Université du Québec
École de technologie supérieure
Department of Software and IT Engineering

# The Development and Experimentation of an International Standard for Very Small Entities Involved in Software Development

**Professor Claude Y Laporte, Eng., Ph.D.**
**Editor, ISO/IEC JTC1 SC7 Working Group 24**
**INCOSE, Montréal, Canada**
**February 18th, 2010**

# Content

- **Introduction**
- **Needs for Standards for Very Small Entities (VSEs)**
- **Establishment of ISO Working Group 24**
- **Approach used by Working Group 24**
- **Survey of VSEs**
- **Accomplishments to Date**
- **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.

**ISO/IEC JTC 1/SC7** = International Organization for Standardization/ International Electrotechnical Commission Joint Technical Committee 1/Sub Committee 7.

# 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

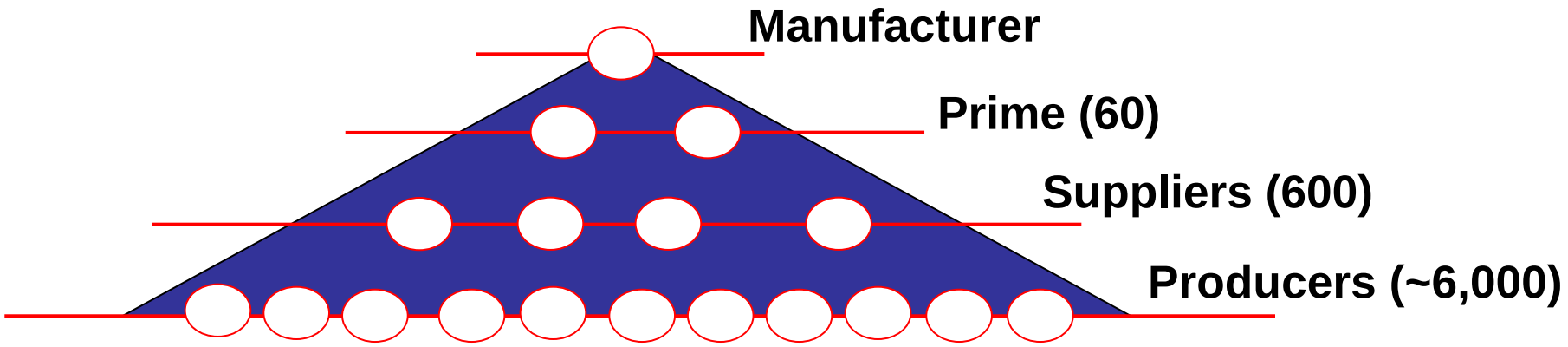
- Software Engineering
- IT Engineering
- Construction Engineering
- Production Engineering
- Electrical Engineering
- Mechanical Engineering
- Logistics and Operations Engineering

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

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

→ **150 students.**

# 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

# 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 (57 % in USA)**
- **Greater Montréal Area - Software Enterprises.**

| Number of employees | Number of Software Enterprises | Percentage |
|---|---|---|
| 1 to 25 | 540 | 78 % |
| 25 to 100 | 127 | 18 % |
| Over 100 | 26 | 4 % |

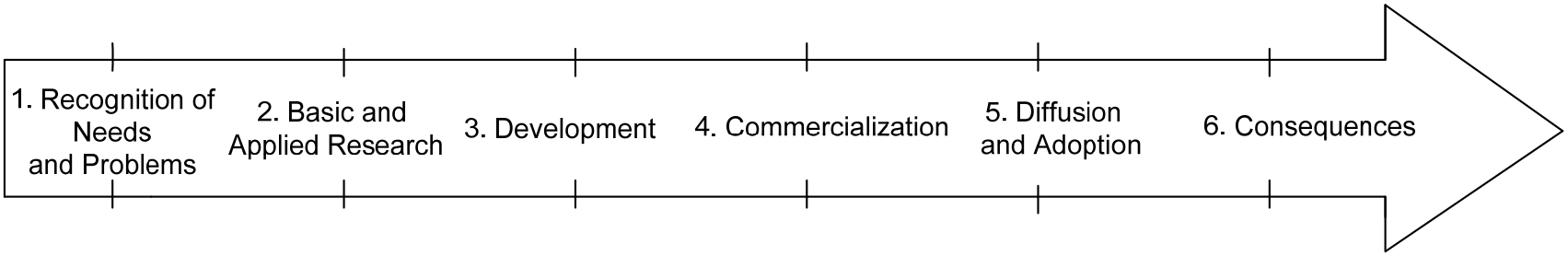
50% of enterprises have less than10 employees
Source: Montreal International, 2006

* OECD: Organisation for Economic Co-operation and Development

# 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** (2010 - )

(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.

# Use of Software Engineering Standards by VSEs Hypothesis of the SIG

- **Reasons for not using 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 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,
  - VSEs are often developing important components for customers.

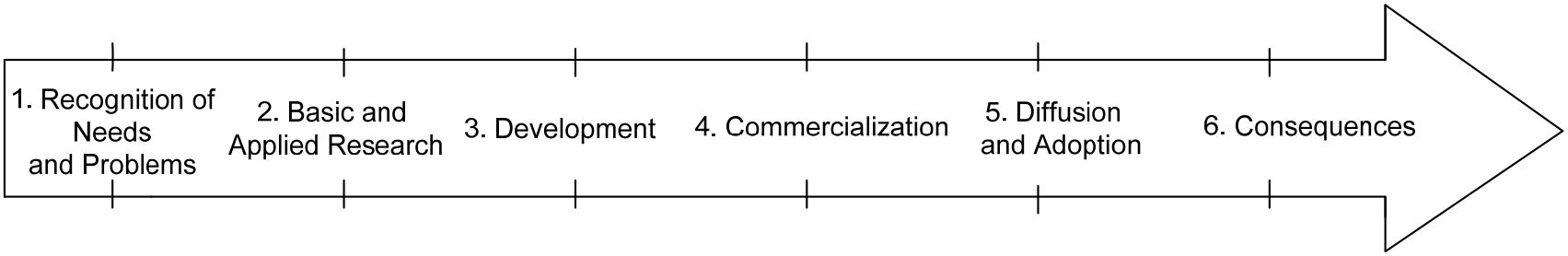
Standards are often developed by large organisations for large organisations !

SE= Software Engineering

# Establishment of 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

# Agenda




- **Phase 1 - Recognition of Needs and Problems (2004)**
- **Phase 2 - Basic and Applied Research**
  - Survey of Process Improvement Initiatives (2005)
  - Survey of VSEs worldwide (2006)
- **Phase 3 – Development (2006-2010)**
- **Phase 4 – Commercialization (2010)**
- **Phase 5 - Diffusion and Adoption (2006 -)**
- **Phase 6 - Consequences (2010 - )**

# 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, Ibague, Villavicencio, Medellin, 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

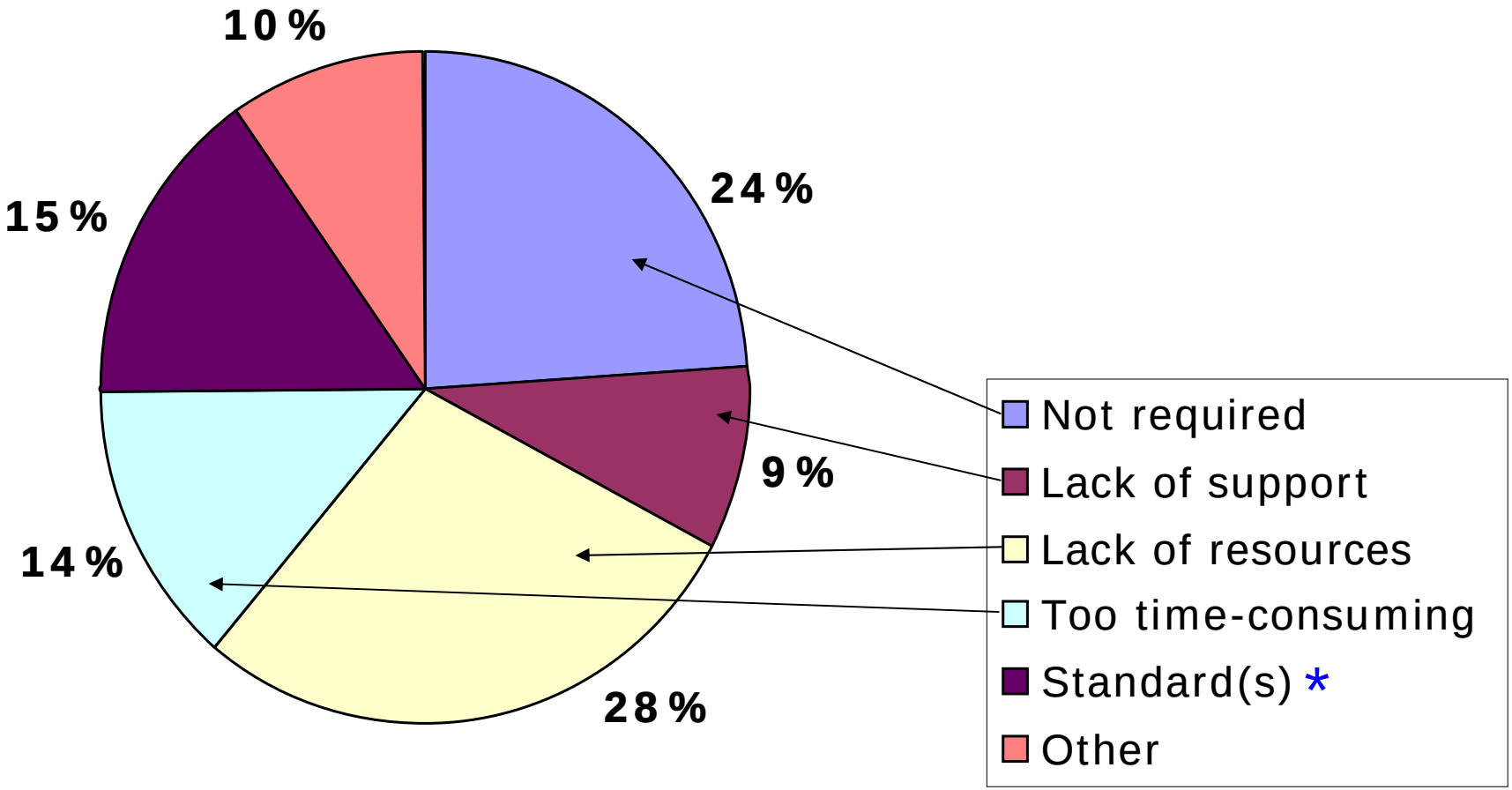
# Survey of VSEs

- **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

| Country | Number of Responses | Country | Number of Responses | Country | Number of Responses |
|---|---|---|---|---|---|
| Argentina | 2 | Finland | 13 | New Zealand | 1 |
| Australia | 10 | France | 4 | Peru | 4 |
| Belgium | 10 | Germany | 1 | Russia | 4 |
| Brazil | 72 | India | 57 | South Africa | 10 |
| Bulgaria | 3 | Ireland | 10 | Spain | 4 |
| Canada | 10 | Italy | 2 | Taiwan | 1 |
| Chile | 1 | Japan | 3 | Thailand | 59 |
| Colombia | 109 | Korea (South) | 4 | Turkey | 1 |
| Czech Republic | 3 | Luxembourg | 3 | United Kingdom | 2 |
| Dominican Republic | 1 | Mexico | 20 | United States | 3 |
| Ecuador | 9 | Morocco | 1 | | |

