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

THE IRISH SOFTWARE
ENGINEERING
RESEARCH CENTRE

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

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Computing Professionals 2010
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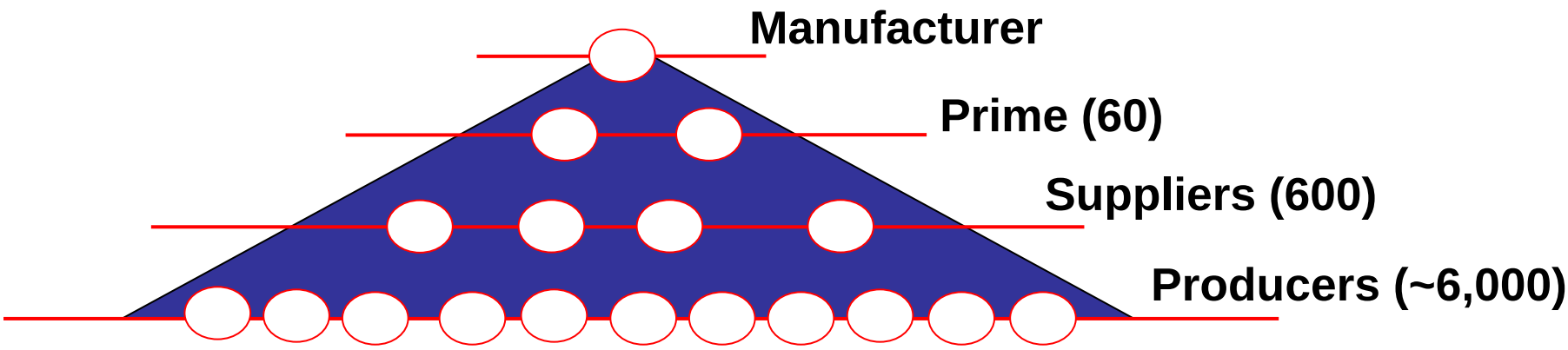
Agenda

- **Needs for Standards for Very Small Entities (VSEs)**
- **Establishment of ISO Working Group 24**
- **Approach used to Develop Standards for VSEs**
- **Accomplishments to Date**
- **Development of Diffusion/Adoption Mechanisms**
- **Next Steps**

VSEs = **V**ery **S**mall **E**ntities are enterprises, projects or departments having up to 25 people.

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

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

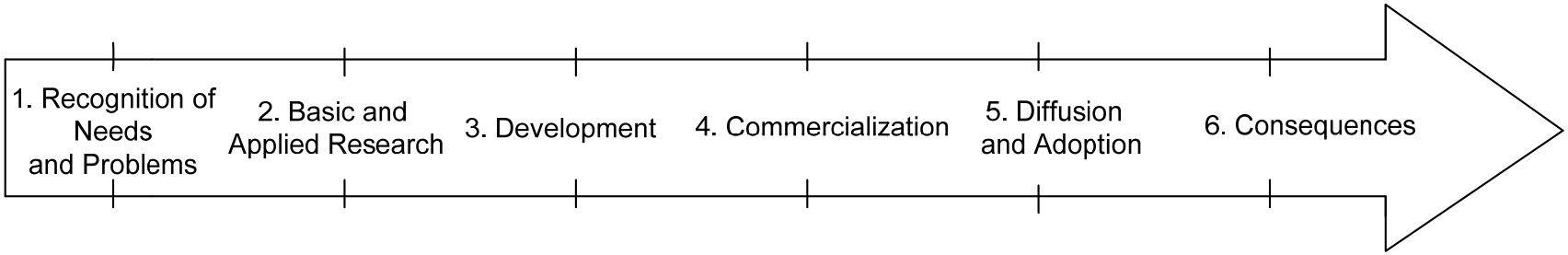
Size of Enterprises

- **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 %

(Gauthier 2004)

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**
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- **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 working group;
      - Prepare a Proposal for the next Plenary meeting in Finland (2005)

Hypothesis of the Special Interest Group

- **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.

Standards are often developed by large organisations for large organisations !

SE = Software Engineering

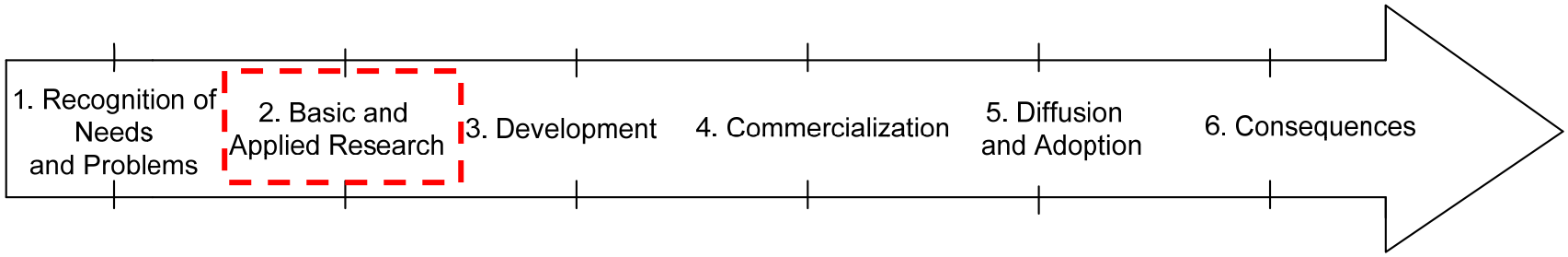
Establishment of Working Group 24

- **Two Workshops in Thailand – March/September 2005**
  - Sponsored by the Thai Industrial Standard Institute and the Thai Software Industry Promotion Agency,
  - Representatives of 10 countries
    - 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



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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

