

# IMPLEMENTATING INTEGRATION OF QUALITY STANDARDS CMMI AND ISO 9001 : 2000 FOR SOFTWARE ENGINEERING

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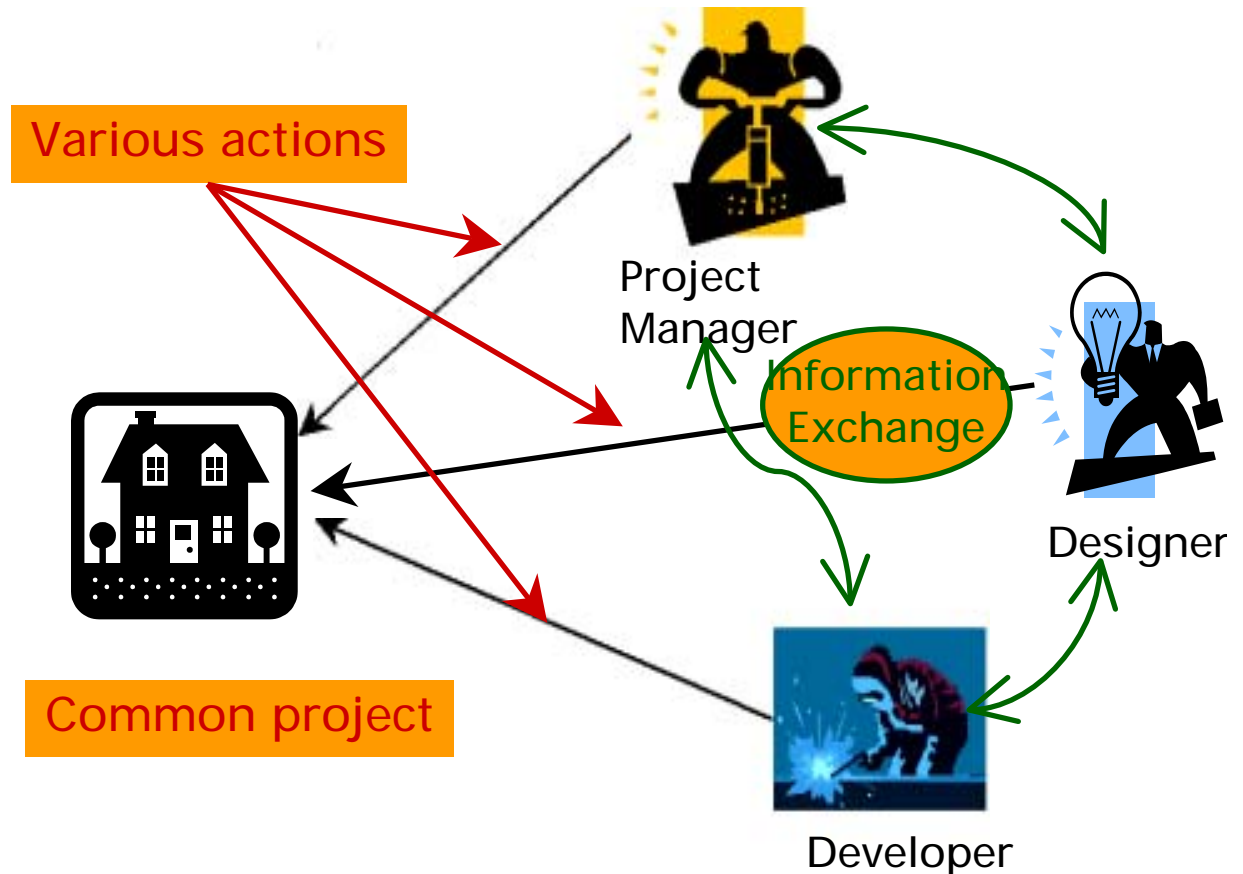
## Summary

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- Context and objectives
- Quality Models and standards
- The integration model proposed
- Case study : Implementation of the reference frame
- Conclusion and perspectives

