ÉCOLE DE TECHNOLOGIE SUPÉRIEURE – MONTRÉAL - CANADA

A Measurement Approach Integrating ISO 15939, CMMI and the ISBSG

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Agenda

- **Introduction**
  - ✓ State-of-the-art
  - ✓ Measurement & Historical Data
- **ISO 15939 – An overview**
  - ✓ Software Measurement Process
  - ✓ Information Needs & Products
- **ISO 15939 vs. CMMI**
  - ✓ Using Both
  - ✓ Methodology
  - ✓ Measurement Interest Areas
  - ✓ QA vs. V&V
- **CMMI – An Analysis**
  - ✓ From ML2 to ML5
  - ✓ An Overview
- **ISBSG – A Turnkey Solution**
  - ✓ Introduction
  - ✓ Analysis
  - ✓ Comparing with CMMI
- **Conclusions**

Introduction

State-of-the-art

- Software Engineering Performances can benefit from continuous improvements
  - ✓ Measurement is the way to objectively evaluate and assess processes against a baseline
  - ✓ "You cannot control what you cannot measure" (De Marco)
- Well-known and recognized sources of information are…
  - ✓ ISO/IEC 15939:2002 (Measurement Process)
  - ✓ CMMI (Capability Maturity Model Integration) Measurement & Analysis (ME) process
  - ✓ ISBSG (International Software Benchmarking Standards Group) data repository and related glossary

LBU1

Introduction

Measurement & Historical Data

- **ISO 15939 / CMMI**
  - ✓ They cover – with few differences (e.g. environment) - all the phases and activities for successfully implementing a measurement program **but** they do not provide measures, only guidance to define measures addressing specific needs
- **ISBSG r10**
  - ✓ It does not provide any process, **but** provides measures and historical data from more than 4000 projects that could be useful for making ISO 15939/CMMI more effective.

Q: …so: for practical use in industry for more efficient measurement and better decision making,can we combine these best practices?

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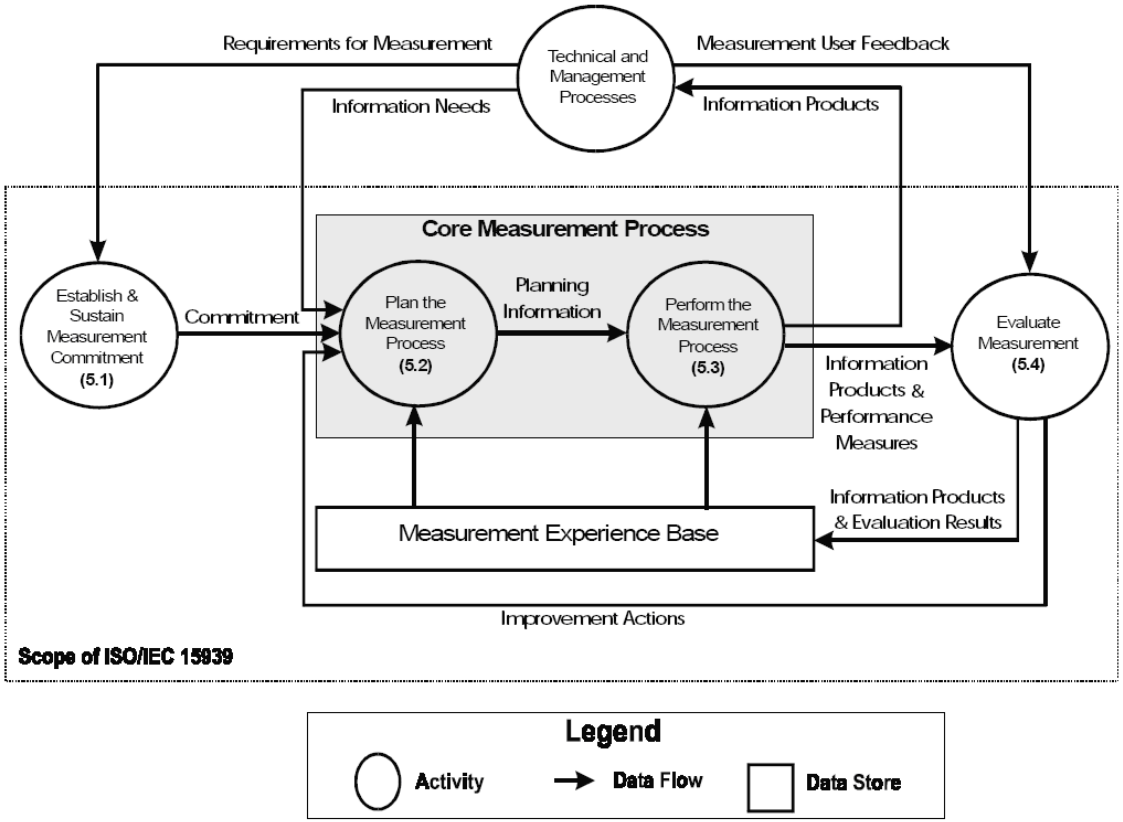
ISO 15939 – An Overview