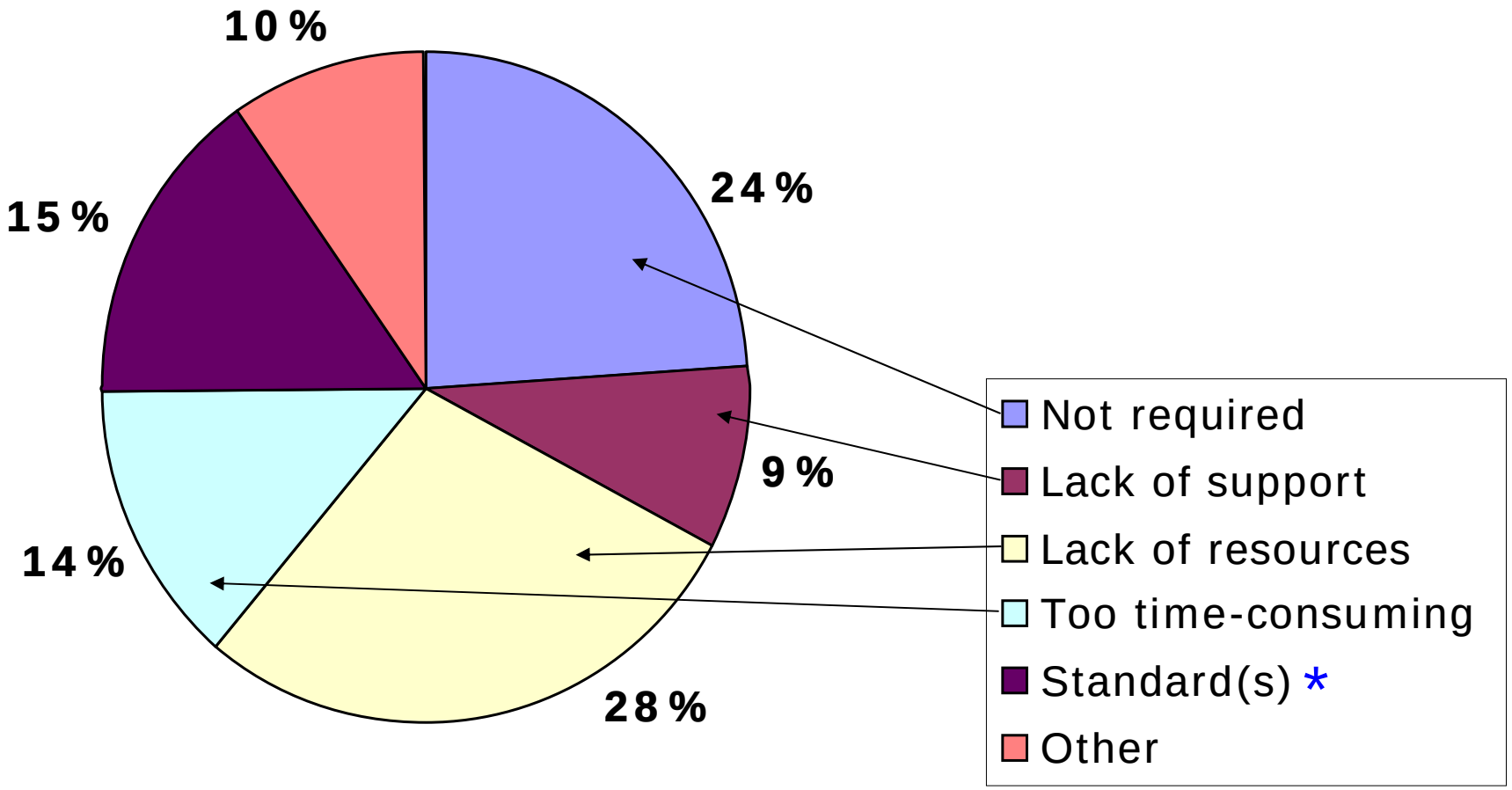
Survey of VSEs

- **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**
  - 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

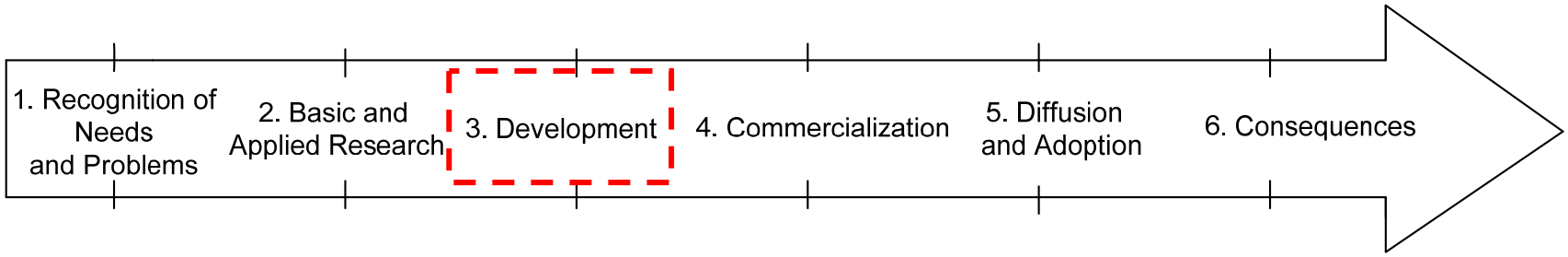
- **Needs Regarding Documentation/Support**
  - 62% were asking for more guidance and examples
  - 55% were requiring 'lightweight' standards that are easy to understand and apply
    - with templates

Subset of Requirements to Develop Standards for VSEs

- R02 - The set of workproducts should initially focus on lower levels of software engineering practices.
- R 08 - Use of the set of workproducts must be affordable.
  - i.e. consultant services should not be necessary.
- R 15 - The set of workproducts should provide the whole spectrum of documents
  - From standards to education material.
- R 33 - The set of workproducts should propose definition of documents.
  - e.g. templates (e.g. requirements templates - use cases)
- R 37 - The set of workproducts 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

(Moscow 2007)

Agenda



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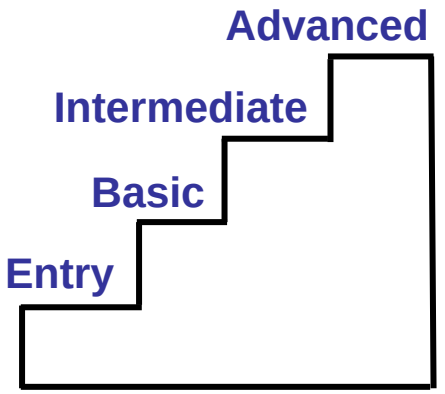
The Strategy of WG 24

- 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.
- 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
  - ISO/IEC 29110 - Lifecycle Profiles for Very Small Entities (VSEs)