## Context

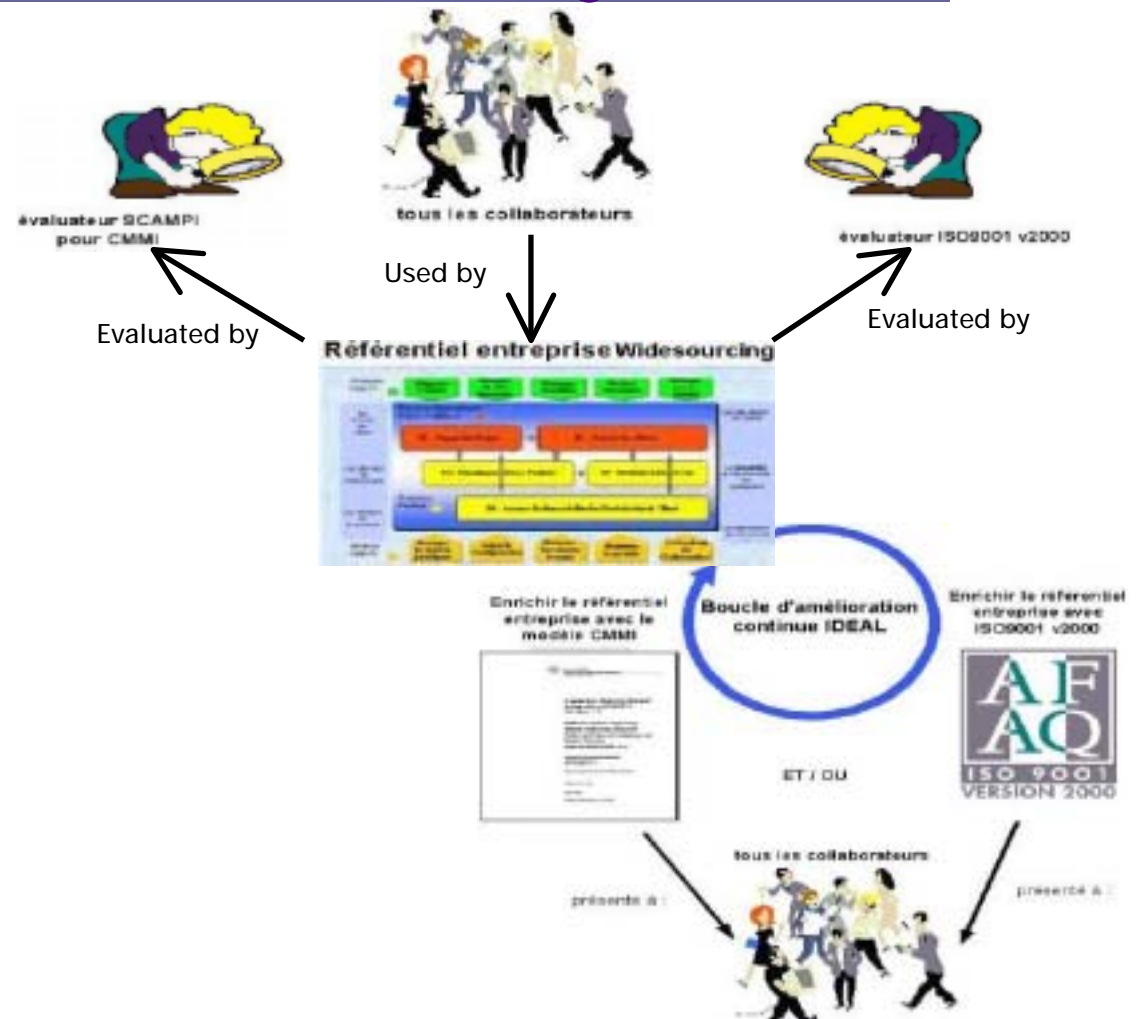
- ▣ Products/Projects more and more complex
- ▣ Need to deliver products better, faster and cheaper
- ▣ Actors participating to the project:
  - Many actors (manager, developers, designers...)
  - Difficulties to exchange information and organize projects.



# Objectives

□ A reference frame, which :

- Integrates the recommendations of different quality standards.
- Allows the evaluation of these quality standards.
- Is easily usable by all employees.
- Is easily exploitable in an organizational improvement approach.



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- Context and objectives
- Quality Models and standards
  - Quality standards and corpus of knowledge
  - CMMI
  - ISO 9001 : 2000
- The integration model proposed
- Case study : Implementation of the reference frame
- Conclusion and perspectives

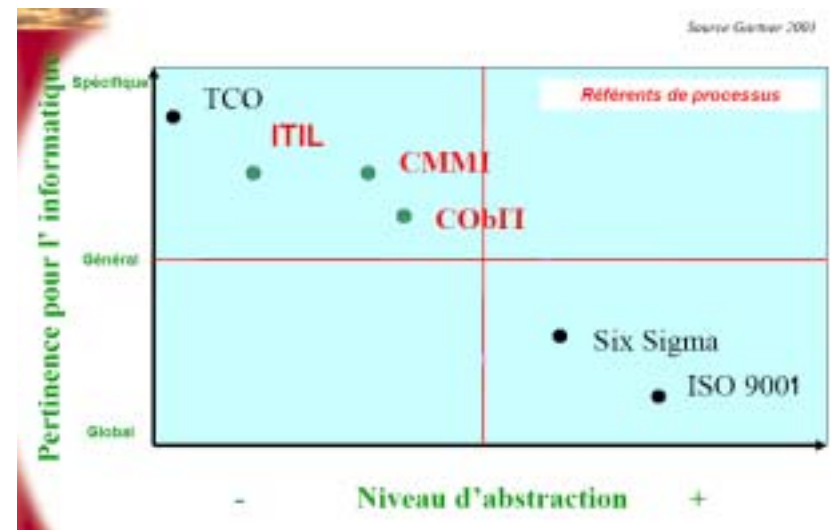
# Quality standards and Corpus of knowledge