Software Measurement Process

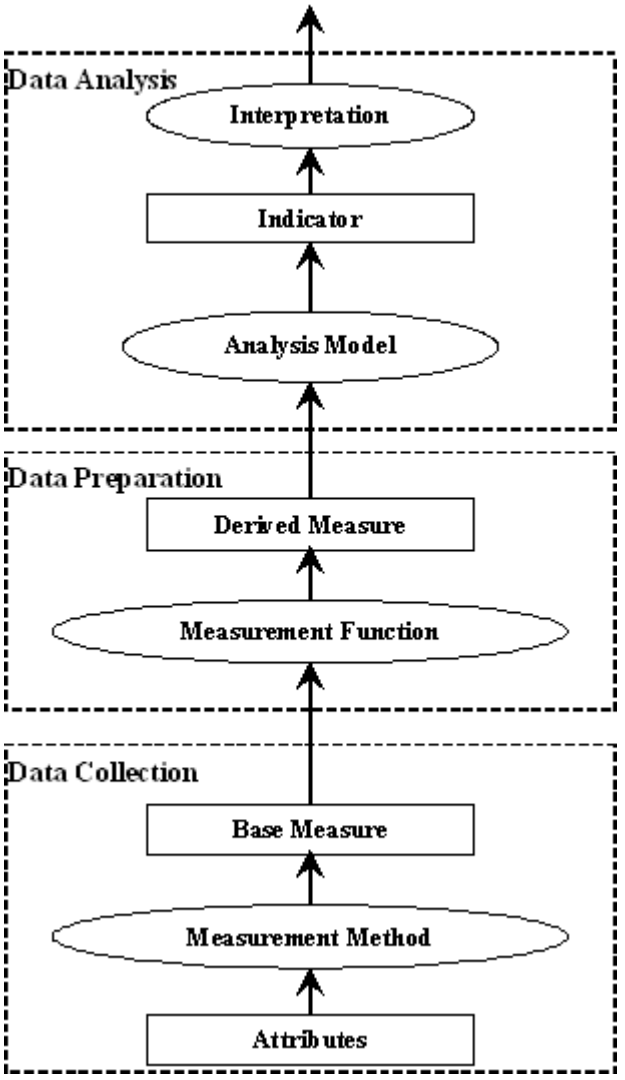
- Four main activities, with a Core Measurement Process
- A Measurement Experience Base as the wheel for such a core process



ISO 15939 – An Overview

Information Needs & Products

- Measurement Information Model (MIM) – Annex A
  - ✓ MIM is an improvement of the basic GQM paradigm
- Subdivided into three steps
  - ✓ **Data Collection** → including measurement methods and base measures
  - ✓ **Data Preparation** → including the agreed-upon mathematical formula and related labels (e.g. measurement functions and derived measures);
  - ✓ **Data Analysis** → including the analysis models, indicators and interpretation



