

Automotive Software Tips for benchmarking

Giuseppe Lami

System & Software Evaluation Center
Istituto di Scienze e Tecnologie dell'Informazione
Consiglio Nazionale delle Ricerche
Pisa (Italy)

Automotive SPIN Italia
(www.automotive-spin.it)



Talk agenda

- Automotive software: overview
- State of the practice
- Empirical Study Methodological Approach
- Empirical Study Results
- Conclusions

ISTI – Information Science and Technologies Institute
is located at the CNR Research Area in Pisa

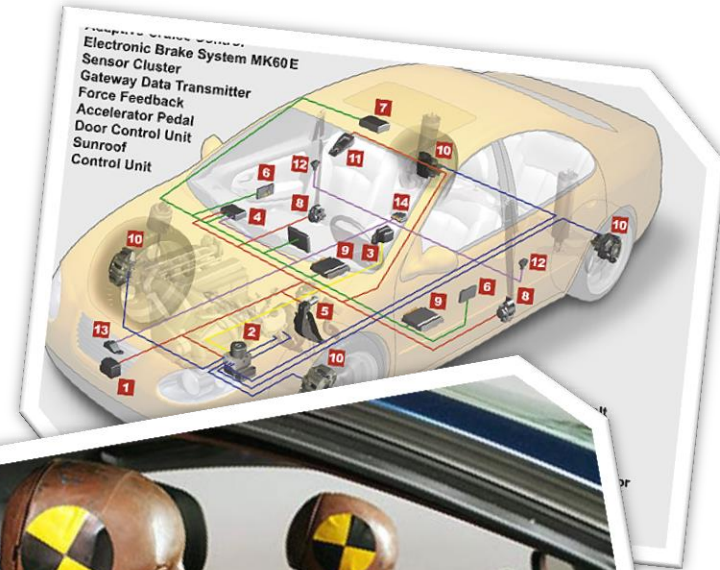
- 103 Research staff (Researchers, Technologists)
- 59 Technical and Administrative staff
- 53 Research Associates
- 96 Graduate Fellows, PhD Students, Post-doctoral Fellows, Theses, Stages



System & Software Evaluation Center

Automotive Software

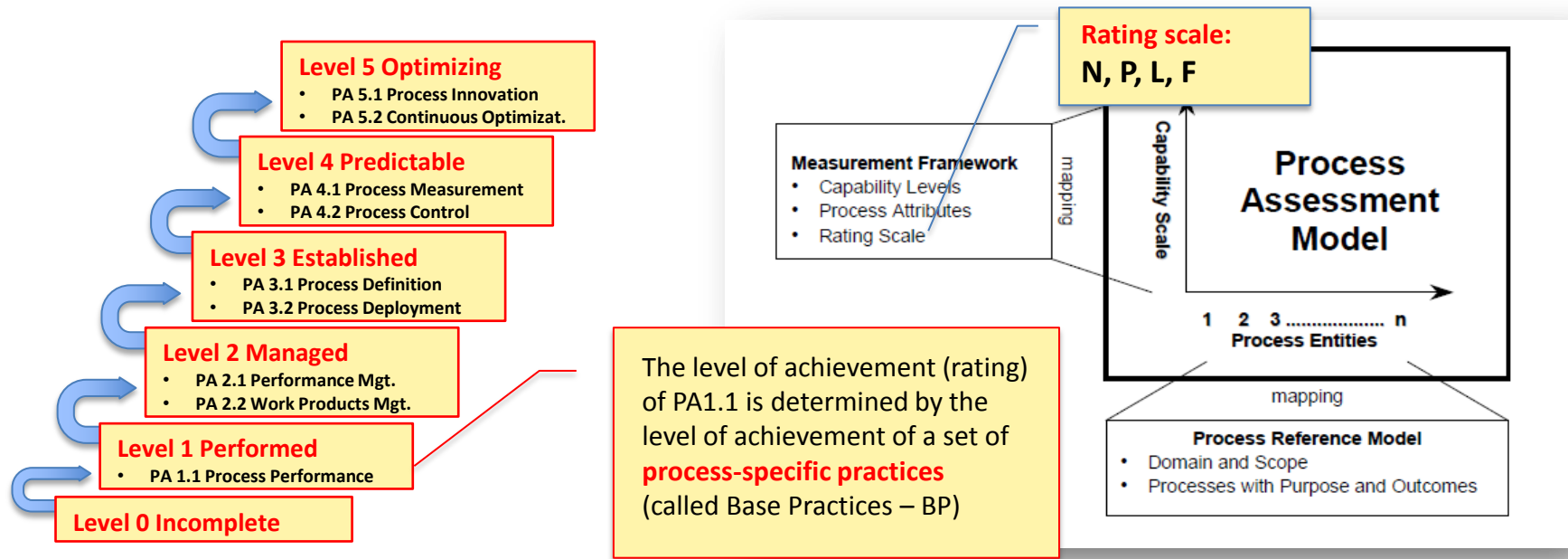
- Very high innovation rate in the last decade
- Interoperability issues
- **Functional** safety issues dramatically increasing
- Cyber-security and functional safety is the true challenge today