# Why don't VSEs use Standards?




* 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

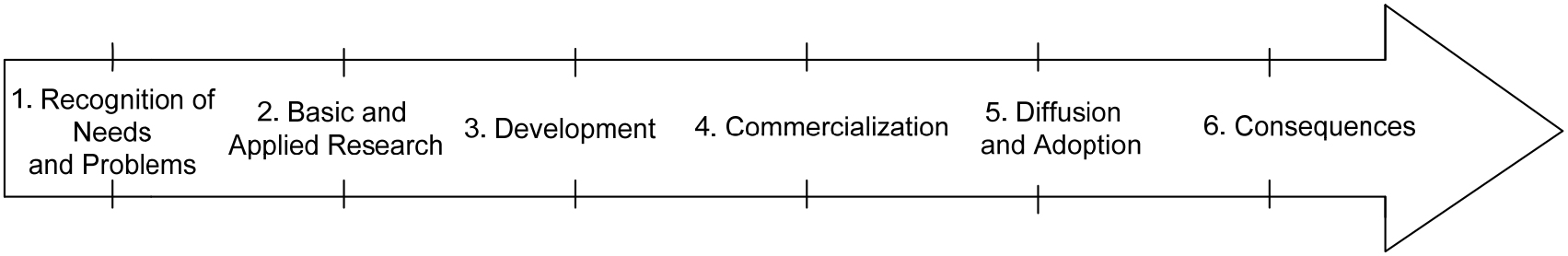
- **Needs Regarding Documentation**
  - 62% are asking for more guidance and examples
  - 55% are requiring 'lightweight' standards that are easy to understand and apply and come with templates

# Subset of Requirements to Develop Standards for VSEs from Bangkok 2005 Meeting

- 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
  - From standards to education material
- R 29 - The set of workproduct should propose to choose a lifecycle
  - Provide examples of lifecycles
- R 33 - The set of workproduct should propose definition of documents.
  - For example templates (e.g. requirements templates - use cases)
- R 37 - The set of workproduct should include compliance table checklists
  - e.g. an Assessment Guide
- 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

(BK1-032 2005)

# Agenda




- **Phase 1 - Recognition of Needs and Problems (2004).**
- **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 (2010 - )**

3. Development

# 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.

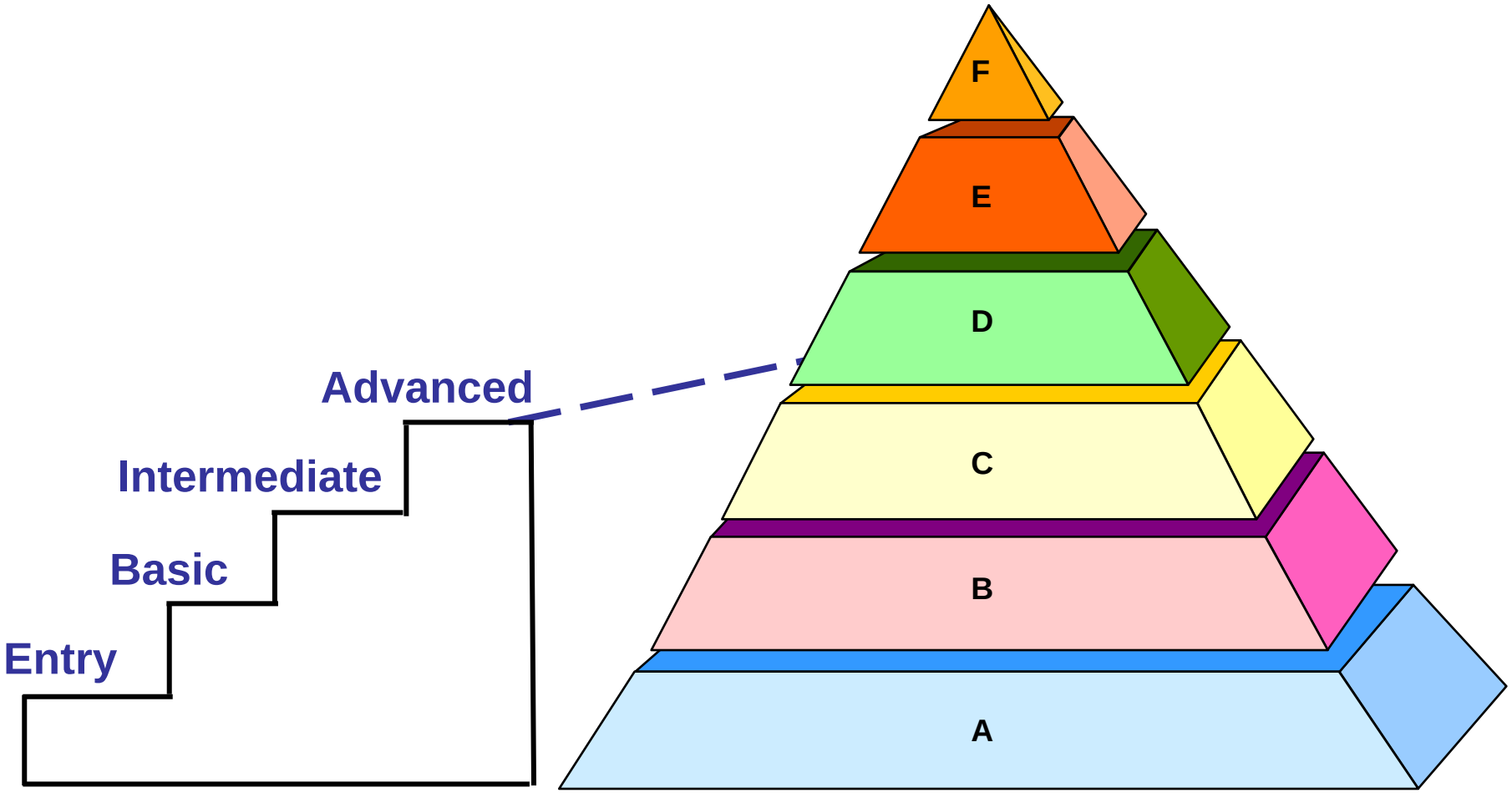
# The "Generic" Profile Group

- Applicable to VSEs that do not develop critical software products*.
  - Does not imply any specific application domain.

In the future new domain-specific profiles may be developed

* **Critical software**: software whose failure could have an impact on safety or could cause large financial or social losses (IEEE 610.12)

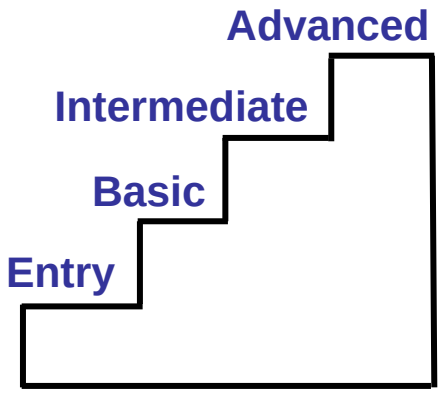
# A Roadmap in 4 Stages (Profiles) for Generic Software Development VSEs



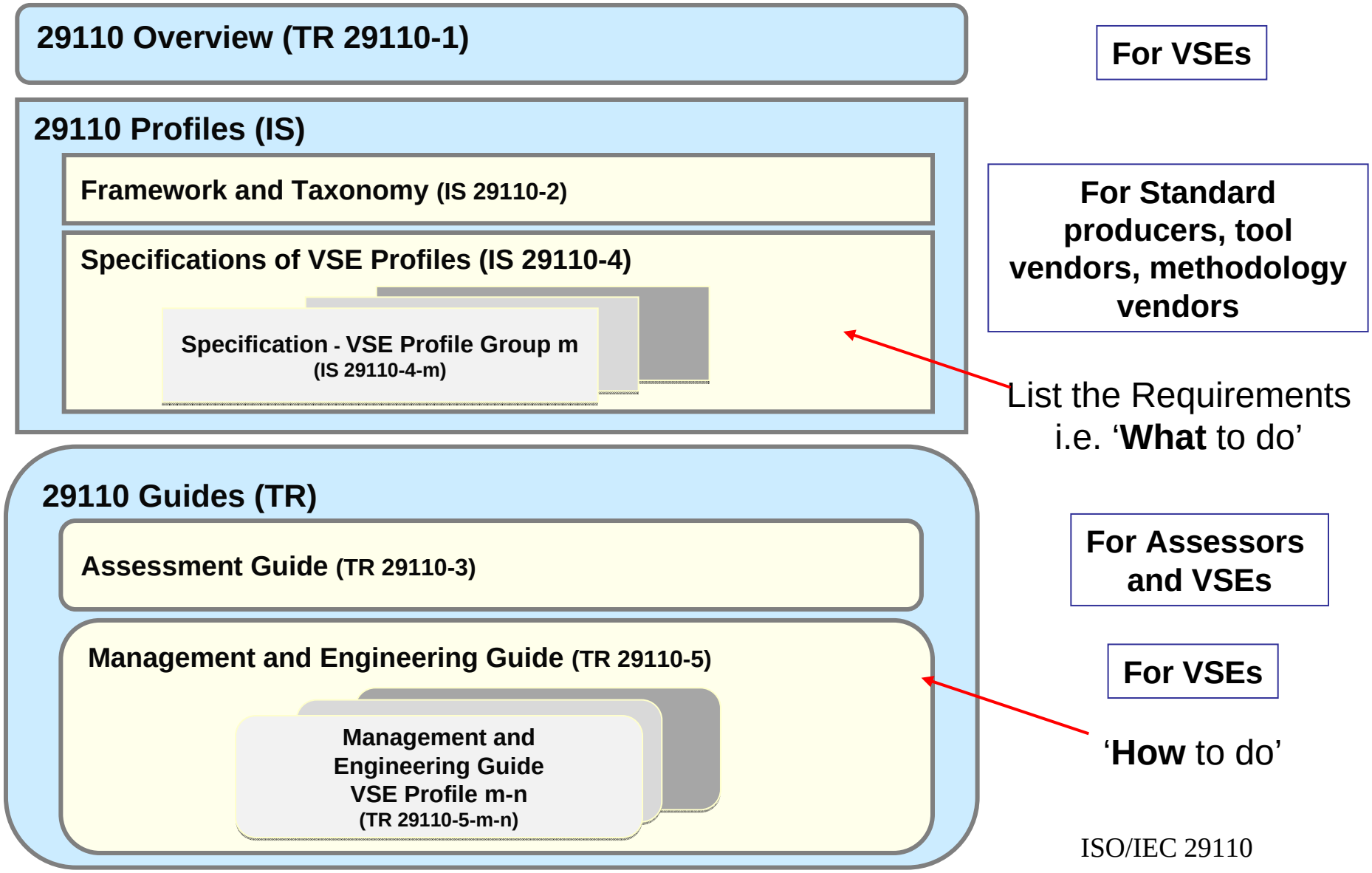
# The Generic Profile Group

- **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 more than one project at a time;
  - **Advanced -** Targets VSEs wishing to put in place business management practices and portfolio management practices

| Profile Group | Profile Name |
|---|---|
| **Generic** | Advanced |
| | Intermediate |
| | Basic |
| | Entry |