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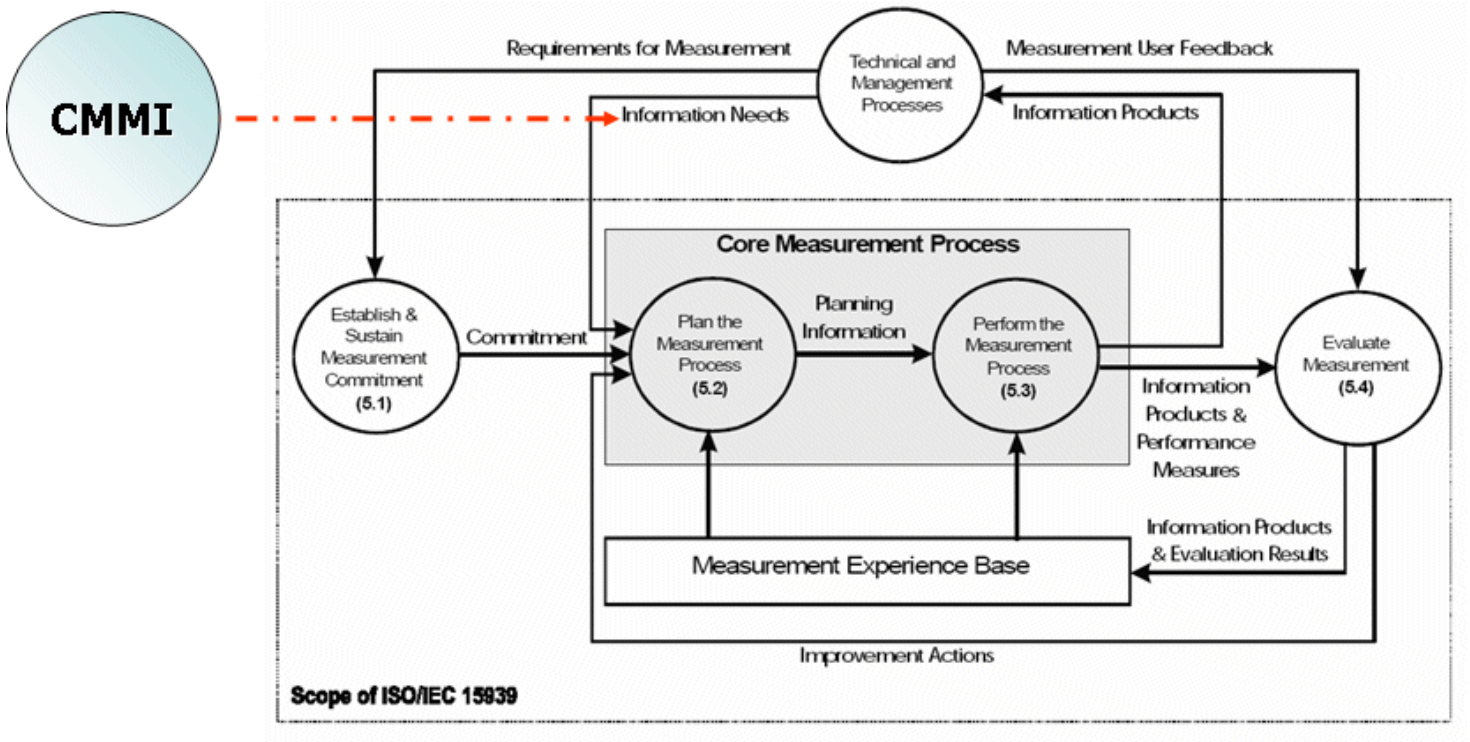
ISO 15939 vs. CMMI

Using Both

- Integrability
  - ✓ CMMI v1.2 offers guidance for filling the *empty space* left open in ISO 15939 §5.2.2.1 (*Information needs for measurement shall be identified*)