## □ Quality standards :

- General:
  - ISO
  - Six sigma
- Software engineering specific:
  - COBIT
  - ITIL
  - CMMI

## □ Corpus of knowledge:

- PMBoK of PMI : provides the fundamentals of project management.
- SWEBoK of IEEE : defines knowledge areas within software engineering



## CMMI

- Capability Maturity Model Integration (CMMI) consists of best practices that address product development and maintenance and cover the product's cycle life
- CMMI integrates old models:
  - SE (Systems Engineering), SW (Software), SS(Supplier Sourcing) and IPPD (Integrated Product and Process Development)
- CMMI regroup 25 "Process Area" (PA)



# CMMI staged representation

- A roadmap for sequencing the implementation of groups of process areas
- Five maturity levels
- Each level provides the foundation for further improvements





# CMMI continuous representation



- ❑ The same basic information as the staged representation, just arranged differently
- ❑ It allows the organization to focus on improving the performance of specific areas according to business goals and objectives



# ISO 9001 : 2000

## □ ISO 9001:2000 “Quality management systems – Requirements”:

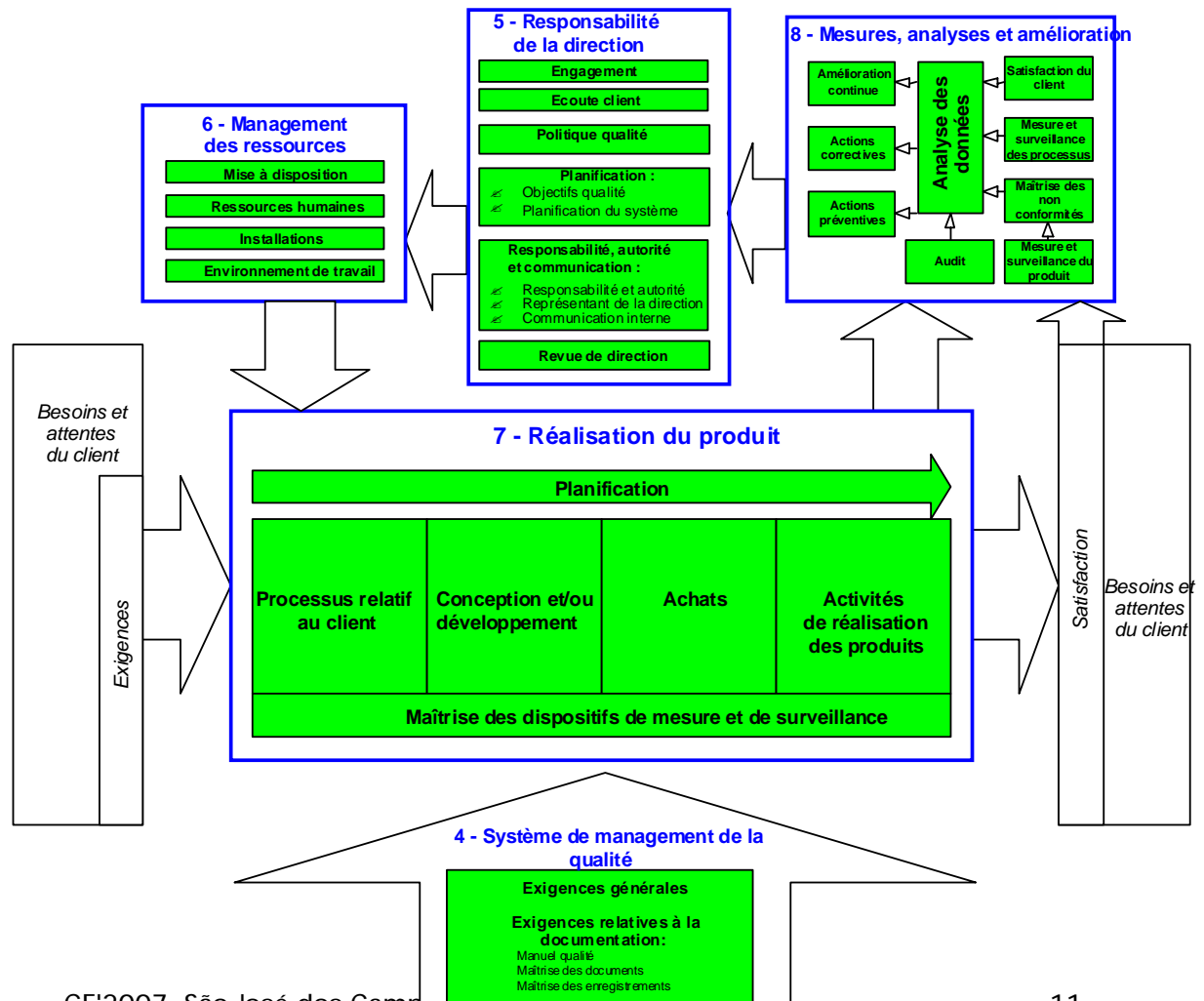