The Generic Profile Group

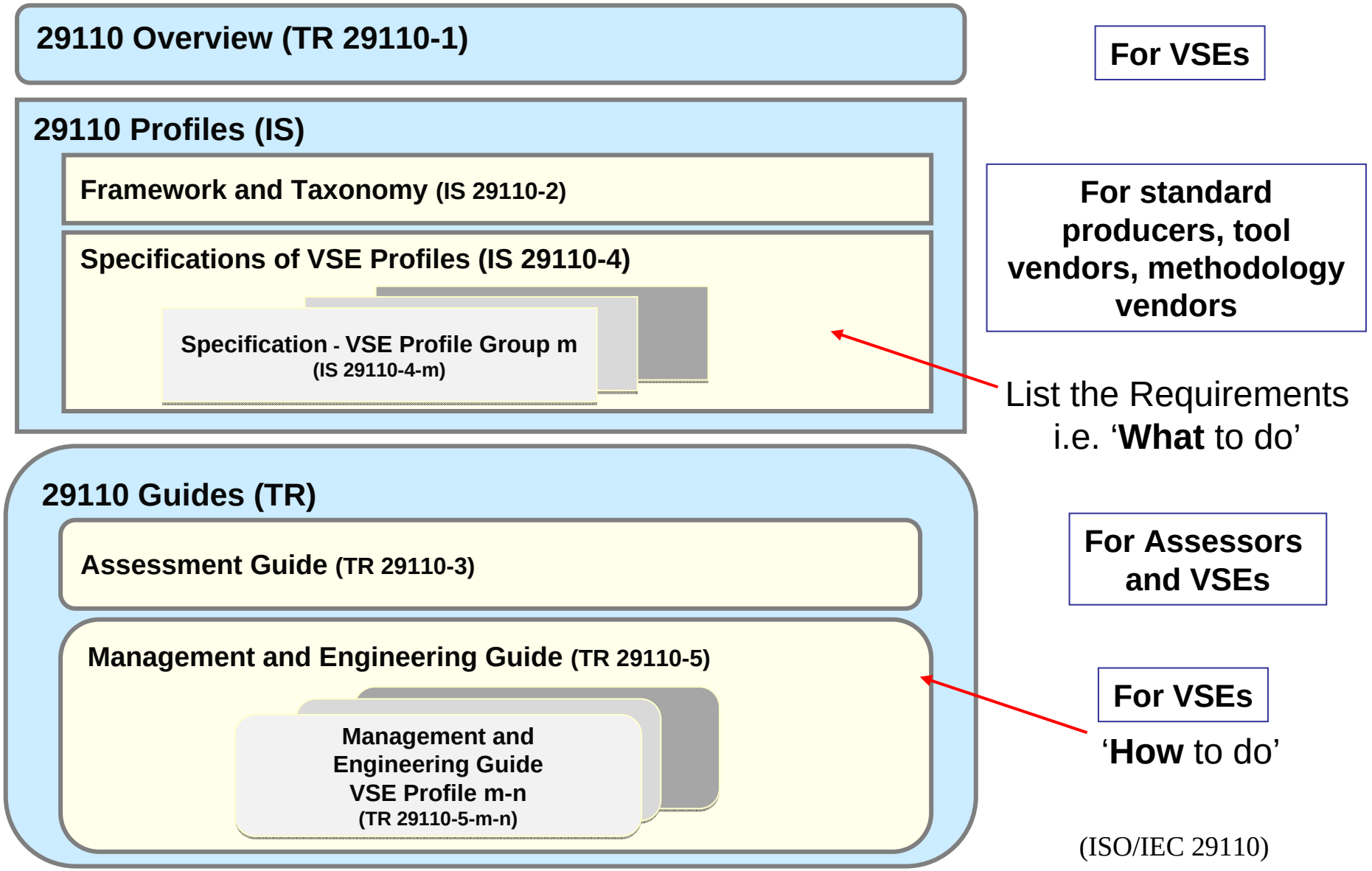
- **Four Profiles (within the Generic Profile Group)**
  - **Entry -** Targets VSEs typically developing 6 person-month projects or start-up VSEs;
  - **Basic -** Targets VSEs developing only one project at a time;
  - **Intermediate -** Targets VSEs developing more than one project at a time;
  - **Advanced -** Targets VSEs wishing to put in place business management practices and portfolio management practices.

Profile Group	Profile Name
Generic	Advanced
	Intermediate
	Basic
	Entry



(ISO/IEC 29110)

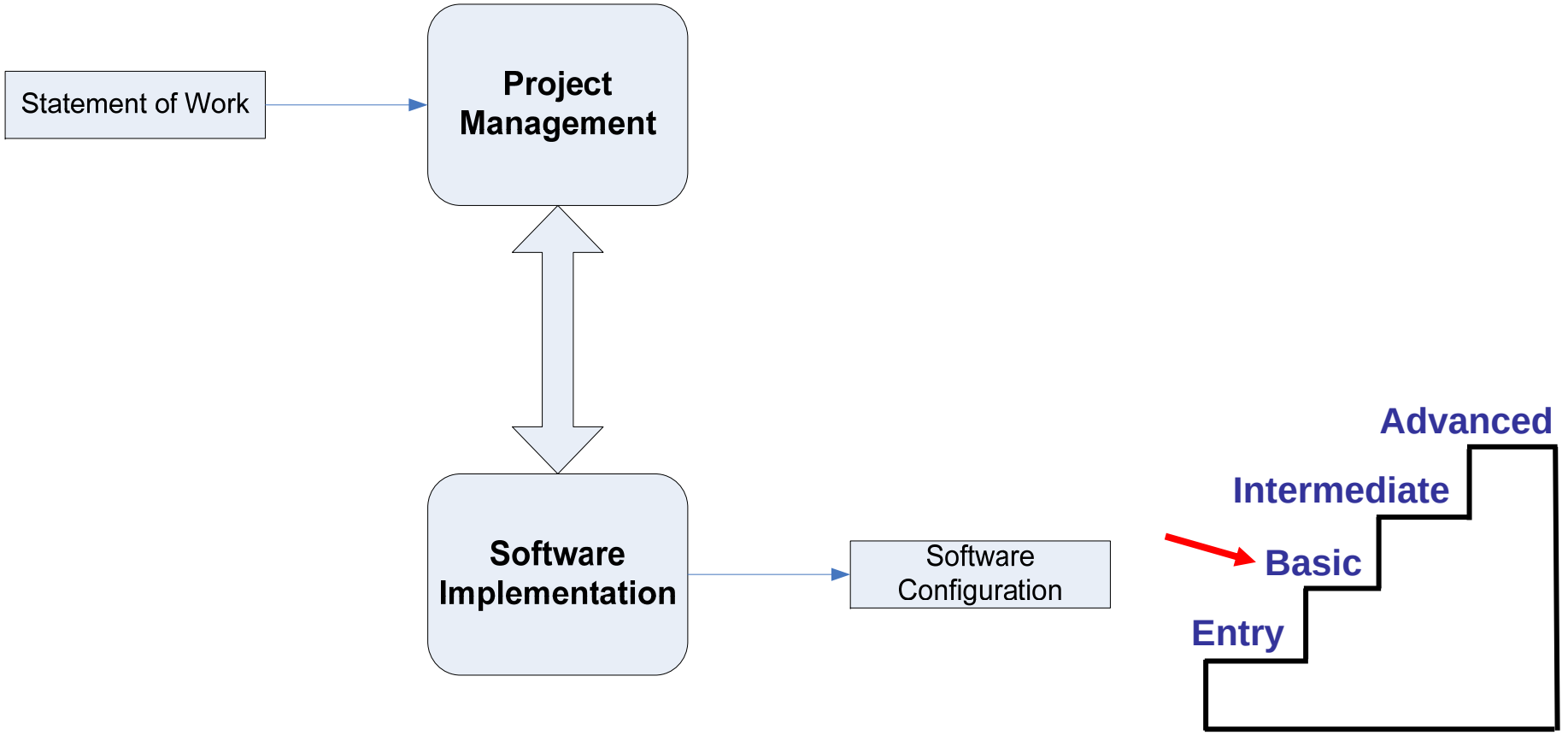
Set of 29110 Documents Targeted by Audience