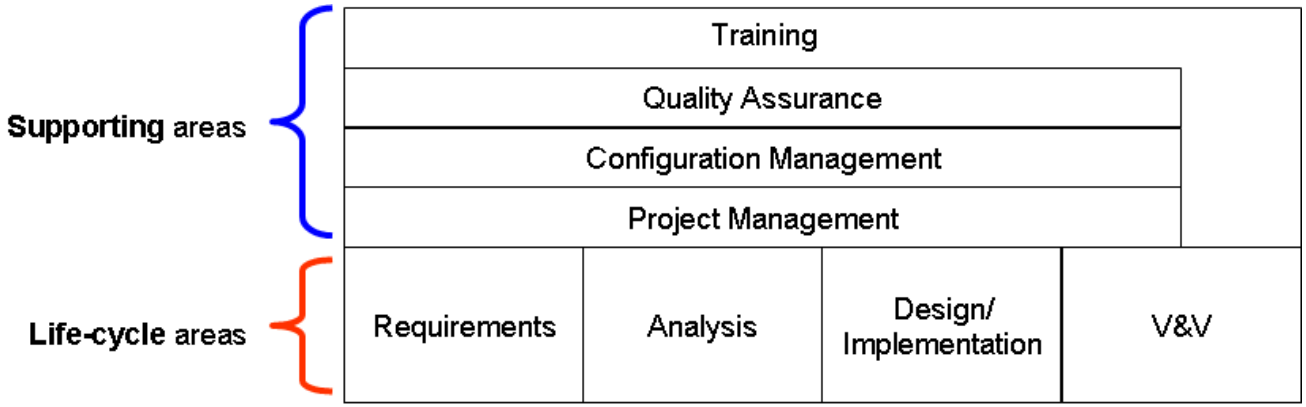
ISO 15939 vs. CMMI

Methodology

- ISO's 15939 Information Needs are based on…
  - ✓ Goals, Constraints, Risks and Problems
- CMMI's Information Needs are based on…
  - ✓ Goals, Practices in the SE/SW environment
- A CMMI Goal/Practice related to Measurement can:
  a) Generate data that could be analyzed in order to produce an objective basis for communication or decision-making
  b) Involves decision-making that would benefit from objective information
  c) Explicitly requires measurement as part of the measurement process
- Relevance Levels (till the more relevant):
  1. "**mentioned**" when the information need is based on the first and/or second criterion;
  2. "**recommended**" when the information need is expressed in terms of measurement without being explicitly required as a part of the measurement process;
  3. "**required**" when the information need is based on the third criterion.

ISO 15939 vs. CMMI

Measurement Interest Areas (MIA)

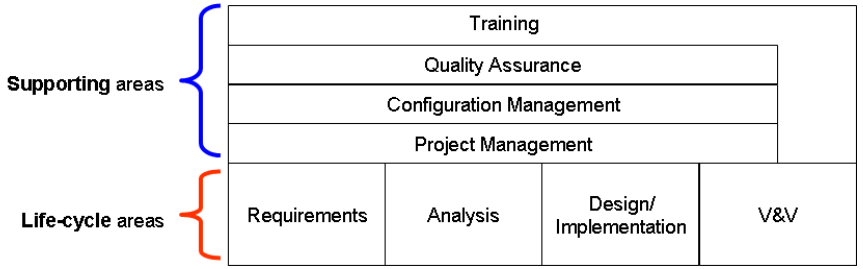


- Goal: to organize the extracted information needs, classifying them and group in a high-level manner
- Sources: ISO 12207 + CMMI
  - ✓ Life-cycle Areas (primary processes)
  - ✓ Supporting Areas (organizational & support processes)

ISO 15939 vs. CMMI

QA vs. V&V

Q: why QA and V&V are placed into different process groups?



- **QA vs V&V**
  - **V&V** → in the scope of a software measurement process, verification and validation activities measure the quality of a specific software product in order to support decision-making surrounding improvement (correcting bugs, re-factoring) of this specific software product.
  - **QA** → within the scope of a software measurement process, QA makes use of the measures with a view to evaluating actual process performance against the managed or defined process in order to support decision-making surrounding improvement of the organization as a whole.
  - **QA + V&V** → both aimed at improving software product quality, but from significantly different points of view.