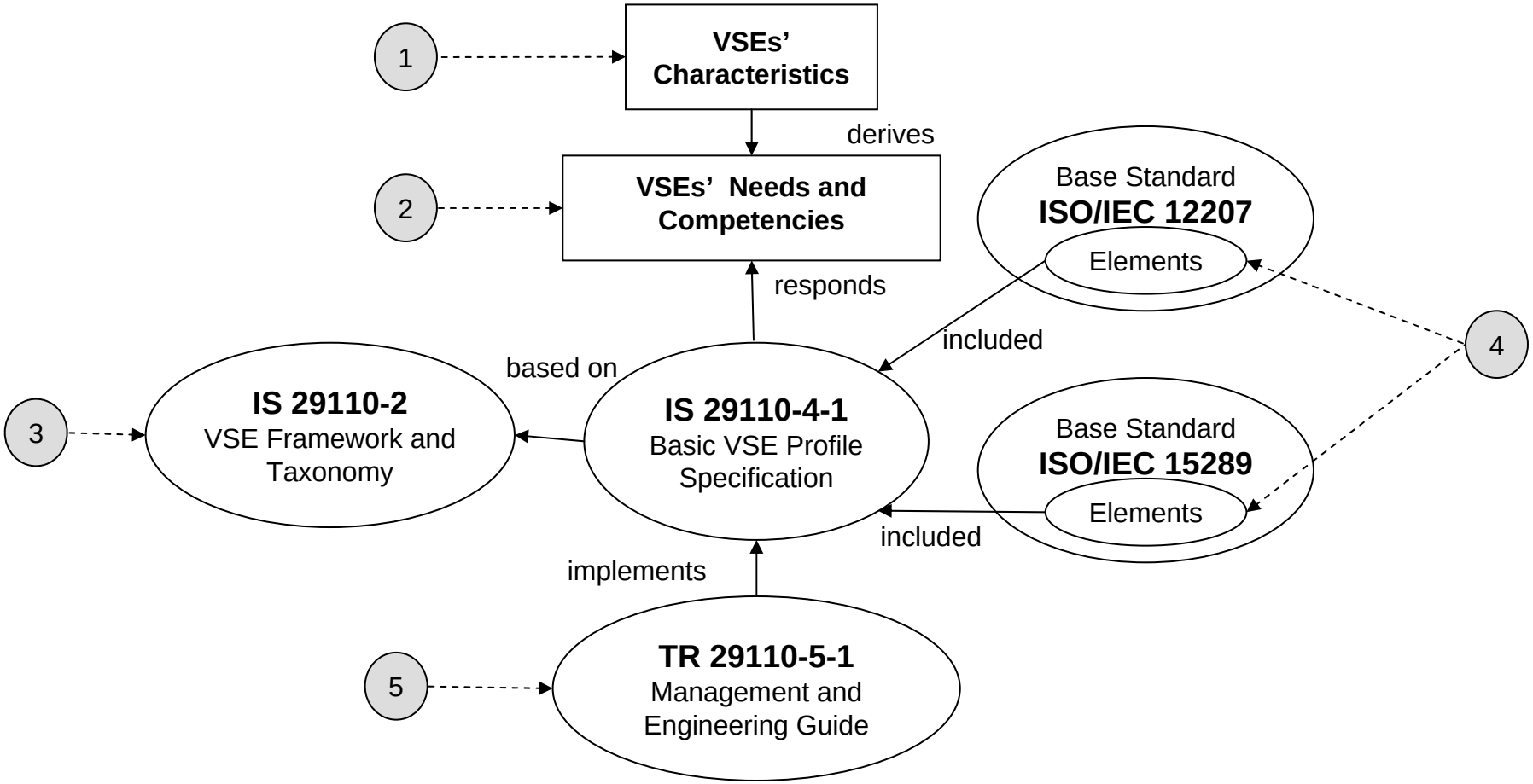


# Set of 29110 Documents Targeted by Audience



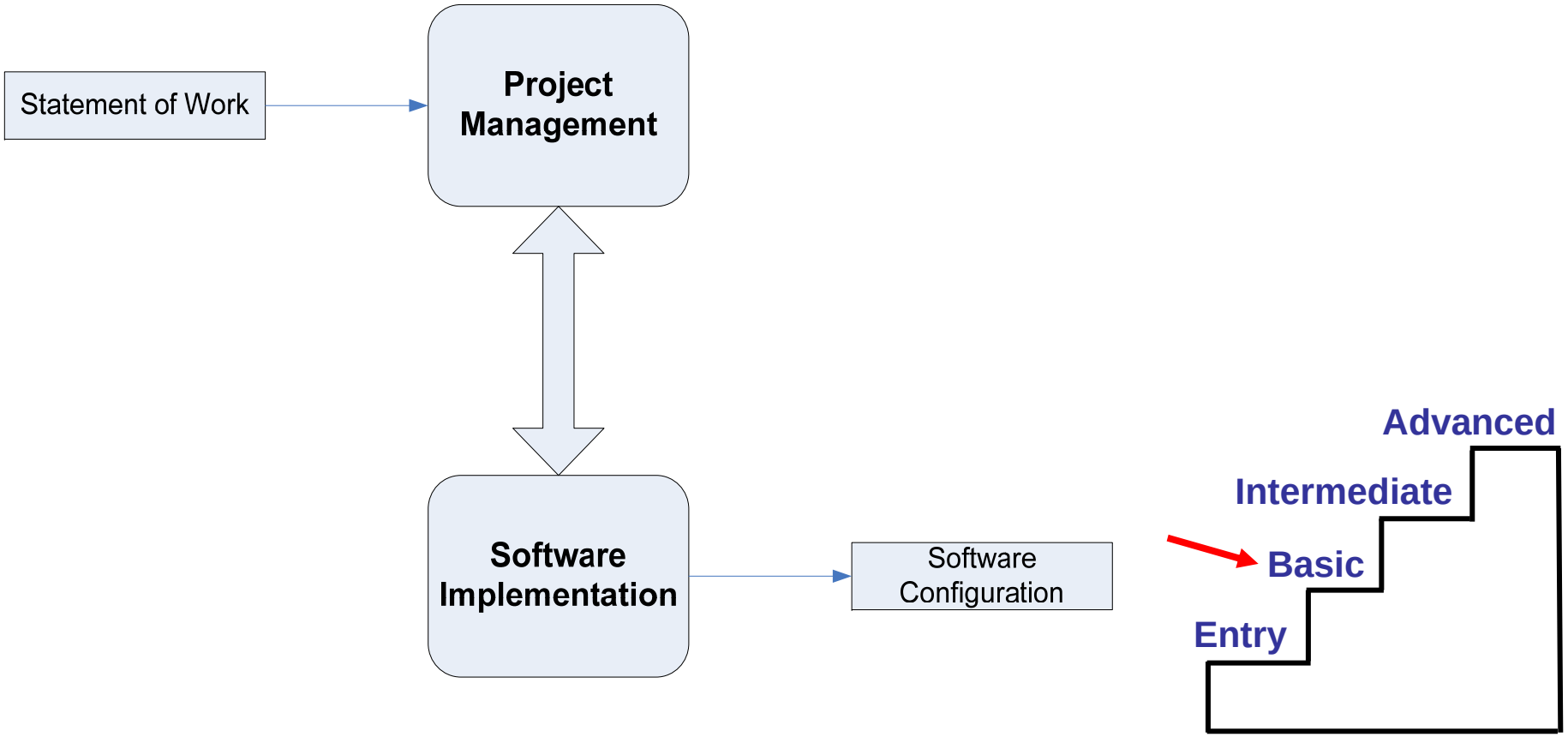

**Obtained approval from ISO to make TRs available at no cost**

# Preparation Steps for the Basic Profile



# ISO/IEC 29110 Part 5-1
# Management and Engineering Guide

- Part 5 provides a Management and Engineering Guide for the VSE Profile described in ISO/IEC IS 29110 Part 4.



# ISO/IEC 29110 Part 5 – Table of Contents

# 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
   - **Role -** Abbreviation of roles involved in the task execution.
   - **Task -** Description of the tasks to be performed.
   - **Input Products -** Products needed to execute the task.
   - **Output Products -** Products created or modified by the execution of the task.

ISO/IEC 29110

# Part 5 - Project Management (PM) Process

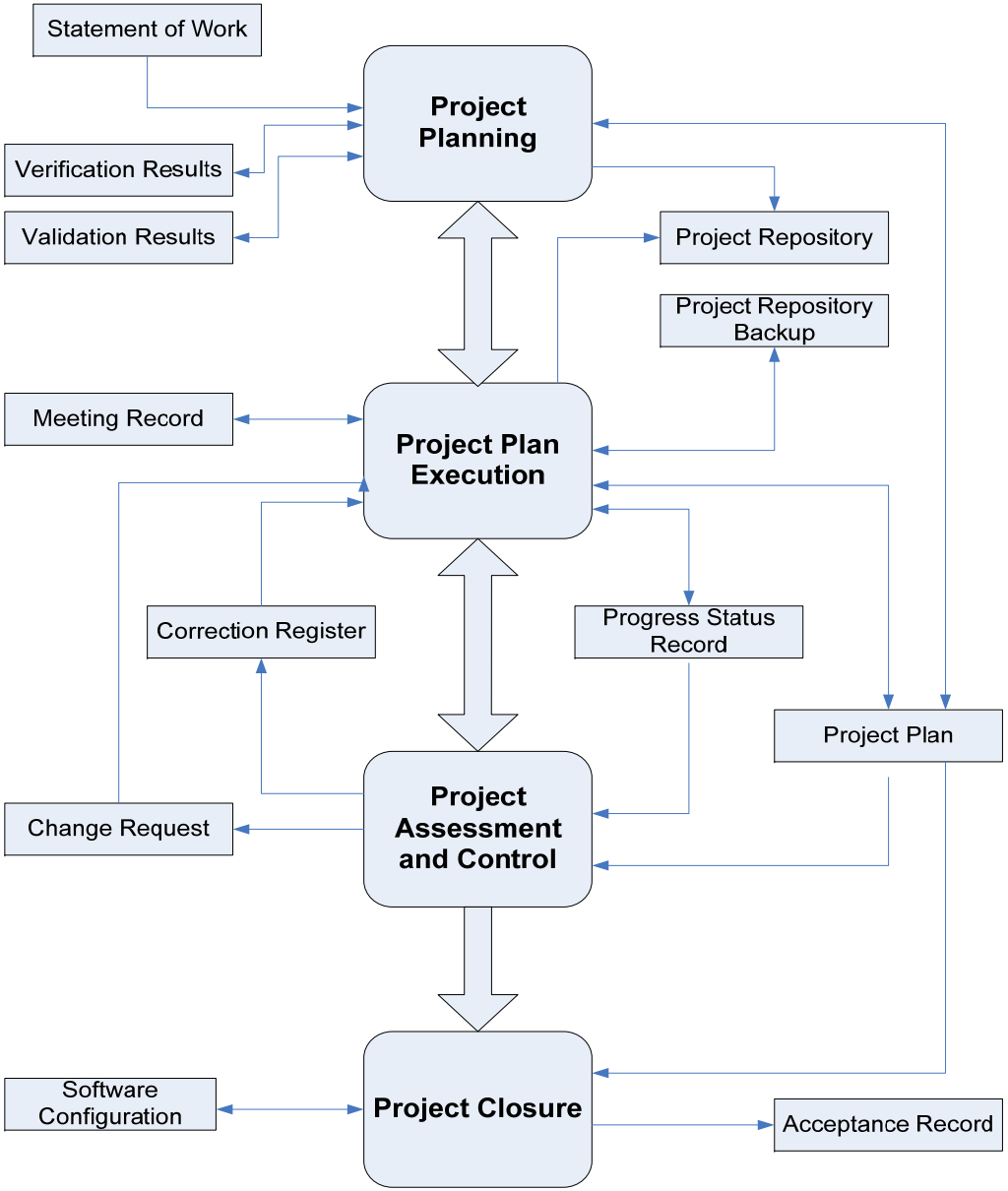
- **Purpose**
  - To establish and carry out in a systematic way the tasks of the software implementation project, which allows complying with the project's objectives in the expected quality, time and costs.
- **Seven Objectives**
  - **PM.O1.** The Project Plan for the execution of the project is developed 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.