- It intended for use in any organization which designs, develops, manufactures, installs and/or services any product or provides any form of service.
- It provides a number of requirements which an organization needs to fulfil if it is to achieve customer satisfaction through consistent products and services which meet customer expectations.

# ISO 9001 : 2000

## □ Requirements

- Section 4: *General Requirements*
- Section 5: *Management Responsibility*
- Section 6: *Resource Management*
- Section 7: *Product Realization*
- Section 8: *Measurement, analysis and improvement*



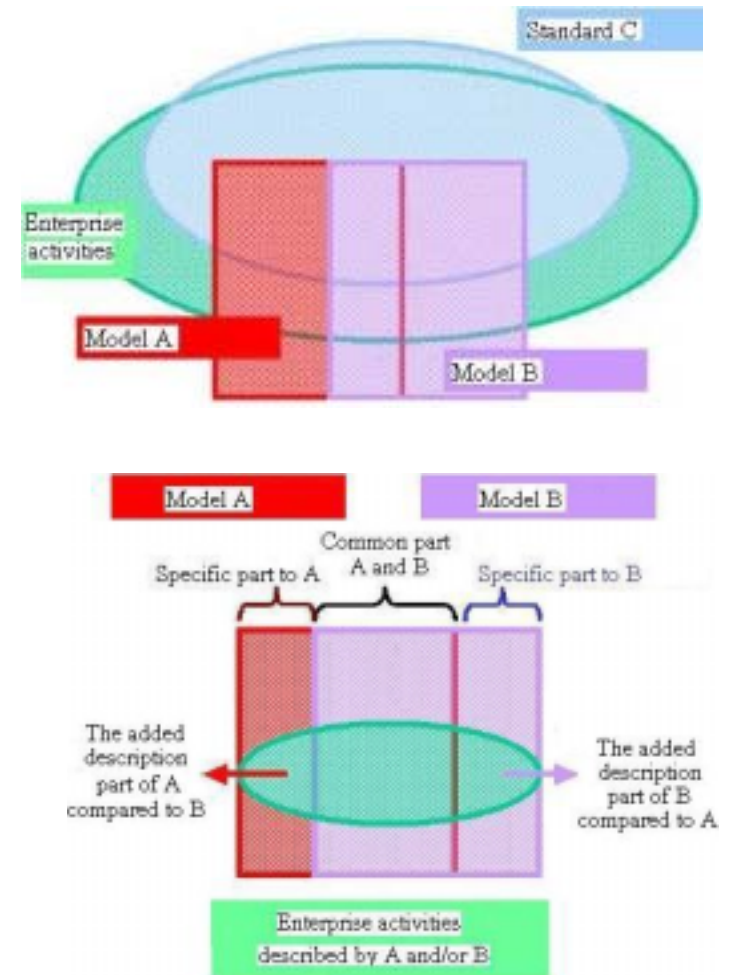
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  - Model description
  - The multi-model approach
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# Model description

- Each quality model, standard and corpus of knowledge describes a part of company activities with its own scope, level of precision and specificity.
- Generally, we find within two models the description of common and specific activities to each model. These two descriptions can be implemented or not in enterprise activities.