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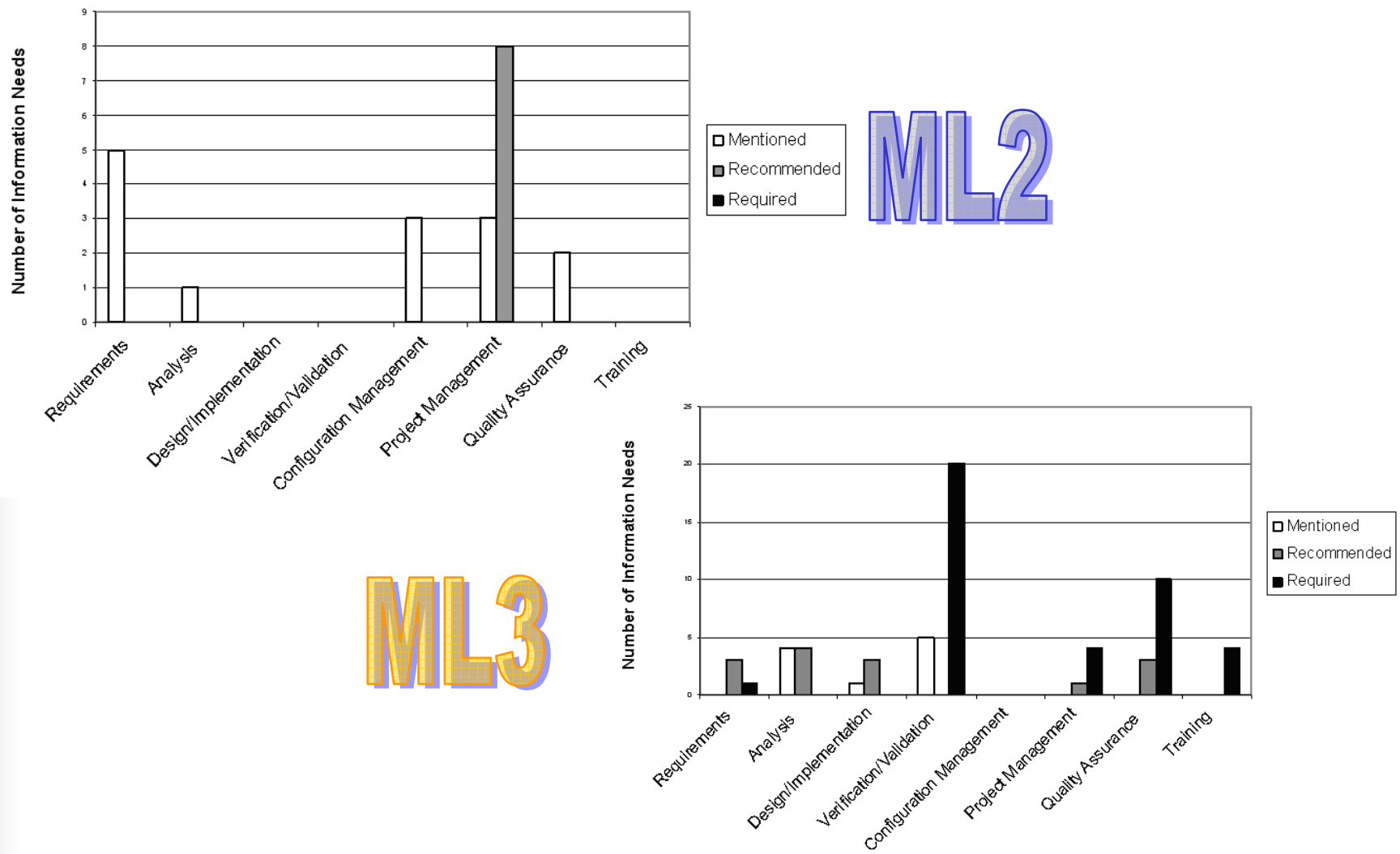
CMMI – An Analysis

From ML2 to ML5 (1/3)

- CMMI: Staged Representation
  - ✓ Maturity Levels (ML) allows to rate the maturity of an Organizational Unit
  - ✓ 5 ML, from 1 (ad-hoc) to 5 (optimizing)
- Analysis goal
  - ✓ Distribution of Information Needs along Maturity Levels
  - ✓ Each Measurement Information Area was evaluated

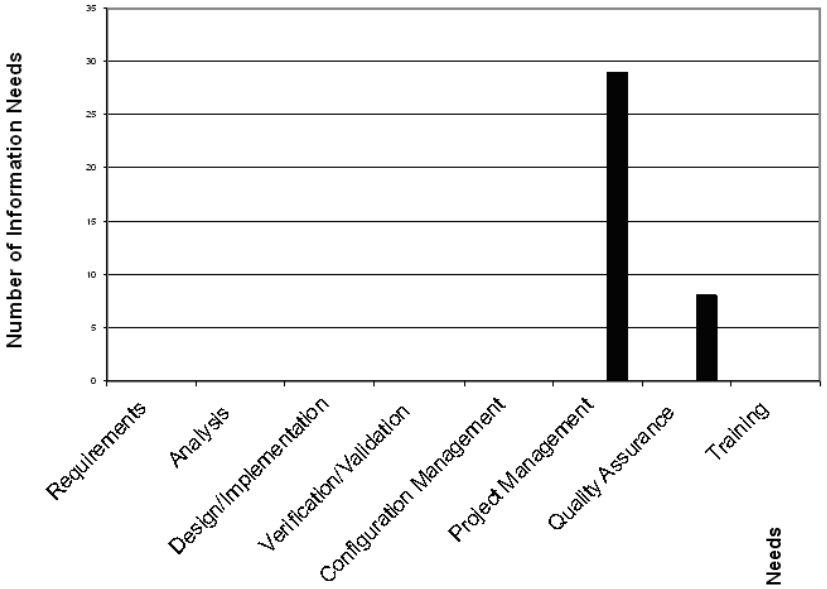
CMMI – An Analysis

From ML2 to ML5 (2/3)