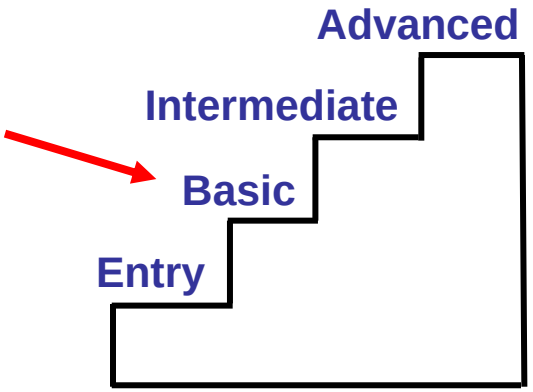
> *6.3.1 Project Planning Process*
>
> *a) the scope of the work for the project is defined;*
>
> *c) the tasks and resources necessary to complete the work are sized and estimated;*
>
> *d) interfaces between elements in the project, and with other project and organizational units, are identified;*
>
> *e) plans for the execution of the project are developed; and*
>
> *f) plans for the execution of the project are activated.*
>
> *6.3.7 Measurement Process*
>
> *a) the information needs of technical and management processes are identified.*
>
> *[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.

# Part 5 - Project Management Process – 4 Activities

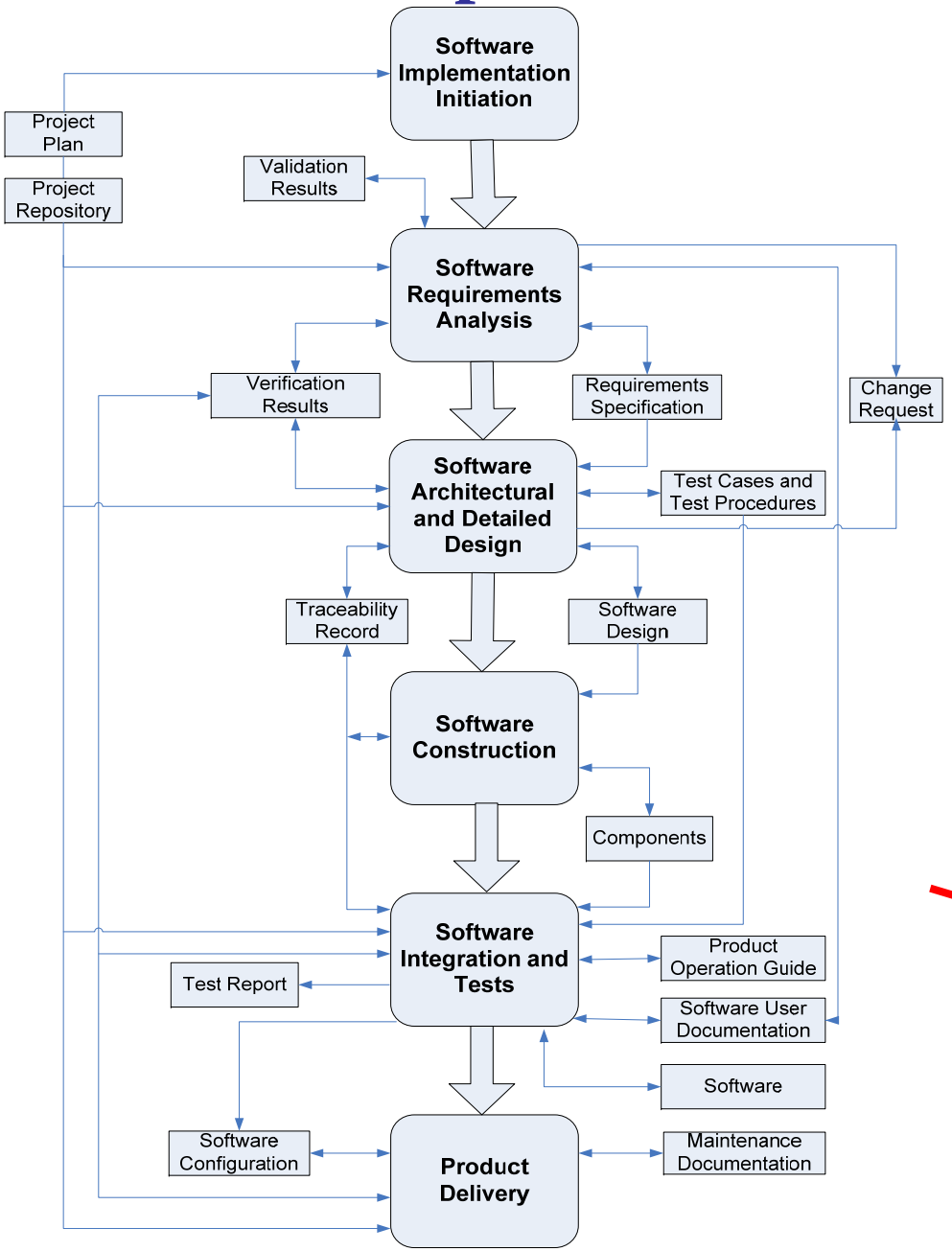


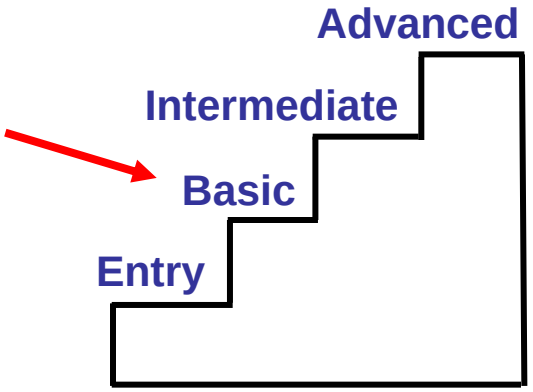



# Software Implementation (SI) Process – 7 Objectives

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

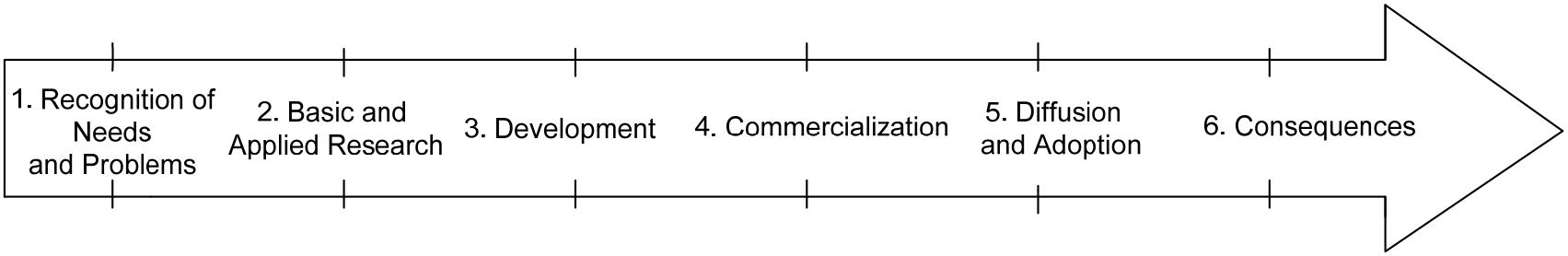


# Comments disposed by WG24

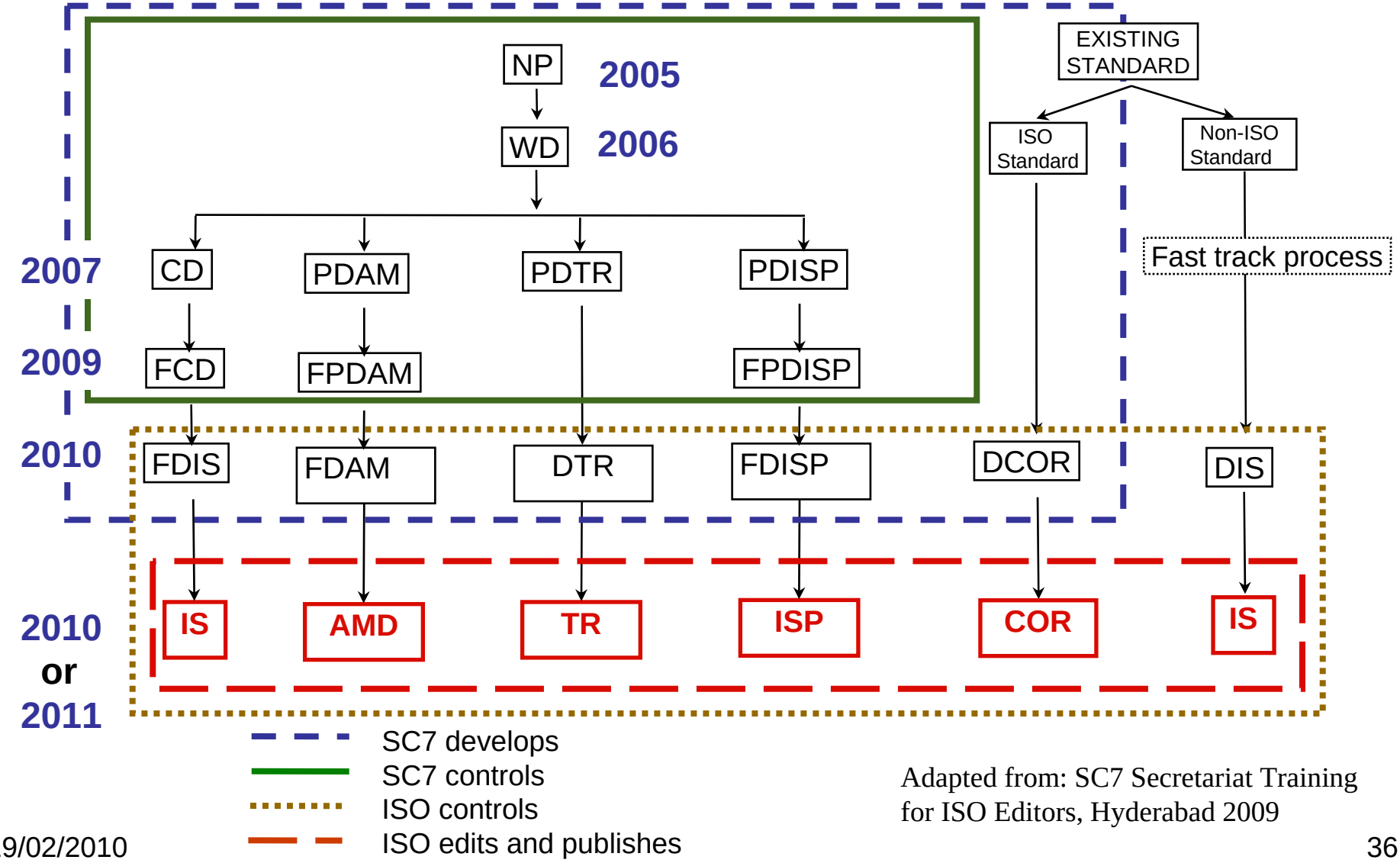
| Title of Document | Berlin 2008 | Mexico 2008 | Hyderabad 2009 | Lima 2009 | Total |
|---|---|---|---|---|---|
| TR 29110-1 Overview | 71 | 61 | 60 | 37 | 229 |
| IS 29110-2 Framework and Profile Taxonomy | 33 | 94 | 52 | 48 | 227 |
| TR 29110-3 Assessment Guide | 18 | 38 | 40 | 31 | 127 |
| IS 29110-4 Basic Profile Specification | 52 | 54 | 54 | 84 | 244 |