Obtained approval from ISO to make TRs available at no cost

ISO/IEC TR 29110 Part 5 – Basic Profile

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



Process Structure Description

1. Name
2. Purpose
3. Objectives
4. Input Products
5. Output Products
6. Internal Products
7. Roles involved
8. Process Diagram
9. Activity Description
   - **Roles -** Abbreviation of roles involved in the task execution.
   - **Tasks -** 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)

Project Management 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**
  - **Objective 1:** 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

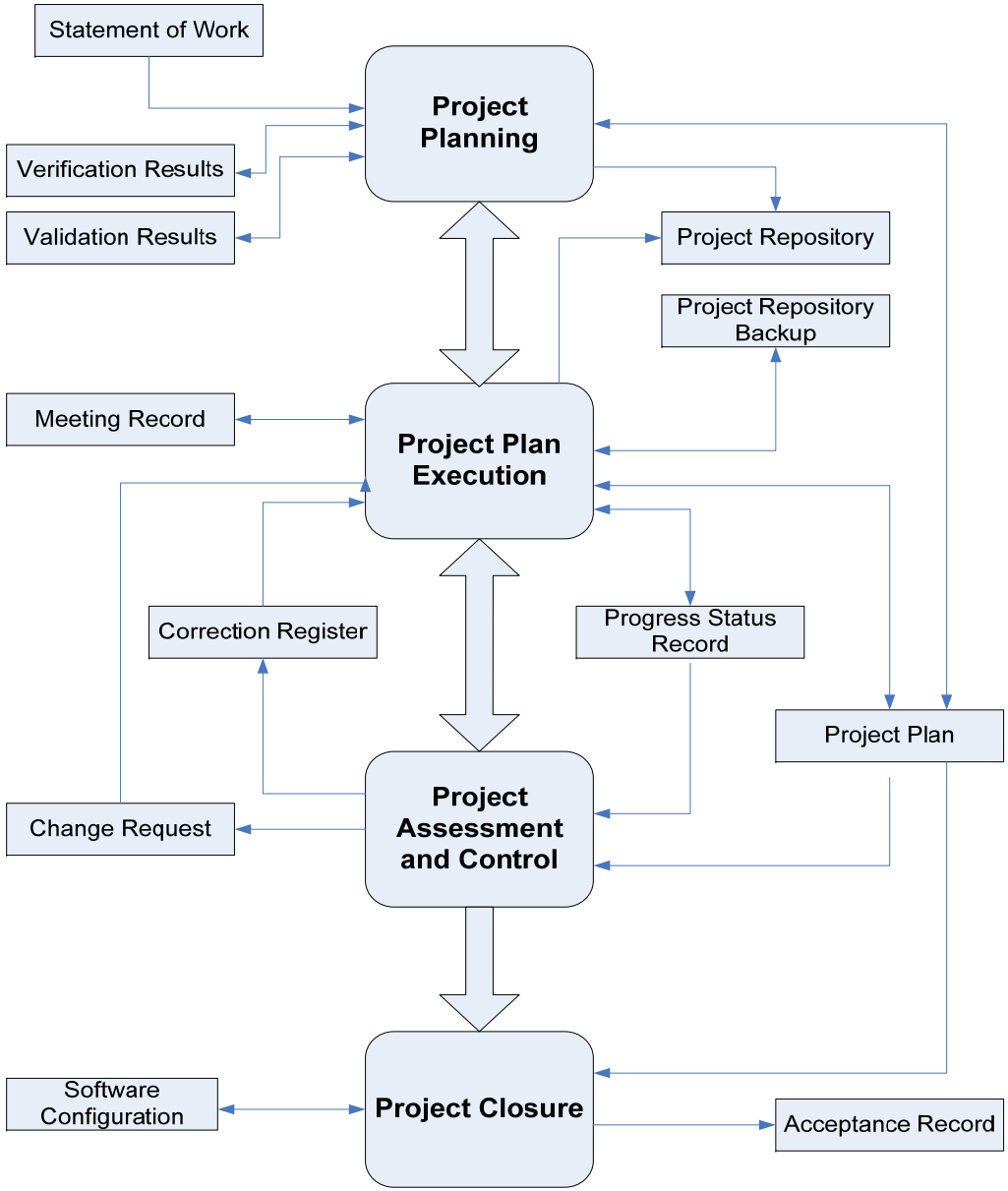
f) plans for the execution of the project are activated.

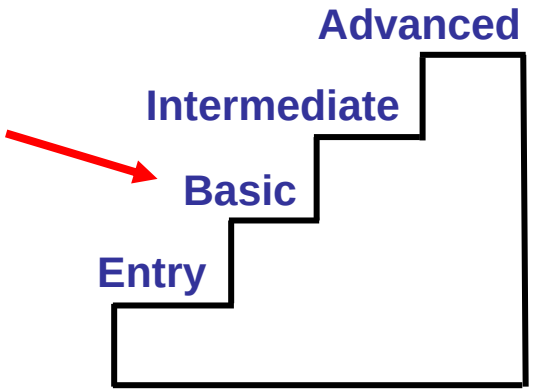
6.3.7 Measurement Process

a) the information needs of technical and management processes are identified.