# The multi-model approach

- We propose four steps in our multi-model approach to integrate different quality models:

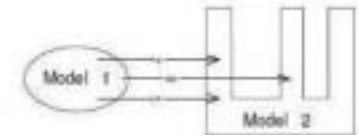
- Models choice
- Analysis of models synergy
- Construction of integrated model
- The adaptation of the integrated model to the enterprise context

## Multi-model approach

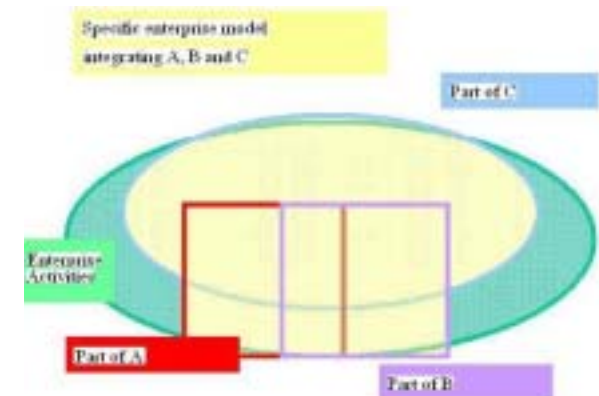
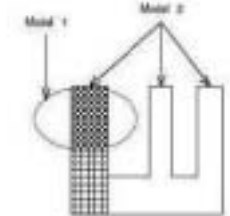
- Step 1: Models choice



- Step 2: Analysis of models synergy



- Step 3: Construction of integrated model





## Step 1 : Models choice

### The multi-model approach:

- **Models choice**
- Analysis of models synergy
- Construction of integrated model
- Adaptation of the integrated model to the enterprise context

- ▣ What are objectives and requirements? Increase customer satisfaction, productivity...
- ▣ What are envisaged models? CMMI, ISO 9001 : 2000, ITIL...
- ▣ Which the budget? X\$...
- ▣ What are resources? Young people experimented ones, consultants, significant number...



We can determine coherence between considered models and enterprise needs and resources. This step permits us to choose the adequate models to implement.

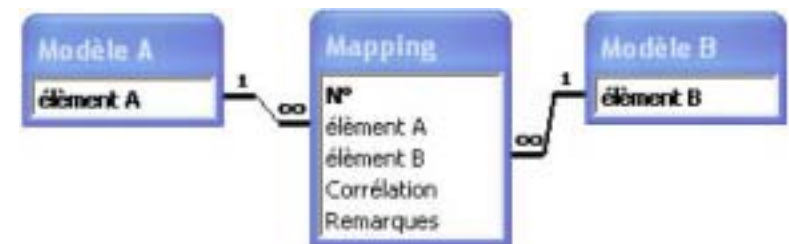


## Step 2 : analysis of models synergy

### The multi-model approach:

- Models choice
- **Analysis of models synergy**
- Construction of integrated model
- Adaptation of the integrated model to the enterprise context

- To analyze models synergy, we implement a mapping between models. This mapping should determine:
  - Levels of abstraction between selected models,
  - Treated functional sectors,
  - For each element of a model, its relation with elements of other models,
  - A level of correlation, in order to qualify each relation.




## Step 3 : Construction of integrated model

### The multi-model approach:

- Models choice
- Analysis of models synergy
- **Construction of integrated model**
- Adaptation of the integrated model to the enterprise context

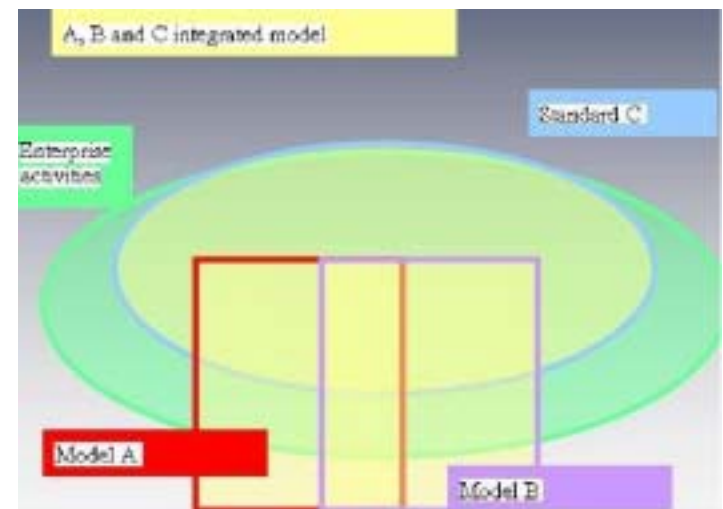
### ■ This step will allow us to:

- Resolve all contradictions in the relations between the elements of models,
- Avoid unfolding of work by consolidating the elements with relations of inclusion and identity,
- Maximize the synergy potential by combining complementary elements.

 We create a theoretical integrated model valid for any enterprise wanting to implement two models A and B.