| TR 29110-5 Basic Profile Management and Engineering Guide | 63 | 208 | 53 | 98 | 422 |
| **Total** | **237** | **455** | **259** | **298** | **1249** |

# 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**
  - Development of the Means to Accelerate the Adoption and Utilization of International Standards by VSEs (2006 - )
- **Phase 6 - Consequences** (2010 - )

# ISO Standard Development Processes

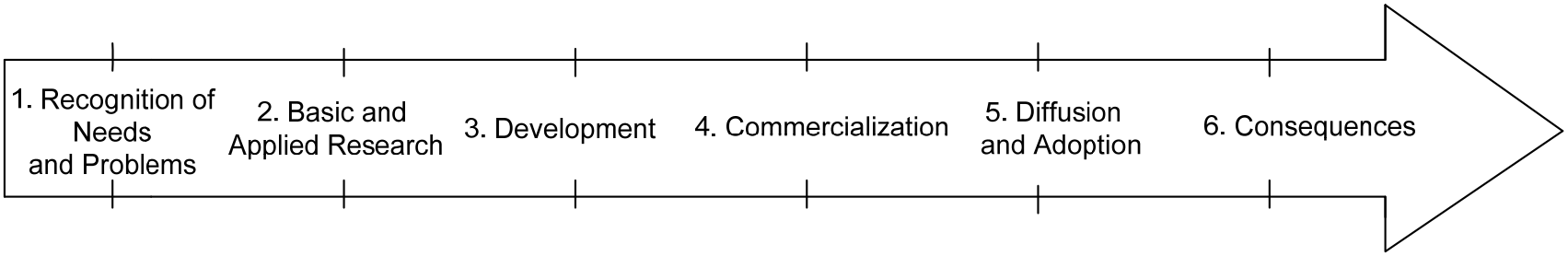



Adapted from: SC7 Secretariat Training for ISO Editors, Hyderabad 2009

# Publication by ISO and Diffusion/Adoption

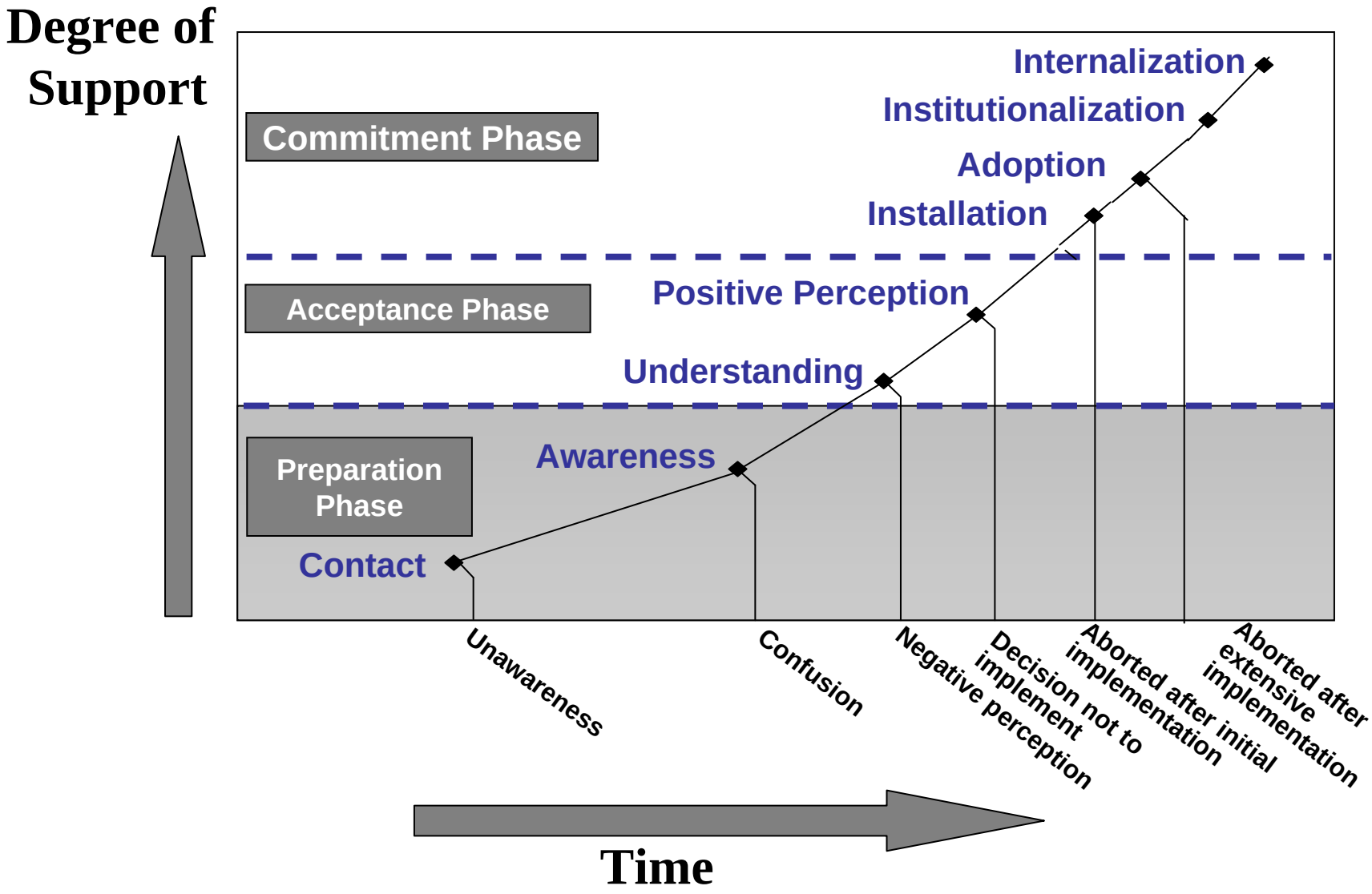
- **Commercialization begins when ISO publishes the Standard**
  - ISO Working Groups are not involved in commercialization
- **Needs of VSEs (from Survey)**
  - Not completely fulfilled with ISO/IEC 29110 Part 5 - Engineering and Management Guide
  - VSEs requested readily usable processes
- **The Concept 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



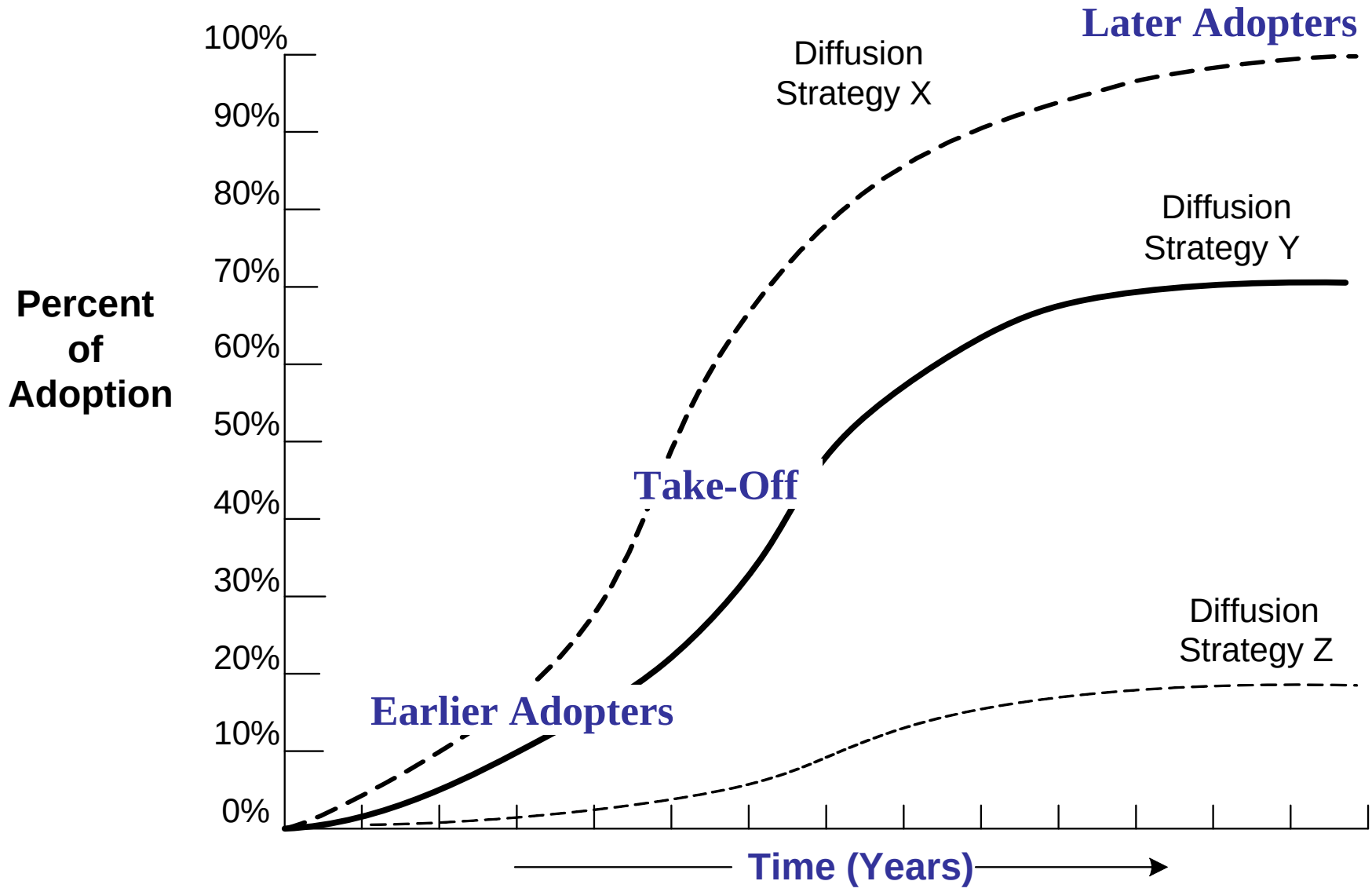

- **Phase 1 - Recognition of Needs and Problems (2004)**
- **Phase 2 - Basic and Applied Research (2005-2005)**
- **Phase 3 – Development (2006-2010)**
- **Phase 4 – Commercialization (2010)**
- **Phase 5 - Diffusion and Adoption (2006 - )**
  - Development of the Means to Accelerate the Adoption and Utilization of International Standards by VSEs (2006 - )
- **Phase 6 - Consequences (2010 - )**