Automotive software industry: state of the practice

- Literature: studies based on questionnaires and surveys involving stakeholders (management, engineering, quality staff)
- Lack of empirical studies based on real data from real projects

Automotive SPICE: a process assessment model



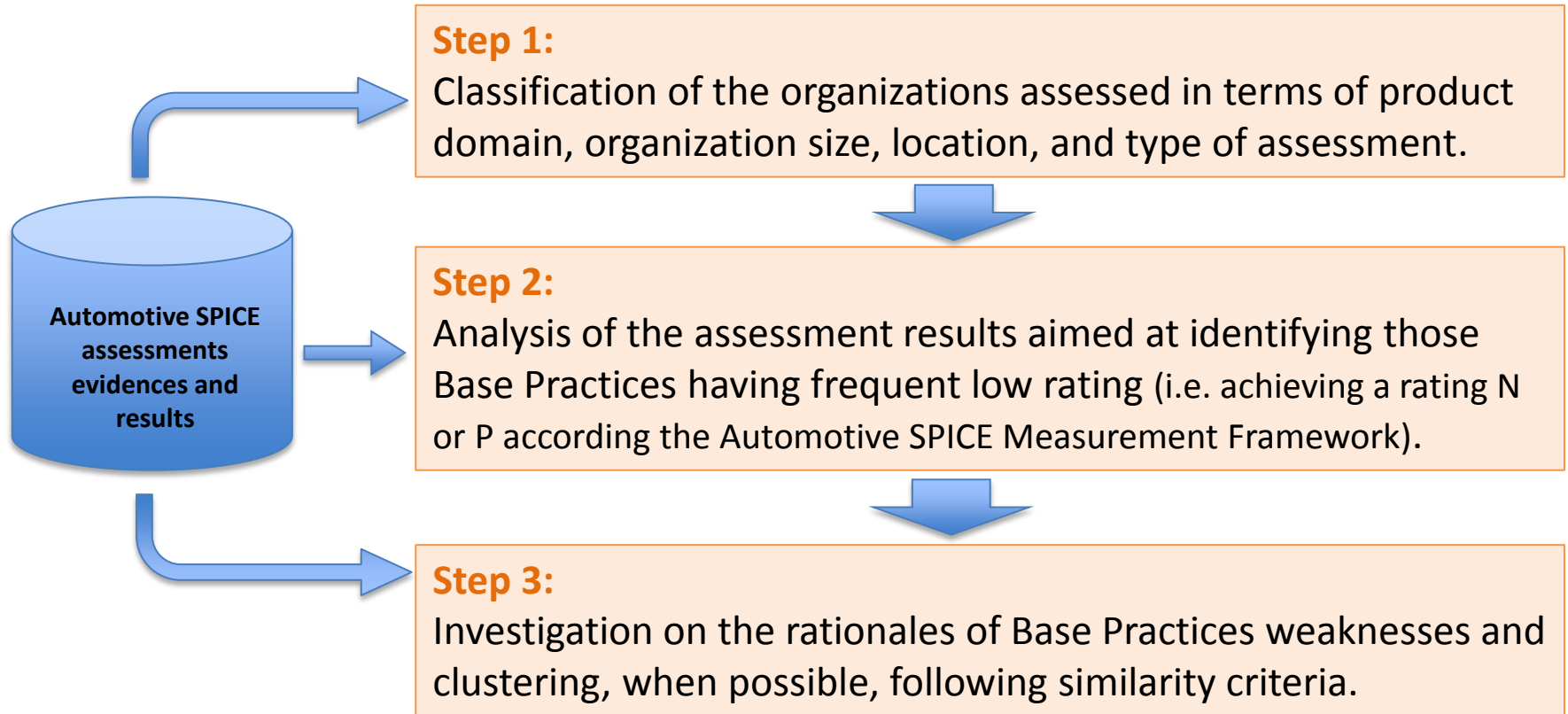
Automotive SPICE PRM

ACQ.3 - Contract agreement	ACQ.15 -Supplier qualification	SUP.1 - Quality Assurance	SUP.10 - Change request management	ENG.5 - Software design
ACQ.4 - Supplier monitoring	MAN.3 - Project management	SUP.2 - Verification	PIM.3 - Process improvement	ENG.6 - Software construction
ACQ.11 - Technical requirements	MAN.5 -Risk management	SUP.4 - Joint Review	ENG.1 - Requirement elicitation	ENG.7 - Software integration test
ACQ.12 - Legal and administrative Requirements	MAN.6 - Measurement	SUP.7 - Documentation	ENG.2 - System requirements analysis	ENG.8 - Software testing