[ISO/IEC 12207, 6.3.1, 6.3.7]

Part 5 - Project Management Process – 4 Activities





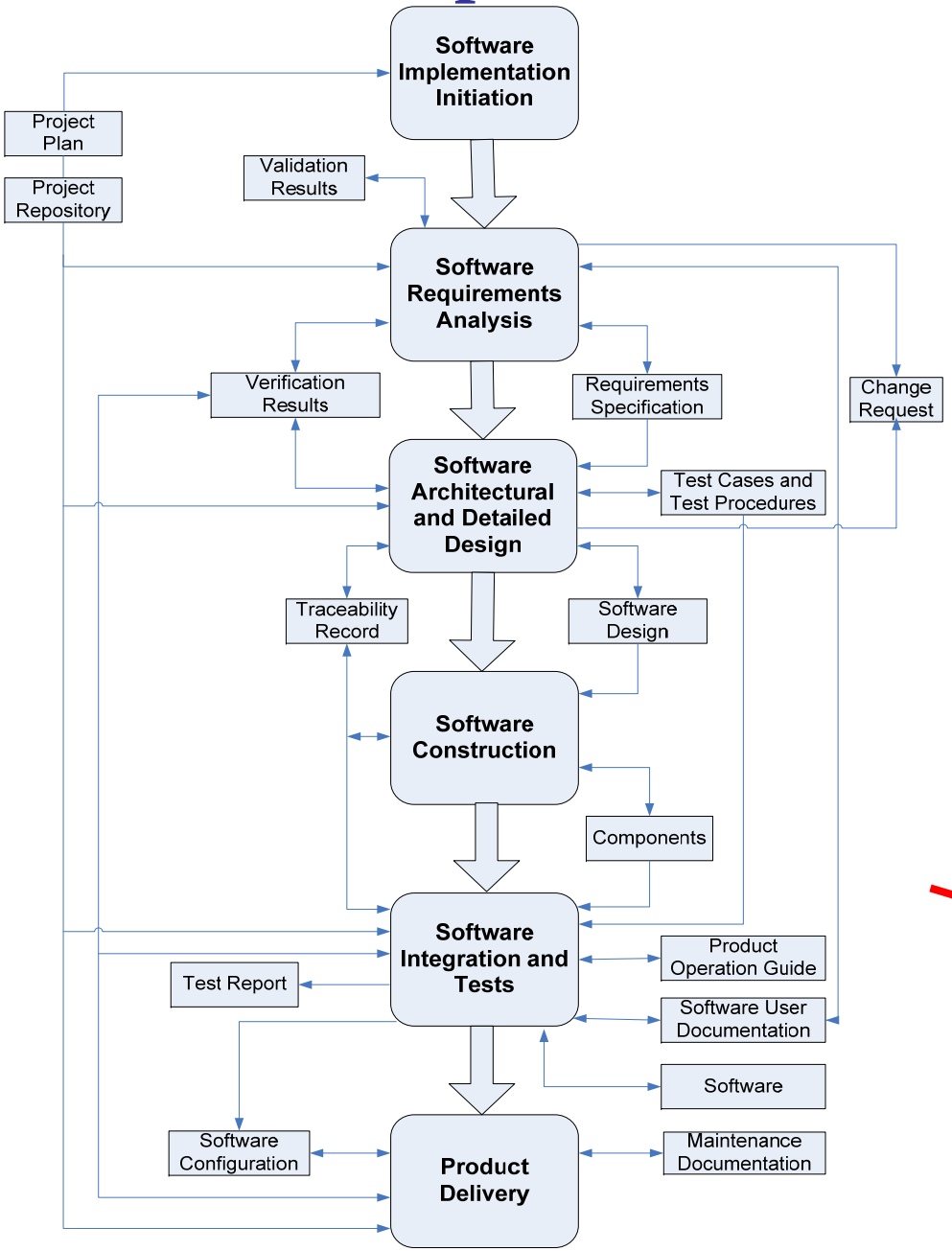
Software Implementation Process

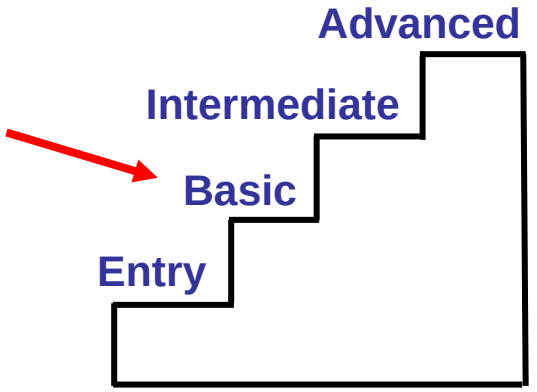
- **Purpose**
  - The systematic performance of the analysis, design, construction, integration and tests activities for new or modified software products according to the specified requirements.
- **Seven Objectives**
  - **Objective 1:** Software requirements are defined, analyzed for correctness and testability, approved by the Customer, baselined and communicated.

> ***6.4.1 Stakeholder Requirements Definition Process***
>
> *a) the required characteristics and context of use of services are specified.*
>
> ***7.1.2 Software Requirements Analysis Process***
>
> *a) the requirements allocated to the software elements of the system and their interfaces are defined;*
>
> *b) software requirements are analyzed for correctness and testability;*
>
> *f) the software requirements are approved and updated as needed; and*
>
> *h) the software requirements are baselined and communicated to all affected parties.*
>
> *[ISO/IEC 12207, 6.4.1, 7.1.2]*

(ISO/IEC 29110)

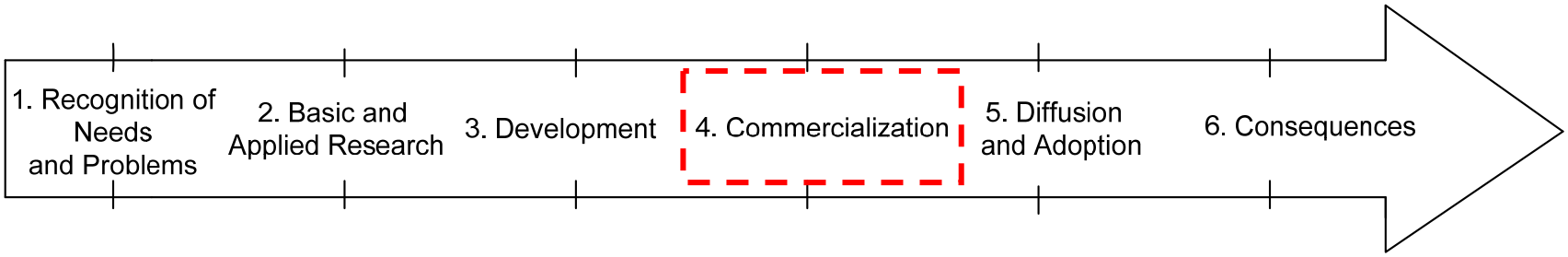
Part 5 - Software Implementation – 6 Activities