# Commitment Curve and the Adoption of a Technology - Standard




Connor 1992

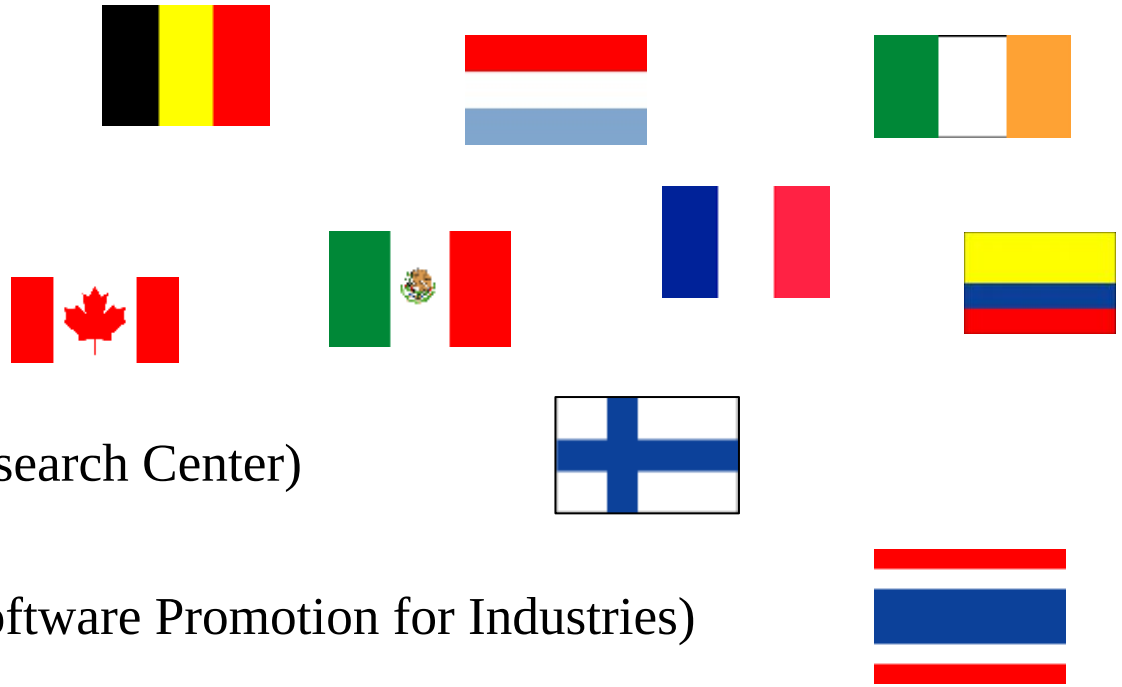
# Rate of Diffusion/Adoption



# 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

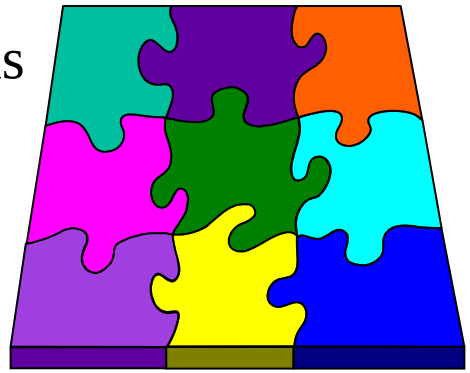
- Belgium (Cetic)
- Canada (ÉTS)
- Colombia (Parquesoft)
- Finland
- France (UBO)
- Ireland (LERO)
- Luxembourg (Tudor Research Center)
- Mexico
- Thailand (Institute of Software Promotion for Industries)



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.
  - A deployment package is not a complete process reference model. 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
  - Ana Vasquez (Mexico)
  - Claude Y Laporte (Canada)

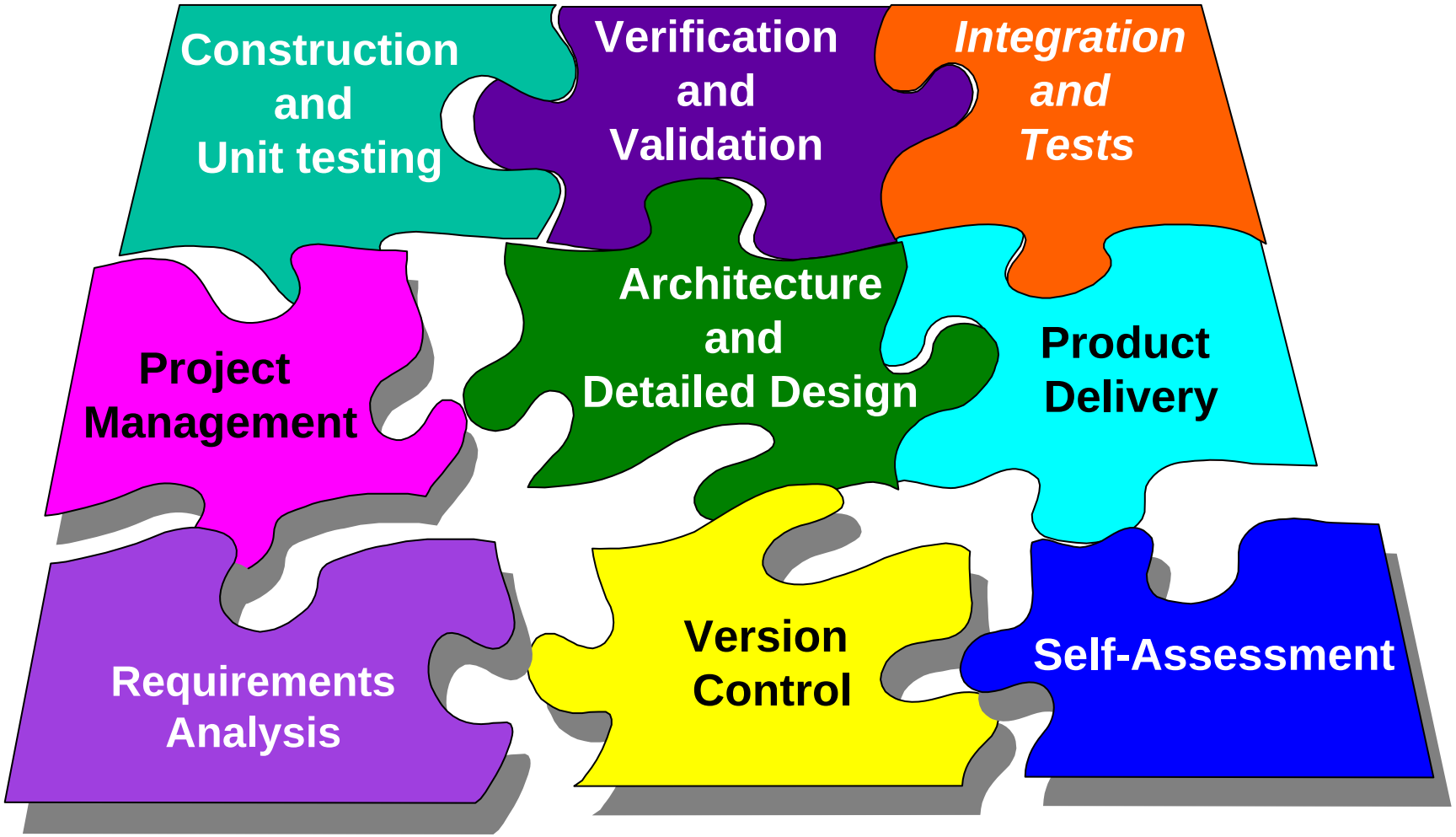


# Content of Deployment Packages

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
9. Reference to Standards and Models: ISO 9001, ISO/IEC 12207, CMMI
10. References
11. Evaluation Form

**Deployment Packages are free !**

# Deployment Packages for the Basic Profile



# Deployment Packages for the Basic Profile

| Title of Deployment Package | Developed by |
|---|---|
| Requirements Analysis | Belgium, Canada |
| Architecture and Detailed Design | Canada |
| Construction and Unit Testing | Mexico |
| Integration and Test | Columbia |
| Verification and Validation | Canada |
| Version Control | Thailand |
| Project Management | Ireland |
| Product Delivery | Canada, Thailand |
| Self-Assessment | Finland |

- **Additional DP**: Conduct of Pilot Projects DP (Canada, Uruguay) *

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

# 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:
    - Computer Aided Design, Computer Aided Manufacturing and Computer Aided Engineering.
  - 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 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 Canada - 1

- **Pilot Project 1 - Centre of Excellence in Neuromics of University of Montréal**
  - Research software allows students to perform various laboratory experiments to understand the functioning of the brain areas used for listening and recognition of sounds.
  - Development of their software process
- **Pilot Project 2 - Gemalto Company**
  - Security and cryptography Company
  - Pilot conducted by the Manager of Embedded System Development
    - Graduate student in Software Engineering
- **Pilot Project 3 – in 2 VSEs**
  - IT support VSE of 1 + 5 consultants
  - VSE of 5 with 1 IT staff
- **Pilot Projects 4 – in 1 VSE**
  - Project conducted at the Department of National Defense
  - Conducted by a Senior undergraduate student in software engineering of ETS