ACQ.13 - Project requirements	SPL.1 - Supplier tendering	SUP.8 - Configuration management	ENG.3 - System architectural design	ENG.9 - System integration test
ACQ.14 - Request for proposals	SPL.2 - Product Release	SUP.9 - Problem resolution management	ENG.4 - Software requirements analysis	ENG.10 - System testing

Empirical Study Scope & Objectives

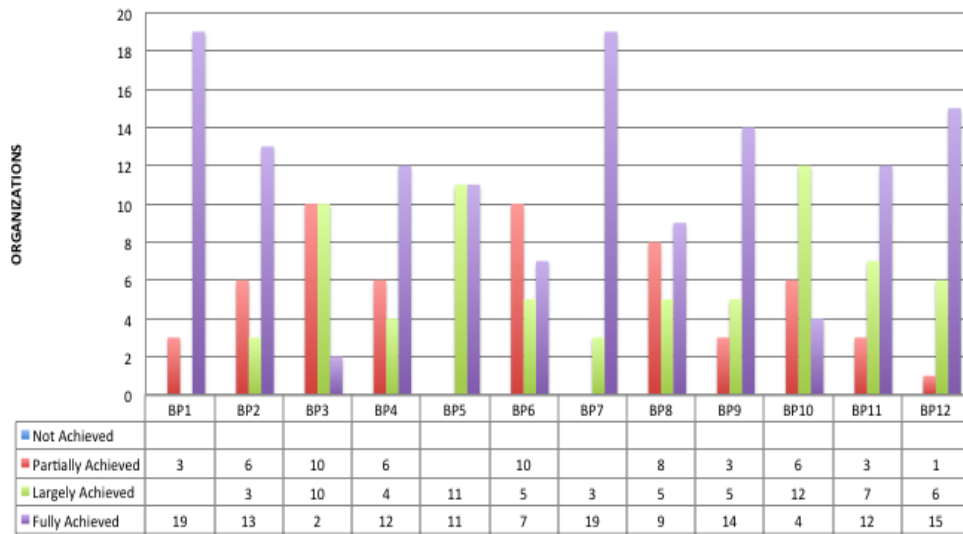
- The processes in the scope of this study are:
 - Project management process (MAN.3)
 - Quality assurance process (SUP.1)
- The objectives of this study are:
 - to identify the most frequently weak practices on the basis of a set of indicators taken from the outcomes of 23+ Automotive SPICE assessments performed in Europe and Asia.
 - to analyze those weak practices to understand common causes.