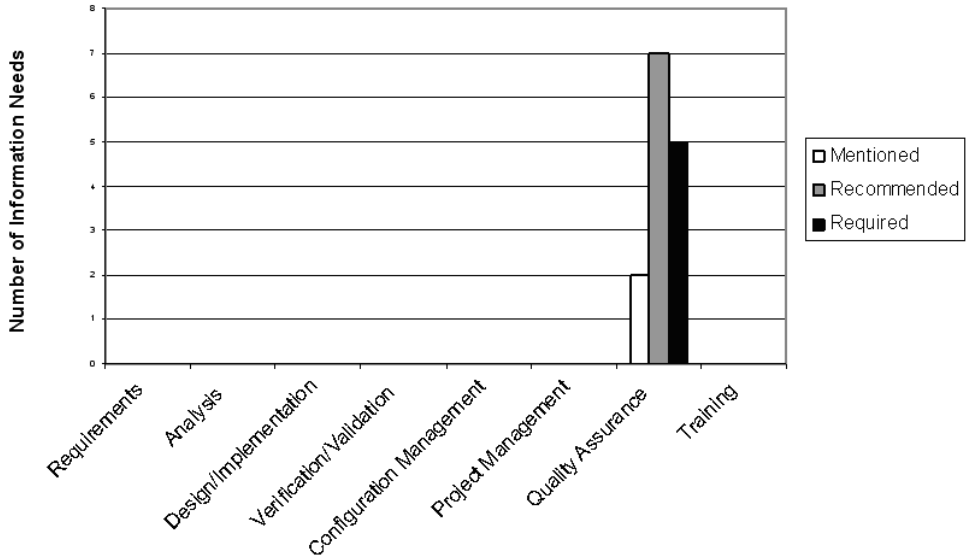
CMMI – An Analysis

From ML2 to ML5 (3/3)



ML4

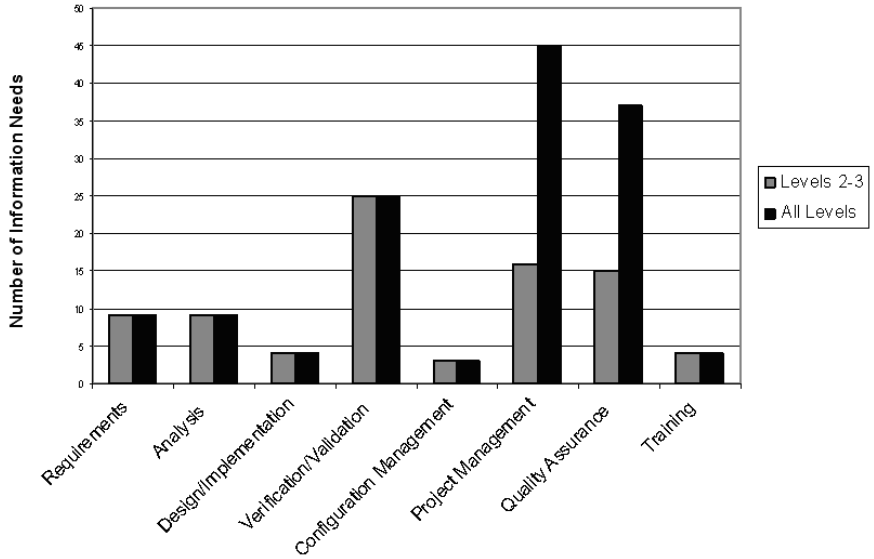
ML5



CMMI – An Analysis

An Overview

Goal: to understand the scope of Software Measurement Process



- ML2 + ML3 together, not only ML2
  - ✓It would be irresponsible to ignore V&V when implementing a measurement process
  - ✓ Approximated equivalence between CMMI ML2-3 and ISO 9001 certified companies (e.g. not possible to exclude PAs such as CAR & DAR)
  - ✓ Staged representation chosen, because easier to analyze

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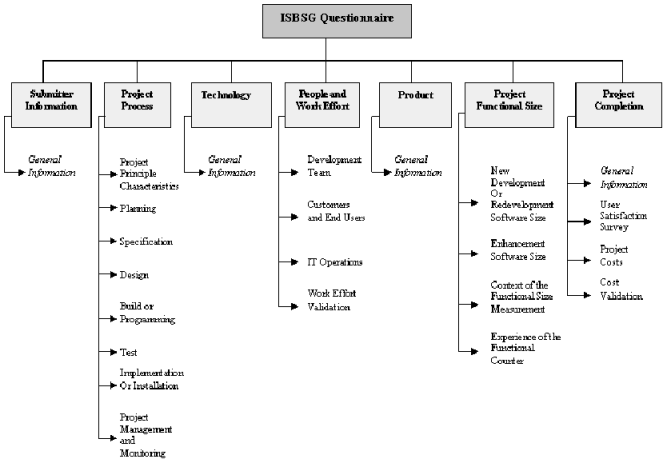
ISBSG – A Turnkey Solution

