survey of VSEs
- Network of VSE Support Centers
- Deployment Packages
- Pilot Projects
- Development of Profiles in Systems Engineering
- Next Steps

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

École de Technologie Supérieure (ETS)

Over 5400 students, 130 professors, 24 general senior lecturers.

About 2000 paid industrial internships in over 800 companies each year (about 10,000$ per internship)

Undergraduate Programs
- Software Engineering
- IT Engineering
- Construction Engineering
- Production Engineering
- Electrical Engineering
- Mechanical Engineering
- Logistics and Operations Engineering

- Graduate Programs
  - Software Engineering
  - Information Technology
  - Other programs

- 650 students
- 19 Professors in the department have a mean industrial experience of 10 years.

150 students.

www.etsmtl.ca
Software and IT Engineering Department of ETS Won the 2011 ISO Award for Higher Education in Standardization

• The award was presented at the ISO General Assembly in India, September 21-23.

• ETS was one of eight finalists.

• The selection committee was particularly impressed by:
  – The integration of standardization aspects into conventional disciplines such as IT and software engineering.
  – The inclusion of standards in engineering subjects such as software quality assurance, maintenance and testing by experienced professors who participate in the work of technical committees and subcommittees.
  – The publications related to the course could serve to provide insights to other institutions wishing to go the same way.
The Importance of VSEs
An Example from Japan

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, 2005
Development of ISO/IEC 29110 Standard for Very Small Entities (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 - )**

(Rogers, 2003)
Use of Software Engineering Standards by VSEs

Our Hypothesis in 2005

- **Reasons for not using Software Engineering (SE) Standards**
  - Not written for or **difficult to use** by VSEs,
  - Current SE standards do not specifically address VSEs’ needs,
  - Current SE standards requires critical mass (**staff, budget, time**) to implement,
  - **Compliance** with existing standards **difficult** to achieve,
  - Net **benefits of using SE standards 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 were often developed by large organisations for large organisations!**
2. Research

Survey of VSEs in 2006

- **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 VSEs don’t Use Standards?

- **24%**: Not required
- **15%**: Lack of support
- **14%**: Lack of resources
- **9%**: Too time-consuming
- **10%**: Standard(s)*
- **28%**: Other

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

- Certification and Recognition
  - Only 18% of VSEs were certified
    - Over 53% of larger companies were 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% of VSEs were asking for more guidance and examples
  - 55% were requiring 'lightweight' standards that are easy to understand and apply and come with templates
Agenda

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

- 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 - )
• **Entry** - Targets VSEs typically developing 6 person-month projects or start-up VSEs;
• **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.

* VSEs that do not develop critical software products
Documents Targeted by Audience

29110 Overview (TR 29110-1)

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)

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 VSEs

For Standard producers, tool vendors, methodology vendors

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

For Assessors and VSEs

‘How to do’

TRs are available free from ISO

02/10/2011

ISO/IEC 29110
ISO/IEC 29110 Part 5 – Table of Contents

Foreword
Introduction
1. Scope
2. Normative references
3. Terms and definitions
4. Basic VSE profile management and engineering guide
   4.1 Introduction
   4.2 Project Management (PM) process
   4.3 Software Implementation (SI) process
   4.4 Roles
   4.5 Product description
   4.6 Software tools requirements

Annex A (informative) – Deployment Package
Bibliography

02/10/2011
Agenda

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

Rate of Diffusion/Adoption

Percent of Adoption

Time (Years)

Diffusion Strategy C
WG 24

Diffusion Strategy B
Development of 3 Guides

Diffusion Strategy A
Do nothing!

02/10/2011
5. Diffusion

Network of Support Centers for VSEs

- **Main Objectives**
  - **Accelerate** deployment and **implementation** of ISO/IEC 29110 Standard
  - Accelerate the development and **application** of **Deployment Packages**

- Belgium (Cetic)
- Brazil (RIOSOFT)
- Canada (ÉTS)
- China (in discussion)
- Colombia (Parquesoft)
- Finland (Tampere University of Technology)
- France (UBO)
- Haiti (in discussion)
- Ireland (LERO)
- Japan (in discussion)
- Luxembourg (Tudor Research Center)
- Mexico (UNAM)
- Peru (in discussion)
- Thailand (Institute of Software Promotion for Industries)
5. Diffusion

Deployment Packages (DPs)

• A set of artefacts developed to facilitate the implementation of a set of practices
  – Deployment packages are not intended to preclude or discourage the use of additional guidelines that VSEs find useful.

• Set of concrete steps to implement the Engineering and Management Guide.