# Pilot Projects Underway in Canada - 2

- **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

# Pilot Projects Planned

- **Dominican Republic and Haiti**
  - Over 150 VSEs in Dominican Republic
  - Establish a software process engineering group to work in the adoption of ISO 29110 and implementation with Pilot Projects in VSEs.
  - Anticipated benefits to business
    - Growth in competitiveness, quality and new business opportunities as a result of adopting and deploying the ISO 29110 standard.
  - Anticipated benefits to education
    - Generate knowledge; create training programs and professional cathedras about software process improvements as a result of researches and deployments the new standard ISO26110 in both countries.
  - Anticipated benefits to employment
    - Creation of new job opportunities related to the new standard ISO29110 such as consultants, auditors, evaluators, and specialist in making rollout of the standard.
  - Intended Beneficiaries
    - At least 5 VSEs (software manufacturers) at the end of the pilot phase in Dominican Republic.
    - At least 5 VSEs for the rollout phase in Haiti.
    - At least 40 students and employees of VSEs in Dominican Republic and Haiti.
    - At least 10 new jobs opportunities in Dominican Republic and Haiti.
    - The academic and scientific community in Dominican Republic and Haiti.
  - Duration
    - A 4-phase project of about 12 months

# 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)
  3. Development of a Software engineering Process using ISO/IEC 29110 TR Part 5 – Engineering and Management Guide
  4. Software Development Using ISO/IEC 29110 TR - Engineering and Management Guide (Czech Republic)
  5. Self-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

# Development of a Public Web Site

- 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

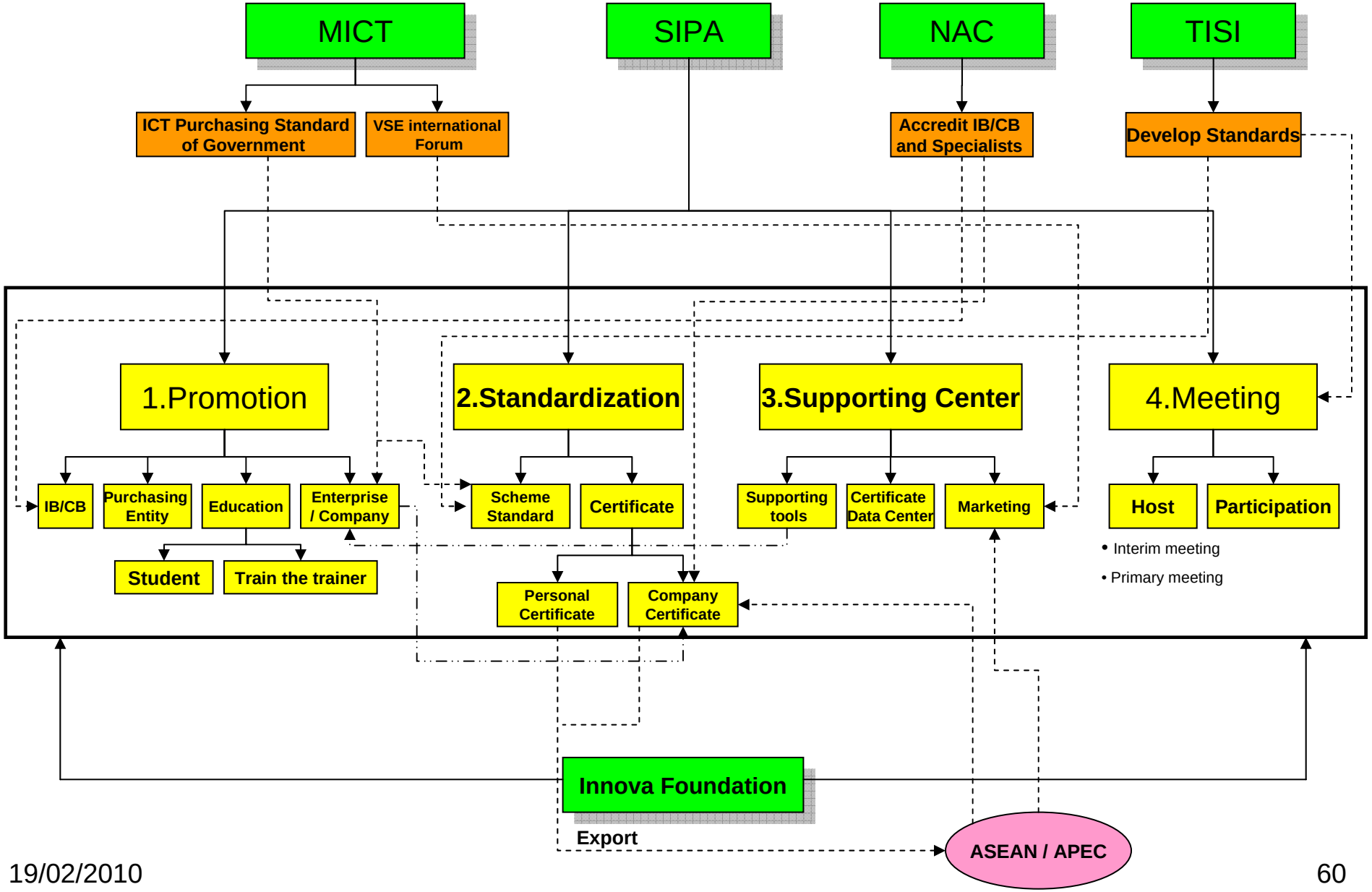
# Technology transfer center for VSEs at the ÉTS

- **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.

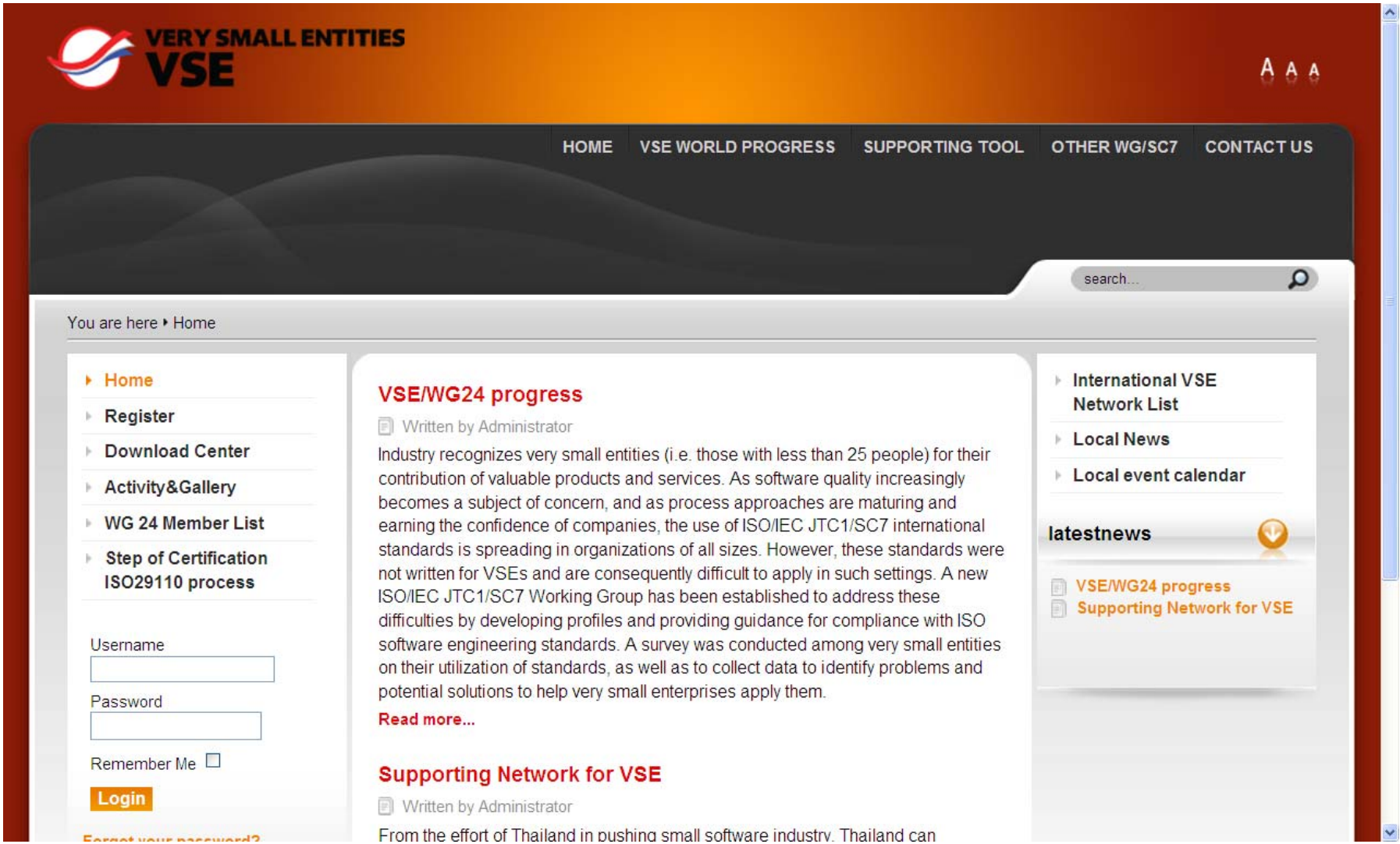
# Thailand and APEC/ASEAN Countries

- **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

# Thai Implementation of ISO/IEC 29110

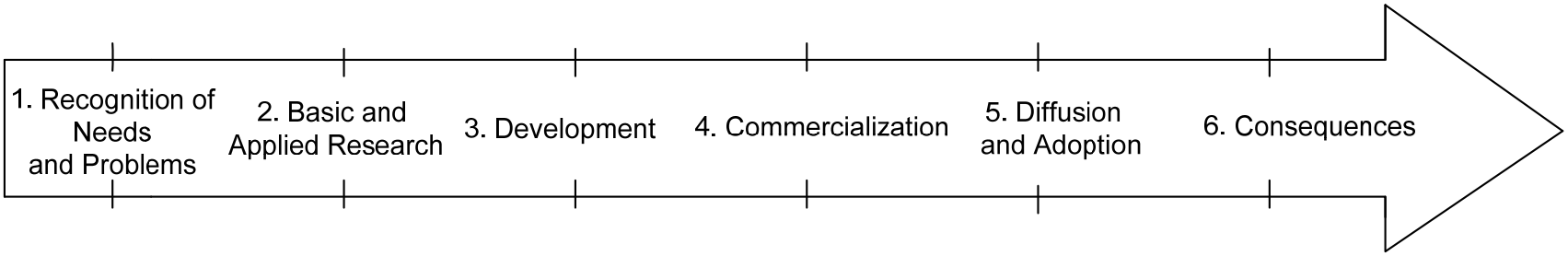


# Thai VSE support Web Site




www.center4vse.net

# Agenda



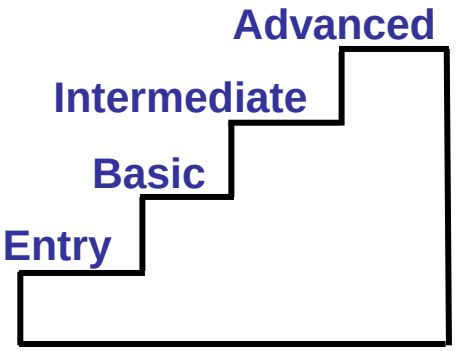

- **Phase 1 - Recognition of Needs and Problems (2004)**
- **Phase 2 - Basic and Applied Research (2005-2005)**
- **Phase 3 – Development (2006-2010)**
- **Phase 4 – Commercialization (2010)**
- **Phase 5 - Diffusion and Adoption (2006 - )**
- **Phase 6 - Consequences (2010 - )**