Introduction

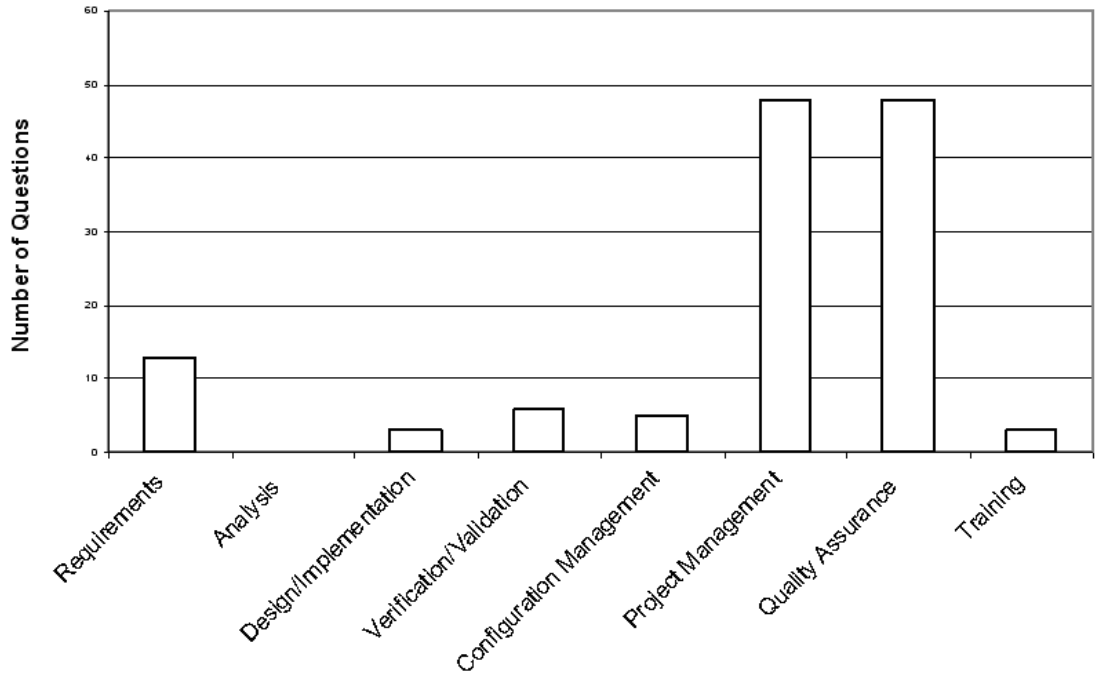
- ISBSG (www.isbsg.org)
  - ✓ Non-profit organization created in 1994,
  - ✓ Goal: to develop the profession of software measurement by establishing a common vocabulary and understanding of terms
  - ✓ Data repository (quite) yearly produced (current release: 10)
  - ✓ Organizational and Technical Data gathered
  - ✓ Questionnaire with 7 sections, 131 questions
- Advantages using ISBSG r10
  - ✓ Helps in faster implementations of the sw measurement process
  - ✓ Data from more than 4000 projects, both development and enhancement ones



ISBSG – A Turnkey Solution

Analysis

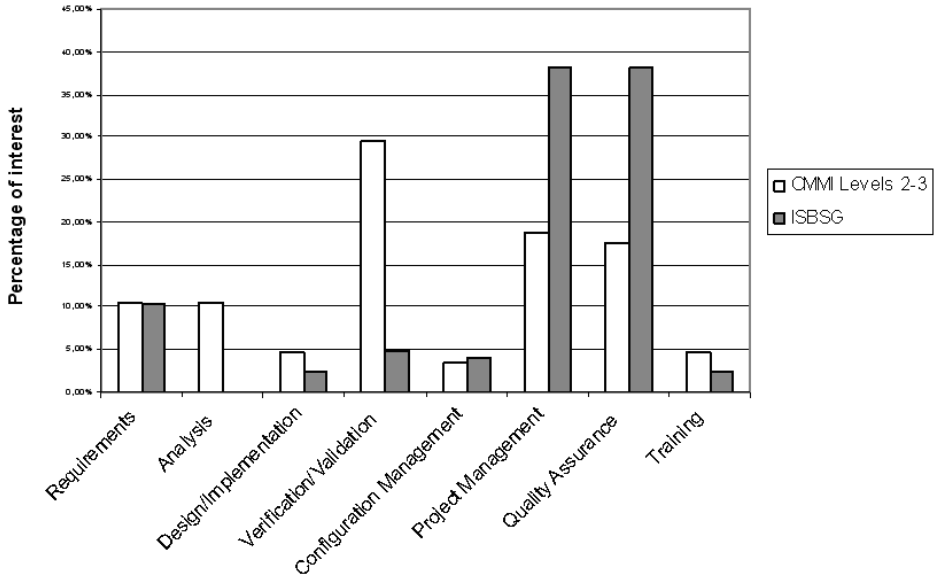
- Questionnaire Distribution
  - ✓ 131 questions, distributed into 7 sections
  - ✓ Project Management & QA are the more relevant MIA