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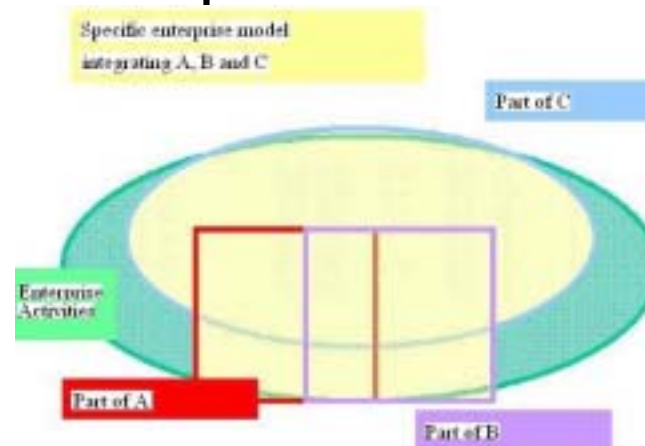


## Step 4 : Adaptation of the integrated model

### The multi-model approach:

- Models choice
- Analysis of models synergy
- Construction of integrated model
- **Adaptation of the integrated model to the enterprise context**

- This step will allow us to retain from each model only relevant elements with enterprise activities and objectives of quality project and to adapt the theoretical integrated model to human and cultural context of the enterprise.



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# Combining ISO 9001 : 2000 and CMMI



- ISO 9001: 2000 and CMMI are both based on a process approach. They are also, compatible and intrinsically complementary.

CMMI	ISO 9001:2000
Applicable in a context of software and system development	Cover all the company activities, including system and software development
Identify the operational practices to implement	Is limited to the definition of the principles of management of quality system

# CMMI and ISO 9001 : 2000 mapping



- Basing on CMMI and ISO 9001 : 2000 synergy, we implement a mapping in order to determine:
  - CMMI practices treated par ISO 9001 : 2000 chapters.
  - ISO 9001 : 2000 chapters treated par CMMI practices.

**Mapping pratique CMMI vers chapitres ISO9001 v2000**

Selectionner:  
un niveau de maturité:

Selectionner:  
un domaine de processus:

Selectionner:  
une pratique:

Titre du domaine de processus:

Titre de la pratique:

Description de la pratique:

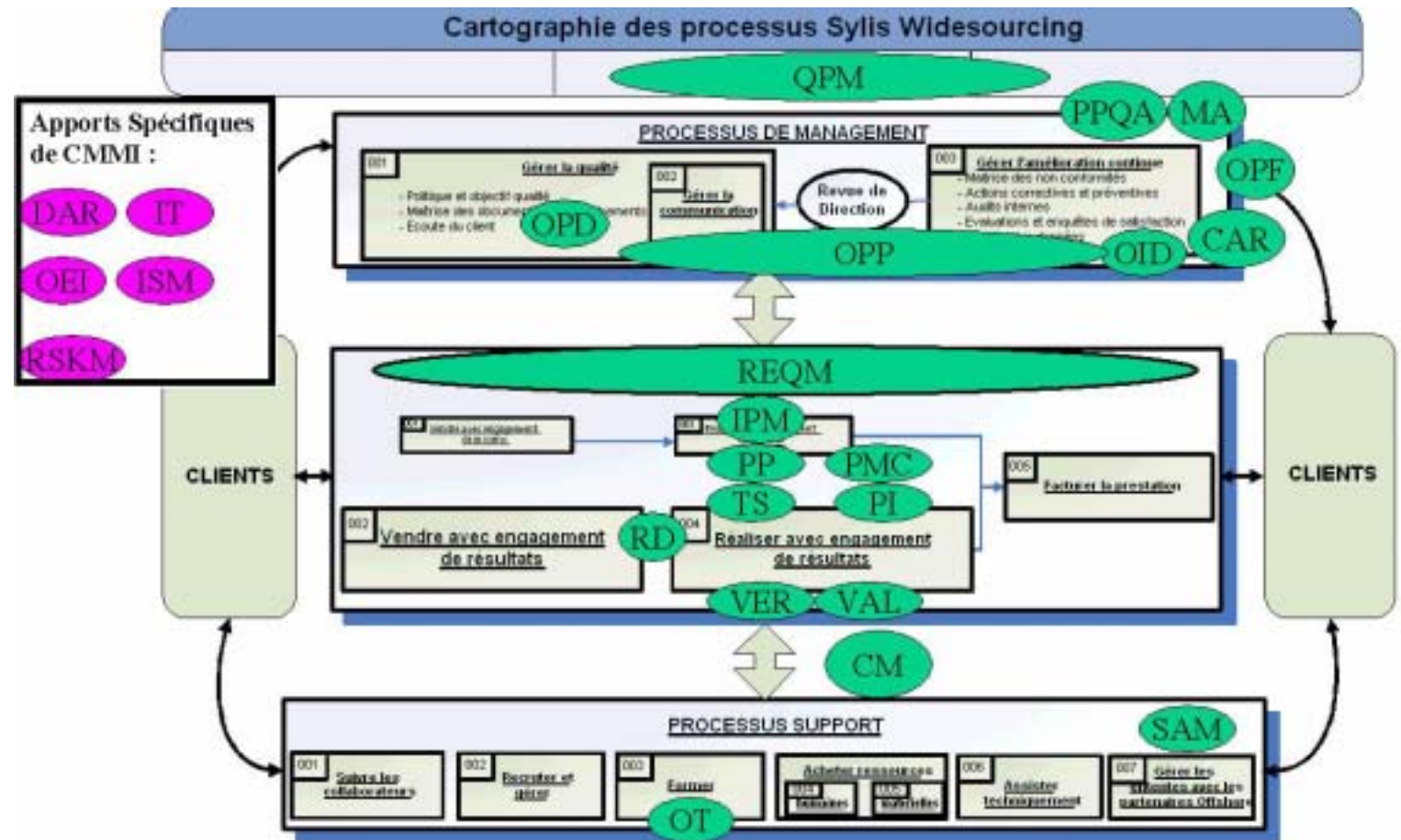
**Résultat du Mapping :**

Chapitre ISO	Titre du chapitre	Coresolution	Remarque
7.2.3	Communication avec le client	M	CMMI est plus facile
8.2.2	Audit interne	S	Plus d'ambiguïté des processus de CMMI est plus explicite.
8.4	Analyse des données	M	CMMI ne recherche pas explicitement la satisfaction du client



# Process cartography

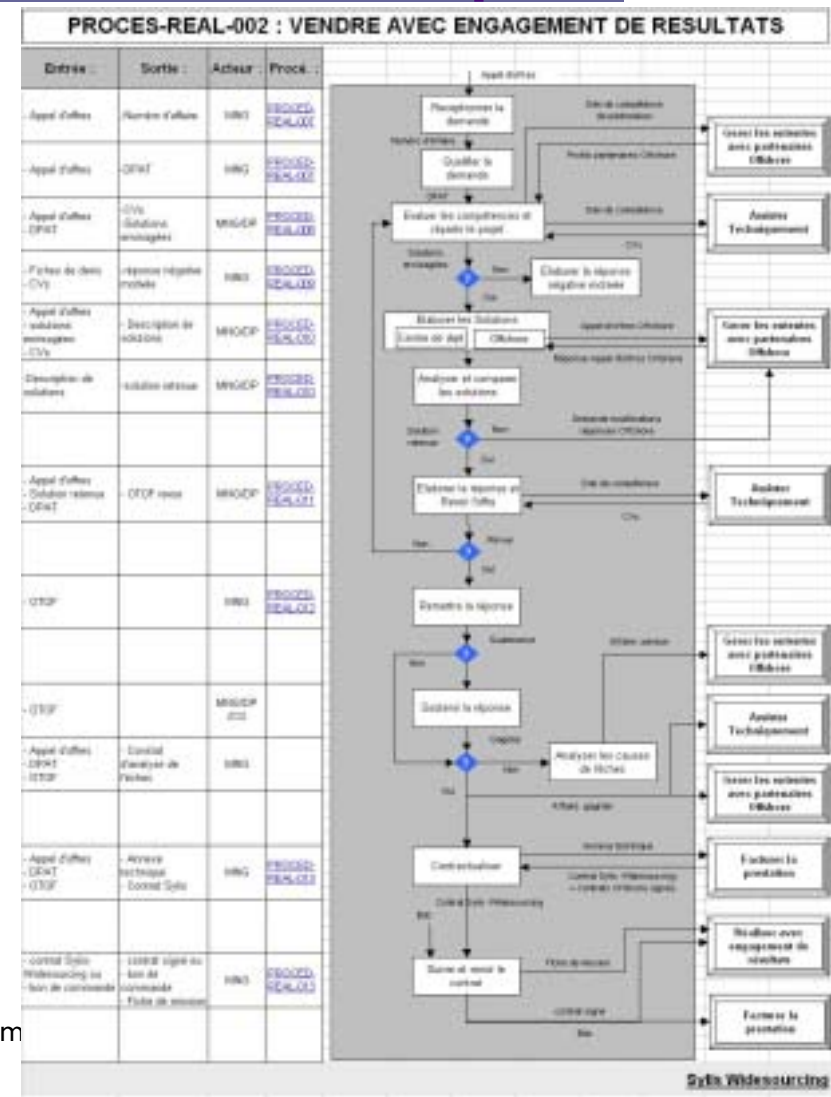
- PA untreated by ISO 9001 : 2000 are pink.
- All the rest of PAs are localized in our ISO procedures.