(ISO/IEC 29110)

Agenda



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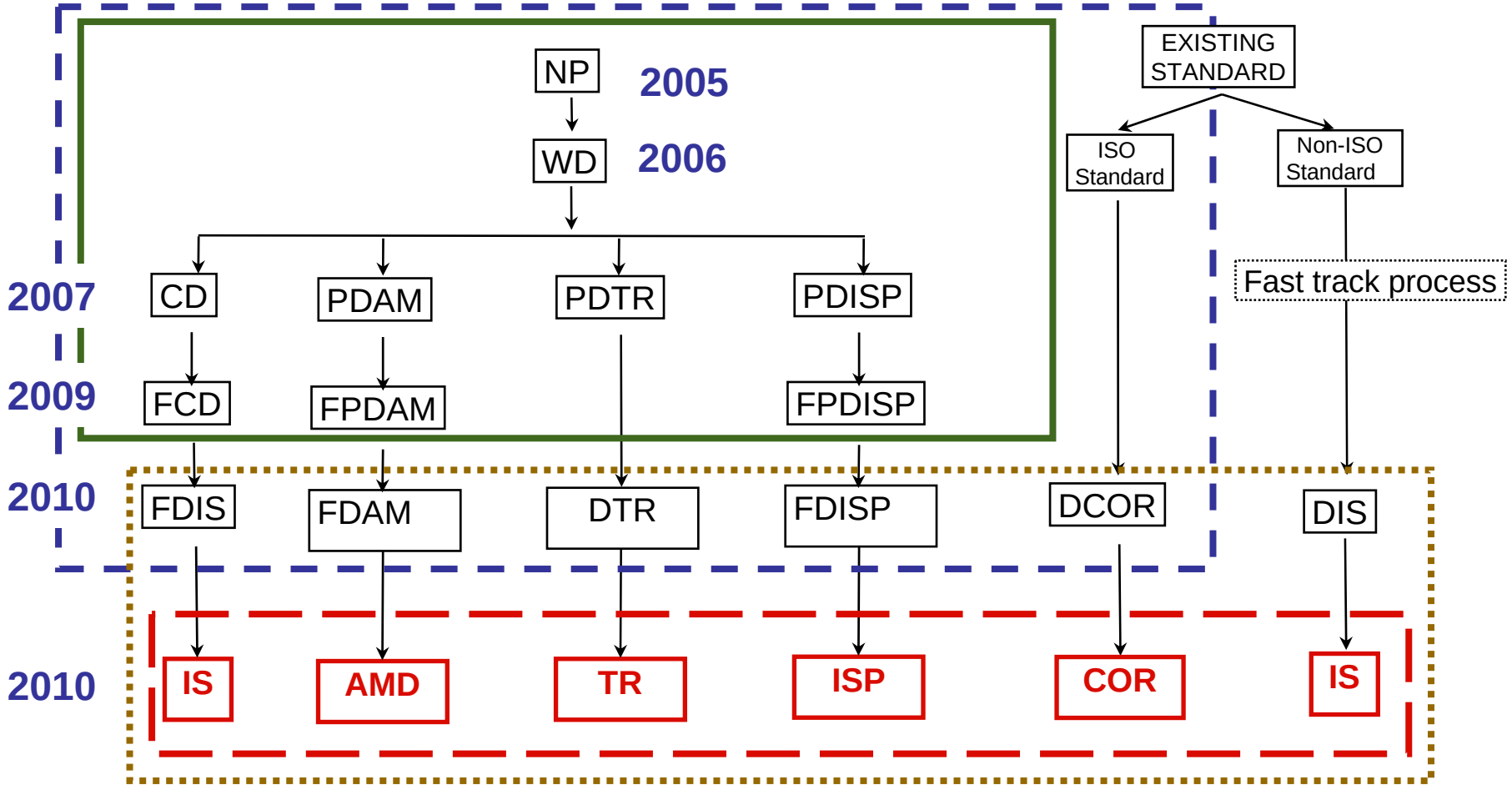
Comments Disposed by WG 24

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**

ISO Standard Development Processes

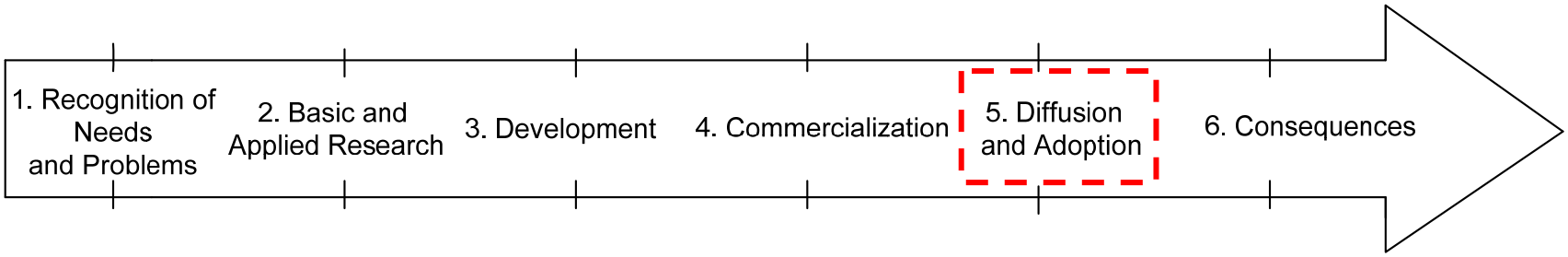


Adapted from: SC7 Secretariat Training for ISO Editors, Hyderabad 2009.