• A VSE can implement its content, without having to implement the complete framework at the same time.
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 (s)

6. Example (s)

7. Checklist (s)

8. Tool (s)


10. References

11. Evaluation Form

Deployment Packages are free!
Deployment Packages for the Basic Profile

5. Diffusion

Construction and Unit testing

Verification and Validation

Integration and Tests

Project Management

Architecture and Detailed Design

Product Delivery

Requirements Analysis

Version Control

Self-Assessment
5. Diffusion

Requirement Analysis Deployment Package

- **Activity covered** - Software Requirements Analysis
  - Task 1 - Requirements Identification
  - **Steps**
  - 1. Collect information about the application domain
    » During this Step, analyst captures the key concepts of the business domain of the customer. The customer assists the analyst by giving him all the information (existing documentation or explanation) that will facilitate this understanding.
  - 2. Identify project’s scope
  - 3. Identify and capture requirements
  - 4. Structure and prioritize requirements

- Requirement Analysis [Traceability Tool](#)
- Requirement Analysis [Training Material](#)
5. Diffusion

Eclipse Plug-in for the Engineering and Management Guide

02/10/2011 (G. Hernandez, W. Gonzalez)
Pilot Projects Completed in Canada

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

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

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

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

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

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

5. Diffusion

- Telecommunication Research Chair
  - Implementation of ISO 29110 Draft Entry Profile process for Master and PhD students
  - Most projects are conducted by 1 graduate student

- Research Laboratory in Medical Imagery and Orthopedic
  - Implementation of ISO 29110 Draft Entry process for Master and PhD students
  - Most projects are conducted by 1 graduate student
5. Diffusion

Education Interest Group

- Concept: Develop a set of Deployment Packages for Education
  - 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. Assessment of an ISO/IEC 29110-Based Software Process
  6. Conduct Deployment of ISO/IEC Standard in a VSE (Canada)

http://profs.logti.etsmtl.ca/claporte/English/VSE/VSE-Education.html
5. Diffusion

A Public Web Site for ISO/IEC 29110

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

http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html

02/10/2011
5. Diffusion

29110 Public Web Sites

- Brazil: http://www.netcenter4vse.org.br
- Canada: www.iso29110.ca (in construction)
- Finland: https://wiki.tut.fi/CoSE/VSE
- Ireland: http://www.lero.ie/project/iso29110
- Japan: www.vse.jp
- Thailand: http://www.center4vse.net/

One web site has been in operation since 2006 at ÉTS
http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html
5. Diffusion

Papers and Communications

5. Diffusion

Publications - Communications

- Elements of ISO/IEC 29110 are introduced in many chapters of 2 French textbooks on Software Quality Assurance
  - e.g. Chapter about standards, risks, reviews, etc.
- INCOSE Workshop (Phoenix, Arizona, Feb. 2011)
  - Presentation to Systems Engineers
- Project Management Institute (Montréal, April 2011)
  - Presentation to Project Managers
- French Association of Systems Engineers (Paris, May 24th)
- Book Chapter (Fall 2011)
Publications - Communications

• ISO 29110 on Wikipedia
  • English version
  • Planned versions
    • Spanish, Portuguese

• IEEE 730 Standard – Software Quality Assurance
  • An annex was written about ISO 29110 standard
    • Description of VSE, needs.
    • Overview ISO 29110, profiles, processes.
    • Coverage of ISO 12207 SQA activities to 29110 Basic profile
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

www.center4vse.net
Agenda

5. Diffusion and Adoption (2006 - )
6. Consequences (2011 - )
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*)
Implementation of ISO/IEC 29110 in Thailand

«Thailand is now using the new software engineering standard ISO29110 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 ISO29110 as the minimum requirement for all Thai government related for software and system procurement.»

Dr. Anukul Tamprasirt, November 29th 2010
Development of Profiles and DPs in Systems Engineering Similar to ISO/IEC 29110

- 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
The initial strategy was to use the INCOSE Systems Engineering (SE) Handbook as the framework for a new ISO standard for VSEs involved in Systems Engineering (SE).

It was proposed, in December 2010, to ‘switch’ from the INCOSE Handbook to the ISO/IEC 15288 standard and keep the Handbook for the development of the set of DPs.

Accomplishments
- A survey was performed
- INCOSE Workshop (Phoenix, USA) in February 2011
  - ISO/IEC 29110 has been presented and discussed
  - Systems engineers reviewed Part 5-1-2 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 VSE involved in SE has been tabled by Canada at the ISO SC7 Plenary meeting in Paris in May 2011
  - To develop a SE Basic profile (i.e. Part 4 and Part 5) to match the ISO 29110 Basic profile

The proposal to develop a new SE standard has been approved.
Conclusion

• **Tools developed to help VSEs implement ISO/IEC 29110**
  – Network of International collaboration Centers to support VSEs
  – Deployment Packages and software tools (e.g. Plug-ins)
  – Public Web sites
  – Pilot Projects, Educational material
  – Articles, book chapter, textbooks
  – Wikipedia

• **Tools under development**
  – Development of a ‘light’ evaluation method
  – Development of formal certification method
  – Development of Deployment Packages (DP) in SharePoint
  – Development of ‘Expert Mode’ DP (2-3 pages)
  – Documentation of Pilot Projects and Case Studies
  – Evaluation of the benefits/impacts of ISO/IEC 29110
  – Development of self-learning/video modules

The set of tools should help VSEs to be more competitive by implementing ISO/IEC 29110
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
Abregado
Merci
Thank you
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