Empirical Study Methodological Approach



Study Results: Project Management

MAN.3 PROJECT MANAGEMENT



Base Practices more frequently weak:

- MAN.3.BP.3:
Determine and maintain estimates for project attributes;
- MAN.3.BP.10:
Monitor project attributes
- MAN.3.BP.6:
Define and maintain project schedule;
- MAN.3.BP.8:
Establish project plan;

Resulting Gap Clusters:

MAN.3.GC1 - Operative scheduling definition and control is informal [BP.6].

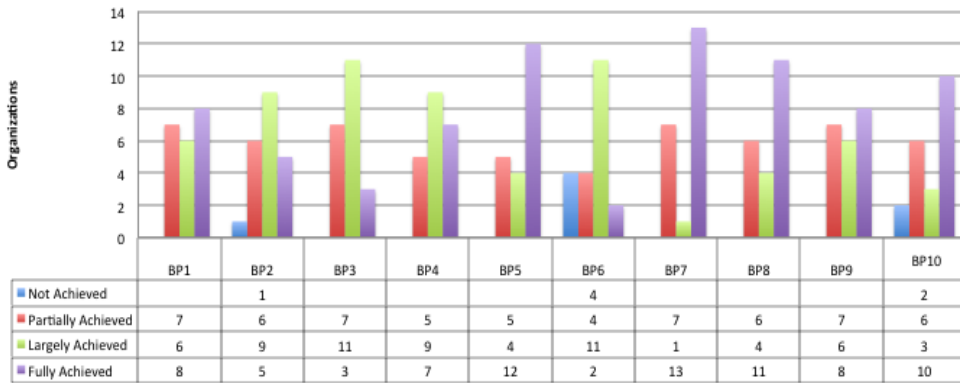
MAN.3.GC2 - Poor project planning update and dissemination [BP.8].

MAN.3.GC3 - Lack of estimations [BP.3].

MAN.3.GC4 - Poor effort management [BP.8, BP.10].

Study Results: Quality Assurance

SUP.1 QUALITY ASSURANCE



Base Practices more frequently weak:

- **SUP.1.BP2:**
Develop and maintain an organization structure which ensures that quality assurance is carried out and report independently.
- **SUP.1.BP3:**
Develop and implement a plan for project quality assurance based on a quality assurance strategy.
- **SUP.1.BP6:**
Assure quality of process activities.

Resulting Gap Clusters:

SUP.1GC1 - Quality assurance organizational lacks [BP.2, BP.3]

SUP.1.CG2 - Poor quality assurance for processes [BP.3]

SUP1.GC.3 - Poor quality assurance planning [BP.6]

Study Results: SW Engineering

- Data related to Software Testing processes are under analysis;
- Some preliminary results:
 - Statistics show weak practices in
 - testing strategy definition (for all level of testing – unit, integration, functional test)
 - Traceability: incomplete traceability among sw requirements, sw design, test cases
 - Statistics show strong practices in
 - Software test cases definition and execution
 - Software test results reporting

Conclusions

- Taking advantage from Automotive SPICE assessments to identify common weak (and strong) practices;
- Assessment data repository potentially very large (thousands of Automotive SPICE assessment performed) → potential for valid statistic results
- Real data from real projects
- Utility of results
 - Setting up improvement actions
 - **Benchmarking**

Thank you

Contacts:

giuseppe.lami@isti.cnr.it