Publication by ISO and Diffusion/Adoption

- **Commercialization really begins when ISO publishes the 29110 Standards and Technical Reports**
  - 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 available at no cost
      - e.g. detailed process descriptions (steps), templates, checklists, etc.
  - Linked to ISO/IEC 29110 Part 5 - Annex A

Agenda



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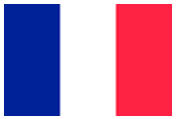
Network of Support Centers for VSEs

- **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)

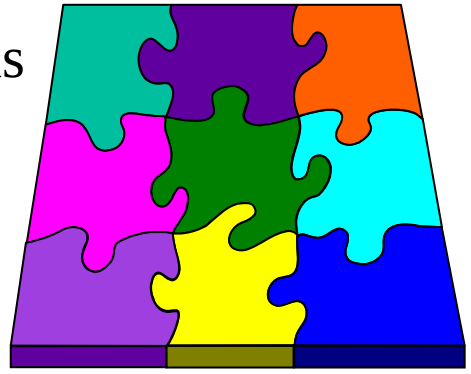





Deployment Packages (DPs)

- 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

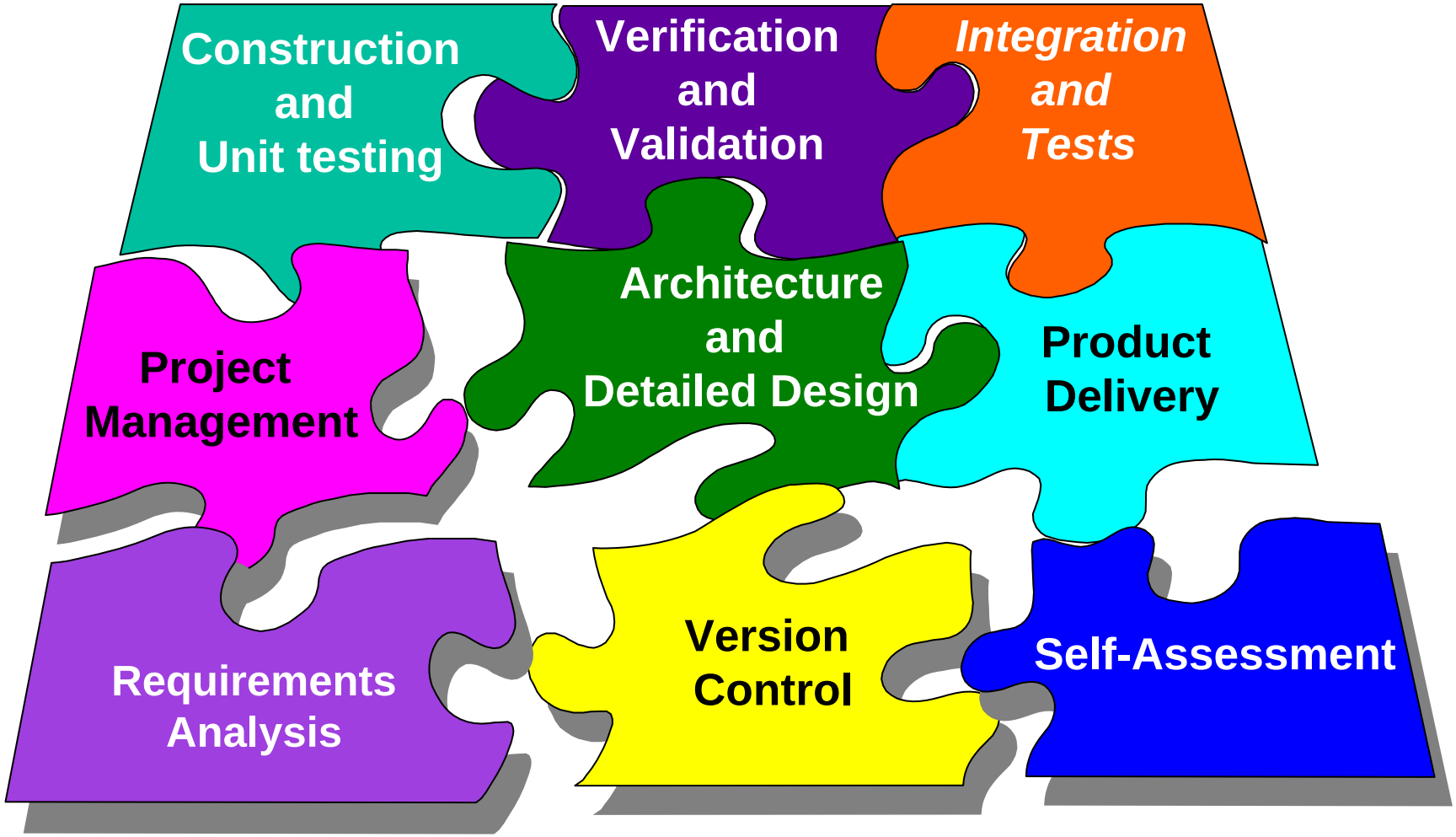


Content of Deployment Packages

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 12207, CMMI
10. References
11. Evaluation Form

Deployment Packages are free

Deployment Packages for the Basic Profile



- **Additional DP**: Select and Conduct of Pilot Projects

Pilot Project Support

- **Deployment Package**
  - To provide tailorable and usable guidelines and materials in order to select and conduct pilot projects in VSEs.
    - 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
- **Support Tools for the Pilot Project 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.

Education Interest Group

- Concept: Deployment Packages for Educators
- 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 standards 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)

Public Web Site

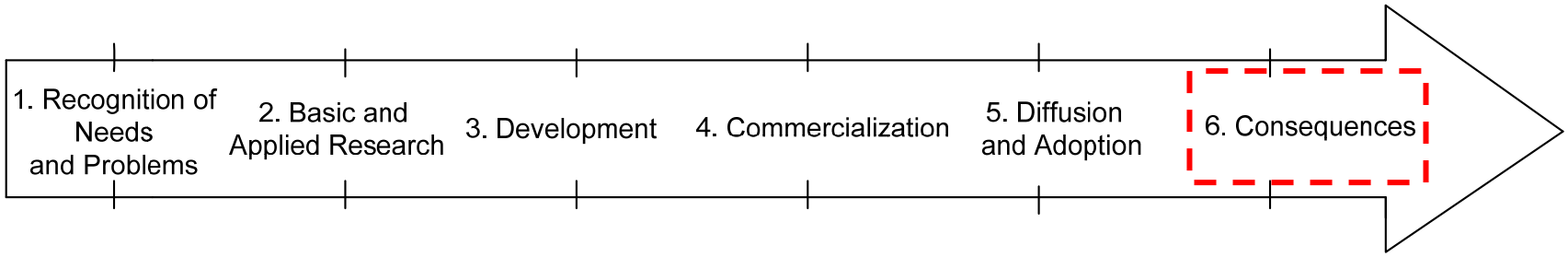
- Members of WG24
- Introduction
- Survey of VSEs
- Network of Centers
- Deployment Packages
- Pilot Projects
- Education Material
- Publications

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

Thailand and APEC/ASEAN Countries

- **Thailand**
  - **Budget**
    - 1,000,000 $ over 3 years
  - **Strategy**
    - ISO 29110 as a standard in Thailand within 2 years after publication by ISO
  - **Outcomes**
    - 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 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