ISBSG – A Turnkey Solution

Comparing with CMMI

- ISBSG-CMMI
  - ✓ No-documented 1:1 relationships
- Some ISBSG 'highlights'
  - ✓ focuses strictly on "project management" and "quality assurance"
  - ✓ lacks "verification and validation" data
  - ✓ does not consider "analysis" at all, not even risk analysis



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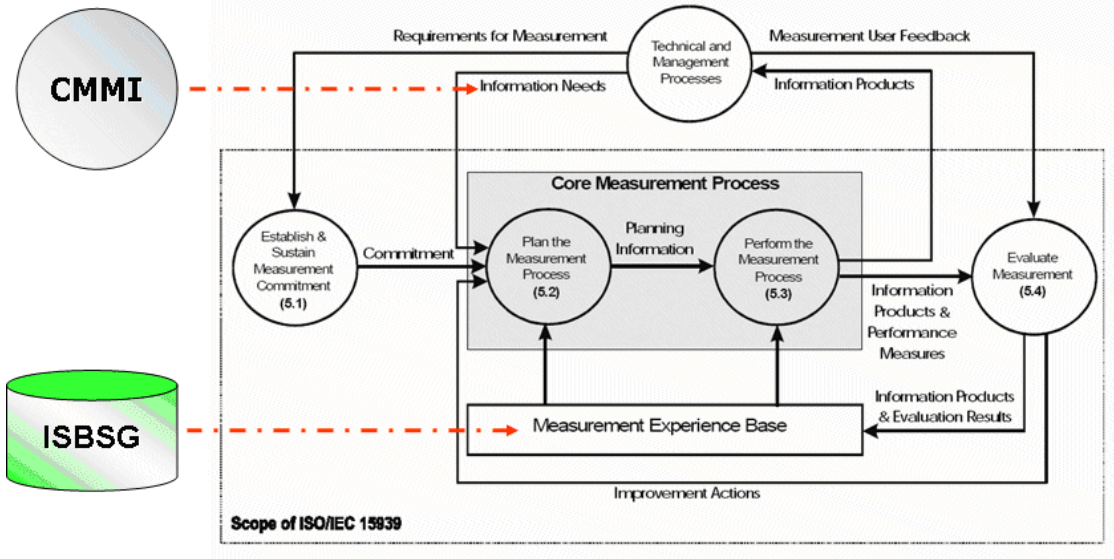
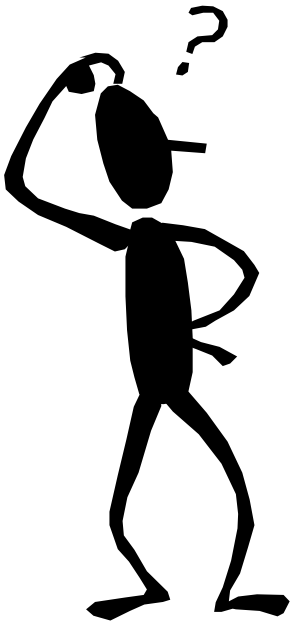
Conclusions

- ISO 15939 & CMMI can be used together, stressing information needs
- ML2+ML3 should be always considered as a unique logical group from a measurement viewpoint
- ISO 15939 asks for a Measurement Experience Base (MEB) that ISBSG can instantiate into an ICT organization, where its own historical data could not be available or for external benchmarks
- ISO 9126-x (parts 2-3-4) can provide further measures (more than 200) about quality product measures and be a companion to ISBSG



Q & A



Grazie! Thank you!

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