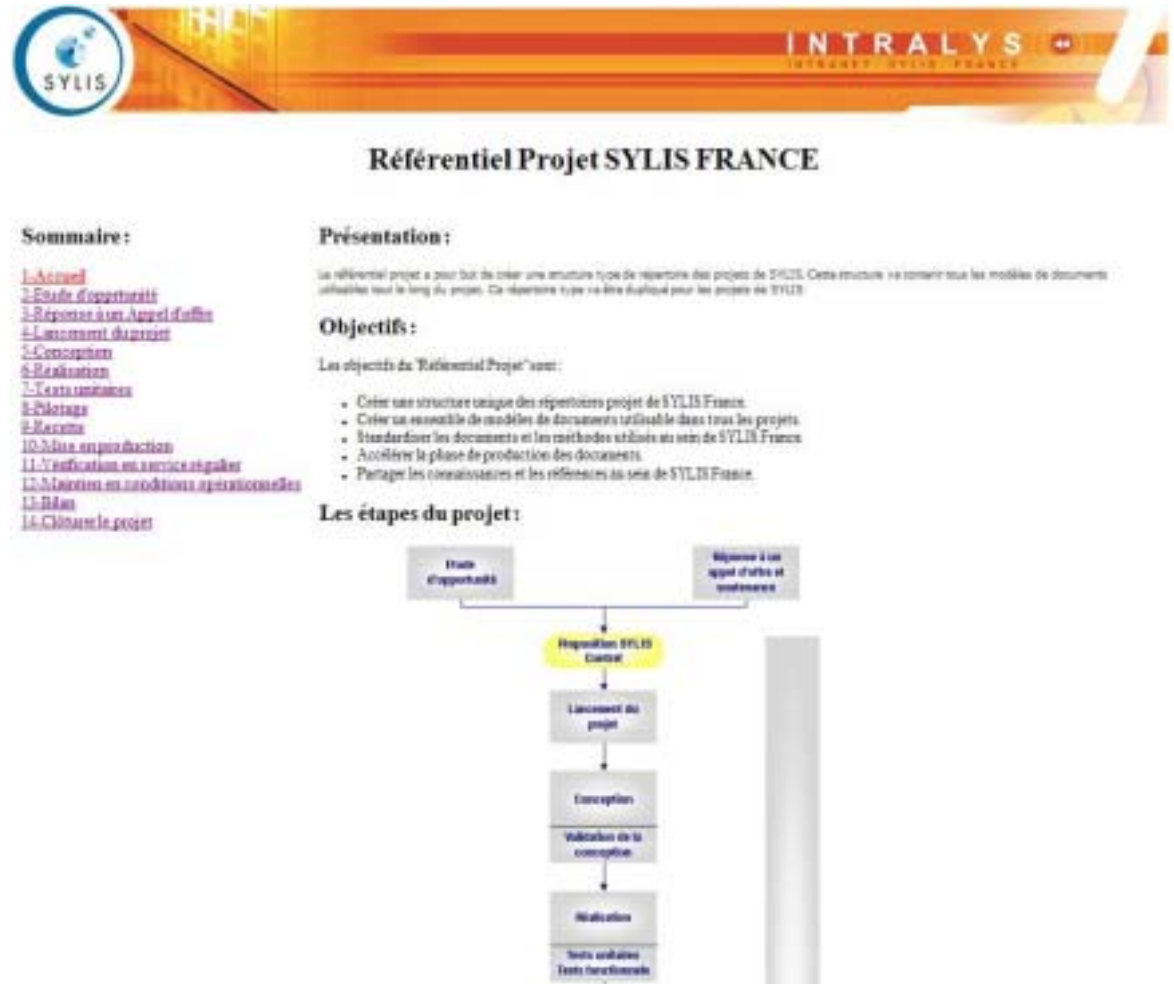
# A process example

- ❑ To each process is attached:
  - Process' risks
  - Performance indicators of the process.
  - Resources (human or other processes) concerned.
  - The explanation of all mentioned procedures.
  - The CMMI PAs integrated in our process.



# Documentary reference

- ❑ Create a standard structure of project documents.
- ❑ Gather the work data of all the project actors.
- ❑ To capitalize on old project.



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## Conclusion

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- ❑ The implementation of a reference frame integrating quality standards ISO 9001 : 2000 and CMMI.
- ❑ Obtaining ISO 9001 : 2000 certification on February 2007.
- ❑ Planning CMMI certification during the 1st semester of 2008.
- ❑ The application of the process improvement model IDEAL .

## Perspectives

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- ❑ Extend our model to integrate a 3rd quality standard (ITIL).
- ❑ Work on interoperability of our reference frame with our partner processes to allow the dialogue and the communication.

**Thank you for your  
attention**