Agenda



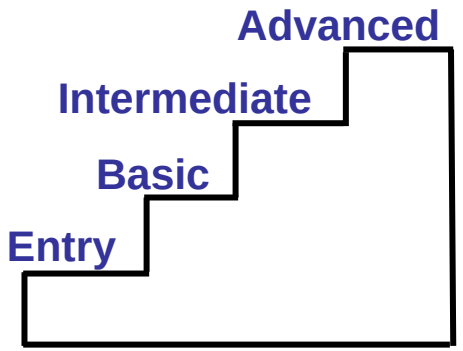
- **Phase 1 - Recognition of Needs and Problems (2004)**
- **Phase 2 - Basic and Applied Research (2005-2005)**
- **Phase 3 – Development (2006-2010)**
- **Phase 4 – Commercialization (2010)**
- **Phase 5 - Diffusion and Adoption (2006 -)**
- **Phase 6 - Consequences (2010 -)**

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

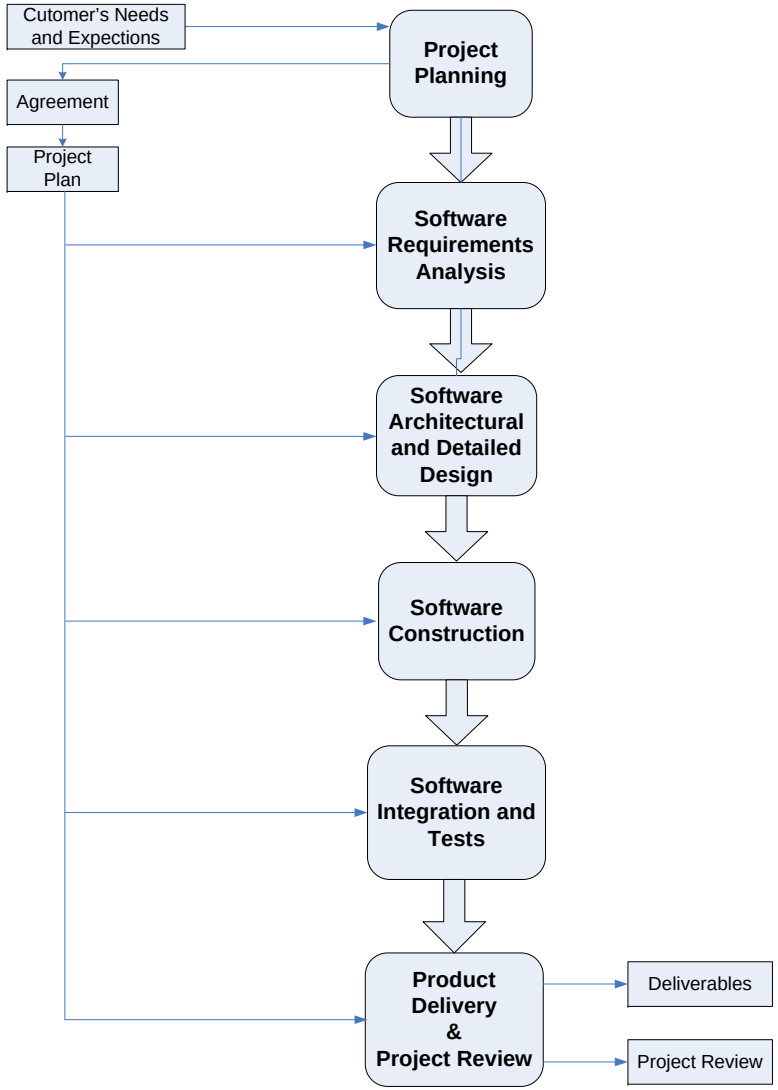
- **Develop the remaining 3 profiles**
  - **Entry**: Six person-months effort or start-up VSEs
  - **Intermediate**: Management of more than one project
  - **Advanced**: business management and portfolio management practices.



- **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

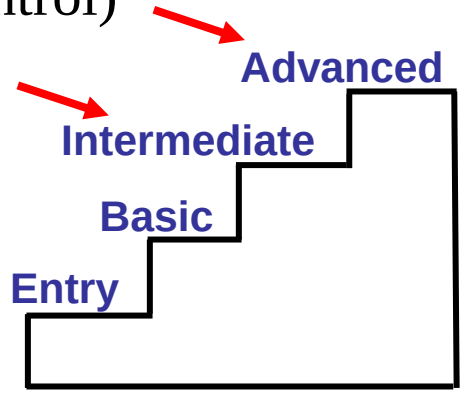
- **Processes**
  - **Project Planning and Monitoring Process**
    - Develop an agreement of product to develop
    - Develop a project plan
    - Monitor project status and perform reviews
  - **Software Development Process**
    - Analyze and Document the Requirement
    - Document the Design
   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



To be discussed at the WG24 meeting in Japan in May 2010

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



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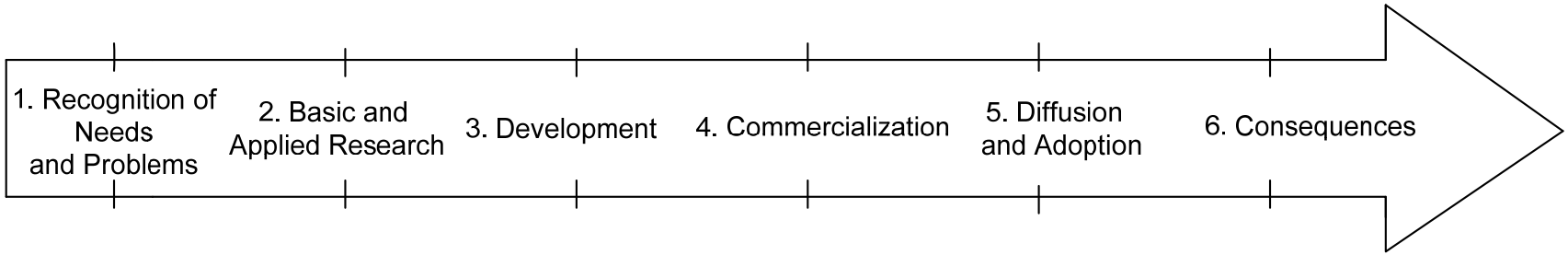
Conclusion



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Why

For Who

By Who

How

When

What

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  - **Web: www.logti.etsmtl.ca/profs/claporte**

- **Public site of WG 24**
  - **Access to deployment packages, presentation material and articles:**
    - http://profs.logti.etsmtl.ca/claporte/English/VSE/index.html

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