# 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

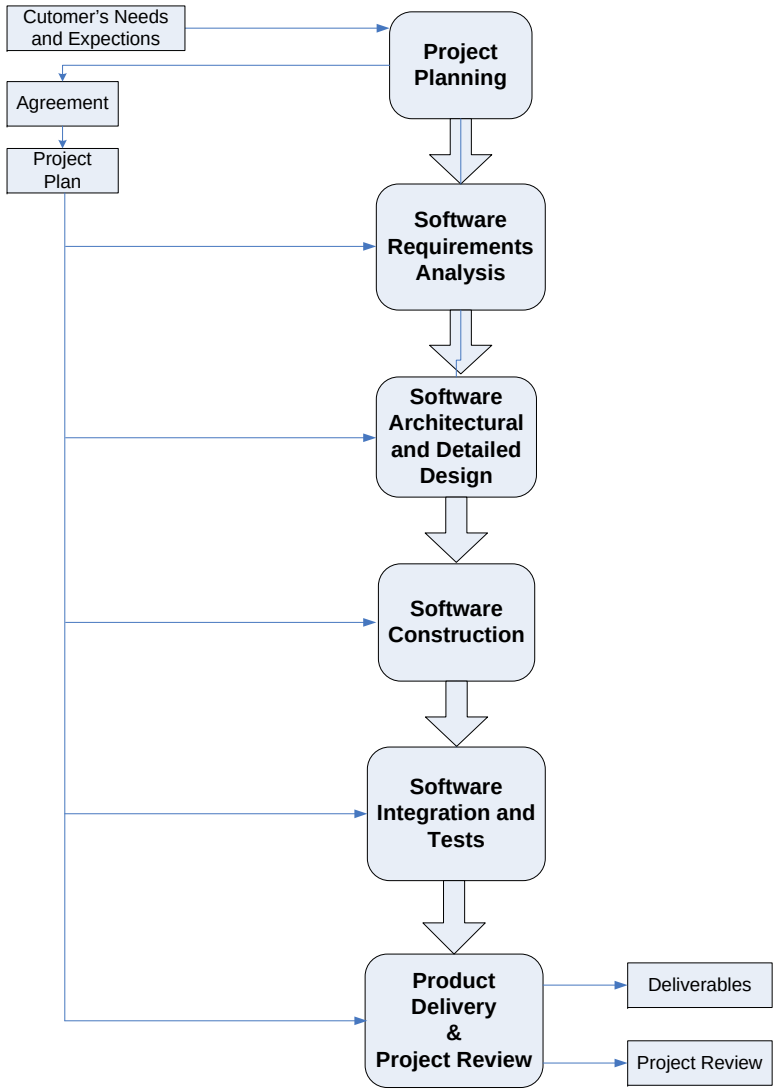
- Develop the remaining 3 profiles
  - **Entry**: six person-months effort or start-up VSEs *
  - **Intermediate**: Management of more than one project
  - **Advanced**: business management and portfolio management practices.




- 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

# Proposed Entry Profile

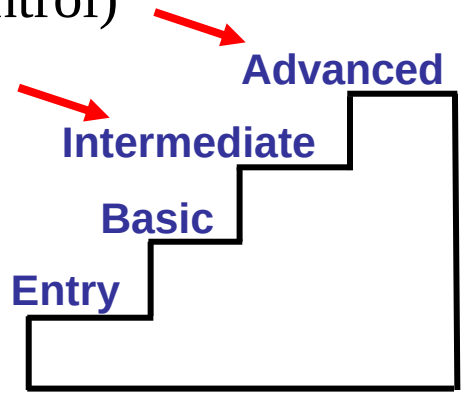
- **Processes**
  - **Project Planning and Monitoring Process**
    - Develop an agreement of product to develop
    - Develop a project plan
    - Monitor project status and perform reviews
  - **Software Development Process**
    - Analyze and Document the Requirement
    - Document the Design
    - Code and Test




* To be discussed at the WG24 meeting in Japan

# Intermediate and Advanced Profiles *

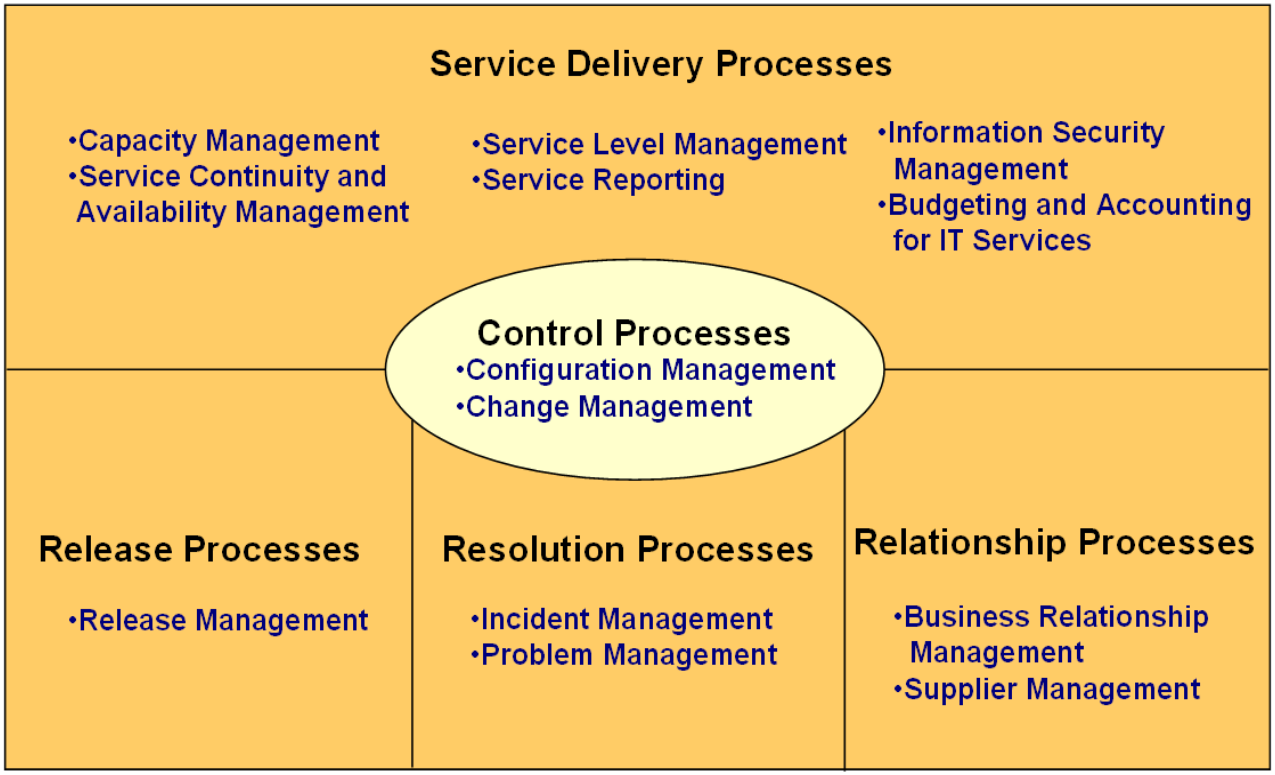
- **Intermediate Profile**
  - Management of more than one project
- **Advanced Profile**
  - Business Management
    - To help the VSE to grow its business: Portfolio management
- **Additional practices**
  - Quality assurance
  - Configuration management (e.g. versus version control)
  - Testing
    - Improved Integration and Acceptance testing
  - Other Practices
    - Supplier management
    - Measurement




* To be discussed at the WG24 meeting in Japan

# 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

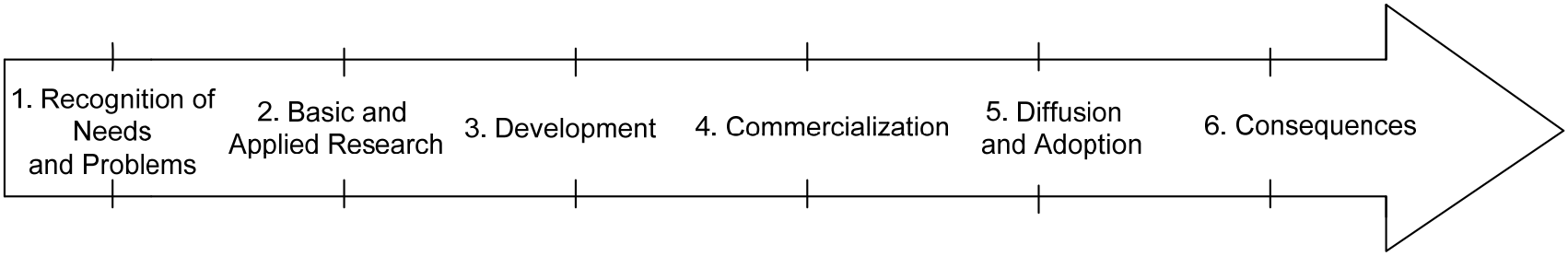
- International Council on Systems Engineering (INCOSE)
- Association Française d'ingénierie système (AFIS)

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

# 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 (2010 - )**

**Why**

**For Who**

**How**

**When**

**What**

**Who**

# References


- ISO/IEC JTC1/SC7 N3288, New Work Item Proposal – Software Life Cycles for Very Small Enterprises, Mai 2005.
- ISO/IEC 12207:2008, Information technology – Software life cycle processes, International Organization for Standardization/ International Electrotechnical Commission: Geneva, Switzerland.
- ISO/IEC 29110 - Lifecycle Profiles for Very Small Entities (VSEs) – Part 1: Overview. International Organization for Standardization/International Electrotechnical Commission: Geneva, Switzerland.
- ISO/IEC 15289:2006 - Systems and software engineering - Content of systems and software life cycle process information products (Documentation)
- Kabli, S., Conception, réalisation et mise a l'essai de trousses de déploiement pour faciliter et accélérer l'implémentation de la norme ISO/CEI 20000 par les très petites structures, ÉTS, 2009.
- Laporte, C.Y., Alexandre, S., O'Connor, R., A Software Engineering Lifecycle Standard for Very Small Enterprises, in R.V. O'Connor et al. (Eds.): EuroSPI 2008, CCIS 16, pp. 129–141.
- Long, L., The Critical Need for Software Engineering Education, Crosstalk - The Journal of Defense Software Engineering, January 2008, pp 6-10.
- Reifer, D., Industry Software Cost, Quality and Productivity Benchmarks. DACS Newsletter, Volume 7, Number 2, 2004
- Rogers, Everett M., Diffusion of Innovations, fifth edition, Free Press, New York, 2003.

# Contact Information

- **Claude Y Laporte**
  - **Voice: + 1 514 396 8956**
  - **E-Mail: Claude.Y.Laporte@etsmtl.ca**
  - **Web: www.logti.etsmtl.ca/profs/claporte**

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